

2021 Annual Interpretive Report

RAAF Base Learmonth

DEF19009



Prepared for
Department of Defence

30 March 2023



now



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Executive Summary

Introduction

Cardno, now Stantec, were engaged by the Australian Department of Defence (“the Client”) to carry out the Per- and Poly-Fluoroalkyl Substances (PFAS) Ongoing Monitoring Plan (OMP)¹ at the Royal Australian Air Force (RAAF) Base Learmonth, Western Australia.

The Ongoing Monitoring Plan (OMP) outlines the rationale and scope for the monitoring of the concentrations and extent of per- and poly- fluoroalkyl substances (PFAS) in groundwater, seepage water, surface water and sediment originating from the RAAF Base Learmonth, WA (‘Base’). The monitoring program consists of biannual monitoring events, as well as a ‘first flush’ monitoring event following the first heavy rainfall of the wet season. A first flush event is important to measure as it is when PFAS concentrations are typically higher than they would be measured at other times. This is due to the build-up of PFAS over the dry season.

The OMP includes sampling and analysis not only from the Base, but also from a number of surrounding (off-Base) waterways. The Base and these surrounding areas are collectively referred to as the ‘Management Area’ and was identified during a Detailed Site Investigation in 2018 (GHD, 2018)². The Management Area is shown on Figure 2, Appendix A of this report.

Objectives

The specific objectives of the monitoring specified in the OMP are to:

- > Evaluate the nature and extent (spatial and temporal) of PFAS impact in groundwater, seepage water and surface water pathways associated with Base sources of PFAS derived from historical use of Aqueous Film-Forming Foam (AFFF);
- > Monitor the migration of PFAS in groundwater, seepage water and surface water from the Base;
- > Provide confirmation of the current understanding of risk; and
- > Provide supporting data for assessment of management actions, where relevant.

Monitoring Scope

The November 2020 – October 2021 monitoring period comprised three monitoring events [November 2020, first flush 2021 (March 2021) and June 2021]. The scope of work for the biannual monitoring events comprised monitoring of 49 groundwater wells, six water seepage locations and 49 collocated sediment and surface water locations, as specified in the OMP. The first flush event conducted in March 2021 comprised the monitoring of 49 collocated sediment and surface water locations following the first heavy rainfall of the season.

Groundwater elevation data was collected from 44 groundwater wells during the biannual monitoring events.

Works were conducted in general accordance with the Sampling and Analysis Quality Plan (SAQP) (Cardno, 2021a), except as summarised in Section 3.6 of this report.

PFAS concentrations in all media tested generally remained within the same order of magnitude as those measured in previous monitoring rounds. Results from previous monitoring rounds can be found in the 2020 Annual Interpretive Report, as well as the Detailed Site Investigation.²

What is an ‘order of magnitude’?

This refers to something decreasing or increasing by multiples of ten. For instance, an increase from 10 to 100 is an order of magnitude increase. When assessing changes in PFAS concentrations at an individual location, all concentrations are considered when determining trends, but order of magnitude changes are discussed separately as they represent a significant change in concentrations from what was reported in the previous event.

If a change is close to established health or environmental criteria, it will also be considered significant.

¹ The OMP is publically available at www.defence.gov.au/Environment/PFAS/learmonth, and is found as Attachment 1 of the PFAS Management Area Plan

² Publically available at www.defence.gov.au/Environment/PFAS/learmonth

The current monitoring network is considered adequate to monitor PFAS in groundwater, surface water runoff and sediment, and to provide an early detection of significant changes in migration.

Groundwater Results

Groundwater Flow Direction

The local groundwater flow pattern (GHD, 2018) at RAAF Base Learmonth was observed to be following the regional flow regime; that is, flowing toward the east. The groundwater flow direction greatly restricts the flow of contaminated groundwater from the Base to Wapet Creek or Exmouth Gulf. Instead, groundwater from the Base tends to flow towards an area of groundwater depression between the Base and the coast. This groundwater depression is naturally occurring due to the surface and subsurface conditions, and means that water preferentially flows towards the depression. As a result, the area has elevated salinity and there is very little overall flow to the surface waters located to the east. It is noted, however, that groundwater levels in wells near the coast are expected to be influenced by the ocean tides.

The results of the OMP monitoring events supported the historical gauging results and groundwater flow directions, with some locations closer to the coast indicating a slight preferential flow to the coast.

PFAS Concentrations

PFAS concentrations in groundwater generally remained within the same order of magnitude as historical data and didn't display any seasonal variability. That is, there was no notable difference between the concentrations measured in the two biannual sampling events even though they are during different seasons.

With the addition of the 2020 and 2021 sampling events, all monitoring wells now have sufficient data to conduct trend analysis to support the interpretation. The results predominantly indicated that there were potentially stable trends or no statistically significant trends in PFAS concentrations. This means there is no observed increasing or decreasing trend in the measurements at this time so there are no changes in our understanding of the plume extents and migration of PFAS.

PFAS concentrations within the on-Base source areas ranged above and below the HEPA (2020) criteria for recreational use (2.0 µg/L). Consistent with previous monitoring, the highest concentrations were within one order of magnitude above the criteria, while the lowest concentration within two orders of magnitude below the criteria.

The highest PFAS concentrations in groundwater outside of the source areas were reported at two on-Base wells relatively close to the fuel farm and maintenance area. However, both these on-Base monitoring locations also recorded a new concentration minimum in June 2021. Further monitoring will provide a greater understanding of any trends in concentrations at these locations.

The majority of off-Base wells located between the Base and the coastline reported PFAS concentrations below the laboratory limit of reporting (LOR) with a couple of exceptions within the northern drainage channel which recorded perfluorooctane sulfonate (PFOS) concentrations marginally above the LOR in November 2020. This is consistent with previous monitoring events.

The 2020-2021 groundwater data, supported by gauging records, confirms the current understanding of the risk for the Management Area, which is low and acceptable.

Seepage Water Results

Seepage water is water that is present in the ground and is moving between surface water and groundwater. The monitoring of seepage water provides data to assess the potential risk of PFAS migrating to the Exmouth Gulf environment. None of the seepage water samples collected during the reporting period (November 2020 – October 2021) recorded detectable PFAS concentrations above the laboratory LOR.

Given the absence of detectable PFAS concentrations and considering that seepage water will be diluted when it reaches the Exmouth Gulf, the potential risk to the environment remains low and acceptable.

Surface Water Results

Surface water sampling was somewhat limited by the majority of the monitoring locations being found dry during the biannual monitoring rounds. Surface water concentrations from locations that were able to be sampled during the biannual monitoring events were generally of the same order of magnitude as historical

What is a 'limit of reporting'?

The limit of reporting (LOR) is the lowest concentration level that the laboratory is able to measure in a sample with a reasonable degree of certainty. Where monitoring shows <LOR, it means that if PFAS is present in the sample it is too low for the laboratory to measure with any degree of certainty.

data. Some new concentration maximums were noted during the March 2021 first flush sampling event, however most of these locations have been sampled less than 3 times and the new maximum concentrations were of similar order of magnitude as historical data. These locations will be reviewed in future monitoring rounds to identify if a trend may be forming.

PFOS concentrations above the laboratory LOR and therefore exceeding of the adopted ecological criteria (LOR adopted), were recorded within WAPET creek. Detected concentrations were however only slightly above the laboratory LOR and are not considered to represent a significant change in the understanding of the risk profile of the Management Area.

Sediment/Surface Soil Results

Sediment and surface soil are sampled to provide an indication regarding the movement of PFAS in the environment. Concentrations recorded during the 2020-2021 reporting period were consistent with historical data (i.e. generally of the same order of magnitude). Some localised new PFOS concentrations (both maximums and minimums) were recorded within the pathway area at SS121, SS123, SS124, SS125, SS243, SS231, SS234 (on-Base drainage channels), SS190 (northern drainage channel), SS293 (central drainage channel). This included some concentrations above the ecological indirect exposure assessment criteria of 0.01 mg/kg. However, no first time detects and only one new exceedance of a guideline criteria was observed within the central drainage channel and can be linked to the heavy rainfall during the 2021 wet season.

Based on the current available data there is no significant change to the risk profile associated with sediments/surface soils.

Risk Summary

The evaluation of analytical results suggests the nature and extent of PFAS in groundwater, seepage water, surface water or sediment remains consistent with that inferred from previous investigations despite slight fluctuations in PFAS concentrations at individual locations.

The understanding of PFAS source areas presented in the investigation phase (GHD, 2018) is supported by the OMP monitoring data, with the highest PFAS concentrations consistently detected within the two previously identified on-Base source areas.

The pathways for PFAS exposure and risks to human health (such as recreational anglers in the Management Area) and ecological receptors (such as land and aquatic flora and fauna) presented in the investigation phase (GHD, 2018) have been reviewed and are still considered to be appropriate and the OMP data collected to date does not suggest any significant changes to these mechanisms or risks.

Information gathered during the monitoring events supported the conclusion made in earlier investigations, that PFAS poses a low risk to recreational anglers with respect to bioaccumulation in commonly caught fish species, and that PFAS poses a low risk to the commercial prawn fisheries of the Exmouth Gulf Managed Prawn Fishery.

The OMP contains management response triggers, which are concentrations that would trigger an additional assessment and risk analysis to determine if additional management is required. The management response trigger (first-time detects) was observed at four monitoring locations. The subsequent review did not suggest a potential unacceptable increase in risk and no further management action was deemed necessary at this time. This will be re-assessed as part of the future 2022 AIR.

The nature and extent of PFAS across all media has not changed from the understanding presented in the investigation phases and the PMAP. Based on the current available data there is no significant change to the risk profile of the Management Area.

Conclusions

The 2020 - 2021 monitoring results met the objective of the OMP and was carried out in general accordance with the SAQP.

Overall, the concentrations of PFAS across the media and locations sampled are consistent and of the same order of magnitude as historical data. Given the remaining PFAS concentrations at the on-Base source areas, it is recommended that the ongoing monitoring program of groundwater, seepage water, surface water and sediment/surface soil is continued to monitor the extent of PFAS, potential migration and any associated risk changes.

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Chemical Names

DOC	Dissolved Organic Carbon
DO	Dissolved Oxygen
PFAS	Per- and Poly-fluoroalkyl Substances
PFHxS	Perfluorohexane Sulfonate
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane Sulfonate
TDS	Total Dissolved Solids (salinity of water)
TSS	Total Suspended Solids

Technical Terms

AFFF	Aqueous Film-Forming Foam
AHD	Australian Height Datum
ANZECC	Australian and New Zealand Environment and Conservation Council
AS	Australian Standard
AST	Above-ground Storage Tank
BGL	Below Ground Level
COC	Chain of Custody
DQI	Data Quality Indicator
DQO	Data Quality Objective
EC	Electrical Conductivity
EPA	Environment Protection Authority
ESA	Environmental Site Assessment
HIL	Health Investigation Level
HSL	Health Screening Level
LOR	Limit of Reporting
N/A	Not Applicable
NATA	National Association of Testing Authorities
NEPC	National Environment Protection Council
NEPM	National Environmental Protection Measure
QA	Quality Assurance
QC	Quality Control
RPD	Relative Percentage Difference
SAQP	Sampling and Analysis Quality Plan
UST	Underground storage tanks

Units

ha	Hectares
mBGL	Metres Below Ground Level
mbTOC	Metres below Top of Casing
mg/kg	Milligram per Kilogram (approximately equivalent to ppm)

mg/L	Milligram per Litre
µS/cm	Micro Siemens per Centimetre (Electrical Conductivity— Water)

Site Specific

OMP	Ongoing Monitoring Plan
PMAP	PFAS Management Area Plan
RAAF	Royal Australian Airforce

1 Introduction

The Australian Department of Defence engaged Cardno to undertake the November 2020, 2021 first flush (March 2021) and June 2021 groundwater, seepage water, surface water and sediment monitoring events at Royal Australian Air Force (RAAF) Base Learmonth ('the site' or 'the Base') as part of the Per- and Poly-Fluoroalkyl Substances (PFAS) Ongoing Monitoring Plan (OMP).

RAAF Base Learmonth is located approximately 30 km south of Exmouth, Western Australia (WA) and is displayed in Figure 1, Appendix A.

1.1 Background

The OMP outlines the rationale and scope for the monitoring of the concentrations and extent of PFAS in groundwater, seepage water, surface water and sediment originating from the site. The monitoring program consists of biannual monitoring events, as well a 'first flush' surface water and sediment monitoring event conducted immediately (or as close as possible) following the first heavy rainfall event of the wet season.

The OMP applies not only to the Base, but also the surrounding areas that, together with the site, make up the "Management Area". For the purposes of this report:

- > The 'site' is defined as RAAF Base Learmonth; and
- > The 'Management Area' is defined in the PFAS Management Area Plan (PMAP) as comprising the Base, plus the land to the east of the Base, including the salt pan, drainage channels, Wapet Creek and extends to Exmouth Gulf.

1.2 Purpose and Objectives

The specific objectives of the monitoring specified in the OMP are to:

- > Evaluate the nature and extent (spatial and temporal) of PFAS impact in groundwater, seepage water and surface water pathways associated with site sources of PFAS derived from historical use of Aqueous Film-Forming Foam (AFFF);
- > Monitor the migration of PFAS in groundwater, seepage water and surface water from the site;
- > Provide confirmation of the current understanding of risk; and
- > Provide supporting data for assessment of management actions, where relevant.

The purposes of the Annual Interpretive Report are to:

- > Inform Defence and key stakeholders of PFAS trends in surface water, seepage water, groundwater and sediment;
- > Assess any variations in the distribution of PFAS for the site and how this changes the understanding of the conceptual site model and risk profile; and
- > Provide recommendations for any potential changes in the location and frequency of sampling which may be incorporated in the revision of the OMP.

1.3 Scope of Work

The OMP was carried out in accordance with the scope and limitations presented in Cardno's Sampling and Analysis Quality Plan (SAQP):

- > Cardno, June 2021, Reference: DEF19009, 'PFAS Ongoing Monitoring Plan Sampling and Analysis Quality Plan (SAQP) RAAF Base Learmonth.

The assessment included the following main components:

1. Undertake the November 2020 groundwater, surface water, seepage water and sediment monitoring event:
 - Gauging of 92 single and multi-level groundwater monitoring wells;
 - Sampling of 32 single level groundwater monitoring wells;

- Sampling of 17 multilevel groundwater monitoring wells;
 - Sampling of six seepage water locations;
 - Sampling of 12 surface water locations; and
 - Sampling of 49 surface soil/sediment locations.
2. Undertake the 2021 First Flush (March 2021) surface water and sediment monitoring event:
- Sampling of 19 surface water locations; and
 - Sampling of 49 surface soil/sediment locations.
3. Undertake the June 2021 groundwater, surface water, seepage water and sediment monitoring event:
- Gauging of 92 single and multi-level groundwater monitoring wells;
 - Sampling of 32 single level groundwater monitoring wells;
 - Sampling of 17 multilevel groundwater monitoring wells;
 - Sampling of six seepage water locations;
 - Sampling of 19 surface water locations; and
 - Sampling of 49 surface soil/sediment locations.
4. Data assessment and reporting for the November 2020 – October 2021 reporting period

1.4 Standards of Assessment and Limitations

This interpretive report has been prepared in general accordance with the current industry standards for an assessment of this type for the purpose, objectives and scope identified in this report.

This report is not any of the following:

- > A Mandatory Audit Report (MAR) or Voluntary Audit Report (VAR) as defined under the *Contaminated Sites Act 2003* (CS Act).
- > A Geotechnical Assessment.
- > A Detailed Site Investigation (DSI).
- > A Detailed Hydrogeological Assessment.
- > A Remediation Action Plan (RAP) or Site Remediation & Validation (SRV) report.
- > A Site Management Plan (SMP).

2 Site Setting

RAAF Base Learmonth is situated on the North-West Cape in the Pilbara Region of WA, in Learmonth, which is situated approximately 30 km south of the township of Exmouth. The Base covers an area of approximately 2,550 hectares (ha).

The buildings and associated infrastructure and support services include:

- > Runway, taxi way and aprons;
- > Aircraft hangers;
- > Civilian Airport terminal;
- > Maintenance and workshop areas;
- > General administration;
- > Domestic housing;
- > Fuel farm (former and current);
- > Sewage treatment ponds;
- > Base water bore-field; and
- > There are also a number of underground storage tanks (USTs) and septic tanks across the site.

2.1 Site Definition and Planning

The site location is presented on Figure 1, Appendix A. Key site identification details are presented in Table 2-1.

Table 2-1 Site Identification Details

Details	Description
Site Address	Minilya-Exmouth Road, Learmonth, WA 6707
Land Description	RAAF Base Learmonth
Owner	Commonwealth of Australia
Planning Zone / Land use	Public Purposes – Commonwealth Government
Local Government Authority (LGA)	Shire of Exmouth

2.2 Surrounding Land Uses and Zoning

The surrounding land uses are outlined in Table 2-2.

Table 2-2 Surrounding Land Uses

Direction	Land Use
North	Kailis Hatchery, Potshot Memorial and pastoral land.
East	Wapet Creek, Solar Observatory, Bureau of Meteorology, pastoral land (Exmouth Gulf Station), Exmouth Gulf further east used for commercial aquaculture (prawn fishing).
West	Base supply bore-field, pastoral land, Cape Range National Park further west.
South	Various landfills, and pastoral land.

2.3 Management Area Description

The OMP includes sampling and analysis not only from the site, but also from a number of surrounding (off-site) waterways. The site and these surrounding areas are collectively referred to as the 'Management Area' (GHD, 2018). The Management Area boundaries are presented on Figure 2-1 and encompasses:

- > RAAF Base Learmonth; and

- > Land east of the Base, including the salt pan, drainage channels, Wapet Creek and extends to Exmouth Gulf.

Figure 2-1 Management Area



The monitoring zones include the source areas (depicted in purple on Figure 2-1), the pathways (on-site and off-site drainage channels) and the receptor areas consisting of WAPET creek and the Exmouth Gulf).

2.4 Environmental Setting

Key details defining the site are summarised in Table 2-3.

Table 2-3 Site Environmental Setting Key Details

Setting	Description
Climate	<p>The region has a hot, semi-arid climate, with a wet and dry season. The maximum temperatures range between 37.9°C (January) and 24.2°C (July) while minimum temperatures range between 11.4°C (July) and 24.7°C (February).</p> <p>Rainfall occurs generally between January and July with monsoonal showers between January and Late April. August to December is generally dry. The highest volume of rainfall typically occurs during the month of June with a mean monthly rainfall amount of 43.5 mm.</p>
Topography	<p>The site is located on a coastal plain and is generally flat. The elevation on-site ranges between 0 and 20 meters relative to the Australian Height Datum (m AHD).</p> <p>To the west of site, the elevation at the coastal ranges increases 220 m AHD.</p>
Acid Sulfate Soil	<p>A review of the Acid Sulfate Soils (ASS) risk mapping, available on the WA Atlas online database indicates the following:</p> <ul style="list-style-type: none"> ▪ To the north of the site is classified as having a moderate to low risk of ASS occurring within the top 3.0 m of natural soil but high to moderate risk of ASS beyond 3m of natural soil surface. ▪ The salt pan to the east is classified as having a high to moderate risk of ASS occurring in the top 3.0 m of natural soil.

Setting	Description
Hydrology	<p>The Exmouth Gulf is located approximately 600 m east of the site at its closest point. The site is also crossed west to east by three ephemeral creeks.</p> <p>RAAF Base Learmonth contains a number of constructed drains that direct surface water towards drainage channels that discharge into Wapet Creek (Central and Southern Channels) or Exmouth Gulf (Northern Channel). Monitoring conducted as part of the PFAS OMP confirms that the water flow in these drains are limited to high rainfall events. The Northern Channel is inundated with seawater during high tides from the coast to the boundary of Base.</p> <p>Wapet Creek is located to the east of Base and is lined with mangroves. Water flows tidally in and out of the creek and low-lying areas around the creek are periodically inundated.</p> <ul style="list-style-type: none"> ▪ The Northern Drainage Channel discharges directly to the Exmouth Gulf. It is a constructed drain on-site but links to a wide natural channel off-site that cuts through the coastal dunes. ▪ The Central Drainage Channel discharges into the northern reach of Wapet Creek. It is a straight constructed channel for its entire length. ▪ The Southern Drainage Channel discharges into the southern reach of Wapet Creek. It is a constructed drain onsite but links to a natural channel offsite that meanders across low lying salt pan topography.
Geology	<p>Regional Geology</p> <p>The site is underlain by quaternary age alluvial, aeolian and littoral sediments superimposed on the coastal plain (Geological Survey of Western Australia 1980).</p> <p>Further inland are Quaternary alluvium and colluvium deposits that have been derived from erosion of the Cape Ranges. The deposits include clays, silts, sands and gravels. The Cape Range forms the highlands to the west of RAAF Base Learmonth and are composed of Tertiary aged Cape Range limestone units.</p> <p>The coastal areas are fringed by Holocene aged beach and sand dunes consisting of quartz and calcarenite sands. An older Quaternary dune unit is located to the south of RAAF Base Learmonth and dune forms are visible. Intertidal flats and mangrove swamps occur immediately west of the coastal sands and are associated with estuarine creeks.</p> <p>Site Specific Geology</p> <p>The findings of intrusive investigative works at RAAF Base Learmonth, undertaken by GHD between January and June 2018, were broadly consistent with the regional geology described above.</p> <ul style="list-style-type: none"> ▪ To the west of RAAF Base Learmonth - the geology encountered comprised of colluvium, sands and sandy clay underlain by limestone rock layer. ▪ On RAAF Base Learmonth – generally sands and clays were observed at the surface, underlain by colluvium/alluvium, gravels and sands and then weathered limestone rock ▪ Salt pan area to the east of Base – generally sands and clays were observed at the surface, underlain by alluvium/colluvium and then shallow limestone rock. Outcrops of limestone displaying fossilised coral were observed along the southern reach of Wapet Creek.
Hydrogeology	<ul style="list-style-type: none"> ▪ Groundwater Occurrence – The Quaternary and Tertiary geology units are hydraulically connected and form a major, unconfined aquifer. <p>Groundwater in the Quaternary units is considered to be perched and discontinuous. The superficial Quaternary layers (dunes, colluvium, alluvium) are considered to be no more than 20 m in thickness. Coastal dunes may also contain relatively fresh groundwater but of limited extent (lenses). This has not been assessed.</p> <p>The main regional aquifer occurs predominantly within the Tulki Limestone (within permeable beds and the karst system) on the flanks of the range and the Mandu Limestone (within joints and minor permeable beds) on the crest of the range. These units extend to depths of greater than 150 m.</p> <ul style="list-style-type: none"> ▪ Depth to Groundwater – During the June 2021 event depth to groundwater was recorded beneath the site at levels of between 0.9 m below ground level (BGL) (MW177) and 6.53 m BGL (MW114), with groundwater elevations recorded between -0.223 m AHD (MW179) and 1.707 m AHD (MW143). Figure 5, Appendix A. ▪ Groundwater Flow Direction – The local groundwater flow pattern (GHD, 2018) at RAAF Base Learmonth was observed to be following the regional flow regime; that is, flowing toward the east. The calculated hydraulic gradient of groundwater across the Base was low and in the order of 0.0003 to 0.0005 m/m.

Setting	Description
	<p>The groundwater flow direction and hydraulic gradients greatly restricts the flow of contaminated groundwater from the Base to Wapet Creek or Exmouth Gulf. Instead, groundwater from the Base tends to flow towards an area of groundwater depression with elevated salinity that lies between the Base and the coast, with there being very little net flow to surface waters further to the east.</p> <p>Groundwater levels in wells near the coast are expected to be influenced by tidal pressure.</p> <p>The results of the OMP monitoring events supported the historical gauging results and groundwater flow directions, with some locations closer to the coast indicating a slight gradient to the coast.</p> <ul style="list-style-type: none"> ▪ Salinity – The results of the June 2021 event indicated groundwater was generally brackish to saline in the western wells, with the groundwater becoming more saline closer to the coast. <p>The saltwater wedge is expected to extend 5.0 km inland from the east coast (Martin, 1990). The DSI identified the water was fresher in the shallow groundwater, likely due to rain infiltration. The salinity distribution in the inferred discharge area to the east is likely to have significant influence on PFAS migration and discharge.</p> <ul style="list-style-type: none"> ▪ Groundwater Use – The DWER groundwater database found no registered abstraction bores were identified within a 1.0 km radius of the site. <p>During the GHD DSI (2018), groundwater was being abstracted from a bore near the Windmill Bore Landfill (approximately 1 km west of the site) where water was being pumped to a water storage tank and then being discharged to the surface via a hose. Flow rate was estimated to be approximately 9,000 L per day. Sheep were observed drinking this water from the surface.</p> <p>The site is down-gradient from the nearest potable water supply which is sourced from a series of wells near the base of Cape Range, 3 km to the west of the site.</p>
Environmental Sensitive Areas	<p>The site is located in close proximity to the Cape Range National Park and Ningaloo Reef to the east.</p> <ul style="list-style-type: none"> ▪ No Threatened Ecological Communities (TECs) with national environmental significance, were identified in the EPBC Act Protected Matters Report generated on November 2, 2017. ▪ Five priority flora species and 36 threatened or priority fauna species are known or expected to be present within 10 km of RAAF Base Learmonth. ▪ The mangrove wetlands are not listed on the Ramsar Convention on Wetlands of International Importance. It does however constitute a sensitive receptor.

2.5 Source Areas

There are a number of monitoring areas, where PFAS was detected in soil or groundwater at concentrations exceeding the adopted assessment levels. These are considered to be the most impacted areas and include (refer to Figure 2, Appendix A):

- > Maintenance Area (Source Area);
- > Former and current Fuel Farm (Source Area);
- > Southern Drainage Channel (Pathway);
- > Central Drainage Channel (Pathway);
- > Northern Drainage Channel (Pathway); and
- > Wapet Creek Northern Reach (Receptor).

The results of the DSI, confirmed by the first year of OMP implementation, indicate that the two main PFAS source areas were the Fuel Farm and the Maintenance Area. PFAS were found to be present in all environmental media tested (soils, groundwater, sediments, and surface water where present) in these source areas. PFAS were also detected at lower concentrations at a number of other locations across the Base.

3 Sampling and Analytical Methodology

3.1 2020 – 2021 Sampling Dates

A summary of the monitoring dates for each event of the reporting period is presented in Table 3-1.

Table 3-1 Summary of Sampling Dates

Sampling event	OMP Activity	Sampling Period
November 2020	Groundwater monitoring (sampling and gauging)	17 to 20 November 2020
	Surface water, seepage water, surface soil and sediment sampling	
2021 First flush	Surface water, surface soil and sediment sampling	3 to 5 March 2021
June 2021	Groundwater monitoring (sampling and gauging)	23 to 24 June 2021
	Surface water, seepage water, surface soil and sediment sampling	

3.2 Groundwater Sampling

Sampling of selected groundwater monitoring locations was performed in accordance with the SAQP (Cardno 2021, Appendix B), applying methods set out in Section 6.3.3 of the SAQP.

The monitoring network includes 32 single level monitoring wells, 17 multilevel wells and six groundwater seepage locations. For the multilevel monitoring wells, only the shallowest (non-dry) screened intervals were sampled. Seepage water sample locations were chosen to assess the inferred groundwater discharge zone along the coast. They include locations near the mouth of Wapet Creek, the Northern Drainage Channel, a low point in the dunes near the southern reach and other locations along the coast.

The groundwater wells monitored as part of the OMP are presented in Table 3-2 and are shown on Figure 3, Appendix A.

Table 3-2 Groundwater Monitoring Well Locations

Monitoring Area	Monitoring Well / Bore ID
On-site Source Areas	Source 1 – Maintenance Area - MW114, MW021, MW113, MW233 (ex MW063, MW063A), MW211 (ex MWA0294), MW162, MW163, MW018, MW164, MW165, MW166, MW167, MW168, MW112, MW115.
	Source 2 – Fuel Farm –MW016, MW105, MW148D, MW148S, MW151, MW159.
Off-site Pathway	MW122, MW146, MW147, MW180, MW181, MW172, MW170, MW127, MW126, MW139, MW140, MW102, MW138, MW145, MW103, MW104, MW134, MW135, MW175, MW124, MW144, MW143.
Off-site Receptor	MW137, MW176, MW177, MW178, MW179, MW141.

3.3 Seepage water Sampling

Seepage water monitoring and sampling was conducted in accordance with the SAQP (Cardno 2021, Appendix B), applying methods set out in Section 6.3.3 of the SAQP. The seepage water monitoring locations monitored as part of the OMP are listed in Table 3-3 and are shown on Figure 3, Appendix A.

Table 3-3 Seepage Water Monitoring Locations

Monitoring Area	Location ID
Off-site Receptor (Exmouth Gulf)	OTH132, OTH134, OTH129, OTH103, OTH106, OTH107.

3.4 Surface water Monitoring

Sampling of selected surface water monitoring locations was generally performed in accordance with the SAQP, Appendix B, applying methods set out in Section 6.3.3 of the SAQP. The surface water locations monitored as part of the OMP are presented in Table 3-4 and are shown on Figure 4, Appendix A.

Table 3-4 Surface water Monitoring Locations

Monitoring Area	Location ID
On-site Drainage Channels (source and pathway)	SS108, SS113, SW114, SW121, SW122, SW123, SS124, SS125, SS157, SS166, SS168, SS170, SS174, SS176, SW219, SS231, SS234, SS235, SS243, SW265, SS277, SS278, SS279
Off-site Drainage channels (source and pathway)	SW189, SS190, SS192, SW193, SS198, SW199, SW200, SS227, SW288, SW291, SS292, SW293, SW298
Off-site Receptor (Wapet Creek)	SW205, SW207, SW208, SW209, SW210, SW211, SW300, SW301, SW302, SW303, SW304, SW305, SW001

Note: 'SS' prefix indicates a shallow soil location also monitored for surface water if occurring.

3.5 Sediment/Surface Soil Monitoring

Sampling of selected sediment/surface soil monitoring locations was generally performed in accordance with the SAQP (Cardno 2021, Appendix B), applying methods set out in Section 6.3.4 of the SAQP. The sampling locations monitored as part of the OMP are presented in Table 3-5 and are shown on Figure 4, Appendix A.

Table 3-5 Sediment/Surface soil Monitoring Locations

Monitoring Area	Location ID
On-site Drainage Channels (source and pathway)	SS108, SS113, SS114, SS121, SS122, SS123, SS124, SS125, SS157, SS166, SS168, SS170, SS174, SS176, SD219, SS231, SS234, SS235, SS243, SS265, SS277, SS278, SS279
Off-site Drainage channels (source and pathway)	SS189, SS190, SS192, SS193, SS198, SD199, SD200, SS227, SS288, SS291, SS292, SS293, SS298
Off-site Receptor (Wapet Creek)	SD205, SD207, SD208, SD209, SD210, SD211, SD300, SD301, SD302, SD303, SD304, SD305, SS301

Note: 'SS' = shallow soil (dry), 'SD' = sediment (wet)

3.6 Deviations from the OMP SAQP

Deviations from the SAQP for the November-2020 – October 2021 reporting period are summarised in Table 3-6.

Table 3-6 Summary of deviations from the OMP SAQP

Location ID	Deviation	Comments
November 2020		
MW105, MW126	Not sampled	These bores were found dry.
MW021	Not found	Well appears to have been covered by recent placement of earth/rockworks.
SW219, SS234, SS235, SW114, SS113, SS231, SS157, SW265, SW189, SS190, SW288, SW193, SS192, SS198, SW293, SS292, SW291, SS227, SS108, SS170, SS168, SS279, SS166, SS243, SS174, SW121, SW122, SS124, SS277, SS125, SS278, SS176, SW123, SW199, SW200, SW298, SW301	Not sampled for surface water	These surface water areas were found dry. No impact to OMP as this still provides information (i.e. no surface water flow).
First Flush 2021 (March 2021)		
SS234, SS235, SW114, SS113, SS231, SS157, SW265, SS192, SS198, SW293, SS292, SW291, SS227, SS108, SS170, SS168, SS279, SS166, SS243, SS174, SW121, SW122, SS124, SS277, SS125, SS278, SS176, SW123, SW298, SW301	Not sampled for surface water	These locations were found dry. No impact to OMP as this still provides information (i.e. no surface water flow).
June 2021		
SW219, SS234, SS235, SW114, SS113, SS231, SS157, SW288, SS192, SS198, SW293, SS292, SW291, SS227, SS108, SS170, SS168, SS279, SS166, SS243, SS174, SW121, SW122, SS124, SS277, SS125, SS278, SS176, SW123, SW199.	Not sampled for surface water	These surface water areas were found dry. No impact to OMP as this still provides information (i.e. no surface water flow).
SW/SS301	Sampled ~300m to the west of monitoring location.	Area not accessible due to flooding. Contingency location is still located within the Southern drainage channel pathway area.

3.7 Changes to the Monitoring Network Condition

No changes to the monitoring network were identified during the 2020 – 2021 sampling program.

4 Quality Control / Quality Assurance

A critical aspect of site assessments is the demonstration of the quality of the data used as the basis for the assessment. This is achieved through a Data Validation process which includes a review of the following data quality indicators, as described in the SAQP:

- > QA documentation;
- > Bias;
- > Data Representativeness;
- > Data Precision & Accuracy;
- > Laboratory Performance;
- > Data Comparability; and
- > Data Set Completeness.

A detailed review of the Quality Assurance/Quality Control (QA/QC) aspects was completed during the monitoring events and are included within the factual reports presented in Appendix C.

4.1 Summary

The laboratory has undertaken different Quality Control (QC) measures in all sets of sample analysis which validate the accuracy of their techniques. The laboratory is appropriately certified for environmental sample analysis. It is considered that the results are accurate and reliable for the purposes of this assessment.

The data validation process has concluded that there are no significant systematic errors in the data collection process. Therefore, the data set used as the basis for the surface water, groundwater and sediment assessment is considered valid and complete.

5 Assessment Criteria

5.1 Groundwater, Seepage Water and Surface water

The assessment levels adopted for groundwater and surface water in this OMP are based upon the Heads of Environmental Protection Authorities Australia and New Zealand (2020) PFAS National Environmental Management Plan 2.0 (NEMP; HEPA 2020) and findings of the Detailed Site Investigation (DSI) (GHD 2018). The adopted assessment criteria for groundwater, seepage water and surface water are detailed in Table 5-1.

Table 5-1 Criteria for Groundwater, Seepage Water and Surface water

Exposure Scenario	Adopted Assessment Criteria		Guidance
	PFHxS / PFOS µg/L	PFOA ¹	
Human Health – Recreational Water	2 ²	10	NHMRC 2019, HEPA 2020
Ecological – 99% species protection	0.00023 ³	19	HEPA 2020
<ol style="list-style-type: none"> 1. Per-fluoro-octanoic Acid (PFOA) 2. Sum of Per-fluoro-octane Sulfonate (PFOS) and Per-fluoro-hexane Sulphonate (PFHxS). 3. PFOS only; Practical screening guideline of 0.01 µg/L is based on typical current laboratory limit of reporting. Therefore, it should be noted that warning and action levels would not be relevant until the detection limits are reduced or the screening levels are increased (HEPA 2020). 			

5.2 Sediment

It is noted that there are currently no Australian regulatory endorsed assessment levels for risk posed to ecology or human health by PFAS in sediment. As detailed in the SAQP (Cardno, 2021), sediment samples were assessed with reference to the PFAS NEMP 2.0 (HEPA, 2020) soil criteria for consistency with the DSI (GHD, 2018). The adopted assessment criteria for sediment are detailed in Table 5-2.

Table 5-2 Criteria for Sediment

Exposure Scenario	Adopted Assessment Criteria		Guidance
	PFHxS / PFOS mg/kg	PFOA	
Human Health - Commercial / industrial (on-base activities)	20 ¹	50	HEPA 2020
Ecological – Direct exposure (interim guidelines)	1 ²	10	HEPA 2020
Ecological - Indirect exposure (interim guidelines)	0.01 ²	-	HEPA 2020
<ol style="list-style-type: none"> 1. Sum of PFOS and PFHxS. 2. PFOS only 			

6 Contextual and Ancillary Information

6.1 Additional Analytical Data

All data available on the ESdat database at the time of reporting for each OMP monitoring location was utilised to form the basis of the interpretations and conclusions presented in this report.

6.2 Remediation and Infrastructure Projects

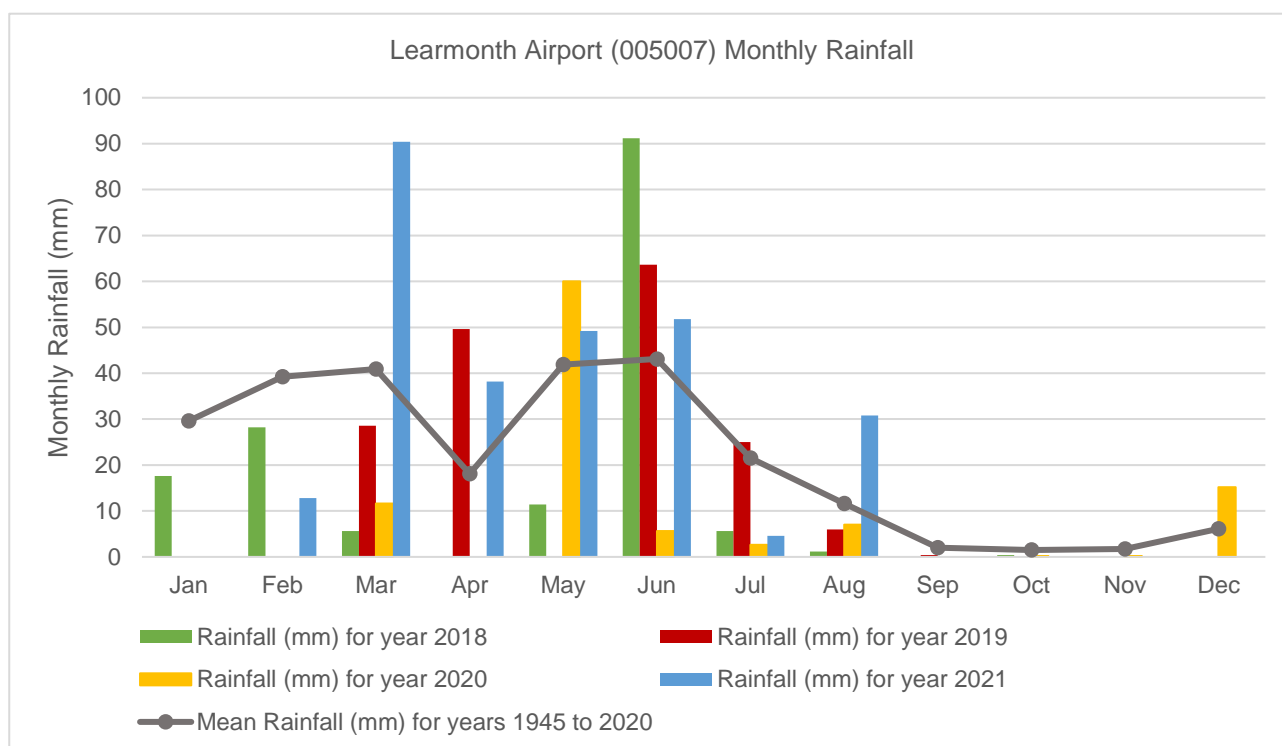
No remediation project or infrastructure works that could affect the interpretation of monitoring results were undertaken at the site during the reporting period.

6.3 Climate

Rainfall can potentially influence the PFAS migration and groundwater levels. Monthly rainfall for 2018 to 2021 obtained from the Bureau of Meteorology (BoM) station No 005007 is displayed in Figure 6-1.

The monthly rainfall amounts for the monitoring period were below average for November, January and February and above for the months of December and March to June.

Figure 6-1 Monthly rainfall and long term mean monthly rainfall for Learmonth Airport (station 005007) (BoM, 2021)



There were variations in rainfall throughout 2021 and the wet season rainfall was above monthly mean, however, it is noted that these climatic conditions have not affected the groundwater gradient or flow direction for the monitoring area. Some flooding was observed within the salt pan and Wapet Creek area during the first flush event in March 2021.

7 Monitoring Data Summary

The November 2020, first flush (March 2021) and June 2021 monitoring results are presented within the factual reports provided in Appendix C. Consolidated data tables are presented in Appendix D.

7.1 Groundwater

7.1.1 Groundwater geochemical parameters

Groundwater geochemical parameters recorded during the November 2020 and June 2021 monitoring events are summarised in Table 7-1 and provided within Table 4, Appendix D.

Table 7-1 Groundwater Geochemical Parameters

Parameter	November 2020	June 2021
DO	0.53 mg/L (MW103) – 5.28 mg/L (MW170) <i>Aerobic conditions</i>	0.45 mg/L (MW139) – 16.2 mg/L (MW102) <i>Aerobic conditions</i>
EC	2,633 µS/cm (MW165) – 109,345 µS/cm (MW147) <i>Saline to hyper saline water</i>	1,206 µS/cm (MW179) – 102,851 µS/cm (MW147) <i>Saline to hyper saline water</i>
pH	6.62 (MW140) – 8.23 (MW211) <i>Near neutral conditions</i>	5.85 (MW134) – 8.27 (MW233) <i>Near neutral conditions</i>
ORP	-134.1 mV (MW141) – 232.9 mV (MW138) <i>Reducing to oxidising groundwater conditions.</i>	-254.9 mV (MW175) – 190.1 mV (MW021) <i>Reducing to oxidising groundwater conditions.</i>

The geochemical parameters were generally within the historical ranges recorded for the site. No noticeable seasonal variability was observed.

7.1.2 Groundwater elevations and migration contours

Groundwater levels recorded during the November 2020 and June 2021 monitoring events and inferred flow directions are summarised in Table 7-2 and gauging data is provided within Table 3, Appendix D. Figure 5, Appendix A, presents the inferred groundwater contours for the November 2020 monitoring event and Figure 6, Appendix A, presents the inferred groundwater contours for the June 2021 monitoring event. Wells close to the coast may be influenced by tidal pressures, these were generally gauged during outgoing tides.

Table 7-2 Groundwater Levels and Flow Direction

Item	November 2020	June 2021
Depths to groundwater	1.52 mbTOC (MW180) – 7.04 mbTOC (MW114)	0.9 (MW177) – 6.53 (MW114)
Groundwater elevation	-0.2 mAHD (MW175) – 1.17 mAHD (MW141)	-0.223 (MW179) – 1.707 (MW143)
Inferred direction of groundwater flow	Groundwater was interpreted to flow towards an area of groundwater depression that lies between the Base and the coast, with there being very little net flow to surface waters further to the east.	
Seasonal difference in groundwater elevation	Groundwater levels were on average 0.51 m deeper during the November event	

Groundwater elevations and flow direction for the reporting period were consistent with historical data.

7.1.3 On-site Source Areas Summary Results

As indicated the Source Areas consist of:

- > Source Area 1 – Maintenance Area; and
- > Source Area 2 – Fuel Farm.

Groundwater monitoring well locations are displayed on Figure 3, Appendix A.

7.1.3.1 Source Area 1 – Maintenance Area

During the most recent monitoring event (June 2021) the following conditions and results were recorded for Source Area 1:

- > Groundwater was fresh to saline across the area with total dissolved solids (TDS) concentrations ranging from 1,280.5 mg/L to 23,005 mg/L;
- > Near neutral pH 6.96 to 8.27;
- > 13 out of 15 groundwater samples from the source area monitoring wells reported detectable PFAS concentrations. All 13 samples exceeded the adopted ecological criteria (99% species protection level for fresh and marine water) of the laboratory limit of reporting (LOR – 0.01 µg/L) for PFOS.

During the November 2020 – October 2021 monitoring period:

- > Detectable concentrations of PFOA ranged from 0.01 µg/L (MW112, MW113, MW114, MW115, MW165) to 0.72 µg/L (MW063, November 2020 event);
- > Detectable concentrations for the sum of PFOS and PFHxS ranged from 0.29 µg/L (MW166, November 2020) to 9.9 µg/L (MW163, June 2021). A total of eight monitoring wells across the source area reported concentrations above the HEPA (2020) recreational use criteria (2.0 µg/L) during the 2020-2021 reporting period;
- > Detectable concentrations of PFOS (considered exceedances of the HEPA ecological criteria for 99% species protection) ranged from 0.01 µg/L (MW113, MW114) to 3.27 µg/L (MW211, November 2020 event).
- > No first detects were reported for the source area monitoring wells;
- > No new exceedances of the assessment criteria were reported; and
- > New maximum and minimum concentrations were recorded across the Source Area 1.

It is noted there is data available for PFOA and PFOS for selected monitoring wells from September 2010 across the Maintenance Area. Where available this data has been assessed as part of this investigation. However, it is also noted that PFHxS was not reported until 2018.

A summary of the PFOA, PFOS and the sum of PFOS and PFHxS concentrations for the reporting period and the historical concentration ranges for Source Area 1 – Maintenance Area monitoring locations are presented in Table 7-3, with a trend graph for the sum of PFOS and PFHxS concentrations plotted on Figure 7-1.

Table 7-3 Source Area 1 – Maintenance Area. Groundwater PFOA, PFOS and Sum of PFOS and PFHxS Concentrations

Location ID	Analyte	Historical range	OMP Monitoring	
		Min – Max (µg/L)	Nov 2020 (µg/L)	Jun 2021 (µg/L)
MW018	PFOS	<0.01 – 2.5	0.78	0.33
	PFOS and PFHxS	<0.01 – 2.93	2.10	1.35
	PFOA	<0.01 – 0.08	0.07	0.06
MW021	PFOS	<0.01 – 0.29		0.21
	PFOS and PFHxS	0.31 – 1.26	NS	0.68
	PFOA	<0.01 – 0.02		0.01
MW063	PFOS	1.4 – 2.32	2.61	Replaced by MW233
	PFOS and PFHxS	7.1 – 8.37	6.53	
	PFOA	<0.01 – 0.69	0.72	
MW233	PFOS	1.4 – 6.7		2.07
	PFOS and PFHxS	2.8 – 8.6	NS	5.96
	PFOA	0.2 – 0.71		0.59
MW112	PFOS	0.62 – 1.1	0.63	0.56
	PFOS and PFHxS	1.22 – 1.7	1.05	0.96

Location ID	Analyte	Historical range	OMP Monitoring	
		Min – Max (µg/L)	Nov 2020 (µg/L)	Jun 2021 (µg/L)
MW113	PFOA	<0.05 - 0.02	<0.01	0.01
	PFOS	<0.01 – 0.002	<0.01	<0.01
	PFOS and PFHxS	<0.01 – 0.003	<0.01	<0.01
	PFOA	<0.001	<0.01	<0.01
MW114	PFOS	<0.01 - 0.002	<0.01	<0.01
	PFOS and PFHxS	<0.01 – 0.004	<0.01	<0.01
	PFOA	<0.001	<0.01	<0.01
MW115	PFOS	0.020 – 0.06	0.06	0.12
	PFOS and PFHxS	0.18 – 0.79	0.39	1.03
	PFOA	<0.01 - 0.01	<0.01	0.02
MW162	PFOS	0.13 - 0.31	0.37	0.15
	PFOS and PFHxS	2.8 – 6.97	3.85	2.17
	PFOA	0.06 – 0.12	0.08	0.05
MW163	PFOS	0.1 - 5.0	2.44	3.22
	PFOS and PFHxS	0.36 - 12	6.64	9.90
	PFOA	<0.05 - 0.3	0.18	0.30
MW164	PFOS	0.38 – 1.3	2.01	1.26
	PFOS and PFHxS	1.7 – 4.09	2.27	3.70
	PFOA	0.058 – 0.12	0.07	0.04
MW165	PFOS	<0.01 - 0.013	0.02	0.02
	PFOS and PFHxS	<0.01 - 0.023	0.02	0.08
	PFOA	<0.01 - 0.002	<0.01	<0.01
MW166	PFOS	0.16 – 0.34	0.18	0.35
	PFOS and PFHxS	0.53 – 0.79	0.29	0.69
	PFOA	0.063 – 0.15	0.03	0.06
MW167	PFOS	0.49 – 0.94	1.22	0.81
	PFOS and PFHxS	1.18 – 2.02	2.53	1.78
	PFOA	0.12 – 0.18	0.18	0.12
MW168	PFOS	0.03 - 0.062	0.06	0.10
	PFOS and PFHxS	0.55 - 0.65	0.62	0.86
	PFOA	0.01 - 0.02	0.01	0.02
MW211	PFOS	3.09 – 6.2	3.27	2.92
	PFOS and PFHxS	5.4 – 8	5.92	4.15
	PFOA	0.11 – 0.17	0.1	0.06
New Maximum		New Minimum	New Exceedance	

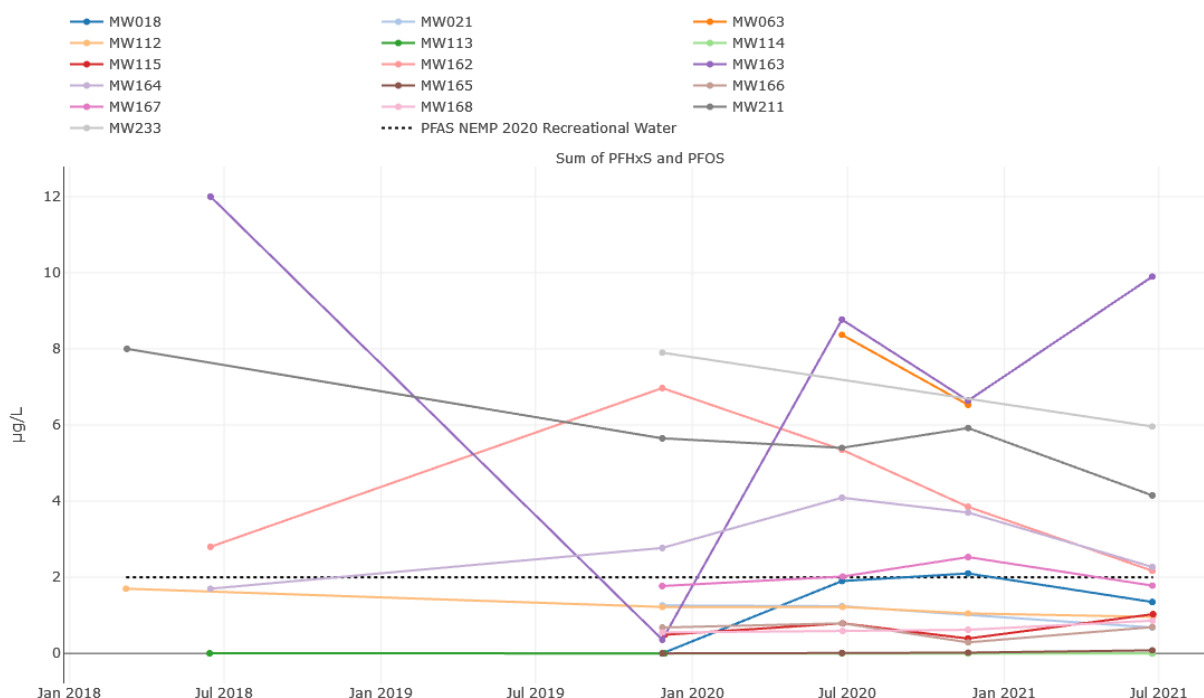
Note:

NS – Not sampled

MW063 – lost in Jun-21 hence replaced by MW233 located 11m from MW063

The highest PFOA, PFOS and Sum of PFOS and PFHxS concentrations were recorded at MW163. New maximum PFAS concentrations were recorded at monitoring well locations MW115, MW162, MW164, MW165, MW166, MW167 and MW211 however, with no new exceedances of the adopted human health assessment criteria for the sum of PFOS and PFHxS.

Figure 7-1 Source Area 1 – Maintenance Area Sum of PFOS and PFHxS Concentration Trends



7.1.3.2 Source Area 2 – Fuel Farm

During the most recent monitoring event (June 2021) the following conditions and results were recorded for Source Area 2.

- > Groundwater was brackish to saline with TDS concentrations ranging from 6,589 mg/L to 50,104 mg/L;
- > Near neutral pH 6.91 to 7.6;
- > Five of the six groundwater samples from the source area reported detectable PFAS concentrations with MW159 reporting below the detection limit. All of these five samples exceeded the adopted ecological criteria (99% species protection level for fresh and marine water) of the laboratory LOR for PFOS; and
- > No first detects or new exceedances were reported for the source area monitoring wells.

During the November 2020 – October 2021 monitoring period:

- > Detectable concentrations of PFOA ranged from 0.01 µg/L (MW105, June 2021) to 2.30 µg/L (MW016, June 2021 event);
- > Detectable concentrations of PFOS (considered exceedances of the HEPA ecological criteria for 99% species protection) ranged from 0.02 µg/L (MW159, November 2020) to 41.9 µg/L (MW151, November 2020)
- > Detectable concentrations for the sum of PFOS and PFHxS ranged from 0.76 µg/L (MW105, June 2021 event) to 82.8 µg/L (MW151 November 2020 event). Four out of six locations across the source area reported concentrations above the HEPA (2020) criteria for recreational use; and
- > New maximum concentrations were recorded at MW148S/D (down-gradient) and a new minimum was recorded at MW151 (up-gradient).

A summary of the PFOA, PFOS and the sum of PFOS and PFHxS concentrations for the reporting period and the historical concentration ranges for Source Area 2 – Fuel Farm monitoring locations are presented in Table 7-4, with a trend graphs for the sum of PFOS and PFHxS concentrations plotted on Figure 7-2.

Table 7-4 Source Area 2 – Fuel Farm. Groundwater PFOA, PFOS and Sum of PFOS and PFHxS Concentrations

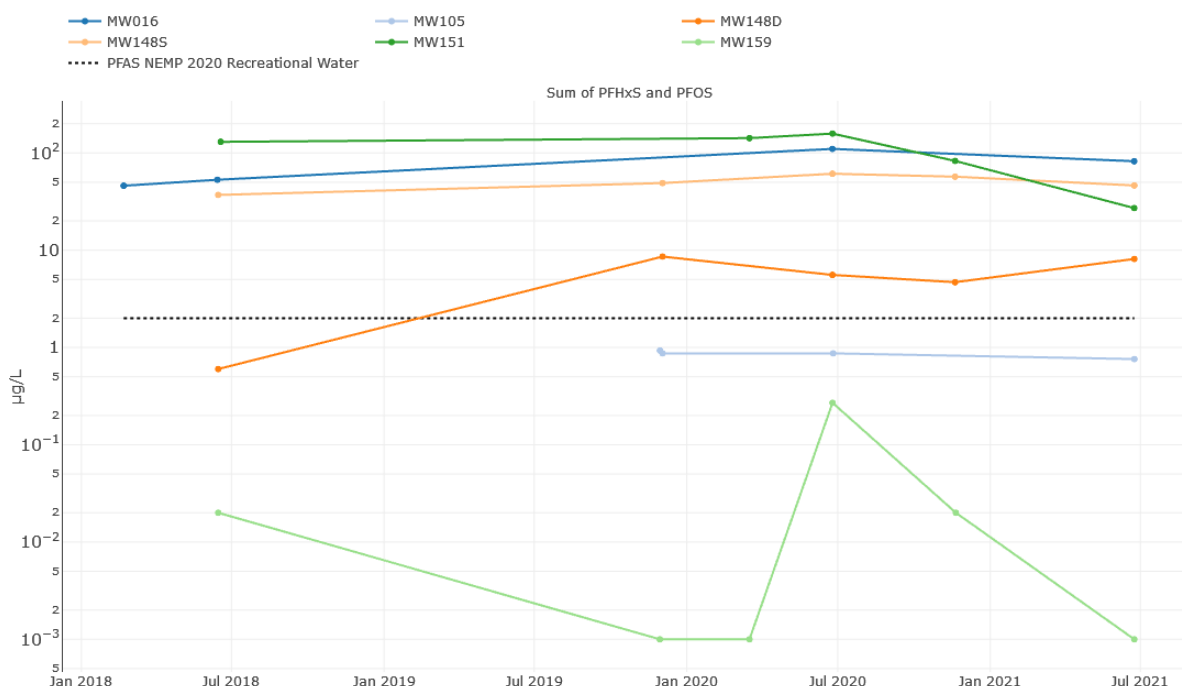
Location ID	Analyte	Historical range	OMP Monitoring	
		Min – Max (µg/L)	Nov 2020 (µg/L)	Jun 2021 (µg/L)
MW016	PFOS	0.84 – 29.8		25.3
	PFOS and PFHxS	46 – 110	NS	82.2
	PFOA	1.4 – 2.53		2.30
MW105	PFOS	0.031 – 0.05		0.03
	PFOS and PFHxS	0.771 – 0.93	NS	0.76
	PFOA	<0.01 - 0.011		<0.01
MW148D	PFOS	0.25 - 2.48	1.86	3.13
	PFOS and PFHxS	0.60 - 8.6	4.69	8.13
	PFOA	0.019 - 0.29	0.15	0.35
MW148S	PFOS	9.4 - 18.4	24.2	20.8
	PFOS and PFHxS	37 - 49	57	46.3
	PFOA	1.4 - 2.24	1.44	1.63
MW151	PFOS	39.1 – 72.6	41.9	13.9
	PFOS and PFHxS	130 - 158	82.8	27.1
	PFOA	2.56 - 6.6	2.05	1.59
MW159	PFOS	<0.001 - 0.017	0.02	<0.01
	PFOS and PFHxS	<0.001 - 0.020	0.02	<0.01
	PFOA	<0.001 - 0.01	<0.01	<0.01
New Maximum		New Minimum	New Exceedance	

Note:

NS – Not sampled

The highest Sum of PFOS and PFHxS concentrations were recorded in MW151, however, it is noted that this location has reported new minimum concentrations during both November 2020 and June 2021 OMP events for all analytes presented in Table 7-4. The highest PFOS and PFOA concentrations were reported at MW016 which also displayed the second highest Sum of PFOS and PFHxS values as shown on Figure 7-2.

Figure 7-2 Source Area 2 – Fuel Farm Sum of PFOS and PFHxS Concentration Trends



Note: A logarithmic scale is used for the vertical axis.

7.1.4 On-site pathway

Groundwater monitoring well locations are displayed on Figure 3, Appendix A.

During the most recent monitoring event (June 2021) the following conditions and results were recorded for the on-site pathway area.

- > Groundwater was saline across the area with TDS concentrations ranging from 12,107 mg/L to 59,060 mg/L;
- > Near neutral pH 6.87 to 7.45; and
- > Four out of nine groundwater samples from the on-site pathway area monitoring wells reported detectable PFAS concentrations. One sample (MW172) exceeded the adopted ecological criteria (99% species protection level for fresh and marine water) of the laboratory LOR for PFOS.

During the November 2020 – October 2021 monitoring period:

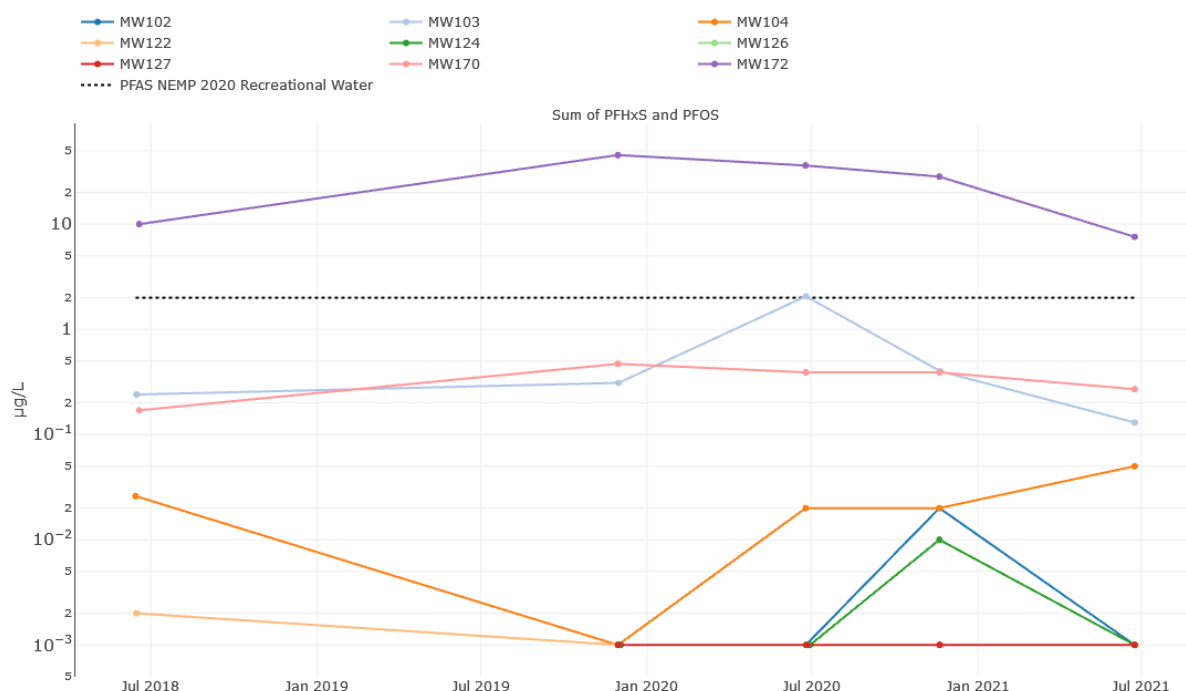
- > A new exceedance of the adopted ecological criteria (99% species protection level for fresh and marine water – LOR adopted) for PFOS was recorded within MW102 (November 2020 event). In addition, new maximum concentrations were recorded for PFOS and the sum of PFOS and PFHxS.
- > Only MW172 recorded detectable concentrations of PFOA: 0.70 µg/L during the November 2020 event and 0.40 µg/L during the June 2021 event which is within historical range for this monitoring well;
- > Detectable concentrations of PFOS ranged from 0.02 µg/L (MW102, June 2021) to 5.46 µg/L (MW172, November 2020)
- > Detectable concentrations for the sum of PFOS and PFHxS ranged from 0.01 µg/L (MW124, June 2021 event) to 28.3 µg/L (MW172, November 2020). Three samples across two locations (MW103 & MW172) were reported above the HEPA (2020) for recreational use criteria; and
- > A first time detect of the sum of PFOS and PFHxS was recorded within MW102 (November 2020 event). In addition, new maximum concentrations were recorded (MW104 and MW172).

A summary of the PFOA, PFOS and the sum of PFOS and PFHxS concentrations for the reporting period and the historical concentration ranges for the on-site pathway area monitoring locations are presented in Table 7-5, with a trend graphs for the sum of PFOS and PFHxS concentrations plotted on Figure 7-3.

Table 7-5 On-site pathway. Groundwater PFOA, PFOS and Sum of PFOS and PFHxS Concentrations

Location ID	Analyte	Historical range	OMP Monitoring	
		Min – Max (µg/L)	Nov 2020 (µg/L)	Jun 2021 (µg/L)
MW102	PFOS	<0.01	0.02	<0.01
	PFOS and PFHxS	<0.01	0.02	<0.01
	PFOA	<0.01	<0.01	<0.01
MW103	PFOS	0.004 – 0.36	0.03	<0.01
	PFOS and PFHxS	0.21 – 2.06	0.40	0.13
	PFOA	<0.01 – 0.07	<0.01	<0.01
MW104	PFOS	<0.01 – 0.02	0.02	<0.01
	PFOS and PFHxS	<0.01 – 0.031	0.02	0.05
	PFOA	<0.01	<0.01	<0.01
MW122	PFOS	<0.001 - 0.001	<0.01	<0.01
	PFOS and PFHxS	<0.001 - 0.002	<0.01	<0.01
	PFOA	<0.01	<0.01	<0.01
MW124	PFOS	<0.01 – 0.005	0.01	<0.01
	PFOS and PFHxS	<0.01 – 0.007	0.01	<0.01
	PFOA	<0.001 – 0.001	<0.01	<0.01
MW126	PFOS	<0.001 – 0.009		<0.01
	PFOS and PFHxS	<0.001 – 0.009	NS	<0.01
	PFOA	<0.01		<0.01
MW127	PFOS	<0.01	<0.01	<0.01
	PFOS and PFHxS	<0.01	<0.01	<0.01
	PFOA	<0.01	<0.01	<0.01
MW170	PFOS	<0.01 - 0.03	<0.01	<0.01
	PFOS and PFHxS	0.17 - 0.47	0.39	0.27
	PFOA	<0.01 – 0.001	<0.01	<0.01
MW172	PFOS	0.51 - 5.37	5.46	1.58
	PFOS and PFHxS	10 - 45.4	28.3	7.58
	PFOA	0.35 - 1.12	0.70	0.40
New Maximum		New Minimum		New Exceedance

Figure 7-3 On-Site Pathways Sum of PFOS and PFHxS Concentration Trends



Note: A logarithmic scale is used for the vertical axis.

7.1.5 Off-site pathways

The off-site pathway areas are identified as:

- > Area west of Wapet Creek;
- > Northern Drainage Channel;
- > Central Drainage Channel; and
- > Southern Drainage Channel.

The groundwater results for these areas are discussed in the following sections.

7.1.5.1 Off-site Area west of Wapet Creek

During the most recent monitoring event (June 2021) the following conditions were recorded for the off-site area west of Wapet Creek:

- > Groundwater was saline across the area with TDS ranging from 11,966.5 mg/L to 66,950 mg/L;
- > Near neutral pH 6.4 to 7.59; and

During the November 2020 – October 2021 monitoring period:

- > No detectable concentrations of PFOA, PFOS or the sum of PFOS and PFHxS were recorded in any of the seven monitoring well across the area.

A summary of the PFOA, PFOS and the sum of PFOS and PFHxS concentrations for the reporting period and the historical concentration ranges for the off-site area to the west of Wapet Creek monitoring locations are presented in Table 7-6. It is noted that the results are predominantly below laboratory LOR and therefore the results have not been plotted.

Table 7-6 Area west of Wapet Creek. Groundwater PFOA, PFOS and Sum of PFOS and PFHxS Concentrations

Location ID	Analyte	Historical range	OMP Monitoring	
		Min – Max (µg/L)	Nov 2020 (µg/L)	Jun 2021 (µg/L)
MW143	PFOS	<0.001 – 0.001	<0.01	<0.01
	PFOS and PFHxS	<0.001 – 0.001	<0.01	<0.01
	PFOA	<0.001	<0.01	<0.01
MW144	PFOS	<0.001 – 0.002	<0.01	<0.01
	PFOS and PFHxS	<0.001 - 0.002	<0.01	<0.01
	PFOA	<0.001 - 0.002	<0.01	<0.01
MW145	PFOS	<0.001 – 0.001	<0.01	<0.01
	PFOS and PFHxS	<0.001	<0.01	<0.01
	PFOA	<0.001	<0.01	<0.01
MW146	PFOS	<0.001 – 0.005	<0.01	<0.01
	PFOS and PFHxS	<0.001 – 0.005	<0.01	<0.01
	PFOA	<0.001 – 0.003	<0.01	<0.01
MW147	PFOS	0.002 – 0.005	<0.01	<0.01
	PFOS and PFHxS	0.0002 – 0.007	<0.01	<0.01
	PFOA	<0.001 – 0.002	<0.01	<0.01
MW180	PFOS	<0.01 – 0.12	<0.01	<0.01
	PFOS and PFHxS	<0.01 – 0.12	<0.01	<0.01
	PFOA	<0.001	<0.01	<0.01
MW181	PFOS	<0.01 – 0.11	<0.01	<0.01
	PFOS and PFHxS	<0.01 – 0.11	<0.01	<0.01
	PFOA	<0.01 – 0.002	<0.01	<0.01
New Maximum		New Minimum	New Exceedance	

Note:

MW000 – multilevel monitoring well, the shallowest screen interval sample results have been used for the assessment.

7.1.5.2 Off-site Northern Drainage Channel

During the most recent monitoring event (June 2021) the following conditions and results were recorded for the off-site Northern Drainage channel area:

- > Groundwater was brackish to saline across the area with TDS ranging from 1,670.5 mg/L to 40,105 mg/L;
- > Near neutral pH 5.85 to 7.77; and

During the November 2020 – October 2021 monitoring period:

- > Two of the three monitoring wells across the area reported detectable PFAS concentrations. The two samples exceeded the adopted ecological criteria (99% species protection level for fresh and marine water) of the laboratory LOR for PFOS [0.02 µg/L (MW134) and 0.04 µg/L (MW175)];
- > One detectable concentration of PFOA was recorded at MW175 (June 2021 event);
- > Detectable concentrations for the sum of PFOS and PFHxS ranged from 0.02 µg/L (MW134) to 0.06 µg/L (MW175) during the November 2020 event; and
- > A first time detect of the sum of PFOS and PFHxS and a new exceedance of the adopted ecological criteria were recorded at MW134 in November 2020.

A summary of the PFOA, PFOS and the sum of PFOS and PFHxS concentrations for the reporting period and the historical concentration ranges for the off-site Northern Drainage Channel monitoring locations are presented in Table 7-7. It is noted that the results are predominantly below laboratory LOR and therefore the results have not been plotted.

Table 7-7 Northern Drainage Channel Groundwater PFOA, PFOS and Sum of PFOS and PFHxS Concentrations

Location ID	Analyte	Historical range	OMP Monitoring	
		Min – Max (µg/L)	Nov 2020 (µg/L)	Jun 2021 (µg/L)
MW134	PFOS	<0.001	0.02	<0.01
	PFOS and PFHxS	<0.001	0.02	<0.01
	PFOA	<0.001	<0.01	<0.01
MW135	PFOS	<0.01 – 0.01	<0.01	<0.01
	PFOS and PFHxS	<0.01 – 0.01	<0.01	<0.01
	PFOA	<0.001 – 0.003	<0.01	<0.01
MW175	PFOS	<0.01 – 0.02	0.04	0.03
	PFOS and PFHxS	<0.01 – 0.02	0.06	0.03
	PFOA	<0.01 – 0.006	<0.01	0.01
New Maximum		New Minimum	New Exceedance	

Note:

MW000 – multilevel monitoring well, the shallowest screen interval sample results have been used for the assessment.

7.1.5.3 Off-site Central Drainage Channel

A single groundwater monitoring well (MW138) is located in the Central Drainage Channel at close proximity to the site boundary. The well reported saline near neutral conditions during the monitoring period. PFAS concentration recorded during the 2020-2021 reporting period were within the range of historical results.

A summary of the PFOA, PFOS and the sum of PFOS and PFHxS concentrations for the reporting period and the historical concentration ranges for the off-site Central Drainage area monitoring location is presented in Table 7-8.

Table 7-8 Central Drainage Channel Groundwater PFOA, PFOS and Sum of PFOS and PFHxS Concentrations

Location ID	Analyte	Historical range	OMP Monitoring	
		Min – Max (µg/L)	Nov 2020 (µg/L)	Jun 2021 (µg/L)
MW138	PFOS	<0.01 – 0.87	0.22	0.09
	PFOS and PFHxS	<0.01 – 1.01	0.27	0.12
	PFOA	<0.01 – 0.02	<0.01	<0.01
New Maximum		New Minimum	New Exceedance	

Note:

MW000 – multilevel monitoring well, the shallowest screen interval sample results have been used for the assessment.

7.1.5.4 Off-site Southern Drainage Channel

Two groundwater monitoring wells are located in the Southern Drainage Channel area. The wells reported saline near neutral conditions during the monitoring period.

PFAS concentrations were recorded above the laboratory LOR during the June 2021 monitoring event with new maximum concentrations occurring for both PFOS and the sum of PFOS and PFHxS.

A summary of the PFOA, PFOS and the sum of PFOS and PFHxS concentrations for the reporting period and the historical concentration ranges for the off-site Central Drainage Area monitoring location is presented in Table 7-9.

Table 7-9 Southern Drainage Channel Groundwater PFOA, PFOS and Sum of PFOS and PFHxS Concentrations

Location ID	Analyte	Historical range	OMP Monitoring	
		Min – Max (µg/L)	Nov 2020 (µg/L)	Jun 2021 (µg/L)
MW139	PFOS	<0.001	<0.01	0.01
	PFOS and PFHxS	<0.001	<0.01	0.04
	PFOA	<0.001	<0.01	<0.01
MW140	PFOS	<0.001 – 0.003	<0.01	<0.01
	PFOS and PFHxS	<0.001 – 0.003	<0.01	<0.01
	PFOA	<0.01	<0.01	<0.01
New Maximum		New Minimum	New Exceedance	

Note:

MW000 – multilevel monitoring well, the shallowest screen interval sample results have been used for the assessment.

7.1.6 Off-site receptors – Wapet Creek and Exmouth Gulf

Six groundwater monitoring wells are located in the off-site receptor area as displayed in Figure 3, Appendix A.

The wells reported saline near neutral conditions during the monitoring period.

PFAS concentrations were recorded below the laboratory LOR at all locations during the monitoring period.

A summary of the PFOA, PFOS and the sum of PFOS and PFHxS concentrations for the reporting period and the historical concentration ranges for the receptor area monitoring locations are presented in Table 7-10. It is noted that the results are below laboratory LOR and therefore the results have not been plotted.

Table 7-10 Off-site receptor area Groundwater PFOA, PFOS and Sum of PFOS and PFHxS Concentrations

Location ID	Analyte	Historical range	OMP Monitoring	
		Min – Max (µg/L)	Nov 2020 (µg/L)	Jun 2021 (µg/L)
MW137	PFOS	<0.01 – 0.004	<0.01	<0.01
	PFOS and PFHxS	<0.01 – 0.011	<0.01	<0.01
	PFOA	<0.01	<0.01	<0.01
MW141	PFOS	<0.001 – 0.003	<0.01	<0.01
	PFOS and PFHxS	<0.001 - 0.003	<0.01	<0.01
	PFOA	<0.001 - 0.002	<0.01	<0.01
MW176	PFOS	<0.01 – 0.002	<0.01	<0.01
	PFOS and PFHxS	<0.01 – 0.002	<0.01	<0.01
	PFOA	<0.001	<0.01	<0.01
MW177	PFOS	<0.01 – 0.002	<0.01	<0.01
	PFOS and PFHxS	<0.01 – 0.003	<0.01	<0.01
	PFOA	<0.001	<0.01	<0.01
MW178	PFOS	<0.01 – 0.004	<0.01	<0.01
	PFOS and PFHxS	<0.01 – 0.008	<0.01	<0.01
	PFOA	<0.001	<0.01	<0.01
MW179	PFOS	<0.01 – 0.010	<0.01	<0.01
	PFOS and PFHxS	<0.01 – 0.019	<0.01	<0.01
	PFOA	<0.01 – 0.001	<0.01	<0.01
New Maximum		New Minimum	New Exceedance	

Note:

MW000 – multilevel monitoring well, the shallowest screen interval sample results have been used for the assessment.

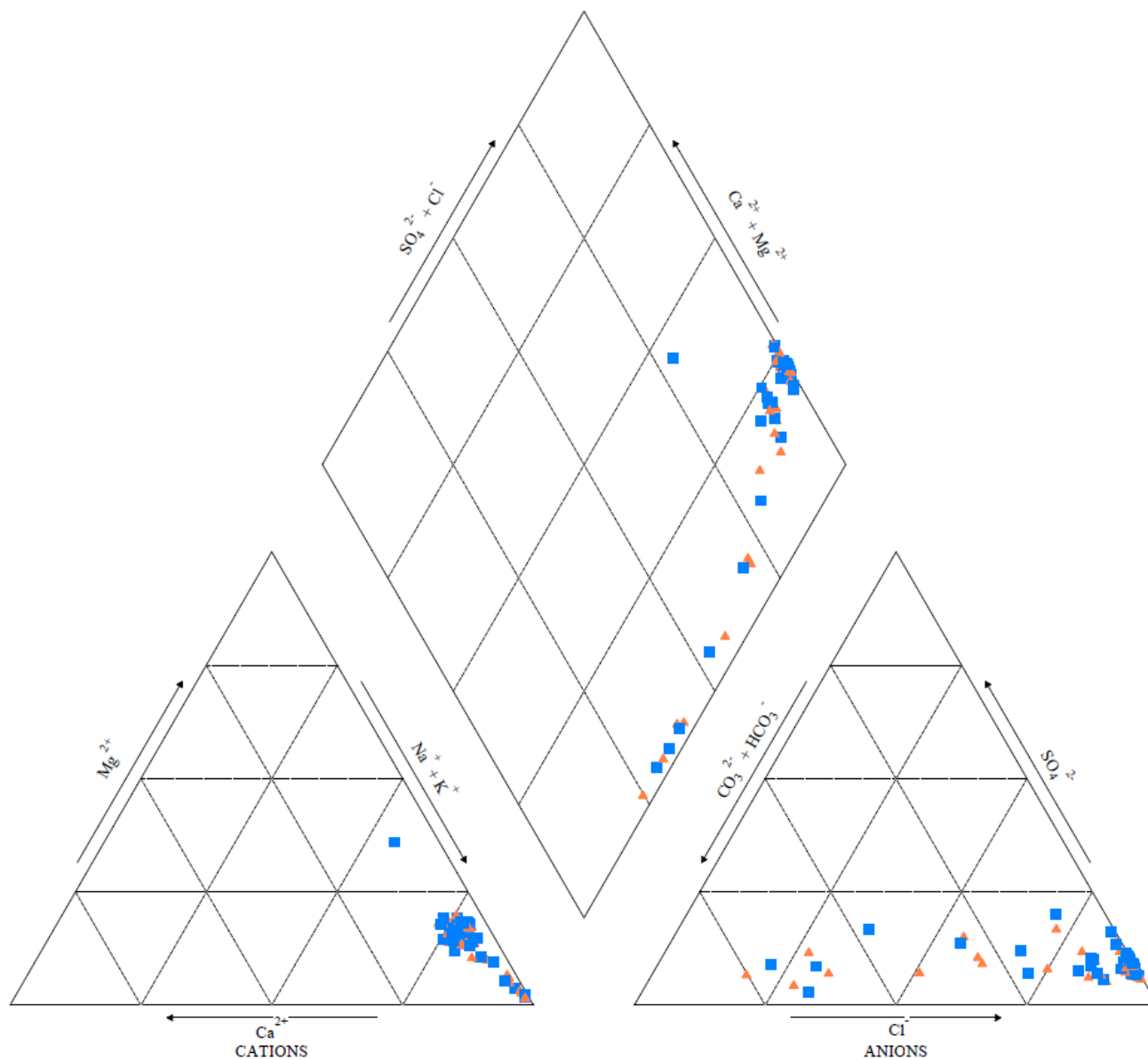
7.1.7 Major Ions Analysis

Major ions analysis was conducted on the groundwater samples collected during each monitoring event to categorise the water type. The results of the major ion analysis are visually represented in a Piper Diagram shown in Figure 7-4. Most samples plotted as sodium-chloride type with a few samples being sodium bicarbonate type. The high level of sodium is related to the saline environment. No significant difference in the hydrochemistry was observed between the two monitoring events/seasons or screen depths.

Figure 7-4 Piper diagram of the groundwater samples

EXPLANATION

- November 2020
- ▲ June 2021



7.2 Seepage Water

As part of the OMP, seepage water is sampled to assess the changes in PFAS concentrations at the receptor, downgradient of the identified source areas, including water discharged to the Exmouth Gulf. Seepage water samples were therefore collected during outgoing tidal cycles.

7.2.1 Seepage water geochemical parameters

Seepage water geochemical parameters recorded during the November 2020 and June 2021 monitoring events are summarised in Table 7-11 and provided within Table 4, Appendix D.

Table 7-11 Seepage water Geochemical Parameters

Parameter	November 2020	June 2021
DO	1.27 mg/L – 4.42 mg/L <i>Aerobic conditions.</i>	5.34 mg/L – 7.14 mg/L <i>Aerobic conditions.</i>
EC	58,999 µS/cm – 69,054 µS/cm	30,756 µS/cm – 58,193µS/cm
TDS	33,675 mg/L – 41,730 mg/L <i>Highly saline conditions.</i>	20,007 mg/L – 37,830 mg/L <i>Highly saline conditions.</i>
pH	7.59 – 8.12 <i>Near neutral conditions.</i>	6.77 – 8.19 <i>Near neutral conditions.</i>
ORP	-69.9 mV – 63.5 mV <i>Reducing conditions.</i>	-35.9 mV – 144.1 mV <i>Reducing to oxidising conditions.</i>

7.2.2 Seepage Water Summary Results

Seepage water has been sampled since February 2018 with detects of PFOS and the sum of PFOS and PFHxS recorded within isolated sampling locations during the previous reporting period (refer to the 2020 AIR, Cardno, 2020). This reporting period, no detections of PFAS, PFOA, PFOS or Sum of PFOS and PFHxS were recorded at any of the monitoring locations.

A summary of the PFOA, PFOS and Sum of PFOS and PFHxS concentrations for the reporting period and the historical concentration ranges for the seepage water monitoring locations are presented in Table 7-12. It is noted that the results are predominantly below laboratory LOR and therefore the results have not been plotted.

Table 7-12 Seepage Water PFOA, PFOS and Sum of PFOS and PFHxS Concentrations

Location ID	Analyte	Historical range	OMP Monitoring	
		Min – Max (µg/L)	Nov 2020 (µg/L)	Jun 2021 (µg/L)
OTH103	PFOS	<0.001 – 0.14	<0.01	<0.01
	PFOS and PFHxS	<0.001 – 0.14	<0.01	<0.01
	PFOA	<0.001	<0.01	<0.01
OTH106	PFOS	<0.001 – 0.001	<0.01	<0.01
	PFOS and PFHxS	<0.001 – 0.001	<0.01	<0.01
	PFOA	<0.001	<0.01	<0.01
OTH107	PFOS	<0.001 - 0.01	<0.01	<0.01
	PFOS and PFHxS	<0.001 - 0.01	<0.01	<0.01
	PFOA	<0.001	<0.01	<0.01
OTH129	PFOS	<0.001 - 0.15	<0.01	<0.01
	PFOS and PFHxS	<0.001 - 0.15	<0.01	<0.01
	PFOA	<0.001	<0.01	<0.01
OTH132	PFOS	<0.001 - 0.01	<0.01	<0.01
	PFOS and PFHxS	<0.001 - 0.01	<0.01	<0.01

Location ID	Analyte	Historical range	OMP Monitoring	
		Min – Max (µg/L)	Nov 2020 (µg/L)	Jun 2021 (µg/L)
OTH134	PFOA	<0.001	<0.01	<0.01
	PFOS	<0.001 - 0.003	<0.01	<0.01
	PFOS and PFHxS	<0.001 - 0.003	<0.01	<0.01
	PFOA	<0.001	<0.01	<0.01
New Maximum		New Minimum	New Exceedance	

7.3 Surface Water

The monitoring of surface water across the Management Area assesses the PFAS extent and changes in surface water migrating from the Base to Wapet Creek through the drainage channels.

Surface water has been sampled since February 2018. In addition, to the biannual events a first flush event was also undertaken in March 2021. It is noted that a number of locations have not been regularly sampled due to being dry most of the time. All locations sampled for surface soil are also monitored for surface water and a sample is collected if surface water is present.

7.3.1 On-site pathway

A summary of the PFOA, PFOS and sum of PFOS and PFHxS concentrations for the reporting period and the historical concentration ranges for the on-site pathway area surface water monitoring locations are presented in Table 7-13. It is noted that a number of the sample locations were dry, or concentrations recorded below the laboratory LOR and therefore the results have not been plotted.

Table 7-13 On-site pathway area Surface Water PFOA, PFOS and Sum of PFOS and PFHxS Concentrations

Location ID	Analyte	Historical range	OMP Monitoring		
		Min – Max (µg/L)	Nov 2020 (µg/L)	First Flush (March 2021) (µg/L)	Jun 2021 (µg/L)
SW114	PFOS	0.081~	NS	NS	NS
	PFOS and PFHxS	0.081~			
	PFOA	<0.001~			
SW121	PFOS	0.18~	NS	NS	NS
	PFOS and PFHxS	0.24~			
	PFOA	0.004~			
SW122	PFOS	1.3~	NS	NS	NS
	PFOS and PFHxS	1.4~			
	PFOA	1.1~			
SW123	PFOS	0.43~	NS	NS	NS
	PFOS and PFHxS	0.48~			
	PFOA	0.004~			
SW219	PFOS	0.002 - 0.34	NS	<0.01	NS
	PFOS and PFHxS	0.002 – 0.38		<0.01	
	PFOA	<0.001 - <0.01		<0.01	
SW265	PFOS	0.052 – 0.22	NS	NS	0.18
	PFOS and PFHxS	0.052 – 0.22			0.18
	PFOA	<0.001			<0.01
New Maximum		New Minimum		New Exceedance	

Notes:

~ Historical data from June 2018 (only sampled once)

NS: Not Sampled

7.3.2 Off-site pathways

The off-site pathway areas for surface water are identified as:

- > Northern Drainage Channel;
- > Central Drainage Channel; and
- > Southern Drainage Channel.

The surface water results for these areas are discussed in the following sections.

7.3.2.1 Northern Drainage Channel

A summary of the PFOA, PFOS and sum of PFOS and PFHxS concentrations for the reporting period and the historical concentration ranges for the off-site Northern Drainage Channel pathway area surface water monitoring locations are presented in Table 7-14. It is noted that a number of the sample locations were dry, or concentrations recorded below the laboratory LOR during OMP monitoring events and therefore the results have not been plotted.

New maximum concentrations were recorded at SW189 and SW193, however it is noted that these monitoring locations had only been sampled once before.

Table 7-14 Northern Drainage Channel Surface Water PFOA, PFOS and Sum of PFOS and PFHxS Concentrations

Location ID	Analyte	Historical range		OMP Monitoring	
		Min – Max (µg/L)	Nov 2020 (µg/L)	First Flush (March 2021) (µg/L)	Jun 2021 (µg/L)
SW189	PFOS	0.04	NS	0.06	0.45
	PFOS and PFHxS	0.04		0.06	0.45
	PFOA	<0.01		<0.01	<0.01
SW193	PFOS	0.03	NS	0.26	<0.01
	PFOS and PFHxS	0.03		0.26	<0.01
	PFOA	<0.01		<0.01	<0.01
SW288	PFOS	0.11	NS	0.10	NS
	PFOS and PFHxS	0.11		0.10	
	PFOA	<0.001		<0.01	
New Maximum		New Minimum		New Exceedance	

Notes:

NS: Not Sampled

SW190 has never been sampled for surface water (dry location).

7.3.2.2 Central Drainage Channel

A summary of the PFOA, PFOS and sum of PFOS and PFHxS concentrations for the reporting period and the historical concentration ranges for the off-site Central Drainage Channel pathway area surface water monitoring locations are presented in Table 7-15. It is noted that a number of the sample locations were dry, or concentrations recorded below the laboratory LOR during the biannual monitoring events and therefore the results have not been plotted. The Central Drainage Channel monitoring locations were found dry during all monitoring events of the 2020-2021 reporting period.

Table 7-15 Central Drainage Channel Surface Water PFOA, PFOS and Sum of PFOS and PFHxS Concentrations

Location ID	Analyte	Historical range		OMP Monitoring	
		Min – Max (µg/L)	Nov 2020 (µg/L)	First Flush (March 2021) (µg/L)	Jun 2021 (µg/L)
SW291	PFOS	0.038~	NS	NS	NS
	PFOS and PFHxS	0.040~			
	PFOA	<0.001~			
SW293	PFOS	0.050~	NS	NS	NS

Location ID	Analyte	Historical range		OMP Monitoring	
		Min – Max (µg/L)	Nov 2020 (µg/L)	First Flush (March 2021) (µg/L)	Jun 2021 (µg/L)
	PFOS and PFHxS	0.050~			
	PFOA	<0.001~			
New Maximum		New Minimum		New Exceedance	

Notes:

~ Historical data from June 2018 only

NS: Not Sampled

SW192 has never been sampled for surface water (dry location).

7.3.2.3 Southern Drainage Channel

A summary of the PFOA, PFOS and sum of PFOS and PFHxS concentrations for the reporting period and the historical concentration ranges for the off-site Southern Drainage Channel pathway area surface water monitoring locations are presented in Table 7-16. It is noted that a number of the sample locations were dry, or concentrations recorded below the laboratory LOR during the biannual monitoring events and therefore the results have not been plotted.

Table 7-16 Southern Drainage Channel Surface Water PFOA, PFOS and Sum of PFOS and PFHxS Concentrations

Location ID	Analyte	Historical range		OMP Monitoring	
		Min – Max (µg/L)	Nov 2020 (µg/L)	First Flush (March 2021) (µg/L)	Jun 2021 (µg/L)
SW199	PFOS			<0.01	
	PFOS and PFHxS	NS	NS	<0.01	NS
	PFOA			<0.01	
SW200	PFOS	<0.01 - 0.003		<0.01	<0.01
	PFOS and PFHxS	<0.01 - 0.003	NS	<0.01	<0.01
	PFOA	<0.001		<0.01	<0.01
SW298	PFOS	0.005		<0.01	
	PFOS and PFHxS	0.005	NS	<0.01	NS
	PFOA	<0.001		<0.01	
New Maximum		New Minimum		New Exceedance	

Note:

NS: Not Sampled

7.3.3 Wapet Creek receptor area

The Wapet Creek receptor area is divided into two areas:

- > Wapet Creek Northern Reach; and
- > Wapet Creek Southern Reach.

The surface water results for these areas are discussed in the following sections.

7.3.3.1 Wapet Creek Northern Reach receptor area

A summary of the PFOA, PFOS and sum of PFOS and PFHxS concentrations for the reporting period and the historical concentration ranges for the Wapet Creek Northern Reach receptor area surface water monitoring locations are presented in Table 7-17. It is noted that the monitoring locations predominantly recorded concentrations below the laboratory LOR during the monitoring events and therefore the results have not been plotted.

Table 7-17 Wapet Creek Northern Reach Surface Water PFOA, PFOS and Sum of PFOS and PFHxS Concentrations

Location ID	Analyte	Historical range		OMP Monitoring	
		Min – Max (µg/L)	Nov 2020 (µg/L)	First Flush (March 2021) (µg/L)	Jun 2021 (µg/L)
SW001	PFOS	<0.01 – 0.01	<0.01	<0.01	<0.01
	PFOS and PFHxS	<0.01 – 0.01	<0.01	<0.01	<0.01
	PFOA	<0.01	<0.01	<0.01	<0.01
SW209	PFOS	<0.001 - 0.11	<0.01	0.12	<0.01
	PFOS and PFHxS	<0.001 - 0.11	<0.01	0.12	<0.01
	PFOA	<0.001	<0.01	<0.01	<0.01
SW210	PFOS	<0.001 - 0.011	<0.01	0.06	0.01
	PFOS and PFHxS	<0.001 - 0.011	<0.01	0.06	0.01
	PFOA	<0.001	<0.01	<0.01	<0.01
SW211	PFOS	<0.001 - 0.06	0.02	<0.01	<0.01
	PFOS and PFHxS	<0.001 – 0.06	0.02	<0.01	<0.01
	PFOA	<0.001	<0.01	<0.01	<0.01
SW300	PFOS	<0.001 - 0.01	<0.01	0.02	0.02
	PFOS and PFHxS	<0.001 - 0.01	<0.01	0.02	0.02
	PFOA	<0.001	<0.01	<0.01	<0.01
SW301	PFOS	0.034			<0.01
	PFOS and PFHxS	0.034	NS	NS	<0.01
	PFOA	<0.001			<0.01
SW302	PFOS	<0.01 - 0.22	<0.01	0.09	<0.01
	PFOS and PFHxS	<0.01 - 0.22	<0.01	0.09	<0.01
	PFOA	<0.001	<0.01	<0.01	<0.01
SW303	PFOS	<0.01 - 0.12	<0.01	<0.01	<0.01
	PFOS and PFHxS	<0.01 - 0.12	<0.01	<0.01	<0.01
	PFOA	<0.001	<0.01	<0.01	<0.01
SW304	PFOS	<0.01 - 0.17	<0.01	<0.01	<0.01
	PFOS and PFHxS	<0.01 - 0.18	<0.01	<0.01	<0.01
	PFOA	<0.01 - 0.003	<0.01	<0.01	<0.01
New Maximum		New Minimum		New Exceedance	

Note:

NS: Not Sampled

During the monitoring period all sampling locations recorded concentrations below the laboratory LOR or detectable concentrations below historical range, with the exception of SW209, SW210 and SW300 which reported a new maximum concentration and SW300 which reported a first time detect of PFOS.

No first time detect or new exceedance of a guideline value were reported during the 2020-2021 monitoring period.

7.3.3.2 Wapet Creek Southern Reach receptor area

A summary of the PFOA, PFOS and sum of PFOS and PFHxS concentrations for the reporting period and the historical concentration ranges for the Wapet Creek Northern Reach receptor area surface water monitoring locations are presented in Table 7-18. It is noted that a number of the sample locations recorded

concentrations below the laboratory LOR during the monitoring events and therefore the results have not been plotted.

Table 7-18 Wapet Creek Southern Reach Surface Water PFOA, PFOS and Sum of PFOS and PFHxS Concentrations

Location ID	Analyte	Historical range		OMP Monitoring	
		Min – Max (µg/L)	Nov 2020 (µg/L)	First Flush (March 2021) (µg/L)	Jun 2021 (µg/L)
SW205	PFOS	<0.001	<0.01	<0.01	<0.01
	PFOS and PFHxS	<0.001	<0.01	<0.01	<0.01
	PFOA	<0.001	<0.01	<0.01	<0.01
SW207	PFOS	<0.001 - 0.05	<0.01	<0.01	<0.01
	PFOS and PFHxS	<0.001 - 0.05	<0.01	<0.01	<0.01
	PFOA	<0.001	<0.01	<0.01	<0.01
SW208	PFOS	<0.001	<0.01	<0.01	<0.01
	PFOS and PFHxS	<0.001	<0.01	<0.01	<0.01
	PFOA	<0.001	<0.01	<0.01	<0.01
SW305	PFOS	<0.001	<0.01	0.02	<0.01
	PFOS and PFHxS	<0.001	<0.01	0.02	<0.01
	PFOA	<0.001	<0.01	<0.01	<0.01
New Maximum		New Minimum		New Exceedance	

During the monitoring period all sampling locations recorded concentrations below the laboratory LOR with the exception of SW305 which recorded a first time detect of PFOS during the first-flush event and a new exceedance of the HEPA (2020) Ecological guideline value for 99% species protection (LOR value adopted).

7.4 Sediment/Surface Soil

The monitoring of sediment/surface soil across the Management Area assesses the PFAS extent and changes in surface water source areas migrating to Wapet Creek and assists in determining changes attributable to seasonal fluctuations. Sediment has been sampled periodically since February 2018. In addition to the OMP biannual monitoring events, a first flush event was also undertaken in March 2021.

7.4.1 On-site pathway Area

A summary of the PFOA, PFOS and Sum of PFOS and PFHxS concentrations for the reporting period and the historical concentration ranges for the on-site pathway area sediment / surface soil sampling locations are presented in Table 7-19.

Table 7-19 On-site pathway area Sediment/Surface Soil PFOA, PFOS and Sum of PFOS and PFHxS Concentrations

Location ID	Analyte	Historical range	OMP Monitoring		
		Min – Max (mg/kg)	Nov 2020 (mg/kg)	First Flush (March 2021) (mg/kg)	Jun 2021 (mg/kg)
SS108	PFOS	0.0013 – 0.0135	0.0006	0.0034	0.0011
	PFOS and PFHxS	0.0013 – 0.0135	0.0006	0.0034	0.0011
	PFOA	<0.0001	<0.0002	<0.0002	<0.0002
SS113	PFOS	0.0002 – 0.0114	0.0039	0.0045	0.0005
	PFOS and PFHxS	0.0002 – 0.0114	0.0039	0.0045	0.0005
	PFOA	<0.0001	<0.0002	<0.0002	<0.0002
SS114	PFOS	0.0039 – 0.0222	<0.0002	0.0390	0.0066
	PFOS and PFHxS	0.0039 – 0.0222	<0.0002	0.0390	0.0066
	PFOA	<0.0001	<0.0002	<0.0002	<0.0002
SS121	PFOS	0.0295 – 0.84	0.0505	0.0559	0.0187
	PFOS and PFHxS	0.0298 – 0.84	0.0507	0.0559	0.0189
	PFOA	<0.0001 – 0.0022	<0.0002	<0.0002	<0.0002
SS122	PFOS	0.011 – 0.0452	0.0056	0.0069	0.0082
	PFOS and PFHxS	0.011 – 0.0452	0.0085	0.0069	0.0086
	PFOA	<0.0001	0.0004	<0.0002	0.0003
SS123	PFOS	0.0344 – 0.108	0.127	0.09	0.0466
	PFOS and PFHxS	0.0344 – 0.109	0.127	0.09	0.0466
	PFOA	<0.0001	<0.0002	<0.0002	<0.0002
SS124	PFOS	0.0026 - 0.0426	0.188	0.0384	0.0766
	PFOS and PFHxS	0.003 - 0.0426	0.188	0.0384	0.0766
	PFOA	<0.0001 – 0.0003	0.0004	<0.0002	<0.0002
SS125	PFOS	0.0024 - 0.0263	0.141	0.0507	0.0152
	PFOS and PFHxS	0.0024 - 0.0263	0.141	0.0507	0.0152
	PFOA	<0.0001	<0.0002	<0.0002	<0.0002
SS157	PFOS	0.0007 – 0.0322	0.0036	0.0010	0.0013
	PFOS and PFHxS	0.0007 – 0.0322	0.0036	0.0010	0.0013
	PFOA	<0.0002 - 0.0021	<0.0002	<0.0002	<0.0002
SS166	PFOS	0.0004 - 0.0022	0.0019	0.0018	0.0004
	PFOS and PFHxS	0.0004 - 0.0022	0.0019	0.0018	0.0004
	PFOA	<0.0001	<0.0002	<0.0002	<0.0002
SS168	PFOS	0.0005 - 0.0022	0.0008	0.0010	0.0020
	PFOS and PFHxS	0.0005 - 0.0022	0.0008	0.0010	0.0020
	PFOA	<0.0001	<0.0002	<0.0002	<0.0002
SS170	PFOS	0.0008 - 0.0028	0.0052	0.0036	0.0010
	PFOS and PFHxS	0.0008 - 0.0028	0.0052	0.0036	0.0010
	PFOA	<0.0001	<0.0002	<0.0002	<0.0002
SS174	PFOS	0.011 - 0.0764	0.154	0.0514	0.0157
	PFOS and PFHxS	0.011 - 0.0764	0.155	0.0514	0.0157
	PFOA	<0.0001	<0.0002	<0.0002	<0.0002
SS176	PFOS	0.0007 – 0.0135	0.0075	0.0018	0.0035
	PFOS and PFHxS	0.0007 – 0.0135	0.0075	0.0018	0.0035
	PFOA	<0.0001	<0.0002	<0.0002	<0.0002

Location ID	Analyte	Historical range	OMP Monitoring		
		Min – Max (mg/kg)	Nov 2020 (mg/kg)	First Flush (March 2021) (mg/kg)	Jun 2021 (mg/kg)
SD219	PFOS	0.0001 - 0.0384	0.0004	0.0007	0.0006
	PFOS and PFHxS	0.0001 - 0.0384	0.0004	0.0007	0.0006
	PFOA	<0.0001	<0.0002	<0.0002	<0.0002
SS231	PFOS	0.0022 – 0.0832	0.0538	0.0095	0.0276
	PFOS and PFHxS	0.0024 – 0.0836	0.0544	0.0095	0.0276
	PFOA	<0.0001	0.0004	<0.0002	<0.0002
SS234	PFOS	0.0077 – 0.07	0.0204	0.0082	0.0160
	PFOS and PFHxS	0.0173 – 0.07	0.0204	0.0082	0.0160
	PFOA	0.0002 – 0.0014	<0.0002	<0.0002	<0.0002
SS235	PFOS	0.0004 – 0.0760	0.0284	0.0219	0.0157
	PFOS and PFHxS	0.0004 – 0.0760	0.0301	0.0223	0.0157
	PFOA	<0.0002 - 0.0002	0.0005	<0.0002	<0.0002
SS243	PFOS	0.0336 – 0.0736	0.0051	0.0760	0.0074
	PFOS and PFHxS	0.0336 – 0.0736	0.0051	0.0760	0.0074
	PFOA	<0.0001	<0.0002	<0.0002	<0.0002
SS265	PFOS	0.0003 – 0.0038	0.0076	0.0012	0.0032
	PFOS and PFHxS	0.0003 – 0.0097	0.0093	0.0012	0.0032
	PFOA	<0.0001	0.0003	<0.0002	<0.0002
SS277	PFOS	0.0012 – 0.0469	0.0076	0.0124	0.0014
	PFOS and PFHxS	0.0012 – 0.0469	0.0076	0.0124	0.0014
	PFOA	<0.0001	<0.0002	<0.0002	<0.0002
SS278	PFOS	0.0009 - 0.0494	0.0023	0.0137	0.0039
	PFOS and PFHxS	0.0009 - 0.0494	0.0023	0.0137	0.0039
	PFOA	<0.0001	<0.0002	<0.0002	<0.0002
SS279	PFOS	0.0003 - 0.0074	NS	0.0028	0.0032
	PFOS and PFHxS	0.0003 - 0.0086		0.0028	0.0032
	PFOA	<0.0001		<0.0002	<0.0002
New Maximum		New Minimum		New Exceedance	

Note:

NS: Not Sampled

All sediment concentrations were recorded below the adopted human health assessment criteria, however, PFOS concentrations within SS114, SS121, SS123, SS124, SS125, SS174, SS231, SS234, SS235 and SS277 were recorded above the ecological indirect exposure assessment criteria, with a number of those locations also recording new maximum concentrations.

New minimum and new maximum concentrations were recorded in sediment sampling locations across the on-site pathway area, however, the concentrations generally remained within the same order of magnitude as historical data.

7.4.2 Off-site pathway areas

The Off-site pathway areas for sediment / surface soil are identified as:

- > Northern Drainage Channel;
- > Central Drainage Channel; and
- > Southern Drainage Channel.

7.4.2.1 Northern Drainage Channel

A summary of the PFOA, PFOS and Sum of PFOS and PFHxS concentrations for the reporting period and the historical concentration ranges for the Northern Drainage Channel sediment / surface soil sampling locations are presented in Table 7-20.

Table 7-20 Northern Drainage Channel Sediment/Surface Soil PFOA, PFOS and Sum of PFOS and PFHxS Concentrations

Location ID	Analyte	Historical range	OMP Monitoring		
		Min – Max (mg/kg)	Nov 2020 (mg/kg)	First Flush (March 2021) (mg/kg)	Jun 2021 (mg/kg)
SS189	PFOS	0.0003 – 0.0109	0.0077	0.0051	0.0017
	PFOS and PFHxS	0.0005 – 0.0111	0.0081	0.0051	0.0017
	PFOA	<0.0001 - 0.0003	0.0003	<0.0002	<0.0002
SS190	PFOS	0.0039 - 0.0349	0.0284	0.0178	0.0019
	PFOS and PFHxS	0.0039 - 0.0355	0.0293	0.0178	0.0019
	PFOA	<0.0001	<0.0002	<0.0002	<0.0002
SS192	PFOS	<0.0001 - 0.0004	<0.0002	<0.0002	<0.0002
	PFOS and PFHxS	<0.0001 - 0.0004	<0.0002	<0.0002	<0.0002
	PFOA	<0.0001	<0.0002	<0.0002	<0.0002
SS193	PFOS	<0.0002 – 0.0014	0.0005	0.0007	<0.0002
	PFOS and PFHxS	<0.0002 – 0.0021	0.0005	0.0007	<0.0002
	PFOA	<0.0001	<0.0002	<0.0002	<0.0002
SS288	PFOS	0.0007 – 0.0274	0.0080	0.0016	<0.0002
	PFOS and PFHxS	0.0007 – 0.0274	0.0080	0.0016	<0.0002
	PFOA	<0.0001	<0.0002	<0.0002	<0.0002
New Maximum		New Minimum		New Exceedance	

All sediment concentrations were recorded below the adopted human health assessment criteria, however, PFOS concentrations within SS190 were recorded above the ecological indirect exposure assessment criteria in November 2020 and March 2021 but also below historical range in June 2021.

7.4.2.2 Central Drainage Channel

A summary of the PFOA, PFOS and Sum of PFOS and PFHxS concentrations for the reporting period and the historical concentration ranges for the Central Drainage Channel sediment / surface soil sampling locations are presented in Table 7-21.

Table 7-21 Central Drainage Channel Sediment/Surface Soil PFOA, PFOS and Sum of PFOS and PFHxS Concentrations

Location ID	Analyte	Historical range	OMP Monitoring		
		Min – Max (mg/kg)	Nov 2020 (mg/kg)	First Flush (March 2021) (mg/kg)	Jun 2021 (mg/kg)
SS198	PFOS	<0.0002 – 0.0047	0.0012	<0.0002	<0.0002
	PFOS and PFHxS	<0.0002 – 0.0047	0.0012	<0.0002	<0.0002
	PFOA	<0.0001	<0.0002	<0.0002	<0.0002
SS291	PFOS	0.0004 – 0.0101	0.0006	0.0014	0.0006
	PFOS and PFHxS	0.0004 – 0.0103	0.0006	0.0014	0.0006
	PFOA	<0.0001	<0.0002	<0.0002	<0.0002
SS292	PFOS	<0.0002 – 0.0025	0.0025	0.0006	0.0006
	PFOS and PFHxS	<0.0002 – 0.0025	0.0025	0.0006	0.0006
	PFOA	<0.0001	<0.0002	<0.0002	<0.0002

Location ID	Analyte	Historical range		OMP Monitoring	
		Min – Max (mg/kg)	Nov 2020 (mg/kg)	First Flush (March 2021) (mg/kg)	Jun 2021 (mg/kg)
SS293	PFOS	0.0005 – 0.0062	0.0017	0.0075	0.0106
	PFOS and PFHxS	0.0005 – 0.0062	0.0017	0.0075	0.0106
	PFOA	<0.0001	<0.0002	<0.0002	<0.0002
New Maximum		New Minimum		New Exceedance	

All sediment concentrations were recorded below the adopted human health assessment criteria, however, PFOS concentrations within SS293 were recorded above the ecological indirect exposure assessment criteria (new exceedance, June 2021).

7.4.2.3 Southern Drainage Channel

A summary of the PFOA, PFOS and Sum of PFOS and PFHxS concentrations for the reporting period and the historical concentration ranges for the Southern Drainage Channel sediment / surface soil sampling locations are presented in Table 7-22.

Table 7-22 Southern Drainage Channel Sediment/Surface Soil PFOA, PFOS and Sum of PFOS and PFHxS Concentrations

Location ID	Analyte	Historical range		OMP Monitoring	
		Min – Max (mg/kg)	Nov 2020 (mg/kg)	First Flush (March 2021) (mg/kg)	Jun 2021 (mg/kg)
SD199	PFOS	<0.0002 – 0.0013	0.0005	0.0007	<0.0002
	PFOS and PFHxS	<0.0002 – 0.0013	0.0005	0.0007	<0.0002
	PFOA	<0.0001	<0.0002	<0.0002	<0.0002
SD200	PFOS	<0.0001 - 0.0004	<0.0002	<0.0002	<0.0002
	PFOS and PFHxS	<0.0001 - 0.0004	<0.0002	<0.0002	<0.0002
	PFOA	<0.0001	<0.0002	<0.0002	<0.0002
SS298	PFOS	<0.0001 – 0.0002	0.0004	<0.0002	<0.0002
	PFOS and PFHxS	<0.0001 – 0.0002	0.0004	<0.0002	<0.0002
	PFOA	<0.0001	<0.0002	<0.0002	<0.0002
New Maximum		New Minimum		New Exceedance	

7.4.3 Wapet Creek receptor area

The Wapet Creek receptor area is divided into two areas:

- > Wapet Creek Northern Reach; and
- > Wapet Creek Southern Reach.

The results for these areas are discussed in the following sections.

7.4.3.1 Wapet Creek Northern Reach

A summary of the PFOA, PFOS and Sum of PFOS and PFHxS concentrations for the reporting period and the historical concentration ranges for the Wapet Creek Northern Reach sediment sampling locations are presented in Table 7-23.

During the monitoring period all concentrations were recorded below the adopted human health and ecological assessment criteria.

Table 7-23 Wapet Creek Northern Reach Sediment/Surface Soil PFOA, PFOS and Sum of PFOS and PFHxS Concentrations

Location ID	Analyte	Historical range	OMP Monitoring		
		Min – Max (mg/kg)	Nov 2020 (mg/kg)	First Flush (March 2021) (mg/kg)	Jun 2021 (mg/kg)
SD209	PFOS	<0.0001 – 0.0003	<0.0002	0.0016	<0.0002
	PFOS and PFHxS	<0.0001 – 0.0003	<0.0002	0.0016	<0.0002
	PFOA	<0.0001	<0.0002	<0.0002	<0.0002
SD210	PFOS	<0.0002 – 0.0016	0.0010	0.0013	0.0012
	PFOS and PFHxS	<0.0002 – 0.0017	0.0010	0.0013	0.0012
	PFOA	<0.0001	<0.0002	<0.0002	<0.0002
SD211	PFOS	<0.0002 – 0.0010	0.0008	0.0020	0.0010
	PFOS and PFHxS	<0.0002 – 0.0010	0.0008	0.0020	0.0010
	PFOA	<0.0001	<0.0002	<0.0002	<0.0002
SD301	PFOS	<0.0002 – 0.0018	0.0005	<0.0002	<0.0002
	PFOS and PFHxS	<0.0002 – 0.0018	0.0005	<0.0002	<0.0002
	PFOA	<0.0002	<0.0002	<0.0002	<0.0002
SD302	PFOS	<0.0001 - 0.0006	<0.0002	0.0013	<0.0002
	PFOS and PFHxS	<0.0001 - 0.0006	<0.0002	0.0013	<0.0002
	PFOA	<0.0001	<0.0002	<0.0002	<0.0002
SD300	PFOS	<0.0001 - 0.0087	0.0015	<0.0002	0.0013
	PFOS and PFHxS	<0.0001 - 0.0087	0.0015	<0.0002	0.0013
	PFOA	<0.0001	<0.0002	<0.0002	<0.0002
New Maximum		New Minimum		New Exceedance	

7.4.3.2 Wapet Creek Southern Reach

A summary of the PFOA, PFOS and Sum of PFOS and PFHxS concentrations for the reporting period and the historical concentration ranges for the Wapet Creek Southern Reach sediment / surface soil sampling locations are presented in Table 7-24.

During the monitoring period all concentrations were recorded below the laboratory LOR similar to historical results.

Table 7-24 Wapet Creek Southern Reach Sediment/Surface Soil PFOA, PFOS and Sum of PFOS and PFHxS Concentrations

Location ID	Analyte	Historical range	OMP Monitoring		
		Min – Max (mg/kg)	Nov 2020 (mg/kg)	First Flush (March 2021) (mg/kg)	Jun 2021 (mg/kg)
SD205	PFOS	<0.0001	<0.0002	<0.0002	<0.0002
	PFOS and PFHxS	<0.0001	<0.0002	<0.0002	<0.0002
	PFOA	<0.0001	<0.0002	<0.0002	<0.0002
SD208	PFOS	<0.0001	<0.0002	<0.0002	<0.0002
	PFOS and PFHxS	<0.0001	<0.0002	<0.0002	<0.0002
	PFOA	<0.0001	<0.0002	<0.0002	<0.0002
SS301	PFOS	<0.0001	<0.0002	<0.0002	<0.0002
	PFOS and PFHxS	<0.0001	<0.0002	<0.0002	<0.0002
	PFOA	<0.0001	<0.0002	<0.0002	<0.0002
New Maximum		New Minimum		New Exceedance	

8 Interpretive Analysis

This section provides a high-level interpretation of the nature and extent of PFAS at RAAF Base Learmonth based on the assessment of the data collected to date, supported by statistical analysis to evaluate whether changes have occurred to the understanding of the risk posed by PFAS in the Management Area.

8.1 Groundwater

All monitoring wells were gauged during both groundwater monitoring events (GMEs). Groundwater flow direction during the November 2020 event is predominantly towards the area of depression (to the east of the runway), whilst the June 2021 event indicated a less defined gradient towards the area of depression (Figure 5-6, Appendix A). The groundwater table was observed to be slightly shallower during the June 2021 event (refer to Table 7-2). This can be related to groundwater recharge occurring via rainfall infiltration during the wet season (January-April) in the Exmouth area. These observations are consistent with the DSI and first year of OMP observations.

A total of 49 monitoring wells were monitored for PFAS during the reporting period. The findings are summarised in the following sections and the sum of PFOS+PFHxS results are displayed in (Appendix A):

- > Figure 7 for the November 2020 event; and
- > Figure 9 for the June 2021 event.

8.1.1 On-site Source Areas

Overall, the PFAS concentrations for the on-site Source Areas monitoring wells are consistent between each GME and historical recorded concentrations. The November 2020 – October 2021 data generally remained of the same order of magnitude as historical results at each monitoring well with one exception.

- > PFOS concentrations one order of magnitude above the historical range were recorded in June 2021 at MW115 (Source Area 1)

The highest PFAS concentrations were reported in the wells in Source Area 2 – Fuel Farm. A number of wells across both source areas have consistently reported concentrations for the sum of PFOS and PFHxS above the HEPA (2020) recreational use criteria (2.0 µg/L):

- > Source Area 1 – Maintenance Area – MW018, MW063, MW162, MW163, MW164, MW167, MW211 and MW233; and
- > Source Area 2 – Fuel Farm - MW016, MW148S, MW148D and MW151.

A number of wells across Source Areas 1 and 2, with the exception of MW113, MW114 and MW165 (Source Area 1) and MW105 and MW159 (Source Area 2), recorded PFOA concentrations above the laboratory LOR, but below adopted human health and ecological assessment criteria.

All PFOS concentrations recorded above the laboratory limit of reporting (LOR - 0.01 µg/L) are considered to exceed the HEPA (2020) 99% species protection level for fresh and marine water, as the criterion of 0.00023 µg/L is lower than the laboratory LOR. All wells across Source Areas 1 and 2 recorded concentrations above the LOR during the monitoring period with the exception of MW113 and MW114 (upgradient of Source Area 1).

The PFAS concentrations at the source area monitoring well appear relatively stable since the start of ongoing monitoring. New concentration maximums or minimums identified during the reporting period are not showing evidence of a plume migration or depletion.

All the monitoring wells now have sufficient data (i.e. a minimum of four results) to conduct Mann Kendall analysis which provides further evidence in regards to plume stability. As no seasonality is observed in the data, it is considered that the Mann-Kendall test is applicable. Mann Kendall analysis outputs are presented in Appendix D.

Potential trends for concentrations of PFOA, PFOS and the sum of PFOS and PFHxS in groundwater across Source Areas 1 and 2 are summarised in Table 8-1 with the associated confidence factor.

Table 8-1 Mann-Kendall Trend Analysis Summary – Source Areas 1 and 2

Source Area	Location	PFOA Trend	Confidence Factor (%)	PFOA Max Conc in Latest Round?	PFOS Trend	Confidence Factor (%)	PFOS Max Conc in Latest Round?	Sum of PFOS & PFHxS Trend	Confidence Factor (%)	Sum of PFOS & PFHxS Max Conc in Latest Round?
Source Area 1	MW018	No Trend	64.0	No	Stable	86.4	No	Stable	76.5	No
	MW021	No Trend	76.5	No	No Trend	88.3	No	No Trend	75.8	No
	MW223	Prob Increasing	93.2	No	Increasing	95.2	No	Stable	59.2	No
	MW112	Stable	81.5	No	Stable	86.4	No	Decreasing	99.6	No
	MW113	Stable	39.3	No	Prob Decreasing	93.2	No	No Trend	86.4	No
	MW114	Stable	39.3	No	Stable	89.8	No	No Trend	86.4	No
	MW115	No trend	64	Yes	Increasing	98.2	Yes	Increasing	97.2	Yes
	MW162	Stable	59.2	No	No Trend	75.8	No	Stable	75.8	No
	MW163	No Trend	50.0	No	Stable	40.8	No	Stable	40.8	No
	MW164	Stable	40.8	No	No Trend	88.3	No	No Trend	59.2	No
	MW165	Stable	75.8	No	No Trend	82.1	No	Increasing	95.8	Yes
	MW166	Stable	75.8	No	No Trend	88.3	No	Stable	37.5	No
	MW167	No Trend	59.2	No	No Trend	82.1	No	No Trend	62.5	No
	MW168	Stable	59.2	No	No Trend	75.8	No	Increasing	95.8	Yes
	MW211	Decreasing	99.2	No	Decreasing	99.2	No	Decreasing	97.2	No
Source Area 2	MW016	No Trend	75.8	No	No Trend	83.3	No	No Trend	83.3	No
	MW105	Decreasing	95.8	No	No Trend	59.2	No	Stable	59.2	No
	MW148S	No Trend	88.3	No	No Trend	75.8	No	No Trend	59.2	No
	MW148D	No Trend	75.8	Yes	No Trend	75.8	Yes	No Trend	59.2	No
	MW151	Stable	88.3	No	Stable	59.2	No	Stable	75.8	No
	MW159	No trend	40.8	No	No Trend	50.0	No	No Trend	59.2	No

The results of the Mann-Kendall trend analysis for PFOA indicate that the plume displays a stable or no statistically significant trend with the exception of MW223 (Source Area 1) that indicates a probably increasing trend with 93.2% confidence. However, concentrations of PFOA at MW223 have remained within the same order of magnitude since the start of monitoring and the June 2021 PFOA results was the lowest since the start of the OMP implementation. MW211 and MW105 are now displaying a decreasing trend for PFOA which is a change from the previous year (PFOA trend was stable until 2020).

The results of the Mann-Kendall trend analysis for PFOS indicates that the plume displays a predominantly stable or no statistically significant trend, with the exception of MW223 and MW115 within Source Area 1, that indicate increasing trends with 95.2 and 98.2% confidence respectively. However, MW211 and MW113, also within Source Area 1 indicates a decreasing and probably decreasing trends with 99.2% and 93.2% confidence respectively.

The results of the Mann-Kendall trend analysis for the sum of PFOS and PFHxS indicates that the plume displays a predominantly stable or no statistically significant trend, with the exception of MW115 within Source Area 1 that indicates an increasing trend with 97.2% confidence. However, MW112 and MW211 within Source Area 1 indicates a decreasing trend with 99.6% and 97.2% confidence.

Overall, the groundwater monitoring results do not suggest a change in the understanding of contamination or risk at these locations, with monitoring locations across the source areas displaying both potential increasing and decreasing trends dependent on the analyte under review.

8.1.2 Pathways and receptors

The 'pathways' and 'receptor' monitoring locations are the closest to the receiving environment and provide indications in regards to potential PFAS plume migration and the exposure risk for the marine and other environments.

The PFAS concentrations for the off-site pathway and receptor monitoring wells are generally consistent between each GME and historical recorded concentrations.

A number of samples have reported concentrations above the respective laboratory LOR for the key PFAS analytes, with concentrations of PFOS within the pathway areas occasionally above ecological assessment criteria (LOR adopted), and the sum of PFOS and PFHxS recorded above the adopted human health (MW172 – on-site pathway) as presented in Table 1, Appendix D.

The highest PFAS concentrations in groundwater for the pathway areas were reported at MW172. It is however noted that this on-site monitoring locations is relatively close to the source areas.

All receptor area monitoring wells recorded PFAS concentrations below the laboratory LOR during the reporting period.

During this monitoring period, monitoring well MW172 within the pathway area recorded PFOA concentrations above the laboratory LOR, but below adopted human health and ecological assessment criteria which is consistent with historical data for this location.

Plume stability (Mann Kendall analysis) has been calculated for each well that has sufficient temporal data (i.e. a minimum of four results). Groundwater monitoring data recorded between February 2018 and June 2021 was used for the assessment, with outputs presented in Appendix D. Groundwater concentration trends for PFOA, PFOS and the sum of PFOS and PFHxS across the pathway and receptor areas are summarised in Table 8-2.

Table 8-2 Mann-Kendall Trend Analysis Summary – Pathway and receptor areas

Source Area	Location	PFOA Trend	Confidence Factor (%)	PFOA Max Conc in Latest Round?	PFOS Trend	Confidence Factor (%)	PFOS Max Conc in Latest Round?	Sum of PFOS & PFHxS Trend	Confidence Factor (%)	Sum of PFOS & PFHxS Max Conc in Latest Round?
Pathway	MW102	Stable	39.3	Equal (LOR)	No Trend	76.5	Yes	No Trend	64.0	No
	MW103	No Trend	50.0	Yes	No Trend	39.3	No	No Trend	64.0	No
	MW104	Stable	39.3	Equal (LOR)	No Trend	50	No	Stable	39.3	Yes
	MW122	No Trend	75.8	Equal (LOR)	Stable	75.8	Equal (LOR)	Stable	75.8	No
	MW124	Stable	76.5	Equal (LOR)	No trend	57.0	No	No Trend	64.0	No
	MW126	Stable	39.3	Equal (LOR)	Stable	59.2	No	No Trend	59.2	Equal (LOR)
	MW127	Stable	39.3	Equal (LOR)	Stable	39.3	Equal (LOR)	Stable	39.3	Equal (LOR)
	MW134	Stable	39.3	Equal (LOR)	No Trend	64.0	No	No Trend	59.2	No
	MW135	No Trend	76.5	Equal (LOR)	No Trend	89.8	No	No Trend	64.0	No
	MW138	No Trend	81.5	No	No Trend	76.5	No	No Trend	81.5	No
	MW143	Stable	39.3	Equal (LOR)	Stable	76.5	Equal (LOR)	Stable	39.3	Equal (LOR)
	MW144	Stable	76.5	Equal (LOR)	Prob Decreasing	93.2	Equal (LOR)	Stable	64.0	Equal (LOR)
	MW145	Stable	39.3	Equal (LOR)	Stable	39.3	Equal (LOR)	Stable	39.3	Equal (LOR)
	MW146	No Trend	76.5	Equal (LOR)	Stable	39.3	Equal (LOR)	Stable	39.3	Equal (LOR)
	MW147	Stable	76.5	Equal (LOR)	Stable	76.5	Equal (LOR)	No Trend	64.0	Equal (LOR)
	MW170	Stable	75.8	Equal (LOR)	No Trend	67.5	No	Stable	50.0	No
	MW172	Stable	50.0	No	No Trend	75.8	No	Stable	75.8	No
	MW175	No Trend	50.0	Yes	No Trend	75.8	No	No Trend	75.8	No
	MW180	Stable	40.8	Equal (LOR)	No Trend	67.5	No	Stable	50.0	No
	MW181	Stable	75.8	Equal (LOR)	No Trend	67.5	No	No Trend	67.5	No
Receptor	MW137	Stable	40.8	Equal (LOR)	No Trend	75.8	No	No Trend	75.8	No
	MW141	Stable	39.3	Equal (LOR)	No Trend	86.4	Equal (LOR)	No Trend	64.0	Equal (LOR)

Source Area	Location	PFOA Trend	Confidence Factor (%)	PFOA Max Conc in Latest Round?	PFOS Trend	Confidence Factor (%)	PFOS Max Conc in Latest Round?	Sum of PFOS & PFHxS Trend	Confidence Factor (%)	Sum of PFOS & PFHxS Max Conc in Latest Round?
	MW176	Stable	40.8	Equal (LOR)	Stable	75.8	Equal (LOR)	Stable	75.8	Equal (LOR)
	MW177	Stable	40.8	Equal (LOR)	Stable	75.8	Equal (LOR)	No Trend	75.8	Equal (LOR)
	MW178	Stable	40.8	Equal (LOR)	No Trend	75.8	Equal (LOR)	No Trend	75.8	Equal (LOR)
	MW179	Stable	75.8	Equal (LOR)	No Trend	75.8	Equal (LOR)	No Trend	75.8	Equal (LOR)

The results of the Mann-Kendall trend analysis for PFOA and the sum of PFOS and PFHxS indicates that the plume displays a potential stable or no statistically significant trend.

The results of the Mann-Kendall trend analysis for PFOS indicates that the plume across the pathway area displays a potential stable trend or no statistically significant trend, with the exception of MW144 within the pathway area that indicates a probably decreasing trend with 93.2% confidence.

Overall, the groundwater monitoring results do not suggest a change in the understanding of PFAS extent or risk at the pathway and receptor locations. This is supported by the gauging data and inferred groundwater flow direction indicating a very low hydraulic gradient and limited flow/interaction from the Base to the Exmouth Gulf.

8.2 Seepage water

The monitoring of seepage water provides data to assess the potential risk to the Exmouth Gulf environment. The seepage water results for the reporting period are depicted on Figures 7 and 9, Appendix A.

During this monitoring period, no detectable concentrations of PFAS were recorded at any of the seepage water monitoring locations which is consistent with historical records.

Plume stability (Mann Kendall analysis) has been calculated for each location that has sufficient temporal data (i.e. a minimum of four results). Seepage water recorded between February 2018 and June 2021 was used for the assessment, with outputs presented in Appendix D. Seepage water concentration trends for PFOA, PFOS and the sum of PFOS and PFHxS are summarised in Table 8-3.

Table 8-3 Mann-Kendall Trend Analysis Summary – Seepage Water

Location	PFOA Trend	Confidence Factor (%)	PFOA Max Conc in Latest Round?	PFOS Trend	Confidence Factor (%)	PFOS Max Conc in Latest Round?	Sum of PFOS & PFHxS Trend	Confidence Factor (%)	Sum of PFOS & PFHxS Max Conc in Latest Round?
OTH103	Stable	39.3	Equal (LOR)	No Trend	50.0	No	No Trend	50.0	No
OTH106	Stable	39.3	Equal (LOR)	Stable	64.0	Equal (LOR)	Stable	37.5	Equal (LOR)
OTH107	Stable	39.3	Equal (LOR)	No Trend	50.0	No	No Trend	50.0	No
OTH129	Stable	39.3	Equal (LOR)	No Trend	40.8	No	No Trend	50.0	No
OTH132	Stable	39.3	Equal (LOR)	No Trend	82.1	No	No Trend	72.9	No
OTH134	Stable	39.3	Equal (LOR)	No Trend	75.8	No	Stable	37.5	Equal (LOR)

The results of the Mann-Kendall trend analysis for PFOA, PFOS and the sum of PFOS and PFHxS indicates that the plume displays a potentially stable or no statistically significant trend due to most of the samples not recording a PFAS detect.

Given the relatively low concentrations detected (if any) and considering the dilution factor when reaching the Exmouth Gulf, it is considered that the potential risk to the environment remains low and acceptable.

8.3 Surface Water

Overall, the PFAS concentrations at surface water sampling locations are predominantly consistent between each sampling event and historical recorded concentrations. However, it is noted that a number of sampling locations within the pathway area have not been sampled since 2018 due to the locations being consistently found dry. Concentrations in surface soil at these locations will provide indication if off-site migration of PFAS is occurring with surface water runoff.

The sum of PFOS and PFHxS concentrations are displayed in (Appendix A):

> Figure 7 for the November 2020 event;

- > Figure 8 for the 2021 first flush (March 2021) event; and
- > Figure 9 for the June 2021 event.

No rainfall was recorded during the biannual monitoring events. On the first day of the First Flush event 68.6 mm of rain was recorded at the Learmonth Airport BoM station, which is ideal First Flush conditions for the sampling event to capture the first surface water flow conditions.

Within the pathway area there were some new concentrations maximum or exceedance recorded following first flush (SW189 and SW193), however, all concentrations for PFOA and for the sum of PFOS and PFHxS were recorded below the adopted human health and ecological assessment criteria. All PFOS concentrations recorded above the laboratory LOR are considered to exceed the HEPA (2020) 99% species protection level for fresh and marine water, as the criterion of 0.00023 µg/L is lower than the laboratory LOR. The relatively elevated rainfall events recorded between March and June 2021 could have contributed to further PFAS mobilisation with surface water.

PFAS concentrations in surface water samples across the receptor area were predominantly below the laboratory LOR during the reporting period, with the exception of:

- > SW209, SW210, SW300 and SW302 – Wapet Creek Northern Reach; and
- > SW305 – Wapet Creek Southern Reach (March 2021, first detect of PFOS).

Mann Kendall trend analysis has been calculated for each location that has sufficient temporal data (i.e. a minimum of four results). Surface water monitoring data recorded between February 2018 and June 2021 was used for the assessment, with outputs presented in Appendix D.

Surface water concentration trends for PFOA, PFOS and the sum of PFOS and PFHxS are summarised in Table 8-4.

Table 8-4 Mann-Kendall Trend Analysis Summary – Surface Water

Monitoring Area	Location	PFOA Trend	Confidence Factor (%)	PFOA Max Conc in Latest Round?	PFOS Trend	Confidence Factor (%)	PFOS Max Conc in Latest Round?	Sum of PFOS & PFHxS Trend	Confidence Factor (%)	Sum of PFOS & PFHxS Max Conc in Latest Round?
Receptor	SW001	Stable	39.3	Equal (LOR)	No Trend	76.5	No	No Trend	76.5	No
	SW205	Stable	39.3	Equal (LOR)	Stable	68.3	Equal (LOR)	No Trend	76.4	No
	SW207	No Trend	50.0	Equal (LOR)	Stable	45.2	Equal (LOR)	No Trend	50	No
	SW208	Stable	45.2	Equal (LOR)	Stable	45.2	Equal (LOR)	Stable	37.9	Equal (LOR)
	SW209	No Trend	61.4	Equal (LOR)	No Trend	88.1	No	No Trend	50	No
	SW210	No Trend	61.4	Equal (LOR)	No Trend	80.9	No	No Trend	82.1	No
	SW211	No Trend	76.4	Equal (LOR)	No Trend	59.4	No	No Trend	86.4	No
	SW300	No Trend	55.7	Equal (LOR)	Prob Increasing	90.7	No	Prob Increasing	90.7	No
	SW301	Prob Decreasing	92.1	Equal (LOR)	Stable	40.8	No	Prob Decreasing	93.2	No
	SW302	No Trend	76.4	Equal (LOR)	No Trend	61.4	No	No Trend	61.4	No
	SW303	No Trend	76.4	Equal (LOR)	No Trend	76.4	No	No Trend	76.4	No
Pathway	SW200	Stable	37.5	Equal (LOR)						
Pathway	SW193	Stable	37.5	Equal (LOR)				No Trend	50.0	No
Wapet Creek	SW304	No Trend	76.5	Equal (LOR)				No Trend	76.5	Equal (LOR)

The results of the Mann-Kendall trend analysis indicate that the PFAS extent displays a potentially stable or no statistically significant trend with the exception of SW301 indicating probably decreasing results with a confidence factor of 92.1%. The PFOS extent also indicated predominantly stable or no statistically significant trend with the exception of SW300 indicating a probably increasing trend with a confidence factor of 90.7%. The results of the Mann-Kendall trend analysis for the sum of PFOS and PFHxS indicates that the plume across the receptor area displays a potential stable trend or no statistically significant trend, with the exception of SW300 that indicates a probably increasing trend with 90.7 confidence and SW301 that indicates a probably decreasing trend with 93.2% confidence.

Seasonal fluctuations are not observed in the field parameters or analytical data, the only change that could be attributed to seasonality is whether or not surface water is present at the monitoring location.

8.4 Sediment/Surface Soil

PFAS concentrations in sediment are monitored within the drainage channels (pathway areas on and off-site) and receptor areas (northern and southern reaches of Wapet Creek) to provide an indication regarding the dispersion and accumulation of PFAS and potential associated direct and indirect exposure risk to receptors.

Sediment concentrations across the on-site pathway area were reported above the laboratory LOR, for at least one PFAS analyte, at all sampling locations during the monitoring period.

PFAS concentrations within the receptor area were predominantly recorded below the laboratory LOR with the exception of SD210, SD211, SD302 and SD300. These locations are located within the northern reach of Wapet Creek which is likely to experience PFAS accumulation in the sediment as a result of low volume flooding events and PFAS dispersion with surface water.

During the reporting period, all concentrations for the sum of PFOS and PFHxS in sediment samples within the receptor area were recorded two orders of magnitude below the adopted ecological assessment criteria for indirect exposure.

All sediment concentrations were recorded below the adopted human health assessment criteria, however, PFOS concentrations within the pathway area at SS121, SS123, SS124, SS125, SS243, SS231, SS234 (on-site drainage channels), SS190 (northern drainage channel), SS293 (central drainage channel) were recorded above the ecological indirect exposure assessment criteria of 0.01 mg/kg. This is likely a result of PFAS mobilisation and dispersion with surface water during flooding events. No exceedance of the ecological criteria for direct exposure (1 mg/kg for PFOS) was recorded.

It is considered that based on the current available data there is no significant change to the risk profile associated with sediments/surface soils within the Management Area.

9 Conceptual Site Model

The evaluation of analytical results within this report does not suggest the nature and extent of PFAS in groundwater, surface water or sediment has significantly changed compared to that inferred from previous data despite the identified fluctuations in PFAS concentrations at individual locations.

The understanding of on-site source areas presented in the investigation phase (GHD, 2018) is supported by the OMP monitoring data presented in this report and previous OMP reports, with the PFAS concentrations in groundwater within the source areas remaining within the same order of magnitude as historical data. It is considered that the predominant stability in PFAS trends in groundwater within the pathway and receptor Areas also suggest the risk profile of these locations do not appear to be changing significantly.

The pathways for PFAS exposure and risks to human health and ecological receptors presented in the investigation phase (GHD, 2018) and ERA (GHD, 2019) are considered to still be relevant and data presented in this report does not suggest any significant changes to these mechanisms or risks.

The variability in the data, and relatively low number of samples collected at some key locations to date (i.e. surface water in receptor areas), requires on-going evaluation which will be completed through the current OMP Program.

The data presented in this report does not significantly change the understanding of the conceptual site model (CSM) presented in the PMAP.

10 Discussion

10.1 Risk Profile

The outcomes of the ecological risk assessment (ERA) undertaken by GHD (GHD, 2019) determined that:

- > PFAS poses a low and acceptable risk to lower trophic level terrestrial and marine aquatic organisms across the Investigation Area;
- > PFAS poses a low and acceptable risk with respect to the potential for bioaccumulation and biomagnification in the food chain across the management area, including the on-base terrestrial, the adjacent saltpan, Exmouth Gulf and the southern reaches of the Wapet Creek; and
- > The PFAS concentrations estimated for fish and benthic infauna in the northern reaches of Wapet Creek marginally exceeded the NEMP avian wildlife diet guideline, designed to evaluate food chain PFAS exposure to bird species. Inherent in this guideline are a number of conservative exposure assumptions, therefore measurable and ecological relevant adverse effects to shorebird populations are considered unlikely to be associated with this exceedance. The weight of available evidence suggests that shorebirds could source a substantial portion of their diet within Wapet Creek with a low risk of chronic adverse PFOS exposures occurring.

It was concluded that the information gathered during the ERA supported the conclusion made in the DSI that PFAS poses a low risk to recreational anglers with respect to bioaccumulation in commonly caught fish species, and that PFAS was unlikely to harm prawn stocks with Exmouth Gulf or to bioaccumulate to potential harmful levels within the commercial prawn catch of the Exmouth Gulf Managed Prawn Fishery (EGMPF).

The data obtained during the reporting period has been reviewed against the management response triggers presented in the OMP. Where a trigger was exceeded, additional assessment and risk analysis were completed. A summary of trigger exceedances and responses is presented in Table 10-1.

Table 10-1 Management response triggers summary

Trigger	Exceedance	Response	Outcome and Discussion
First time detect of PFAS at a monitoring well in the pathway area.	MW102 (Nov-20); MW134 (Nov-20); MW139 (Jun-21)	<ul style="list-style-type: none"> ▪ Review the individual results and average/median results across the monitoring zone. ▪ Conduct a more in-depth statistical analysis of the data to assess how stable the system is. ▪ Review the CSM to make a qualitative judgement on risk to the receptor. 	<p>These three monitoring wells are situated close to the site's boundaries and at proximity to wells that have previously reported PFAS detects.</p> <p>Statistical analysis (refer to Section 8.1.2) generally indicates stable PFAS trends in groundwater in the pathway areas.</p> <p>The initial response does not indicate a potential unacceptable increase in risk – No further action required.</p>
First time detect of PFAS at a surface water location in Wapet Creek.	SW305 (Mar-21)	<ul style="list-style-type: none"> ▪ Review the individual results and average/median results across the monitoring zone. ▪ Conduct a more in-depth statistical analysis of the data to assess how stable the system is. ▪ Review the CSM to make a qualitative judgement on risk to the receptor. 	<p>First time detect is isolated (no other monitoring location in the southern reach of Wapet Creek reported a detect) and likely related to the first flush conditions (increased mobilisation of PFAS with flooding).</p> <p>No PFAS was detected above LOR during subsequent sampling events.</p> <p>Statistical analysis (refer to Section 8.3) generally indicates stable PFAS trends in surface water in Wapet Creek.</p> <p>The initial response does not indicate a potential unacceptable increase in risk – No further action required</p>

Based on the additional data collected as part of the 2-year implementation of the OMP, there is no significant change to this risk profile and any potential future changes in groundwater, surface water,

seepage water and sediment PFAS concentrations will continue to be evaluated through monitoring and reporting in order to re-assess the risk as required.

10.2 Triggers for OMP Review

The OMP is to be reviewed annually considering existing trend data available to tailor the monitoring program to site-specific characteristics. A review of the OMP may be required for several reasons including (but not limited to):

- > Policy changes, regulatory requirements or regulator advices;
- > Changes or refinements to the monitoring network, frequency and parameters;
- > Feedback and information received as part of stakeholder engagement activities;
- > A change in the understanding of the risk for the site;
- > Significant changes of land use within the Management Area or at close proximity;
- > Impacts of remediations works; and
- > The requirements of a post-remediation Site Management Plan.

The 2020 - 2021 monitoring results did not identify a change in the risk profile for the Management Area or further management actions that would trigger the need for an OMP review. However, updated guidance has been published since the development of the OMP and updated assessment criteria should be amended in the next revision of the OMP.

11 Conclusions

Groundwater, surface water, seepage water and sediment sampling were completed between November 2020 and October 2021 in accordance with the PMAP OMP, and SAQP (Cardno, 2021). Available historical data was also used for this assessment. The monitoring conducted during the reporting period has met the objectives of the OMP (refer to Section 1.2) and SAQP (Appendix B).

Overall, the concentrations of PFAS across the media and locations sampled are consistent and of the same order of magnitude as historical data. Potential increasing and decreasing trends were observed at individual monitoring locations, noting that not all changes in PFAS concentrations were increases. Where there was sufficient data (i.e. a minimum of four results) to undertake statistical analysis on groundwater and surface water, the Mann Kendall trend analysis outcomes predominantly indicated that there were potentially stable trends or no statistically significant trends.

The highest PFAS concentrations in groundwater were recorded at the Source Area 2 - Fuel Farm. However, there is no evidence of plume migration towards sensitive receptors. This is supported by the groundwater levels recorded and inferred groundwater flow direction.

The pathway and receptor trigger (first time detect of PFAS) was exceeded at three groundwater monitoring locations (MW102, MW134 and MW139) and one surface water monitoring location (SW305) during the reporting period. Following further assessment, it was considered that no potential unacceptable increase in risk occurred as a result of these first time detects.

The nature and extent of PFAS across all media sampled has not changed from the understanding presented in the investigation phases, the PMAP and the 2020 AIR. Based on the current available data, there is no significant change to the risk profile of the Management Area.

No changes to the CSM understanding are noted and no changes to the management measures (i.e. ongoing monitoring) are recommended at this stage.

Given the remaining PFAS concentrations at the on-site source areas, the ongoing monitoring program should be continued to monitor the plume extent over time and re-assess the risk profile as required. A review of the monitoring network adequacy will form part of an OMP review.

12 References

General References

1. Australian Standard AS 4482-2005 Guide to the investigation and sampling of sites with potentially contaminated soils, Part 1 – Non-volatile and semi-volatile compounds.
2. Australian Standard AS 4482-1999 Guide to the investigation and sampling of sites with potentially contaminated soils, Part 2 – Volatile substances.
3. Australian Water Quality Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ, 2000).
4. Bureau of Meteorology, Climate Data Online (<http://www.bom.gov.au/climate/data/?ref=ftr>)
5. Contaminated Sites Act 2003, Western Australia.
6. Department of Defence, August 2019, Contamination Management Manual
7. Department of Defence, July 2020, OMP Annual Interpretive Report Guidance, version 0.1
8. Department of the Environment and Energy (2017) in the National Greenhouse and Energy Reporting Scheme Measurement Technical Guidelines for the Estimation of Emissions by Facilities in Australia.
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APPENDIX

A

FIGURES




now





Legend

 Management Area


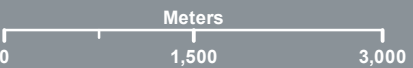
 RAAF Learmonth

FIGURE 1
1:60,000 Scale at A3



Site Location

2021 ANNUAL INTERPRETIVE REPORT
RAAF BASE LEARMONTH
DEPARTMENT OF DEFENCE



Map Produced by Cardno WA
Date: 2022-10-26 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0960-GS-001_RegionalLocation 02.mxd
Aerial Imagery Supplied by Google Earth



FIGURE 2
1:31,000 Scale at A3

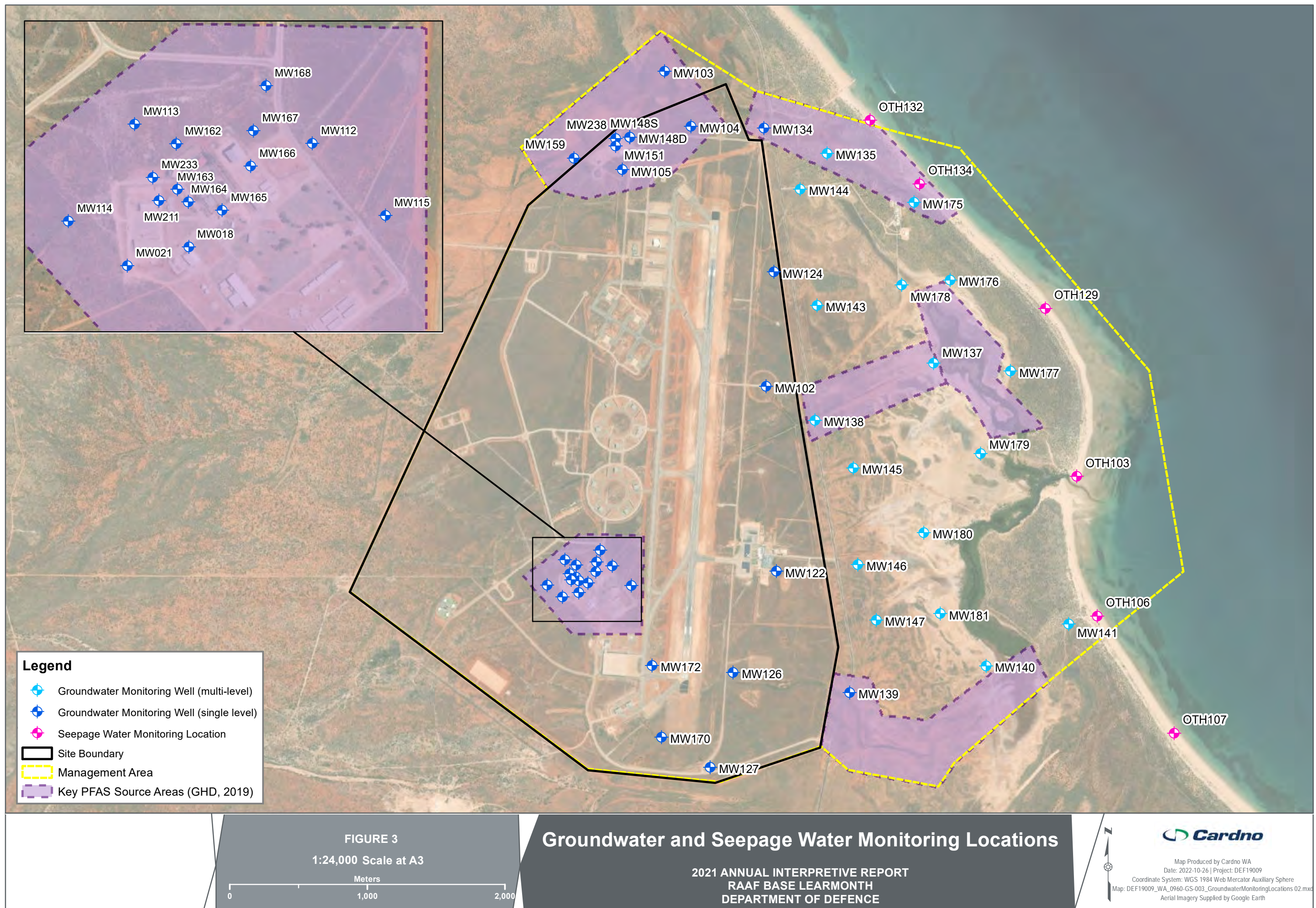
Meters
0 1,000 2,000

Management Areas

2021 ANNUAL INTERPRETIVE REPORT
RAAF BASE LEARMONTH
DEPARTMENT OF DEFENCE



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Date: 2022-10-26 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
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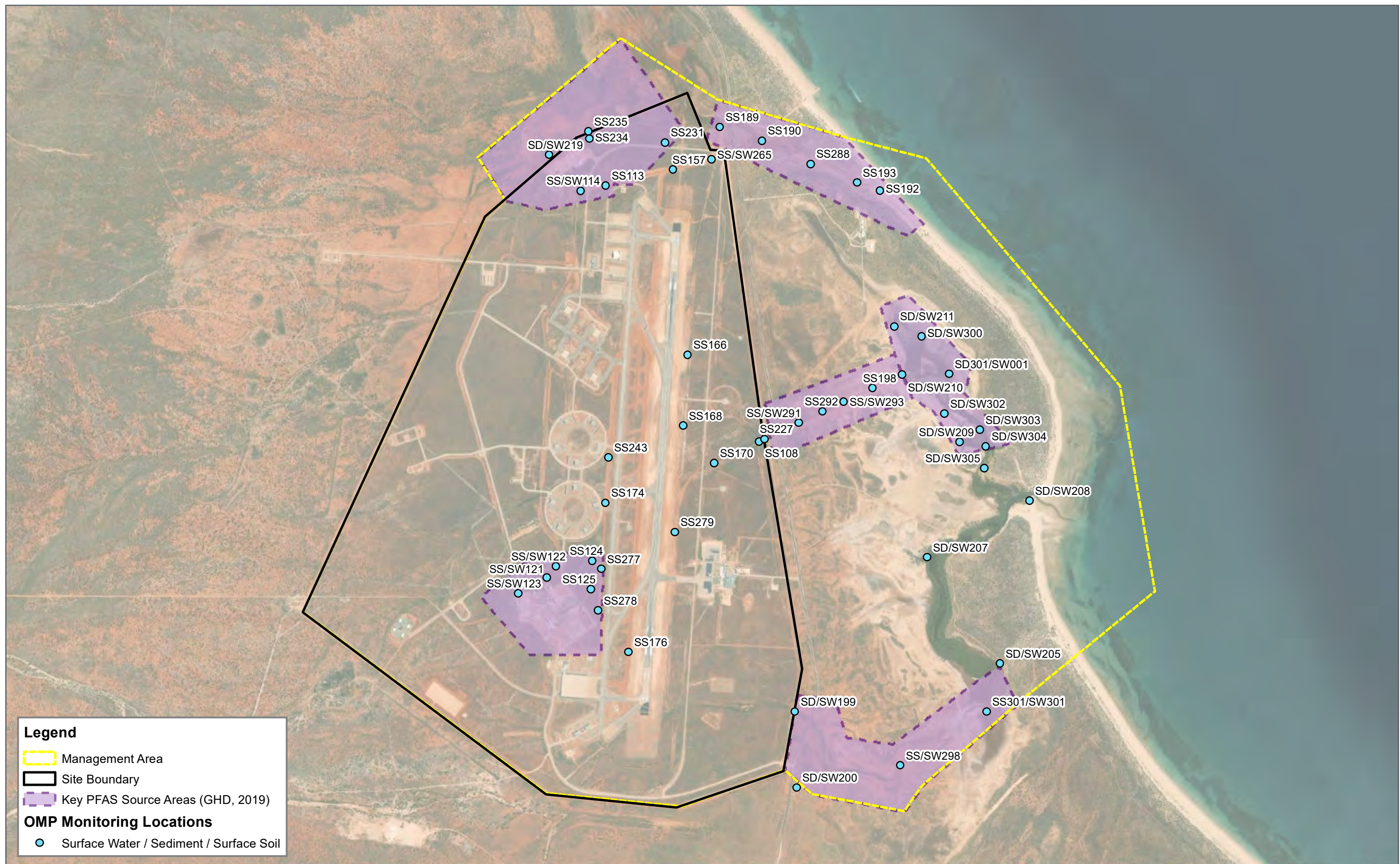
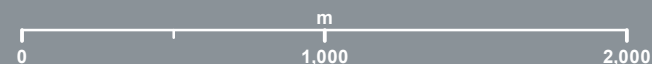


FIGURE 4
1:25,000 Scale at A3



Surface water and sediment monitoring locations

2021 ANNUAL INTERPRETIVE REPORT
RAAF BASE LEARMONTH
DEPARTMENT OF DEFENCE



Map Produced by Cardno WA
Date: 2022-10-26 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0960-GS-004_SurfaceWater&SedimentMonitoringLocations 02.mxd

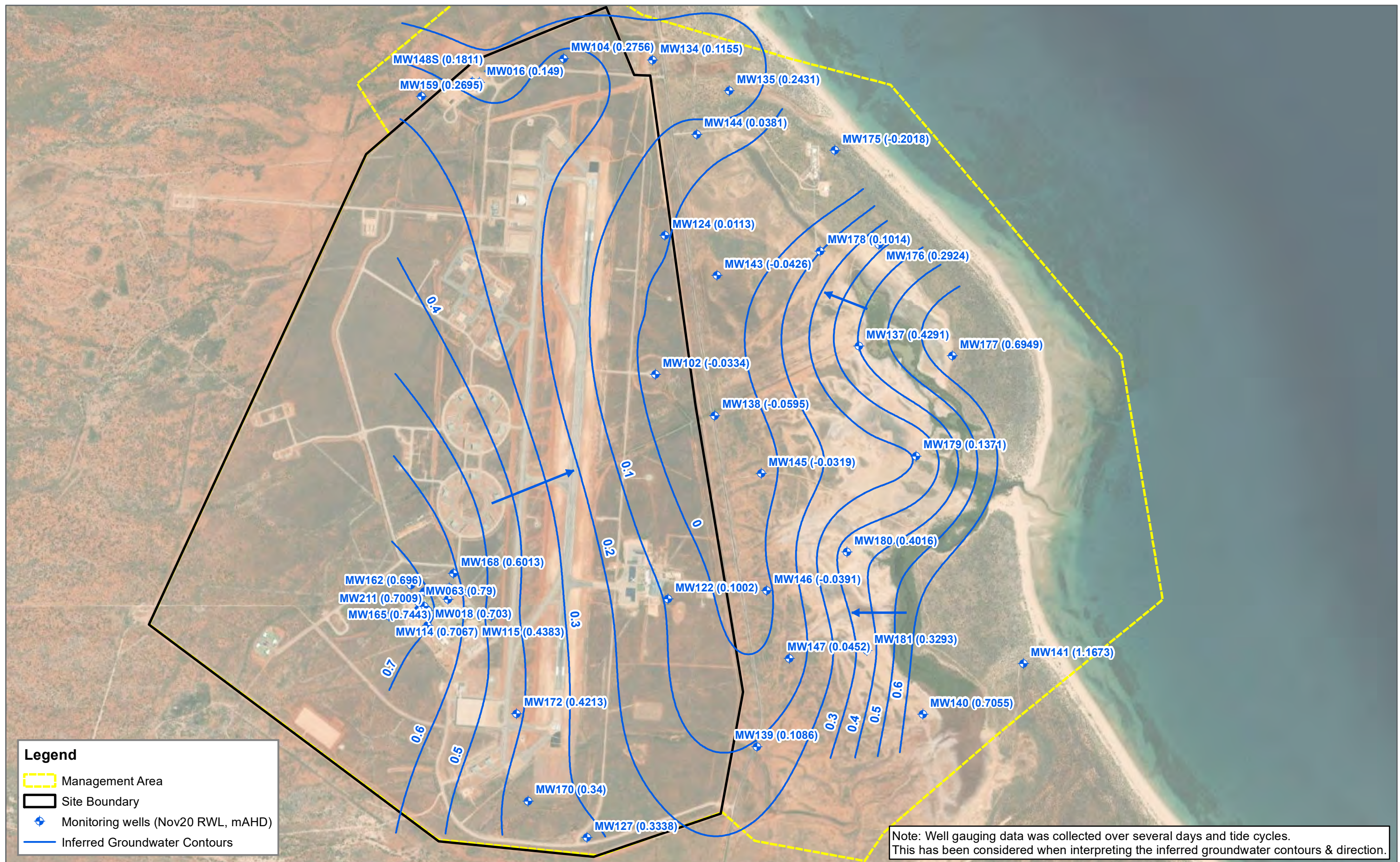
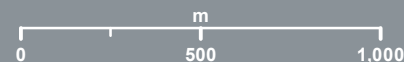


FIGURE 5
1:21,000 Scale at A3



Inferred Groundwater Contours (Nov-20)

2021 ANNUAL INTERPRETIVE REPORT
RAAF BASE LEARMONTH
DEPARTMENT OF DEFENCE



Cardno

Map Produced by Cardno WA
Date: 2022-10-26 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0960-GS-005_Nov20GWContours 01.mxd
Aerial Imagery Supplied by Google Earth

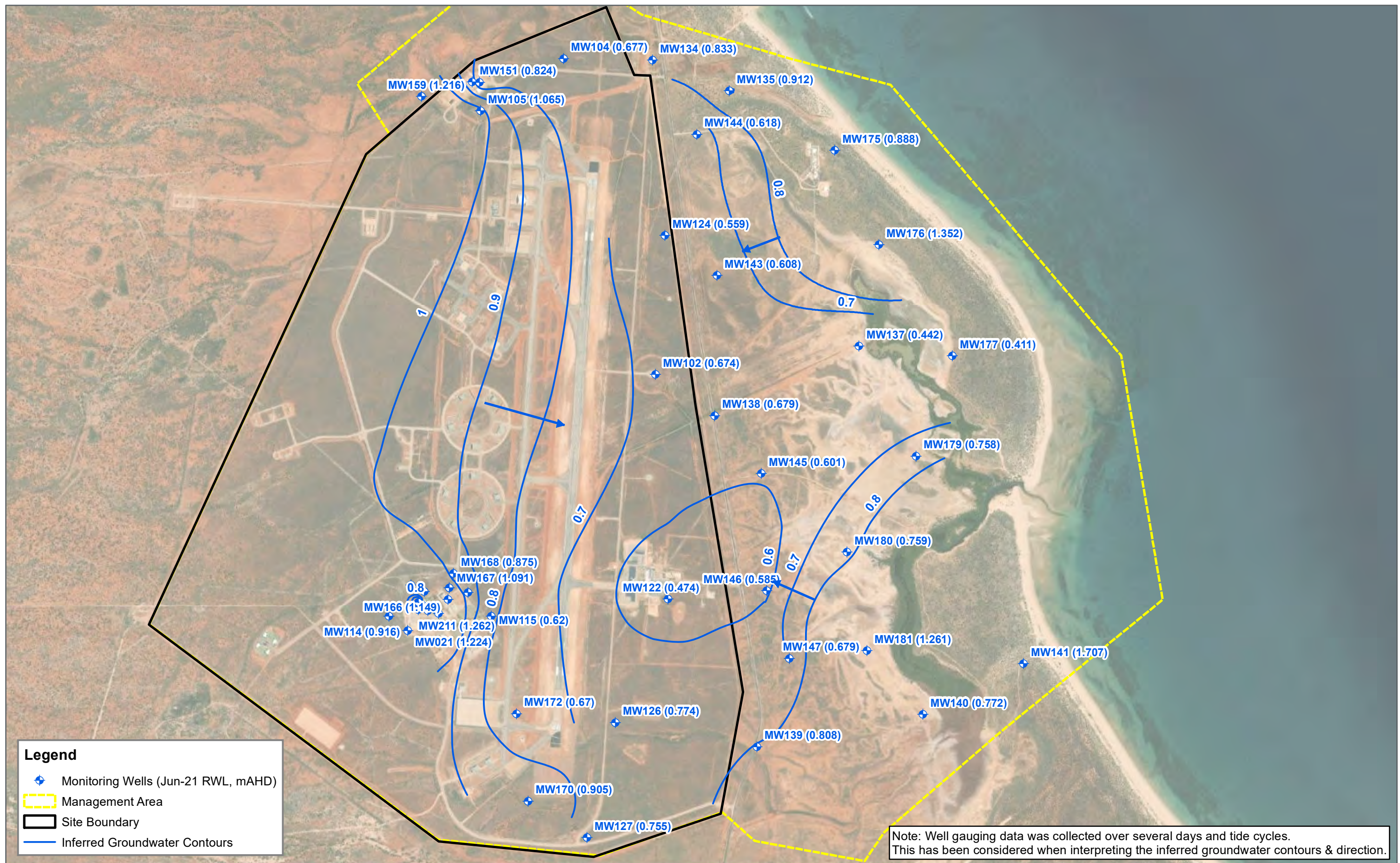


FIGURE 6
1:21,000 Scale at A3

0 500 1,000
m

Inferred Groundwater Contours (Jun-21)

2021 ANNUAL INTERPRETIVE REPORT
RAAF BASE LEARMONTH
DEPARTMENT OF DEFENCE



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Map Produced by Cardno WA
Date: 2022-10-26 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0960-GS-006_June21GWContours 01.mxd
Aerial Imagery Supplied by Google Earth



Legend

Site Boundary
 Management Area

March 21

Not Sampled
 Below LOR
 LOR to 0.07 ug/L
 0.07 ug/L to 0.7 ug/L
 0.7 ug/L to 7.0 ug/L
 7.0 ug/L to 70 ug/L
 >70 ug/L

FIGURE 8
1:22,000 Scale at A3

PFOS+PFHxS concentrations (Mar-21)

2021 ANNUAL INTERPRETIVE REPORT
RAAF BASE LEARMONTH
DEPARTMENT OF DEFENCE



Map Produced by Cardno WA
Date: 2022-10-26 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0960-GS-008_Mar21_PFOS+PFHxS 02.mxd
Aerial Imagery Supplied by Google Earth

APPENDIX

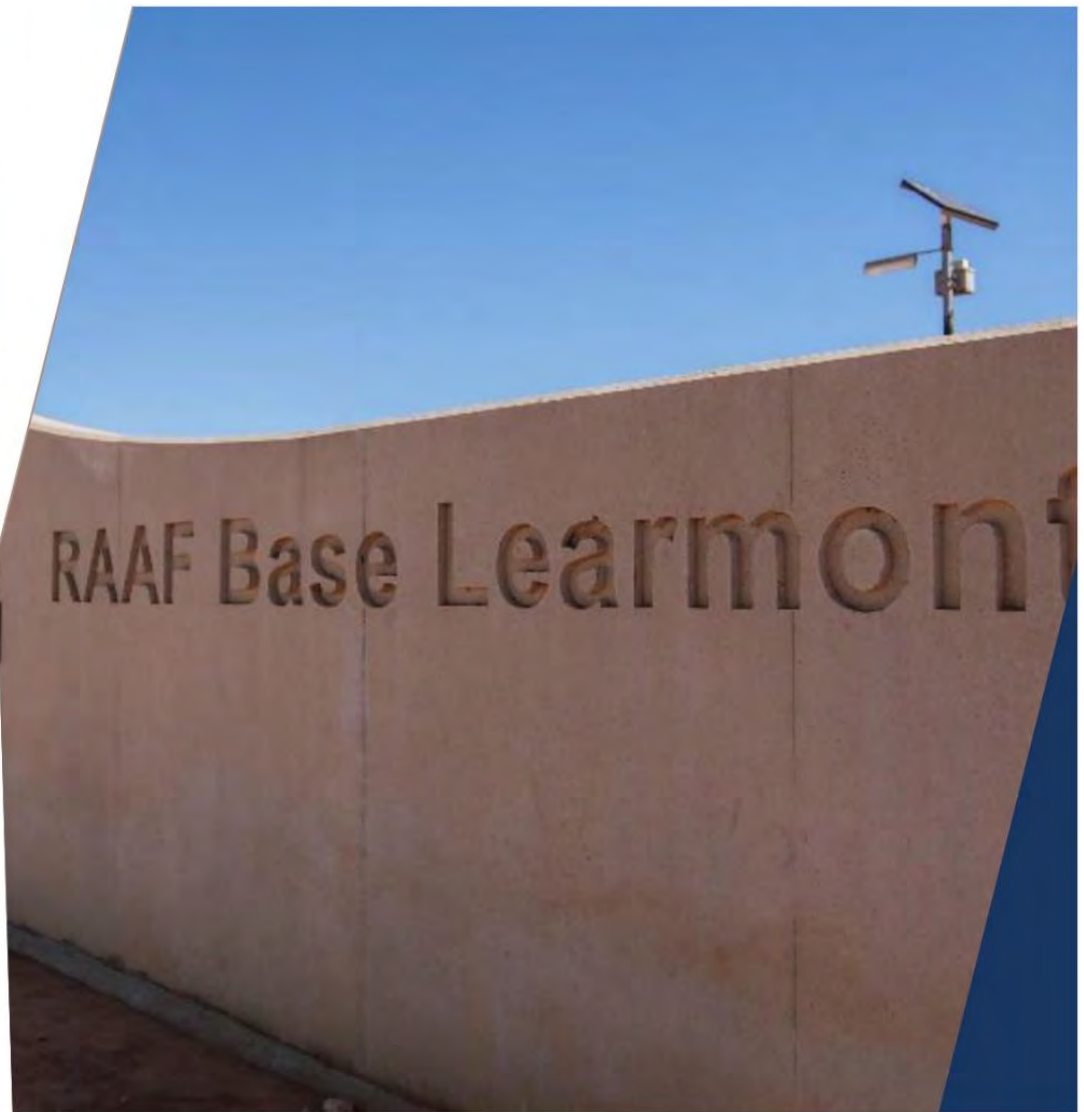
B

SAQP



now





PFAS Ongoing Monitoring Plan Sampling and Analysis Quality Plan (SAQP)

RAAF Base Learmonth

Prepared for
Department of Defence

June 2021



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Appendix A Figures

Appendix B Full PFAS Analytical Suite

1 Introduction

Cardno have been engaged by the Australian Department of Defence ('Defence' or 'Client') to prepare a Sampling and Analysis Quality Plan (SAQP) as part of the Ongoing Monitoring Plan (OMP), the purpose of which to monitor trends in the extent and concentrations of per- and poly-fluoroalkyl substances (PFAS) impacts identified on and around RAAF Base Learmonth, located approximately 30km south of Exmouth, Western Australia (Figure 1, Appendix A).

The OMP SAQP applies to not only RAAF Base Learmonth, but also the surrounding areas that, together with the Base, make up the "Management Area". For the purposes of this report:

- > "the Site" was defined as RAAF Base Learmonth (Figure 1, Appendix A).
- > "the Management Area" was defined as comprising the Site, plus the land east of the Base, including the salt pan, drainage channels, WAPET creek and extends to Exmouth Gulf (Figure 2, Appendix A).

The Site is located on Commonwealth Land and is regulated under Commonwealth environmental legislation. The OMP outlines the rationale and scope for the monitoring of the concentrations and extent of PFAS in groundwater, surface water and sediment originating from the Site for an initial three-year monitoring period. The three-year monitoring period consists of two main sampling events in June and November, as well as a 'first flush' surface water and sediment monitoring event conducted immediately (or as close as possible) following the first heavy rainfall event of the wet season (January or February).

1.1 Purpose & Objectives

The objective of the OMP SAQP is to present the specific monitoring locations, sampling methodologies and quality control / quality assurance measures for the monitoring of the concentrations and extent of PFAS in groundwater, surface water and sediment originating from the Site. These findings will inform risk management decisions by Defence and the Western Australian Government to protect human health and the environment.

The specific purposes of the monitoring specified in the OMP is to:

1. Evaluate changes in the nature and extent (spatial and temporal) of PFAS impact in groundwater and surface water pathways associated with Site sources of PFAS derived from AFFF;
2. Monitor the migration of PFAS in groundwater, sediment and surface water from the Site;
3. Provide confirmation of the current understanding of risk; and
4. Provide supporting data for assessment of management actions, where relevant.

1.2 Previous Reports

The following key reports prepared in relation to the RAAF Base Learmonth PFAS Investigation have been used as a basis to develop this SAQP:

- > Department of Defence, May 2019, RAAF Base Learmonth PFAS Management Area Plan, Revision 4.
- > Department of Defence, May 2019, RAAF Base Learmonth PFAS Ongoing Monitoring Plan.
- > GHD, December 2018, RAAF Base Learmonth – PFAS Investigations – Preliminary and Detailed Site Investigation Report.
- > GHD, April 2019, RAAF Base Learmonth – PFAS Investigations – Ecological Risk Assessment Preliminary (ERA).
- > Cardno, April 2020, PFAS OMP Biannual Monitoring Event Factual Report RAAF Base Learmonth
- > Cardno, May 2020, PFAS OMP First Flush Sampling Event Factual Report RAAF Learmonth
- > Cardno, December 2020, PFAS OMP 2020 post-summer Biannual Monitoring Event RAAF Base Learmonth.
- > Cardno, February 2021, PFAS OMP 2020 post-winter Biannual Monitoring Event RAAF Base Learmonth
- > Cardno, April 2021, PFAS OMP, DRAFT 2020 Annual Interpretive Report – RAAF Base Learmonth
- > Cardno, April 2021, PFAS OMP First Flush Sampling Event Factual Report RAAF Learmonth

1.3 Responsible Parties

Responsible parties and responsibilities associated with the implementation of the OMP are detailed in Table 1-1.

Table 1-1 Responsible Parties

Role	Responsibilities
Department of Defence – PFAS Investigation and Management Branch	<ul style="list-style-type: none"> Implement this OMP. Engage suitably qualified environmental consultants/contractors to carry out the works specified in the OMP
RAAF Base Learmonth – Base Support Manager/Site Manager and Environment and Sustainability Manager	<ul style="list-style-type: none"> Review and approve all necessary permits required for implementation of the works outlined in the OMP.
Environmental Consultant	<ul style="list-style-type: none"> Obtain necessary permits from RAAF Base Learmonth to implement the works outlined in the OMP. Liaise with State regulators (e.g. Department of Biodiversity, Conservation and Attractions) to arrange sampling of off-Site waterways, as required. Undertake the monitoring activities outlined in this SAQP. Produce a monitoring report that summarises the data and findings of each monitoring event and is consistent with the requirements of this SAQP. Produce an annual interpretive report including recommendations for any potential changes in the location and frequency of sampling which may be incorporated in the revision of the OMP. Upload analytical data from each monitoring event to the relevant Defence ESdat database.

1.4 Relevant Guidelines

This SAQP has been prepared in general accordance with the WA *Contaminated Sites Act 2003* (CS Act), applicable industry standards and guidelines relevant to an assessment of this type, and has been formulated in reference to the following:

- > National Environment Protection Council (NEPC), 1999, *National Environmental Protection (Assessment of Site Contamination) Measure (as amended 2013)* (ASC NEPM).
- > Heads of Environmental Protection Authority's Australia and New Zealand (HEPA), January 2020, *PFAS National Environmental Management Plan (NEMP) 2.0*.
- > Australian Standard AS 4482-2005 *Guide to the investigation and sampling of sites with potentially contaminated soils, Part 1 - Non-volatile and semi-volatile compounds*.
- > Standards Australia 1998. AS/NZ 5667:1998 *Water quality – sampling*.
- > Australian and New Zealand Guidelines, 2018. *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*.
- > Department of Defence, Department of Energy, 2018, *Quality System Manual Schedule B15*.
- > U.S. Environmental Protection Agency (EPA), 2000, 'Guidance for the Data Quality Objectives Process (EPA QA/G-4)'.
- > USEPA, 2002, 'Guidance on Environmental Data Verification and Data Validation (EPA QA/G-8)'.

- > Department of Environment and Regulation (DER), 2014, *Assessment and Management of Contaminated Sites*¹.
- > National Health and Medical Research Council (NHMRC), August 2019, *Guidance on Per and Polyfluoroalkyl Substances (PFAS) in Recreational Water*.

1.5 Standards of Assessment and Limitations

This SAQP has been prepared in general accordance with the current industry standards for an assessment of this type for the purpose, objectives and scope identified in this report.

The scope presented in this SAQP report are derived only from available desk-based information and site inspection undertaken. This SAQP is not any of the following:

- > A Mandatory Audit Report (MAR) or Voluntary Audit Report (VAR) as defined under the *Contaminated Sites Act 2003* (CS Act).
- > A Geotechnical Assessment.
- > A Detailed Site Investigation (DSI).
- > A Detailed Hydrogeological Assessment.
- > A Remediation Action Plan (RAP) or Site Remediation & Validation (SRV) report.
- > A Site Management Plan (SMP).

2 Site Description and Management Areas

RAAF Base Learmonth is located approximately 30 km South of Exmouth and covers an area of 2,550 hectares (ha).

The buildings and associated infrastructure and support services include:

- > Runway, taxi way and aprons
- > Aircraft hangers
- > Civilian Airport terminal
- > Maintenance and workshop areas
- > General administration
- > Domestic housing
- > Fuel farm (former and current)
- > Sewage treatment ponds
- > Base water bore-field
- > There are also a number of underground storage tanks (USTs) and septic tanks across the site.

2.1 Site Definition and Planning

For the purposes of this SAQP report, “the Site” was defined as comprising RAAF Base Learmonth. A detailed description of the Site is provided in GHD’s DSI Report (GHD, 2018). The site location is presented on Figure 1, Appendix A.

Key Site identification details are presented in Table 2-1.

¹ It is noted that Site is located on Commonwealth Land and is regulated under the Commonwealth environmental legislation, the State based DWER guidelines are relevant for the sampling of off-Site waterways.

Table 2-1 Site Identification Details

Details	Description
Site Address	Minilya-Exmouth Road, Learmonth, WA 6707
Land Description	RAAF Base Learmonth
Owner	Commonwealth of Australia
Planning Zone / Land use	Public Purposes – Commonwealth Government
Local Government Authority (LGA)	Shire of Exmouth

2.2 Surrounding Land Uses and Zoning

The surrounding land uses are outlined in Table 2-2.

Table 2-2 Surrounding Land Uses

Direction	Land Use
North	Kailis Hatchery, Potshot Memorial and pastoral land
West	WAPET Creek, Solar Observatory, Bureau of Meteorology, Exmouth Gulf and pastoral land
East	Pastoral land; Exmouth Gulf further east used for commercial prawn fishing
South	Various landfills, base supply bore-field and pastoral land

3 Environmental Setting

Key details defining the site are summarised in Table 3-1.

Table 3-1 Key Site Details

Setting	Description
Climate	<p>The region has a hot, semi-arid climate, with a wet and dry season. The maximum temperatures range between 37.9°C (January) and 24.2°C (July) while minimum temperatures range between 11.4°C (July) and 24.7°C (February).</p> <p>Rainfall occurs generally between January and July with monsoonal showers between January and Late April. August to December is generally dry. The highest volume of rainfall typically occurs during the month of June with a mean monthly rainfall amount of 43.5 mm.</p>
Topography	<p>The Site is located on a coastal plain and is generally flat. The elevation on site ranges between 0 and 20 meters relative to the Australian Height Datum (m AHD).</p> <p>To the west of site, the elevation at the coastal ranges are 220 m AHD.</p>
Acid Sulfate Soil	<p>A review of the Acid Sulfate Soils (ASS) risk mapping, available on the WA Atlas online database indicates the following:</p> <ul style="list-style-type: none"> to the north of the site is classified as having a moderate to low risk of ASS occurring within the top 3m of natural soil but high to moderate risk of ASS beyond 3m of natural soil surface the salt pan to the east is classified as having a high to moderate risk of ASS occurring in the top 3m of natural soil.
Hydrology	<p>The Exmouth Gulf is located approximately 600 m east of the site at its closest point. The site is also crossed west to east by three ephemeral creeks.</p> <p>RAAF Base Learmonth contains a number of constructed drains that direct surface water towards drainage channels that discharge into WAPET Creek (Central and Southern channels) or Exmouth gulf (northern channel). It was considered likely that the water flow in these drains are limited to high rainfall event. The northern channel was noted by GHD to inundated with seawater during high tide from the coast to the boundary of Base.</p>

Setting	Description
	<p>WAPET creek is located to the east of Base and is lined with mangroves. Water flows tidally in and out of the creek and low-lying areas around the creek are periodically inundated.</p> <ul style="list-style-type: none"> ▪ The northern drainage channel discharges directly to the Exmouth Gulf. It is a constructed drain onsite but links to a wide natural channel offsite that cuts through the coastal dunes. ▪ The central drainage channel discharges into the northern reach of WAPET Creek. It is a straight constructed channel for its entire length. ▪ The southern drainage channel discharges into the southern reach of WAPET Creek. It is a constructed drain onsite but links to a natural channel offsite that meanders across low lying salt pan topography.
Geology	<p>Regional Geology</p> <p>The Site is underlain by quaternary age alluvial, aeolian and littoral sediments superimposed on the coastal plain (Geological Survey of Western Australia 1980). Further inland are Quaternary alluvium and colluvium deposits that have been derived from erosion of the Cape Ranges. The deposits include clays, silts, sands and gravels. The Cape Range forms the highlands to the west of RAAF Base Learmonth and are composed of Tertiary aged Cape Range limestone units.</p> <p>The coastal areas are fringed by Holocene aged beach and sand dunes consisting of quartz and calcarenite sands. An older Quaternary dune unit is located to the south of RAAF Base Learmonth and dune forms are visible. Intertidal flats and mangrove swamps occur immediately west of the coastal sands and are associated with estuarine creeks.</p> <p>Site Specific Geology</p> <p>The findings of intrusive investigative works at RAAF Base Learmonth, undertaken by GHD between January and June 2018, were broadly consistent with the regional geology described above.</p> <ul style="list-style-type: none"> ▪ To the west of RAAF Base Learmonth - the geology encountered comprised of colluvium, sands and sandy clay underlain by limestone rock layer ▪ On RAAF Base Learmonth – generally sands and clays were observed at the surface, underlain by colluvium/alluvium, gravels and sands and then weathered limestone rock <p>Salt pan area to the east of base – generally sands and clays were observed at the surface, underlain by alluvium/colluvium and then shallow limestone rock. Outcrops of limestone displaying fossilised coral were observed along the southern reach of WAPET Creek.</p>
	<ul style="list-style-type: none"> ▪ Groundwater Occurrence – The Quaternary and Tertiary geology units are hydraulically connected and form a major, unconfined aquifer. Groundwater in the Quaternary units is considered to be perched and discontinuous. The superficial Quaternary layers (dunes, colluvium, alluvium) are considered to be no more than 20 m in thickness. Coastal dunes may also contain relatively fresh groundwater but of limited extent (lenses). This has not been assessed. The main regional aquifer occurs predominantly within the Tulki Limestone (within permeable beds and the karst system) on the flanks of the range and the Mandu Limestone (within joints and minor permeable beds) on the crest of the range. These units extend to depths of greater than 150 m. ▪ Depth to Groundwater – A total of 32 existing groundwater monitoring wells were gauged during October 2017 by GHD with depth to groundwater ranging from approximately 1.2 m below ground level (mbgl) to approximately 36 mbgl. The depth to water increased toward the west whereby the deepest groundwater SWLs were encountered at the foothills of the Cape Range in the production bore-field. Groundwater in the low-lying area near WAPET Creek was within 1.5 m of the surface and so is likely to interact with surface salt deposits. ▪ Groundwater Flow Direction – The local groundwater flow pattern (GHD, 2018) at RAAF Base Learmonth was observed to be following the regional flow regime; that is, flowing toward the east. The calculated hydraulic gradient of groundwater across the Base was low and in the order of 0.0003 to 0.0005 m/m. The groundwater flow direction and hydraulic gradients greatly restricts the flow of contaminated groundwater from the Base to WAPET Creek or Exmouth Gulf. Instead, groundwater from the Base tends to flow towards an area of groundwater depression with elevated salinity that lies between the Base and the coast, with there being very little net flow to surface waters further to the east.
Hydrogeology	

Setting	Description
	<ul style="list-style-type: none"> ▪ Salinity – The groundwater was generally fresh in the western wells, though groundwater near the base supply bore-field and Windmill Bore Landfill was brackish-saline. This is likely due to the abstraction of groundwater. The saltwater wedge is expected to extend 5 km inland from the east coast (Martin, 1990). The DSI identified the water was fresher in the shallow groundwater, likely due to rain infiltration. The salinity distribution in the inferred discharge area to the east is likely to have significant influence on PFAS migration and discharge. ▪ Groundwater Use – The DWER groundwater database found no registered abstraction bores were identified within a 1km radius of the site. During the GHD DSI, groundwater was being abstracted from a bore near the Windmill Bore Landfill where water was being pumped to a water storage tank and then being discharged to the surface via a hose. Flow rate was estimated to be approximately 9,000 L per day. Sheep were observed drinking this water from the surface.
Environmental Sensitive Areas	<p>The site is located in close proximity to the Cape Range National Park and Ningaloo Reef to the east.</p> <ul style="list-style-type: none"> – No Threatened Ecological Communities (TECs) with national environmental significance, were identified in the EPBC Act Protected Matters Report generated on November 2, 2017. – Five priority flora species and 36 threatened or priority fauna species are known or expected to be present within 10 km of RAAF Base Learmonth. – The mangrove wetlands are not listed on the Ramsar Convention on Wetlands of International Importance. It does however constitute a sensitive receptor.

Further information can be found in the Consolidated DSI report (GHD, 2018).

4 Source Areas and Risk

The Site has been subject of previous PFAS investigations, including:

- > A combined Preliminary Site Investigation and Detailed Site Investigation (GHD, 2018)
- > An Ecological Risk Assessment (GHD 2019).

4.1 Source Areas

There are three Monitoring Areas, where PFAS was detected in soil or groundwater at concentrations exceeding the adopted assessment levels. These are considered to be the most impacted areas and include (refer to Figure 2, Appendix A):

- > 1A – Maintenance Area (Source Area)
- > 2A and 2B– Former and current Fuel Farm (Source Area)
- > 1D – Southern Drainage Channel (Pathway)
- > 1E – Central Drainage Channel (Pathway)
- > 2C – Northern Drainage Channel (Pathway)
- > 1G – WAPET Creek northern reach (Receptor)

The results of the DSI indicate that the two main PFAS source areas were the Fuel Farm and the Maintenance Area. PFAS were found to be present in all environmental media tested (soils, groundwater, sediments, and surface water where present) in these source areas. PFAS were also detected at lower concentrations at a number of other locations across the Base.

5 Data Quality Objectives

Development of data quality objectives (DQOs) for the OMP SAQP is based on guidance presented in

the ASC NEPM (NEPC 2013) and are consistent with 'RAAF Base Learmonth PFAS Investigation PFAS Ongoing Monitoring Plan (Defence, 2019). The DQO process comprises the following seven steps:

- > Step 1: State the problem
- > Step 2: Identify the decision/principal study question(s)
- > Step 3: Identify the Inputs into the Decision
- > Step 4: Study Boundaries
- > Step 5: Decision rules
- > Step 6: Tolerable limits on decision errors
- > Step 7: Optimisation of the data collection process

The DQOs are detailed in Table 5-1.

Table 5-1 Data Quality Objectives

Data Quality Step	Description
State the Problem	<p>The DSI (GHD, 2018) identified PFAS in groundwater, surface water and sediment within the Management Area at concentrations exceeding the relevant assessment levels. The primary mechanisms by which PFAS has migrated off-Site are considered to be via surface drains, notably the Central Drainage Channel which discharges directly into WAPET Creek.</p>
	<p>The preliminary ERA (GHD, 2019) identified one exposure risk associated with foraging seabirds from the consumption of impacted biota in the northern reach of WAPET Creek. Current data for the majority of sampling locations is limited to one or two sampling events. Whilst the findings of the Preliminary ERA (GHD, 2019) recognised that an adverse ecological impact is unlikely, a robust dataset is required to assess trends in the nature, extent and magnitude of PFAS concentrations within sediment, surface water and groundwater</p>
	<p>Groundwater</p> <ul style="list-style-type: none"> Groundwater was found to be contaminated with PFAS, with the highest concentrations identified in the two main source areas, with relatively low concentrations elsewhere. PFAS concentrations varied both vertically within the groundwater profile and laterally across the site. Generally, the concentrations reduced with depth and distance from contamination source areas. Concentrations of PFAS in groundwater on the Base and in the vicinity of the Base exceed the guidelines for drinking water in the fuel farm, the maintenance area, MW117 (Base Landfill), STP, MW124 (Salt pan area), MW138 (Central Drainage Channel), MW172 (Former Aircraft Parking Area South), MW183 (UST at Former Powerhouse) and MW108 (UST/AST at ALER 36). In these areas the groundwater is saline and is not potable, and groundwater is not used for potable purposes. Traces of PFAS have been identified in potable wells to the west of RAAF Base Learmonth; however, the concentrations do not exceed the drinking water guideline. The groundwater flow direction and hydraulic gradients greatly restricts the flow of contaminated groundwater from the Base to WAPET Creek or Exmouth Gulf. Traces of PFAS have been detected in shallow seepage water along shorelines; this contamination is most likely to have resulted from localised infiltration of contaminated surface water rather than groundwater migrating from the Base. It was concluded that groundwater contamination present at the Base poses a low risk to the aquatic ecosystems of surface waters (WAPET Creek and the Gulf).
	<p>Surface Water</p> <ul style="list-style-type: none"> Concentrations of PFAS in surface water exceed the recreational water guideline in drains off-site at SW171 and in the Maintenance Area (SW122). Groundwater may discharge to a surface water body where recreational activities occur such as swimming. However, the groundwater flow direction and hydraulic gradients greatly restrict the rate of flow and the discharge to WAPET Creek or Exmouth Gulf. Measured concentrations in surface water bodies are below relevant guideline. Waters of the WAPET Creek southern reach are regularly flushed by the tides and PFAS was not detected in samples of surface water and biota. Waters of the northern reach are irregularly flushed by the tides, and PFAS was detected in samples of surface water and crabs. The concentrations of PFAS in crabs were low and do not pose a risk to humans consuming crustaceans from the northern reach of WAPET Creek. Trace concentrations of PFAS were detected in water seeping from the coast line and discharging to Exmouth Gulf. PFAS were not detected in fish and crabs in the Gulf waters.
	<p>Soil and Sediment</p> <ul style="list-style-type: none"> PFAS contamination in the Maintenance Area exceeded the human health screening level protective of residential land-use however, the soil collected in residential backyards were below guidelines. In several locations (the Maintenance Area, Fuel Farm, BH209 (Grid sample onsite) and BH329 (UST at Former Powerhouse) there were exceedances of the screening criterion for Interim Ecological Indirect Exposure Commercial/Industrial. Contaminated soil and sediment can be mobilised and flow along surface drains offsite to WAPET Creek and Exmouth Gulf; however, such migration will be

Data Quality Step	Description
	<p>generally limited to larger rainfall events and flooding and will be subject to significant dilution</p> <p>Most of the sampling locations (groundwater, surface water, and sediment sampled as part of the DSI) have only been tested once or twice (i.e. limited time series/seasonal data). A robust dataset is required to assess trends in the nature, extent and magnitude of PFAS concentrations within sediment, surface water and groundwater to validate/improve the understanding of the CSM in relation to spatial and temporal variability of PFAS concentrations within the Management Area and associated receptors.</p>
Identify the decision/principal study question(s)	<p>This OMP is to provide further data to assess the following principal study questions:</p> <ul style="list-style-type: none"> What are the changes and trends in the nature, extent and magnitude of PFAS concentrations in the groundwater, surface water and sediment within the Management Area? Has the nature, extent and magnitude of PFAS concentrations changed significantly to warrant a revision of the ERA? Has the nature, extent and magnitude of PFAS concentrations changed significantly to warrant refinement of any existing management measures? Has the nature, extent and magnitude of PFAS concentrations changed significantly or are they likely to change?
Identify the Inputs into the Decision	<p>The following inputs are required to resolve the principal study questions outlined in Step 2:</p> <ul style="list-style-type: none"> PFAS concentrations in groundwater, surface water and sediment from previous and future monitoring events. Field data (i.e. groundwater levels, physico-chemical parameters) on groundwater and surface water from previous and future monitoring events. An appropriate statistical evaluation of the data (e.g. using Mann-Kendall or similar analysis) including short and long term trends, in particular for surface water and groundwater concentrations. Comparison of data sets to relevant endorsed assessment levels (refer to Section 7).
Study Boundaries	<p>Ongoing monitoring will be undertaken within the boundaries of the Management Area (Figure 2, Appendix A) at the groundwater, surface water and sediment monitoring locations outlined in Sections 6.3.1 and 6.4.1.</p> <p>Monitoring will be undertaken every six months, with one monitoring event in November and June.</p> <p>An additional surface water and sediment monitoring event will take place following the first flush immediately (or as close as possible) following the first heavy rainfall event of the wet season. Section 6.4 provides further detail on the monitoring frequency.</p>
Develop a Decision Rule	<ul style="list-style-type: none"> The analytical and field data will be used to assess changes to the nature, extent and magnitude of PFAS in surface water, sediment and groundwater and to provide supporting data for assessment of management actions, where relevant. Trends in PFAS concentrations, including an assessment of temporal and spatial changes, will be assessed using an appropriate statistical analysis approach (e.g. using Mann- Kendall, GWSdat or similar analysis), with a specified level of confidence based upon the number of monitoring rounds completed. The analytical data will be compared to the relevant assessment levels (presented in Section 7) and/or historic concentrations (i.e. maximum concentration) recorded during prior monitoring rounds [i.e. during the DSI (GHD, 2018)] to evaluate changes in the risk profile and whether revision of the OMP, ERA or implemented management measures is warranted. <p>Where exceedances of adopted assessment criteria levels (presented in Section 7) or new detections are reported, further interrogation of data will be undertaken to the extent relevant to assess the risk profile and location. A summary of the key decision rules as detailed below:</p> <ol style="list-style-type: none"> Have the analytical data collected as part of the monitoring program met the DQI (refer Table 5-2.below)? If yes, then the data can be used to answer the decision rule below and the decision statements developed in Step 2. If no, then an assessment of the need to collect additional data will be required.

Data Quality Step	Description
	<p>2. Do PFAS concentrations exceed the investigation criteria? If no, then the contamination would be considered not to pose an unacceptable risk. Where results exceed the adopted investigation criteria, this may not necessarily indicate an unacceptable level of risk. Further risk assessment, and potentially additional investigations, will be required to determine the potential for unacceptable impacts.</p> <p>3. Has PFAS been detected in any of the off-site bores previously not detected? If yes, do PFAS concentrations reported indicate an increasing trend and/or exceed historic maximum concentrations? Do results indicate a potential risk to associated receptors including associated risks that PFAS may present towards human receptors (i.e. consumers of abstracted water). Further risk assessment, and potentially additional investigations, will be required to determine the potential for unacceptable impacts.</p> <p>4. Has PFAS been detected in onsite drainage channels and offsite surface water bodies within the management areas? If yes, do PFAS concentrations reported indicate an increasing trend or exceed historic maximum concentrations? Do results indicate a potential risk to receptors and changes to the risk profile? Further risk assessment, and potentially additional investigations, will be required to determine the potential for unacceptable impacts.</p> <p>The Annual Interpretive Report will review the results obtained against these triggers/decisions and the management response triggers and contingencies detailed in the OMP (Section 4.3).</p>
Specify Limits on Decision Error	<p>The potential for significant decision errors will be minimised by completing a robust QA/QC program in accordance with DER and NEPM guideline requirements. Standard operating procedures will be closely followed in the field to ensure accurate and representative data acquisition. DQIs will be applied to assess usability of data prior to making decisions, based on precision, accuracy, representativeness, comparability and completeness. The acceptable limit on decision error is 95% compliance with the applied DQIs (see Table 5-2). If any of the DQIs are not met, further assessment will be necessary to evaluate the significance of the non-conformance and any corrective actions.</p>
Optimise the Design for Obtaining the Data	<p>The design of the OMP has been made in consideration of historical activities at the site, historical investigations (and findings i.e. DSI and ERA), in the context of developing responses to the principal study questions outlined in Step 2 and to meet the DQOs ensuring that a representation of the current site condition can be achieved.</p> <p>The OMP scope for the first three years of monitoring is outlined in Section 6. Following initial implementation (and review following each monitoring event), the available data will be reviewed and evaluated to determine if the frequency of monitoring should increase or decrease to provide better understanding of PFAS concentration fluctuations and potential risks to receptors.</p> <p>As additional information is gathered during the course of this monitoring program, it may be beneficial for the proposed scope of works to be altered from the initial design. Changes to the proposed monitoring, if considered necessary, will be made based on risk profile reviews and updated CSM and in consultation with Defence.</p> <p>Other factors that will optimise the design for obtaining data will include the use of laboratories that are NATA accredited for PFAS analysis and ensure laboratory LORs are suitable to meet the relevant adopted assessment levels (where possible), experienced field scientist(s), robust field and laboratory quality assurance/quality control protocols are adopted and Field and analytical data are collected in accordance with the PFAS NEMP (HEPA 2020), ASC NEPM (NEPC 2013) and the assessment of contaminated sites (DER 2014).</p>

An assessment of the Data Quality Indicators (DQIs) relating to both field and laboratory procedures will be undertaken with appropriate documentation provided for each environmental element or media assessed. The DQIs adopted for the DSI are summarised in Table 5-2.

Table 5-2 Data Quality Indicators

Data Quality Indicator	Detail								
QA Documentation	Provision of appropriate work plans, DQI and DQO defined for the site and all QA/QC aspects documented.								
Bias	<p>A measure of the potential distortion in an analysis which can result in errors in one direction (e.g. one laboratory consistently higher results or consistent poor spiked matrix recovery).</p> <p>Bias will be assessed with reference to the analysis of spiked matrix samples (NEPC 1999b).</p>								
Representativeness	<p>A qualitative measure of the confidence that data is representative of each medium present on the site. Use of appropriate and documented sampling methods, sampling handling, preservation and transport and holding times.</p> <p>A quantitative measure of data variability or reproducibility, measured by the calculation of %RPD values for duplicate samples (i.e. measure of agreement).</p> <p>Precision in DQI is considered an important assessment in an environmental study (USEPA, 2002, Guidance on Environmental Data Verification and Data Validation). It can be measured as follows:</p> <ul style="list-style-type: none"> Percentage of the mean of the measurement such as Relative Percent Difference (i.e. %RPD). The %RPD will be calculated for the field and secondary duplicate (i.e. inter and intra-laboratory analysis); and Use of similar analytical method and instrument (e.g. for inter-laboratory assessment). <p>The %RPD will be considered as acceptable if the values are:</p> <table border="1"> <thead> <tr> <th>Magnitude of result</th><th>Acceptable RPD range</th></tr> </thead> <tbody> <tr> <td><10 x limited of reporting (LOR)</td><td>No limits</td></tr> <tr> <td>10 – 20 x LOR</td><td>0% - 50%</td></tr> <tr> <td>>20 x LOR</td><td>0% - 20%</td></tr> </tbody> </table> <ul style="list-style-type: none"> Should there be a result that is greater than acceptable RPD range, then a “review should be conducted of the cause (e.g. instrument calibration, appropriateness of method used)” (NEPC, 2013). <p>For the purpose of this OMP, field and secondary duplicates should be collected at a rate of 1 in 10 samples (HEPA 2020 and GHD, 2018).</p>	Magnitude of result	Acceptable RPD range	<10 x limited of reporting (LOR)	No limits	10 – 20 x LOR	0% - 50%	>20 x LOR	0% - 20%
Magnitude of result	Acceptable RPD range								
<10 x limited of reporting (LOR)	No limits								
10 – 20 x LOR	0% - 50%								
>20 x LOR	0% - 20%								
Precision:									
Accuracy	<p>A quantitative measure of the closeness of data to a ‘true value’, measured by the analysis of spike, blank and laboratory control samples (LCS). The LCS consists of a standard reference material or a matrix of known concentration.</p> <p>For the purpose of assessing accuracy it is required that at least one LCS for each process batch be analysed (NEPC, 2013).</p>								
Comparability	A qualitative measure of the confidence that data may be considered to be equivalent for each sampling and analytical event. By use of standard procedures, comparable methods, qualified personnel and review of sample integrity.								
Completeness	A measure of the amount of usable data (expressed as a percentage - %) from a data collection activity, based on completeness of test program, overall QA/QC completeness and validity of data set.								

6 Ongoing Monitoring Program

6.1 OMP SAQP History

The changes made to the OMP SAQP since the Rev1 are documented in Table 6-1.

Table 6-1 OMP SAQP History

SAQP Version	Date	Report Section	Changes	Justification
Rev 2	21/11/2019	-	Formatting and figures updates, minor changes.	Defence review
Rev 3	18/06/2020	7	Update of assessment criteria and reference to HEPA (2020).	New guideline (HEPA, 2020)
Rev 4	10/03/2021	6.3	Table 'Wells construction details' added. Well ID update as per DCARM update (MWA0294 renamed MW211). MW063A (lost) replaced by MW233	DCARM update Defence review
		6	Methodology tables updates	
Rev 5	14/06/2021	6	Groundwater Methodology table updates	Defence review

6.2 Management Area Description

The OMP includes sampling and analysis not only from the Site, but also from a number of surrounding (off-Site) waterways. The Site and these surrounding areas are collectively referred to as the "Management Area" (GHD, 2018). The Management Area boundaries are presented on Figure 2, Appendix A and encompasses:

- > RAAF Base Learmonth.
- > land east of the Base, including the salt pan, drainage channels, WAPET Creek and extends to Exmouth Gulf.

6.3 Groundwater Monitoring

6.3.1 Groundwater Monitoring Network

The monitoring network investigated during the DSI (GHD, 2018) includes 32 single level monitoring wells and 17 multilevel wells. The network of on- and off-Site groundwater monitoring locations are summarised in Table 6-2 and Table 6-3.

Table 6-2 Single Level Monitoring Wells

Location	Well Depth	Well ID	Average Screen Interval (mBGL)
On-site (30)	Shallow	MW114, MW021, MW113, MW165, MW166, MW167, MW168, MW112, MW115, MW122, MW172, MW170, MW127, MW126, MW102, MW105, MW148S, MW151, MW159, MW103, MW104, MW124	2 - 8
	Deep	MW162, MW163, MW164, MW48D	17 - 20
	Unknown	MW233, MW211, MW018, MW116	-
Off-site (2)		MW139, MW134	3 - 9

The concentrations of PFOA and sum of PFOS and PFHxS recorded in the multilevel wells during the DSI (GHD, 2018) are summarised in Table 6-3. The PFAS concentrations were generally consistent or lower in the deeper screened intervals than the shallow interval.

Table 6-3 Multilevel groundwater wells

Well ID	Screen Interval (mBGL)	Times Sampled	2018 Sum of PFHxS + PFOS (µg/L)	2018 PFOA (µg/L)
MW135	2.5 - 3	2	0.008	0.003
	4.5 - 5	2	0.011	0.001
	6.5 - 7	2	0.031	0.001
	9 - 9.5	2	0.011	ND
MW137	0.8 – 1.3	1	0.011	ND
	2.5 – 3	1	0.013	ND
	4.5 – 5	1	0.011	ND
	6.5 - 7	1	0.008	ND
MW138	3 - 3.5	1	ND	ND
	5 - 5.5	1	0.1	0.004
	7 - 7.5	2	0.006	0.002
	9 - 9.5	2	0.1	0.004
MW140	1.5 - 2	1	0.003	ND
	3.5 - 4	1	0.003	ND
	6 - 6.5	1	0.002	ND
	8.5 - 9	1	ND	ND
MW141	1.5 - 2	2	0.002	0.002
	3 – 3.5	2	0.008	ND
	5 – 5.5	2	0.007	ND
	7 – 7.5	2	0.003	ND
MW143	3 – 3.5	2	ND	ND
	5 – 5.5	2	ND	0.002
	7 – 7.5	2	0.008	0.002
	9 – 9.5	2	ND	0.003
MW144	3 – 3.5	2	0.001	0.002
	5 – 5.5	2	ND	0.002
	7 – 7.5	2	ND	0.006
	9 – 9.5	2	ND	ND
MW145	3 – 3.5	2	ND	ND

Well ID	Screen Interval (mBGL)	Times Sampled	2018 Sum of PFHxS + PFOS (µg/L)	2018 PFOA (µg/L)
	5 – 5.5	2	ND	ND
	7 – 7.5	2	ND	ND
	9 – 9.5	2	0.005	ND
MW146	2.5 – 3	2	0.028	0.001
	4.5 – 5	2	ND	0.003
	6.5 – 7	2	ND	0.001
	8.5 - 9	2	ND	0.001
MW147	3 – 3.5	2	0.007	0.002
	5 – 5.5	2	ND	ND
	7 – 7.5	2	ND	0.002
	9 – 9.5	2	ND	ND
MW175	4 – 4.5	2	0.017	0.006
	5.5 – 6	1	0.012	0.007
	7 – 7.5	1	0.007	0.003
	9 – 9.5	1	0.007	0.008
MW176	1.5 - 2	1	0.002	ND
	3.5 - 4	1	0.007	ND
	6 - 6.5	1	0.001	ND
	8.5 - 9	1	ND	ND
MW177	1.5 – 2	1	0.003	ND
	3.5 – 4	1	0.004	ND
	6 – 6.5	1	0.003	ND
	8.5 - 9	1	0.002	ND
MW178	2 – 2.5	1	0.008	ND
	4 – 4.5	1	0.013	ND
	7 – 7.5	1	0.005	ND
	9 – 9.5	1	0.003	ND
MW179	1 – 1.5	1	0.019	0.001
	3.2 – 3.7	1	0.007	0.002
	5.9 – 6.4	1	0.006	0.003
	8.5 - 9	1	0.004	0.002

Well ID	Screen Interval (mBGL)	Times Sampled	2018 Sum of PFHxS + PFOS (µg/L)	2018 PFOA (µg/L)
MW180	1 – 1.5	1	0.002	ND
	3.5 – 4	1	0.002	ND
	6 – 6.5	1	0.003	ND
	8.5 - 9	1	0.001	ND
MW181	1.5 – 2	1	0.003	0.002
	3.5 – 4	1	0.002	0.004
	5.5 – 6	1	0.001	ND
	7 – 7.5	1	0.002	0.003

The groundwater monitoring locations as part of the OMP monitoring are presented in Table 6-4, along with the rationale for the selection, and are shown on Figure 3, Appendix A. For the multilevel monitoring wells, only the shallowest-non-dry screened intervals will be sampled.

Seepage water sample locations were chosen to assess the inferred groundwater discharge zone along the coast and are shown on Figure 3. They include locations near the mouth of WAPET Creek, the Northern Drainage Channel, a low point in the dunes near the southern reach and other locations along the coast.

Table 6-4 OMP Groundwater Monitoring Locations

Area	Monitoring Well / Bore ID	Rationale
Source Areas	Source 1 – Maintenance Area - 0960_MW114, 0960_MW021, 0960_MW113, 0960_MW233, 0960_MW211, 0960_MW162, 0960_MW163, 0960_MW018, 0960_MW164, 0960_MW165, 0960_MW166, 0960_MW167, 0960_MW168, 0960_MW112, 0960_MW115.	Confirmation of overall PFAS impact identified in the DSI (GHD, 2018). Assessment of overall changes in PFAS concentration in the source areas to provide temporal data on depletion of the source zone.
	Source 2 – Fuel Farm– 0960_MW016, 0960_MW105, 0960_MW148D, 0960_MW148S, 0960_MW151, 0960_MW159	
Pathway	0960_MW122, 0960_MW146, 0960_MW147, 0960_MW180, 0960_MW181, 0960_MW172, 0960_MW170, 0960_MW127, 0960_MW126, 0960_MW139, 0960_MW140, 0960_MW102, 0960_MW138, 0960_MW145, 0960_MW103, 0960_MW104, 0960_MW134, 0960_MW135, 0960_MW175, 0960_MW124, 0960_MW144, 0960_MW143.	Confirmation of overall PFAS impact identified in the DSI (GHD, 2018). Assessment of changes in PFAS concentration and distribution in the main migration pathways. This will also allow for early detection of significant changes in migration so contingencies can be put in place.
Receptor	0960_MW137, 0960_MW176, 0960_MW177, 0960_MW178, 0960_MW179, 0960_MW141	Confirmation of overall PFAS impact identified in the DSI (GHD, 2018). Assessment of changes in PFAS concentration and distribution in the main aquatic receptors.
Seepage	0960_OTH132, 0960_OTH134, 0960_OTH129, 0960_OTH103, 0960_OTH106, 0960_OTH107	To assess the inferred groundwater discharge zone along the coast.

Construction details for the groundwater wells monitored as part of the OMP are provided in Table 6-5.

Table 6-5 OMP Groundwater Monitoring Wells Construction Details

Well ID	Date drilled	Easting ¹	Northing ¹	RL TOC (mAHD)	Depth (mbgl)	Screen interval (mbgl)
MW016	2006	199481.91	7540459.03	4.022	6.1	3.1-6.1
MW018	2006	199251.86	7537465.65	6.403	8.5	5.5-8.5
MW021	2006	199143.14	7537433.45	6.745	8.6	5.6-8.6
MW102	2018	200487.728	7538870.392	4.6266	8.5	2.5-8.5
MW103	2018	199762.727	7540965.102	2.2785	5.8	1.0-5.8
MW104	2018	199946.08	7540599.855	2.7256	6.5	1.0-6.5
MW105	2018	199491.679	7540303.158	3.7272	8.0	2.0-8.0
MW112	2018	199473.4723	7537651.252	5.1191	8.0	3.0-8.0
MW113	2018	199156.14	7537686.096	7.3165	10.0	4.0-10.0
MW114	2018	199037.9871	7537512.217	7.7467	10.0	4.0-10.0
MW115	2018	199604.327	7537522.607	4.9133	8.0	3.0-8.0
MW122	2018	200580.746	7537635.452	3.9702	7.7	1.7-7.7
MW124	2018	200525.625	7539636.566	2.9183	6.0	1.0-6.0
MW126	2018	200301.728	7536952.205	4.5088	8.0	2.0-8.0
MW127	2018	200158.599	7536314.042	5.6238	8.5	2.5-8.5
MW134	2018	200439.185	7540598.585	2.5155	5.7	1.0-5.7
MW135	2018	200867.402	7540438.161	2.7781	3.0	2.5-3.0
				2.7828	5.0	4.5-5.0
				2.7858	7.0	6.5-7.0
				2.7884	9.5	9.0-9.5
MW137	2018	201611.362	7539047.314	2.1687	1.3	0.8-1.3
				2.1691	3.0	2.5-3.0
				2.2017	5.0	4.5-5.0
				2.2034	7.0	6.5-7.0
MW138	2018	200820.406	7538649.357	3.3074	3.5	3.0-3.5
				3.3166	5.5	5.0-5.5
				3.3205	7.5	7.0-7.5
				3.3224	9.5	9.0-9.5
MW139	2018	201088.954	7536832.655	4.1386	7.0	2.0-7.0
MW140	2018	202004.879	7537028.632	2.4916	2.0	1.5-2.0
				2.5035	4.0	3.5-4.0
				2.5081	6.5	6.0-6.5
				2.5345	9.0	8.5-9.0
MW141	2018	202555.223	7537320.681	2.7999	2.0	1.5-2.0
				2.8073	3.5	3.0-3.5

Well ID	Date drilled	Easting ¹	Northing ¹	RL TOC (mAHD)	Depth (mbgl)	Screen interval (mbgl)
MW144	2018	200691.327	7540195.613	2.8221	7.5	7.0-7.5
				2.8273	9.5	9.0-9.5
				3.0481	3.5	3.0-3.5
				3.052	5.5	5.0-5.5
				3.0545	7.5	7.0-7.5
				3.0573	9.5	9.0-9.5
MW145	2018	201084.426	7538337.599	3.1416	3.5	3.0-3.5
				3.1481	5.5	5.0-5.5
				3.1506	7.5	7.0-7.5
MW146	2018	201126.901	7537691.759	3.1519	9.5	9.0-9.5
				2.7937	3.5	3.0-3.5
				2.8009	5.5	5.0-5.5
				2.802	7.5	7.0-7.5
MW147	2018	201259.369	7537322.231	2.8184	9.5	9.0-9.5
				2.9123	3.5	3.0-3.5
				2.9152	5.5	5.0-5.5
				2.9183	7.5	7.0-7.5
MW148D	2018	199536.808	7540521.489	2.9209	9.5	9.0-9.5
MW148S	2018	199537.603	7540521.649	3.5778	20.0	14.0-20.0
MW151	2018	199442.761	7540459.319	3.6851	8.0	2.0-8.0
MW159	2018	199164.27	7540373.912	4.0631	8.0	2.0-8.0
MW162	2018	199230.504	7537650.674	4.1895	9.0	3.0-9.0
MW163	2018	199232.4874	7537569.5756	6.856	20.0	17.0-20.0
MW164	2018	199251.946	7537546.874	6.7808	20.0	17.0-20.0
MW165	2018	199312.5481	7537531.6778	6.7893	20.0	17.0-20.0
MW166	2018	199363.212	7537610.565	6.1043	9.0	3.0-9.0
MW167	2018	199368.445	7537673.832	5.7441	8.5	2.5-8.5
MW168	2018	199390.678	7537754.41	6.2094	8.5	2.5-8.5
MW170	2018	199828.672	7536509.856	6.1713	8.5	2.5-8.5
MW172	2018	199755.067	7536989.143	5.639	8.5	2.5-8.5
MW175	2018	201458.887	7540121.278	5.6193	8.5	2.5-8.5
				4.7916	4.5	4.0-4.5
				4.7982	6.0	5.5-6.0
				4.7995	7.5	7.0-7.5
MW176	2018	201711.745	7539606.488	4.8316	9.5	9.0-9.5
				2.127		

Well ID	Date drilled	Easting ¹	Northing ¹	RL TOC (mAHD)	Depth (mbgl)	Screen interval (mbgl)
				2.2517	4.0	3.5-4.0
				2.2531	6.5	6.0-6.5
				2.2718	9.0	8.5-9.0
				2.1612	2.5	2.0-2.5
MW178	2018	201387.629	7539566.48	2.1614	4.5	4.0-4.5
				2.1726	7.5	7.0-7.5
				2.1762	9.5	9.0-9.5
				2.222	1.5	1.0-1.5
MW179	2018	201939.471	7538448.239	2.2371	3.7	3.2-3.7
				2.2653	6.4	5.9-6.4
				2.2689	9	8.5-9.0
				1.9179	1.5	1.0-1.5
MW180	2018	201567.932	7537913.284	1.9226	4	3.5-4.0
				1.9368	6.5	6.0-6.5
				1.9458	9	8.5-9.0
				2.2333	2	1.5-2.0
MW181	2018	201688.497	7537372.233	2.2773	4	3.5-4.0
				2.2789	6	5.5-6.0
				2.3122	7.5	7.0-7.5
				6.3409		
MW211*		199199.771	7537549.138	6.3409		
MW233	2015	199198.57	7537590.67	6.262	7	4-7

Note: * No bore log available

6.3.2 Monitoring Frequency

All groundwater monitoring locations listed in Table 6-4 will be sampled every six months for the three years. The main sampling events will be undertaken in November and June to record the concentration and extent of PFAS and determine any seasonal fluctuations or trends. This monitoring frequency aligns with the climate of the Management Area, which features the highest volume of rainfall typically between January and July and lower rainfall between September and December.

Groundwater sampling, particularly those near WAPET Creek and Exmouth Gulf, must consider tidal periods to ensure spurious elevation data is not used to assess groundwater flow. Given the remoteness of the site, one-off opportunistic sampling is not considered feasible. Seepage sampling will occur at low, outgoing tides which is considered the optimal condition for groundwater discharge.

6.3.3 Groundwater Sampling Methodology

Groundwater sampling methodology are detailed in the following sections.

6.3.3.1 Groundwater Monitoring Wells

Groundwater monitoring will be undertaken by no purge HydraSleeve® method for the single-level wells, while the multilevel wells will be sampled with a peristaltic pump and seepage water sampling will be conducted through methodology consistent with the 2018 DSI, as detailed in Table 6-6.

Table 6-6 Groundwater Monitoring Wells – Sampling Method

Activity	Details
Well Gauging	Standing Water Level (SWL) will be gauged using an interface probe. All wells will be measured against a specified mark at the top of the well casing.
Groundwater Field Parameters	<p>For the single level wells, the field parameters will be recorded via a down-hole water quality meter (positioned within the mid screen interval) prior to deployment of HydraSleeves® or pre-sample collection.</p> <p>For the multilevel wells, the field parameters will be recorded with a flow through cell during purging.</p> <p>The following field parameters will be recorded using a water quality meter:</p> <ul style="list-style-type: none"> pH. electrical conductivity (EC). oxidation reduction potential (ORP). Dissolved oxygen (DO). Temperature. <p>Once field parameters have stabilised (as indicated by at least three consecutive measurements falling within +/- 10% of each other) measurement will be recorded on field data records.</p> <p>All field instruments (e.g. water quality meter) will be calibrated by the equipment supplier and daily readings of reference solutions (bump tests) completed to optimise the accuracy of the measurements taken.</p>
Peristaltic pumping (multilevel well sample collection)	<p>The shallowest (non-dry) wells will be sampled at each location using Teflon-free dedicated and disposable high-density polyethylene (HDPE) tubing coupled to a peristaltic pump system. The groundwater will be purged at a low flow rate of 0.2L/min.</p> <p>Near-continuous monitoring of SWL and field parameters will be undertaken during purging and post sample collection to ensure limited drawdown effects. The groundwater will be sampled when the field parameters have stabilised, or before drawdown reaches a maximum of 30 cm.</p>
Deployment and Retrieval of HydraSleeves (single level well sample collection)	<p>HydraSleeve will be deployed with top weight sample collection to begin at the lowest point.</p> <p>HydraSleeve sampling devices will be left in wells for a minimum of 4 hours to allow restabilisation of the well following the slight disturbance caused by sampler deployment.</p> <p>Samples will be collected via continuous pull method at a rate allowing the water to pass through the check valve into the sample sleeve.</p> <p>Samples will be discharged immediately (minimise changes in chemistry) via discharge tube.</p>
Alternative sampling methodology (hand bailing)	<p>Disposable HDPE hand bailers, attached to a polypropylene string, will be used in the event that the water column isn't sufficient to fill the hydrasleeve. Purging of the well (i.e. removal of 3x well volumes) will be undertaken prior to sampling to ensure that a sample representative of the aquifer is taken.</p>
Seepage Water Sampling	<p>Sampling will be carried out in a two-hour period; one hour each side of the low tide. Sampling protocol will involve a shallow excavation in the beach sand; just above where inundation by wave action is occurring. In-situ water parameters will be measured from water seeping into the excavation using a calibrated water quality meter. Water seeping in to the excavation will be purged prior to measuring water quality parameters (using a dedicated syringe or jug). Once</p>

Activity	Details
	more water seeps in to the excavation, sampling containers will be lowered into the exposed seepage water and filled.
Field Records	<p>Field records will include the following information:</p> <ul style="list-style-type: none"> Sampling time, date and name of the sampler. Weather conditions. Sample Collection method. Sampling equipment decontamination procedures where non-disposable sampling equipment is utilised. Calibration and daily bump test records. <p>All sample documentation including field notebooks, reporting records, COC and equipment calibration certificates and procedures will be retained within project files.</p>
Decontamination procedure	<p>Dedicated HydraSleeves will be used at each groundwater bore thus removing the need for decontamination.</p> <p>All re-usable sampling equipment will be thoroughly washed using PFAS-free detergent then double rinsed with clean water before the sample collection.</p>
Sample identification, preservation transport and holding times	<p>Each sample will be labelled with the sample location, date, project identification number and sampler's initials.</p> <p>Samples will be collected directly in appropriately preserved laboratory supplied bottles (Teflon-free) and packed in chilled containers for delivery to the laboratory under Chain of Custody (CoC) documentation.</p> <p>Sample containers, preservation procedures, sample storage requirements and holding times will be undertaken in accordance with those recommended by Standards Australia (AS/NZS 5667.1:1998 and AS 4482.1 as appropriate).</p> <ul style="list-style-type: none"> All holding times will comply with the requirements set out in "Australian Standard AS/NZS 5667.1:1998 and AS 4482.1".
Laboratory Testing	<ul style="list-style-type: none"> Full PFAS analytical suite (see Appendix B). Major anions and cations (include calcium, magnesium, sodium, potassium, chloride, sulfate, alkalinity and ionic balance) Dissolved Organic Carbon (DOC), Total suspended solids (TSS), total dissolved solids (TDS) and pH.
Laboratory Testing – Quality Control	<ul style="list-style-type: none"> Groundwater QC samples will be collected at the following frequencies as detailed in the OMP (DoD, 2019): Field duplicate (intra-laboratory) samples at 1 per 10 water samples or 1 per batch if the batch is less than 10 samples. Field triplicate (inter-laboratory) samples at 1 per 10 water samples should be sent to a secondary laboratory. Rinsate blank sample at 1 per day [collected off re-used sampling equipment (e.g. interface probe)]. Field blank samples at 1 per day.
Laboratory Accreditation and Limits of Reporting	<p>All groundwater analysis will be undertaken by laboratories accredited by the NATA.</p> <ul style="list-style-type: none"> Primary analysis will be undertaken by ALS Global Laboratories (Perth) Secondary analysis will be undertaken by Eurofins (Perth). <p>Laboratory LORs will be suitable to meet the relevant adopted assessment levels (0.01 µg/L).</p>

6.4 Surface Water and Sediment Monitoring

6.4.1 Monitoring Locations

The surface water and sediment locations within the Monitoring Areas described in section 4.1, sampled as part of the DSI (GHD, 2018) are summarised in Table 6-7.

Table 6-7 Summary of Surface Water and Sediment Monitoring Locations (GHD, 2018)

Management Area	Location	Soil Monitoring Location (Sediment/Shallow Soil)	Surface Water Monitoring locations
1a	Maintenance Area (Source Area)	SS240, SS241, SS120, SS121, SS122, SS124, SS125, SS126, SS239, SS238, SS119, SS123	SW120, SW121, SW122, SW119, SW123
2a & 2b	Former and Current Fuel Farm	SD219, SS109, SS110, SS111, SS112, SS113, SS114, SS115, SS228, SS229, SS231, SS232, SS233, SS234, SS235	SW114, SW219
1d	Southern Drainage Channel (Pathway)	SD199, SS296, SS201, SD200, SS297, SD202, SS298, SS299, SD203, SS300, SS301, SD204, SS302, SD205	SW302, SW200, SW202, SW204, SW297, SW298, SW299, SW300, SW301
1e	Central Drainage Channel (Pathway)	SS195, SS291, SS196, SS292, SS197, SS198, SS293, SS294, SS295	SW195, SW291, SW293, SW294, SW295
2c	Northern Drainage Channel (Pathway)	SS189, SS286, SS190, SS194, SS288, SS191, SS289, SS193, SS290, SS192, SS287	SW286, SW287, SW288, SW289, SW290, SW304, SW303
1g	Northern reach of WAPET Creek (Receptor)	SD208, SD209, SD210, SD211	SW208, SW209, SW210, SW211, SW305, SW306,

The surface water locations as part of the OMP monitoring are presented in Table 6-8 along with the rationale for the selection, and are highlighted on Figure 4, Appendix A. The location shown on Figure 4 are for guidance and actual locations will depend on conditions at the time of sampling. Priority will be given to areas where surface water has pooled and to low lying areas where sediment can accumulate.

Table 6-8 OMP Surface Water and Sediment Monitoring Locations

Area	Surface water Sampling Location ID	Sediment Sampling Location ID	Rationale
Drainage channels (source and pathway)	Bi-annual and first flush events:	Bi-annual and first flush events:	<p>The monitoring will assess the PFAS extent and changes in the Central Drainage Channel leading to WAPET Creek. It will also confirm the low risk posed by sediment and surface water in other drainage channels.</p> <p>Monitoring of these locations will provide an indication of any change in the nature or magnitude of PFAS in surface waters and sediments, and will help in determining changes attributable to seasonal fluctuations.</p> <p>Priority will be given to areas where surface water has pooled and to low lying areas where sediment can accumulate. This includes surface water pooling on Base at the flood gate release point, which if present during wet season monitoring will be sampled.</p>
	0960_SW219, 0960_SS234, 0960_SS235, 0960_SW114, 0960_SS113, 0960_SS231, 0960_SS157, 0960_SW265, 0960_SW189, 0960_SS190, 0960_SW288, 0960_SW193, 0960_SS192, 0960_SS198, 0960_SW293, 0960_SS292, 0960_SW291, 0960_SS227, 0960_SS108, 0960_SS170, 0960_SS168, 0960_SS279, 0960_SS166, 0960_SS243, 0960_SS174, 0960_SW121, 0960_SW122, 0960_SS124, 0960_SS277, 0960_SS125, 0960_SS278, 0960_SS176, 0960_SW123, 0960_SW199, 0960_SW200, 0960_SW298	0960_SD219, 0960_SS234, 0960_SS235, 0960_SS114, 0960_SS113, 0960_SS231, 0960_SS157, 0960_SS265, 0960_SS189, 0960_SS190, 0960_SS288, 0960_SS193, 0960_SS192, 0960_SS198, 0960_SS293, 0960_SS292, 0960_SS291, 0960_SS227, 0960_SS108, 0960_SS170, 0960_SS168, 0960_SS279, 0960_SS166, 0960_SS243, 0960_SS174, 0960_SS121, 0960_SS122, 0960_SS124, 0960_SS277, 0960_SS125, 0960_SS278, 0960_SS176, 0960_SS123, 0960_SD199, 0960_SD200, 0960_SS298	
WAPET CREEK (Receptor)	Bi-annual and first flush events:	Bi-annual and first flush events:	<p>WAPET Creek is the most important receptor with respect to identified risk. Monitoring of these locations will provide an indication of any change in the nature or magnitude of PFAS in surface waters and sediments, and will help in determining changes attributable to seasonal fluctuations</p>
	0960_SW211, 0960_SW300, 0960_SW210, 0960_SW301, 0960_SW302, 0960_SW303, 0960_SW209, 0960_SW304, 0960_SW305, 0960_SW207, 0960_SW208, 0960_SW205, 0960_SS301	0960_SD211, 0960_SD300, 0960_SD210, 0960_SD301, 0960_SD302, 0960_SD303, 0960_SD209, 0960_SD304, 0960_SD305, 0960_SD207, 0960_SD208, 0960_SD205, 0960_SS301	

6.4.2 Surface Water and Sediment Monitoring Frequency

The surface water and sediment monitoring locations listed in Section 6.4.1 will be sampled three times per year, as follows:

- > November and June to record the concentration and extent of PFAS and determine any seasonal fluctuations or trends. This monitoring frequency aligns with the climate of the Management Area, which features the highest volume of rainfall typically between January and July and lower rainfall between September and December. This sampling should be conducted in conjunction with the groundwater monitoring described in Section 6.3.
- > An additional monitoring event will be conducted immediately (or as close as possible) following the first heavy rainfall event of the wet season in January or February. This would serve to assess the potential increase in PFAS surface water concentrations following 'first flush' rainfall and subsequent timeframe for attenuation to 'long-term average' concentrations.

6.4.3 Surface Water Sampling Methodology

The methodology for the surface water monitoring is detailed in Table 6-9.

Table 6-9 Surface Water Monitoring

Item	Details
Field parameters	<p>Surface water physiochemical parameters (i.e. pH, electrical conductivity (EC), oxidation reduction potential (ORP), dissolved oxygen (DO), and temperature) will be recorded at the time of sampling using a pre-calibrated water quality meter.</p> <p>Field observations such as odours or sheen presence must also be recorded on field sampling sheets.</p>
Sampling Method	<p>Surface water samples will be collected directly into sample containers using a 'Grab' (manual) sample method via a long-handled sampling device.</p> <p>Where depth permits, the sample container should be positioned at least 10 cm below the surface water level and above the sediment bed and oriented with the capped opening facing downwards to avoid the collection of surface films.</p> <p>Samples will be decanted into the laboratory supplied sample containers.</p> <p>Samples will be collected in accordance with Australian/New Zealand Standards (AS/NZS 5667.1:1998) '<i>Water quality – Sampling – Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples</i>'.</p>
Sample Collection	<p>Water samples were placed directly into appropriately labelled, laboratory supplied sample bottles and packed in chilled containers for delivery to the laboratory under Chain of Custody documentation.</p>
Decontamination	<p>All re-usable sampling equipment will be thoroughly washed using PFAS-free detergent, then double rinsed with clean water before the sample collection.</p>
Sample identification, preservation, transport and holding times.	<p>Each sample will be labelled with the sample location, date, project identification number and sampler's initials.</p> <p>Samples will be contained in appropriately preserved laboratory supplied bottles (Teflon-free) and packed in chilled containers for delivery to the laboratory under Chain of Custody (CoC) documentation.</p> <p>Sample containers, preservation procedures, sample storage requirements and holding times will be undertaken in accordance with those recommended by Standards Australia (AS/NZS 5667.1:1998 and AS 4482.1 as appropriate).</p> <ul style="list-style-type: none"> ▪ All holding times will comply with the requirements set out in "Australian Standard AS/NZS 5567.1:1998 and AS 4482.1".
Field Records	<p>Field records will include the following information:</p> <ul style="list-style-type: none"> ▪ Sampling time, date and name of the sampler. ▪ Weather conditions. ▪ Sample Collection method. ▪ Sampling equipment decontamination procedures where non-disposable sampling equipment is utilised. ▪ Calibration and daily bump test records.

Item	Details
	All sample documentation including field notebooks, reporting records, COC and equipment calibration certificates and procedures will be retained within project files.
Laboratory Testing	<p>Surface water samples will be analysed for the following:</p> <ul style="list-style-type: none"> Full PFAS analytical suite (see Appendix B). Major anions and cations (include calcium, magnesium, sodium, potassium, chloride sulfate, alkalinity and ionic balance) DOC, TSS, TDS and pH.
Laboratory Testing – Quality Control	<p>Surface water QC samples will be collected at the following frequencies as detailed in the SAQP:</p> <ul style="list-style-type: none"> Field duplicate (intra-laboratory) samples at 1 per 10 water samples or 1 per batch if the batch is less than 10 samples. Field triplicate (inter-laboratory) samples at 1 per 10 water samples should be sent to a secondary laboratory. Rinsate blank sample at 1 per day [collected off re-used sampling equipment (e.g. interface probe)].
Laboratory Accreditation and Limits of Reporting	<p>All surface water analysis will be undertaken by laboratories accredited by the NATA.</p> <ul style="list-style-type: none"> Primary analysis will be undertaken by ALS Global Laboratories (Perth) Secondary analysis will be undertaken by Eurofins (Perth). <p>Laboratory LORs will be suitable to meet the relevant adopted assessment levels (0.01 µg/L).</p>

6.4.4 Sediment Sampling Methodology

The methodology for sediment sampling is detailed in Table 6-10.

Table 6-10 Sediment Investigation Methodology

Item	Details
Sample Collection	<p>Sediment samples will be collected at the sediment/water interface (0-0.1 mbgl) using hand tools (e.g. trowel, hand auger, PVC pipe etc.) with samples placed directly into appropriately labelled, laboratory supplied sample containers and packed in chilled containers for delivery to the laboratory under Chain of Custody documentation.</p> <p>At each sampling location, the sediment sample will be visually assessed and observations (including physical description) recorded on field data sheets.</p>
Field Records	<p>Field records will include the following information:</p> <ul style="list-style-type: none"> Sampling time, date and name of the sampler. Sample description and condition. Weather conditions. Sample Collection method. Sampling equipment decontamination procedures where non-disposable sampling equipment is utilised. <p>All sample documentation including field notebooks, reporting records, COC and equipment calibration certificates and procedures will be retained within project files.</p>
Decontamination	<p>All re-usable sampling equipment will be thoroughly washed using PFAS-free detergent, then double rinsed with clean water before the sample collection.</p>
Laboratory Testing	<p>Sediment samples will be analysed for the following:</p> <ul style="list-style-type: none"> Full PFAS analytical suite (see Appendix B). Total organic carbon (TOC), EC, cation exchange capacity (CEC) and pH
Laboratory Testing – Quality Control	<p>Sediment QC samples will be collected at the following frequencies as detailed in the SAQP:</p> <ul style="list-style-type: none"> Field duplicate (intra-laboratory) samples greater than 1 per 20 sediment samples or 1 per batch if the batch is less than 20 samples.

Item	Details
	<ul style="list-style-type: none"> Field triplicate (inter-laboratory) samples greater than 1 per 20 sediment samples should be sent to a secondary laboratory.
Laboratory Accreditation and Limits of Reporting	<p>All surface water analysis will be undertaken by laboratories accredited by the NATA.</p> <ul style="list-style-type: none"> Primary analysis will be undertaken by ALS Global Laboratories (Perth) Secondary analysis will be undertaken by Eurofins (Perth). <p>Laboratory LORs will be suitable to meet the relevant adopted assessment levels (0.005 mg/kg).</p>

7 Assessment Criteria

7.1 Groundwater and Surface Water

The assessment levels adopted for groundwater and surface water in this OMP are based upon the Heads of Environmental Protection Authorities Australia and New Zealand (2020) PFAS National Environmental Management Plan 2.0 (NEMP; HEPA 2020) and finding of previous site assessment i.e. Detailed Site Investigation (DSI) (GHD, 2018). The adopted assessment criteria for groundwater and surface water are detailed in Table 7-1.

Table 7-1 Criteria for Groundwater, Seepage Water and Surface Water

Receptor	Adopted Assessment Criteria
Ecological	<p>99% species protection level for Fresh Water and interim Marine Water:</p> <ul style="list-style-type: none"> PFOS – 0.00023* µg/L PFOA – 19 µg/L
Human Health	<p>Recreational Water:</p> <ul style="list-style-type: none"> PFOS + PFHxS – 2.0 µg/L PFOA – 10 µg/L

*The criterion of 0.00023 µg/L is lower than the laboratory level of reporting (LOR) and is somewhat impractical. However, the PFAS NEMP 2020 allows for the adoption of the laboratory LOR as a screening level rather than a quantified measurement. At a minimum, the LOR to be adopted is to be consistent with the LORs in the DSI (GHD, 2018).

7.2 Sediment

It is noted that there are currently no Australian regulatory endorsed assessment levels for risk posed to ecology or human health by PFAS in sediment. Most of the time these will be dry and sediment that has accumulated in the base of unsealed drainage lines can be assumed to be associated with exposure pathways similar to those of in-situ soils. Sediments will therefore be assessed with reference to the soil assessment criteria detailed in the PFAS NEMP 2.0 (HEPA, 2020). Criteria for sediment samples are presented in Table 7-2.

Table 7-2 Criteria for Sediment

Receptor	Adopted Assessment Criteria
Ecosystems	<p>Ecological direct exposure (interim guidelines)</p> <ul style="list-style-type: none"> PFOS – 1 mg/kg PFOA – 10 mg/kg <p>Ecological indirect exposure (interim guidelines)</p> <ul style="list-style-type: none"> PFOS – 0.01 mg/kg
Human Health	<p>Commercial / industrial (on-base activities)</p> <ul style="list-style-type: none"> PFOS + PFHxS – 20 mg/kg PFOA – 50 mg/kg

8 Reporting

8.1 Factual Reporting

A factual report should be produced at the completion of each monitoring event that summarises the data and findings of each monitoring event. Each factual report will present the findings and contain the following information:

- > Introduction
- > Scope of work completed.
- > Description of sampling methodologies used.
- > Field observations (e.g. condition of monitoring wells, description of purged water) and water quality parameter measurements.
- > Summary of any changes to the monitoring network condition that may affect data integrity, or require rectification works, and recommendations for repair, replacement or decommissioning of a location
- > Evaluation of the applicability of adopted assessment levels.
- > Review of the suitability of the data for assessment purposes (QA/QC evaluation).
- > Summary tables presenting gauged groundwater and surface water levels.
- > Presentation of inferred groundwater contours and inferred groundwater flow direction in a figure.
- > Summary tables of analytical results in comparison to adopted assessment levels.
- > Graphs showing historical concentrations of PFOS, PFOA and PFOS plus PFHxS.
- > Laboratory reports, Chain of Custody (CoC) documentation, field sampling records, data validation and QA/QC details, equipment calibration certificates and other relevant documentation.

In the event that further investigation, management and/or remediation are required, recommendations will be presented in a separate 'technical memorandum'.

8.2 Interpretive Reporting

Upon completion of each year's monitoring period an interpretive report will be prepared. As a minimum, each interpretive report should include the following:

- > The factual information described in Section 8.1.
- > Evidence of compliance with the requirements of the SAQP and meeting stated objectives of the OMP.
- > Relevant figures depicting sampling locations and site-specific hydrogeological features.
- > Laboratory results and analysis including comparison with relevant screening criteria as identified in each OMP.
- > Assessment and commentary on appropriate Quality Assurance/ Quality Control (QA/QC) procedures.
- > A discussion of analytical results in relation to the following:
 - Trends in PFAS concentrations, including an assessment of temporal changes and/or changes to the extent of PFAS impacts. Trends should be assessed using an appropriate statistical analysis approach (e.g. using Mann-Kendall or similar analysis), with a specified level of confidence based upon the number of monitoring rounds completed.
 - Consideration, based on data trends, as to whether any of the existing remediation / management measures should be re-assessed, with a view to potential modification, supplementation or cessation.
 - Assessment against the management response triggers and contingencies detailed in the OMP.
 - Assessment of whether changes to the CSM and/or risk assessment are required.
 - Whether recalibration or changes to the groundwater model are required to provide a better understanding of the potential future extent of PFAS impact in groundwater.

-
- > Based on the data obtained, an assessment of the OMP sampling requirements with a view to establishing whether:
 - The number of locations monitored could be reduced, such as where PFAS concentrations are stable and are considered to present a low risk to receptors.
 - Additional monitoring locations are required, including the installation of new monitoring wells or sampling of additional existing wells (and/or private bores) to provide better understanding of the nature, extent or magnitude of PFAS impacts in a particular portion of the Management Area.
 - The frequency of monitoring should increase or decrease to provide better understanding of PFAS concentration fluctuations and potential risks to receptors.
 - Monitoring of additional media should be included in the OMP. *For example, if monitoring of surface water demonstrates a trend of increasing PFAS concentrations, or if concentrations significantly greater than those recorded in previous investigations are recorded, then the requirement to conduct monitoring of aquatic biota should be considered (DoD, 2019).*
 - > An overview of remedial works or construction and maintenance activities undertaken in the management area during the reporting period, which may impact the CSM
 - > A statement as to whether the risk profile has changed overall, or for any specific location at the Site, and a recommendation as to whether this should trigger an OMP and/or PMAP review, or other action.

9 References

General References

1. Australian Standard AS 4482-2005 Guide to the investigation and sampling of sites with potentially contaminated soils, Part 1 – Non-volatile and semi-volatile compounds.
2. Australian Water Quality Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ, 2000).
3. *Contaminated Sites Act 2003*, Western Australia.
4. Department of Defence, Department of Energy, 2018, Quality System Manual Schedule B15.
5. Department of the Environment and Energy (2017) in the National Greenhouse and Energy Reporting Scheme Measurement Technical Guidelines for the Estimation of Emissions by Facilities in Australia.
6. Department of Environment Regulation (DER), 2014, *Assessment and Management of Contaminated Sites*.
7. Environmental Protection Agency (United States EPA), November 2002, Reference: EPA/240/R-02/004, 'Guidance on Environmental Data Verification and Data Validation'.
8. The Heads of EPAs Australia and New Zealand (HEPA; 2020) PFAS National Environmental Management Plan (NEMP) 2.0, January 2020.
9. National Environment Protection Council (NEPC), 1999, National Environmental Protection (Assessment of Site Contamination) Measure (as amended), registered May 2013.
10. National Health and Medical Research Council (NHMRC) (2011 – updated 2018) National Water Quality Management Strategy Australian Drinking Water Guidelines 6, August 2018
11. NHMRC, August 2019, Guidance on Per and Polyfluoroalkyl Substances (PFAS) in Recreational Water.
12. Standards Australia/Standards New Zealand (1998) AS5667.1:1998 'Water Quality – Sampling, Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples'.
13. U.S. Environmental Protection Agency (EPA), 2000, 'Guidance for the Data Quality Objectives Process (EPA QA/G-4)'.
14. USEPA, 2002, 'Guidance on Environmental Data Verification and Data Validation (EPA QA/G-8)'.

Site Specific References

15. Cardno, April 2020, PFAS OMP Biannual Monitoring Event Factual Report RAAF Base Learmonth
16. Cardno, May 2020, PFAS OMP First Flush Sampling Event Factual Report RAAF Learmonth
17. Cardno, December 2020, PFAS OMP 2020 post-summer Biannual Monitoring Event RAAF Base Learmonth.
18. Cardno, February 2021, PFAS OMP 2020 post-winter Biannual Monitoring Event RAAF Base Learmonth
19. Cardno, April 2021, PFAS OMP, DRAFT 2020 Annual Interpretive Report – RAAF Base Learmonth
20. Cardno, April 2021, PFAS OMP First Flush Sampling Event Factual Report RAAF Learmonth
21. Department of Defence, May 2019, RAAF Base Learmonth PFAS Management Area Plan
22. Department of Defence, May 2019, RAAF Base Learmonth PFAS Ongoing Monitoring Plan.
23. GHD, December 2018, RAAF Base Learmonth – PFAS Investigations – Preliminary and Detailed Site Investigation Report.
24. GHD, April 2019, RAAF Base Learmonth – PFAS Investigations – Ecological Risk Assessment Preliminary (ERA).




APPENDIX

A

Figures



Legend

 Management Area


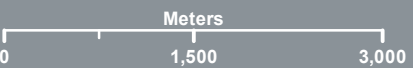
 RAAF Learmonth

FIGURE 1
1:60,000 Scale at A3

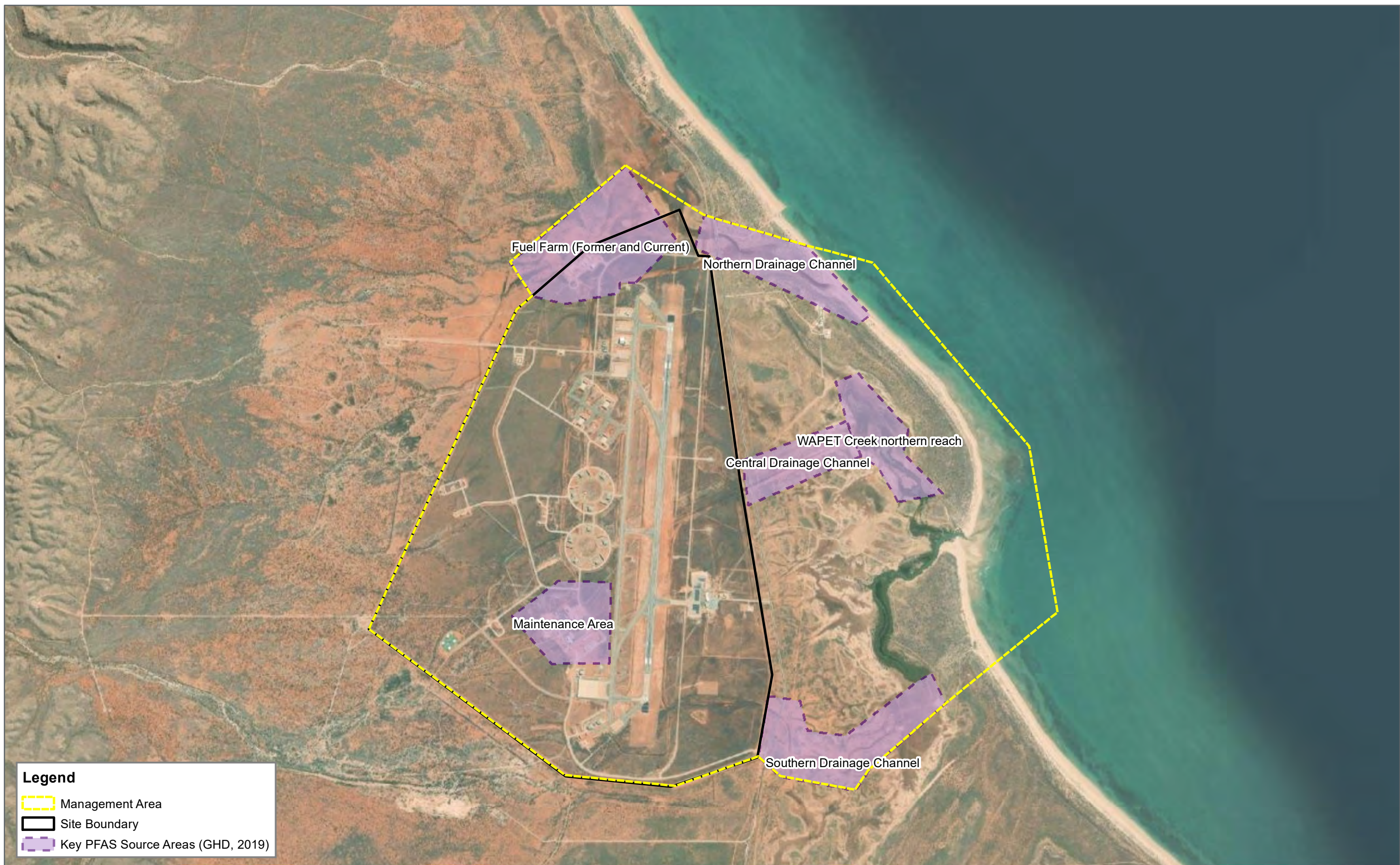


Site Location

SAMPLING AND ANALYSIS QUALITY PLAN
RAAF BASE LEARMONTH
DEPARTMENT OF DEFENCE



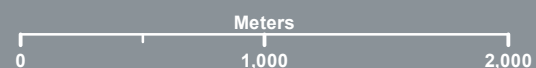
Map Produced by Cardno WA
Date: 2021-05-13 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0960-GS-001_RegionalLocation 02.mxd
Aerial Imagery Supplied by Google Earth



Legend

- Management Area
- Site Boundary
- Key PFAS Source Areas (GHD, 2019)

FIGURE 2
1:31,000 Scale at A3

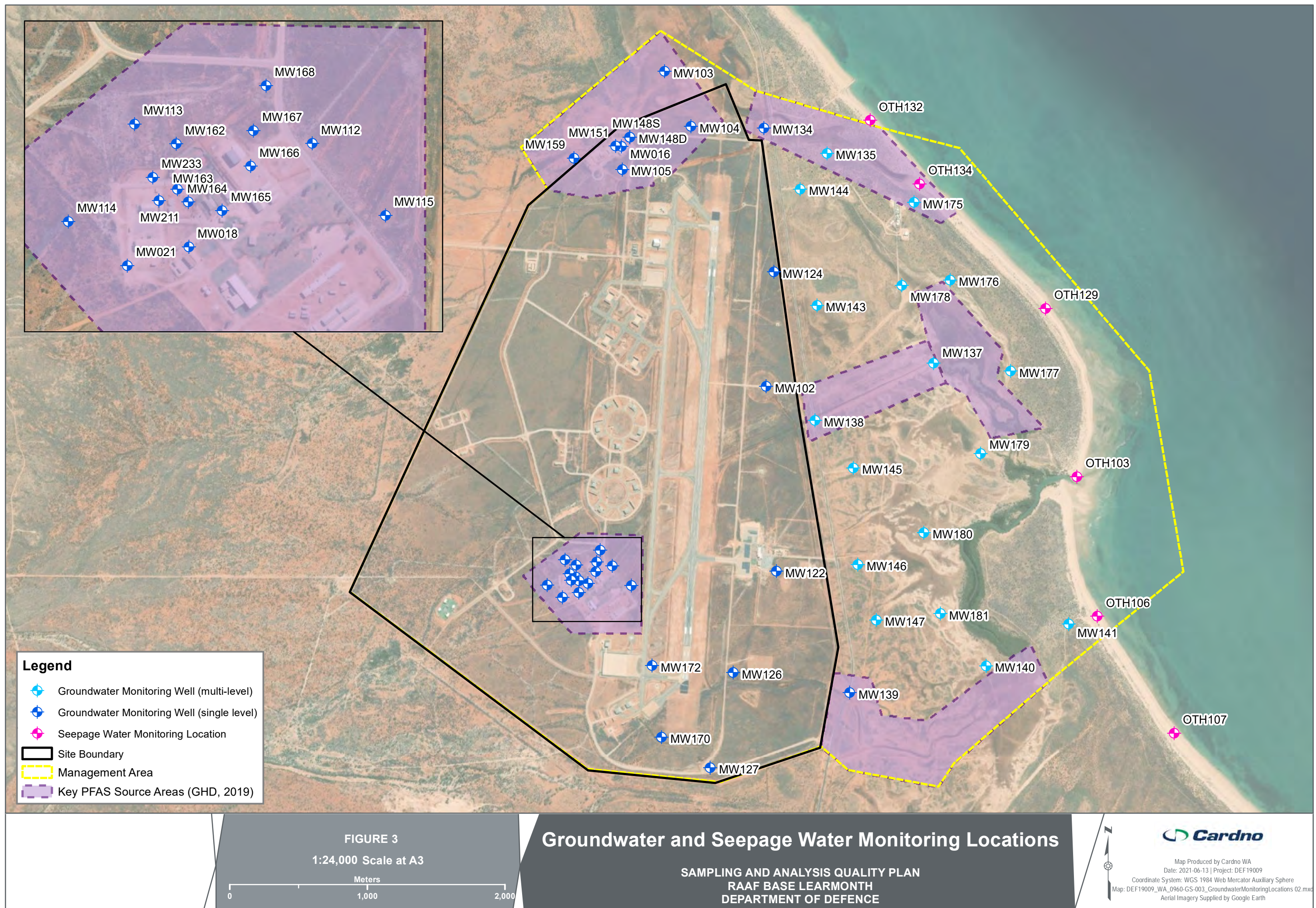


Management Areas

SAMPLING AND ANALYSIS QUALITY PLAN
RAAF BASE LEARMONTH
DEPARTMENT OF DEFENCE



Map Produced by Cardno WA
Date: 2021-06-14 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0960-GS-002_ManagementAreas 02.mxd
Aerial Imagery Supplied by Google Earth



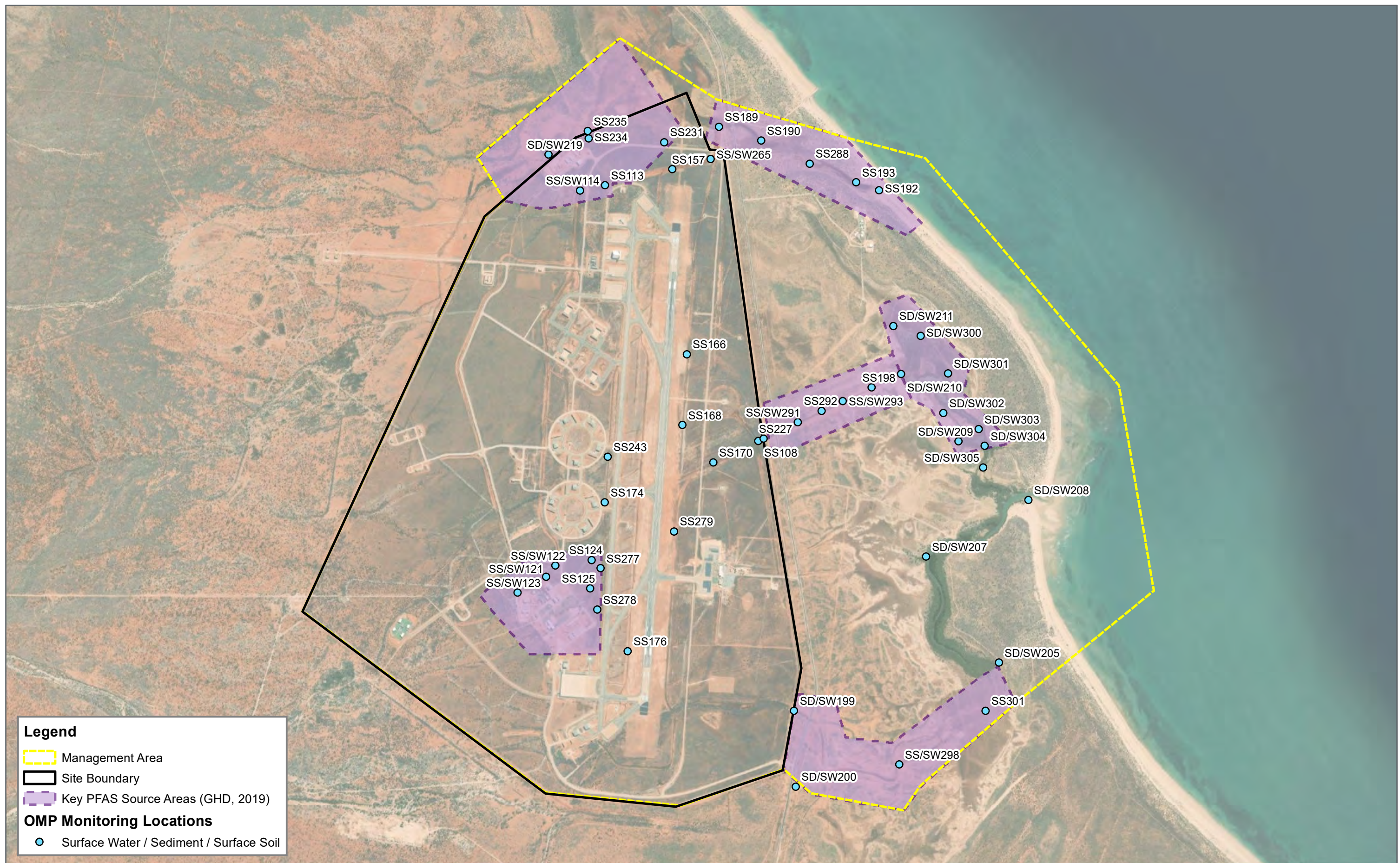
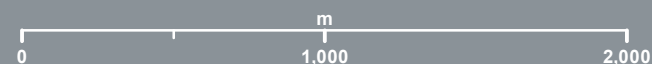


FIGURE 4
1:25,000 Scale at A3



Surface water and sediment monitoring locations

SAMPLING AND ANALYSIS QUALITY PLAN
RAAF BASE LEARMONTH
DEPARTMENT OF DEFENCE



Map Produced by Cardno WA
Date: 2021-06-13 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0960-GS-004_SurfaceWater&SedimentMonitoringLocations 02.mxd



APPENDIX

B

Full PFAS Analytical Suite

Full PFAS Analytical Suite

Group	Analyte	CAS No.
Perfluoroalkane Sulfonic Acids	Perfluorobutane sulfonic acid (PFBS)	375-73-5
	Perfluoropentane sulfonic acid (PFPeS)	2706-91-4
	Perfluorohexane sulfonic acid (PFHxS)	355-46-4
	Perfluoroheptane sulfonic acid (PFHpS)	375-92-8
	Perfluorooctane sulfonic acid (PFOS)	1763-23-1
	Perfluorodecane sulfonic acid (PFDS)	335-77-3
Perfluoroalkane Carboxylic Acids	Perfluorobutanoic acid (PFBA)	375-22-4
	Perfluoropentanoic acid (PFPeA)	2706-90-3
	Perfluorohexanoic acid (PFHxA)	307-24-4
	Perfluoroheptanoic acid (PFHpA)	375-85-9
	Perfluorooctanoic acid (PFOA)	335-67-1
	Perfluorononanoic acid (PFNA)	375-95-1
	Perfluorodecanoic acid (PFDA)	335-76-2
	Perfluoroundecanoic acid (PFUnDA)	2058-94-8
	Perfluorododecanoic acid (PFDoDA)	307-55-1
	Perfluorotridecanoic acid (PFTTrDA)	72629-94-8
	Perfluorotetradecanoic acid (PFTeDA)	376-06-7
Perfluoroalkyl Sulfonamides	Perfluorooctane sulphonamide (FOSA)	754-91-6
	N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8
	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2
	N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	2448-09-7
	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2
	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9
	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6
(n:2) Fluorotelomer Sulfonic Acids	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4
	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2
	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4
	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0



About Cardno

Cardno is a professional infrastructure and environmental services company, with expertise in the development and improvement of physical and social infrastructure for communities around the world. Cardno's team includes leading professionals who plan, design, manage and deliver sustainable projects and community programs. Cardno is an international company listed on the Australian Securities Exchange [ASX:CDD]



APPENDIX

C

FACTUAL REPORTS



now



PFAS OMP Biannual Monitoring Event Factual Report

2020 Post Winter

RAAF Learmonth

DEF19009



Prepared for
Department of Defence

22 February 2021

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Our report is based on information made available by the client. The validity and comprehensiveness of supplied information has not been independently verified and, for the purposes of this report, it is assumed that the information provided to Cardno is both complete and accurate. Whilst, to the best of our knowledge, the information contained in this report is accurate at the date of issue, changes may occur to the site conditions, the site context or the applicable planning framework. This report should not be used after any such changes without consulting the provider of the report or a suitably qualified person.

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Chemical Names

DOC	Dissolved Organic Carbon
DO	Dissolved Oxygen
PFAS	Per- and Poly-fluoroalkyl Substances
PFHxS	Per-fluoro-hexane Sulphonate
PFOA	Per-fluoro-octanoic Acid
PFOS	Per-fluoro-octane Sulfonate
TDS	Total Dissolved Solids (salinity of water)
TOC	Total Organic Carbon
TSS	Total Suspended Solids

Technical Terms

AFFF	Aqueous Film-Forming Foam
AHD	Australian Height Datum
ANZECC	Australian and New Zealand Environment and Conservation Council
AS	Australian Standard
BGL	Below Ground Level
COC	Chain of Custody
DQI	Data Quality Indicator
DQO	Data Quality Objective
EC	Electrical Conductivity
EPA	Environment Protection Authority
ESA	Environmental Site Assessment
HIL	Health Investigation Level
HSL	Health Screening Level
LOR	Limit of Reporting
N/A	Not Applicable
NATA	National Association of Testing Authorities
NEPC	National Environment Protection Council
NEPM	National Environmental Protection Measure
QA	Quality Assurance
QC	Quality Control
RPD	Relative Percentage Difference
SAQP	Sampling and Analysis Quality Plan

Units

ha	Hectares
mBGL	Metres Below Ground Level
mbTOC	Metres below Top of Casing
mg/kg	Milligram per Kilogram (approximately equivalent to ppm)
mg/L	Milligram per Litre
µS/cm	Micro Siemens per Centimetre (Electrical Conductivity - Water)

Site Specific

OMP	Ongoing Monitoring Plan
FTG	Fire Training Ground
RAAF	Royal Australian Airforce

1 Introduction

1.1 Background

Cardno was engaged by the Australian Department of Defence (“the Client”) to carry out the Per- and Poly-Fluoroalkyl Substances (PFAS) Ongoing Monitoring Plan (OMP) biannual sampling event at the Royal Australian Airforce (RAAF) Learmonth (“the Site”). The Site is located approximately 30 km south of Exmouth, WA (Figure 1, Appendix A).

The OMP was carried out in accordance with the scope and limitations presented in Cardno’s Sampling and Analysis Quality Plan (SAQP):

- > Cardno, 18 June 2020, Reference: DEF19009, ‘PFAS Ongoing Monitoring Plan Sampling and Analysis Quality Plan (SAQP) RAAF Base Learmonth’.

The SAQP was reviewed prior to the monitoring event and no changes were required.

For the purposes of this report:

- > “the Site” was defined as RAAF Base Learmonth.
- > “the Management Area” was defined as comprising the site, plus the land east of the Base, including the salt pan, drainage channels, Wapet Creek and extends to Exmouth Gulf.

1.2 Purpose & Objectives

The objective of the OMP is to assess the changes in the nature and extent of PFAS within the environment, specifically where there is an identified potentially elevated risk to a receptor or a potential future risk to a receptor associated with Defence’s historical use of legacy Aqueous Film Forming Foam (AFFF).

The purpose of this PFAS OMP factual report is to provide an up-to-date status of the condition of the site as it is currently understood in relation to the most recent sampling event.

The objectives of the report are:

- > To provide a succinct summary of the 2020 post-winter sampling event and provision of analytical results with supporting tables and figures.
- > To provide confirmation of the current understanding of risk.
- > To provide supporting data for the assessment of management actions, where relevant.

1.3 Relevant Guidelines

This assessment has been undertaken in general accordance with applicable industry standards for a site investigation for the purpose, objectives and scope identified in this report. These standards are set out in:

- > National Environment Protection Council (NEPC), 1999, National Environmental Protection (Assessment of Site Contamination) Measure (as amended 2013) (ASC NEPM).
- > Heads of Environmental Protection Authority’s Australia and New Zealand (HEPA), January 2020, PFAS National Environmental Management Plan (NEMP) 2.0.
- > Australian Standard AS 4482-2005 Guide to the investigation and sampling of sites with potentially contaminated soils, Part 1 - Non-volatile and semi-volatile compounds.
- > Standards Australia 1998. AS/NZ 5667:1998 Water quality – sampling.
- > Australian and New Zealand Guidelines, 2018. Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

- > Department of Environment and Regulation (DER), 2014, Assessment and Management of Contaminated Sites¹.
- > Department of Defence, Department of Energy, 2018, Quality System Manual Schedule B15.
- > U.S. Environmental Protection Agency (EPA), 2000, 'Guidance for the Data Quality Objectives Process (EPA QA/G-4)'.
- > USEPA, 2002, 'Guidance on Environmental Data Verification and Data Validation (EPA QA/G-8)'.
- > National Health and Medical Research Council (NHMRC), August 2019, Guidance on Per and Polyfluoroalkyl Substances (PFAS) in Recreational Water.

2 Scope of Work

Cardno carried out the tasks detailed in the following sections in order to satisfy the purpose and objectives of this assessment.

2.1 Groundwater Monitoring

Sampling of selected groundwater bores was performed in accordance with the SAQP, applying methods set out in section 3 of this report. The groundwater bores monitored as part of the OMP are presented in Table 2-1, and are shown on Figure 3, Appendix A.

Table 2-1 Groundwater Monitoring Locations

Monitoring Area	Location ID
Source Area 1 – Maintenance Area	0960_MW114, 0960_MW021, 0960_MW113, 0960_MW063, 0960_MW211, 0960_MW162, 0960_MW163, 0960_MW018, 0960_MW164, 0960_MW165, 0960_MW166, 0960_MW167, 0960_MW168, 0960_MW112, 0960_MW115.
Source Area 2 – Fuel Farm	0960_MW016, 0960_MW105, 0960_MW148_D, 0960_MW148_S, 0960_MW151, 0960_MW159.
Pathway	0960_MW122, 0960_MW146, 0960_MW147, 0960_MW180, 0960_MW181, 0960_MW172, 0960_MW170, 0960_MW127, 0960_MW126, 0960_MW139, 0960_MW140, 0960_MW102, 0960_MW138, 0960_MW145, 0960_MW103, 0960_MW104, 0960_MW134, 0960_MW135, 0960_MW175, 0960_MW124, 0960_MW144, 0960_MW143.
Receptor	0960_MW137, 0960_MW176, 0960_MW177, 0960_MW178, 0960_MW179, 0960_MW141.

2.2 Seepage Water Monitoring

Sampling of selected seepage water monitoring locations was performed in accordance with the SAQP, applying methods set out in section 3 of this report. The seepage water locations monitored as part of the OMP are presented in Table 2-2 and are shown on Figure 3, Appendix A.

Table 2-2 Seepage Water Monitoring Locations

Monitoring Area	Location ID
Seepage	0960_OTH132, 0960_OTH134, 0960_OTH129, 0960_OTH103, 0960_OTH106, 0960_OTH107.

¹ It is noted that Site is located on Commonwealth Land and is regulated under the Commonwealth environmental legislation, the State based DWER guidelines are relevant for the sampling of off-Site private properties and waterways.

2.3 Surface water Monitoring

Sampling of selected surface water monitoring locations was performed in accordance with the SAQP, applying methods set out in section 3 of this report. The surface water locations monitored as part of the OMP are presented in Table 2-3 and are shown on Figure 4, Appendix A.

Table 2-3 Surface water Monitoring Locations

Monitoring Area	Location ID
Drainage channels	SW219, SS234, SS235, SW114, SS113, SS231, SS157, SW265, SW189, SS190, SW288, SW193, SS192, SS198, SW293, SS292, SW291, SS227, SS108, SS170, SS168, SS279, SS166, SS243, SS174, SW121, SW122, SS124, SS277, SS125, SS278, SS176, SW123, SW199, SW200, SW298.
WAPET Creek	SW211, SW300, SW210, SW301, SW302, SW303, SW209, SW304, SW305, SW207, SW208, SW205, SS301.

2.4 Sediment Monitoring

Sampling of selected sediment (or shallow soil if dry) monitoring locations was performed in accordance with the SAQP, applying methods set out in section 3 of this report. The sediment locations monitored as part of the OMP are presented in Table 2-4 and are shown on Figure 5, Appendix A.

Table 2-4 Sediment Monitoring Locations

Monitoring Area	Location ID
Drainage channels	SD219, SS234, SS235, SS114, SS113, SS231, SS157, SS265, SS189, SS190, SS288, SS193, SS192, SS198, SS293, SS292, SS291, SS227, SS108, SS170, SS168, SS279, SS166, SS243, SS174, SS121, SS122, SS124, SS277, SS125, SS278, SS176, SS123, SD199, SD200, SS298.
WAPET Creek	SD211, SD300, SD210, SD301, SD302, SD303, SD209, SD304, SD305, SD207, SD208, SD205, SS301.

Note: 'SS' prefix indicates a shallow soil (dry) location, 'SD' prefix a sediment (wet) location

2.5 Data Management

All the data included in the Report has been collected, uploaded to the ESdat database and reviewed according to the data management requirements of the DCMM Annex L.

The sample naming convention detailed in the DCMM Annex L was used in the field.

2.5.1 Defence ESdat database

Data collected as part of the 2020 post-winter OMP monitoring event was uploaded to the ESdat database according to the data management requirements of the DCMM Annex L, including:

- > All field data collected was uploaded;
- > Laboratory data was uploaded and approved; and
- > QA/QC data was reconciled.

2.6 Deviations from the OMP SAQP

Deviations from the SAQP (Cardno, 2020) for the 2020 post-winter monitoring event are presented in Table 2-5.

Table 2-5 Summary of deviations from the OMP SAQP

Location	Deviation	Comments
SW199, SW200, SW219, SS108, SS113, SW114, SW121, SW122, SW123, SS124, SS125, SS157, SS166, SS168, SS170, SS174, SS176, SW189, SW190, SW192, SW193, SS198, SS231, SS234, SS235, SS243, SS265, SS277, S278, SS279, SW288, SW291, SS292, SW293, SW298, SS301, SS227.	Not sampled	These surface water monitoring locations were found dry

Location	Deviation	Comments
MW105, MW126	Not sampled	These groundwater monitoring wells were found dry
MW021	Not found	Well appears to have been covered by recent placement of earth/rockworks

3 Methodology

3.1 Groundwater Sampling Methodology

Groundwater monitoring was undertaken applying the methods detailed in Table 3-1.

Table 3-1 Groundwater Sampling Method

Activity	Details
Well Gauging	Standing Water Level (SWL) were gauged using an interface probe. All wells were measured against a specified mark at the top of the well casing.
Groundwater Field Parameters	<p>Groundwater field parameters were recorded via a down-hole water quality meter (positioned within the mid screen interval) prior to deployment of HydraSleeves® or pre-sample collection. The following field parameters were recorded using a water quality meter:</p> <ul style="list-style-type: none"> pH. electrical conductivity (EC). oxidation reduction potential (ORP). Dissolved oxygen (DO). Temperature. <p>Once field parameters have stabilised (as indicated by at least three consecutive measurements falling within +/- 10% of each other) measurement were recorded on field data records.</p> <p>All field instruments (e.g. water quality meter) were calibrated by the equipment supplier to optimise the accuracy of the measurements taken. Calibration certificates are provided in Appendix D.</p>
Deployment and Retrieval of HydraSleeves (single level well sample collection)	<p>HydraSleeve were deployed with top weight sample collection to begin at the lowest point. HydraSleeve sampling devices were left in wells for a minimum of 12 hours to allow restabilisation of the well following the slight disturbance caused by sampler deployment.</p> <p>Samples were collected via continuous pull method at a rate allowing the water to pass through the check valve into the sample sleeve.</p> <p>Samples were discharged immediately (minimise changes in chemistry) via discharge tube.</p> <p>Following sampling, hydrasleeves were deployed in preparation for the next OMP monitoring event using the same string for consistency between event (same depth of sampling i.e. within screen).</p>
Peristaltic pump (multi-level wells sample collection)	<p>The shallowest (non-dry) wells were sampled at each multi-level well location, using Teflon-free dedicated and disposable high-density polyethylene (HDPE) tubing coupled to a peristaltic pump system. The groundwater was purged at a low flow rate of 0.2 mL/min.</p> <p>SWL and field parameters were measured during purging and post sample collection to ensure limited drawdown effects. The groundwater was sampled when the field parameters had stabilised.</p>
Decontamination procedure	<p>Dedicated HydraSleeves/tubing were used at each groundwater bore thus removing the need for decontamination.</p> <p>All re-usable sampling equipment was thoroughly washed using PFAS & phosphate-free detergent, then double rinsed with clean water before the sample collection.</p>

Activity	Details
Sample identification, preservation transport and holding times	<p>Each sample was labelled with the sample location, date, project identification number and sampler's initials.</p> <p>Samples were collected directly into appropriately preserved laboratory supplied bottles (Teflon-free) and packed in chilled containers for delivery to the laboratory under Chain of Custody (CoC) documentation.</p> <p>Sample containers, preservation procedures, sample storage requirements and holding times were undertaken in accordance with those recommended by Standards Australia (AS/NZS 5667.1:1998 and AS 4482.1 as appropriate).</p>
Laboratory Testing	<p>Groundwater samples were submitted for the following analysis:</p> <ul style="list-style-type: none"> Full PFAS analytical suite (refer to the SAQP for full list of analytes). Major anions and cations (include calcium, magnesium, sodium, potassium, chloride, sulfate, alkalinity and ionic balance). Dissolved organic carbon (DOC), total suspended solids (TSS), total dissolved solids (TDS) and pH. <p>The primary laboratory was ALS Global Laboratories (Perth), and the secondary laboratory (quality control) was Eurofins (Perth). Both laboratories are NATA-accredited for the parameters tested. Copies of the NATA stamped laboratory reports and Chain of Custody documentation are included in Appendix D.</p>
Laboratory Testing – Quality Control	<p>Groundwater QC samples were collected at the following frequencies as detailed in the SAQP (Cardno, 2020):</p> <ul style="list-style-type: none"> Field duplicate (intra-laboratory) samples at 1 per 10 water samples or 1 per batch if the batch is less than 10 samples. Field triplicate (inter-laboratory) samples at 1 per 10 water samples and sent to a secondary laboratory. Rinsate blank sample at 1 per day [collected off re-used sampling equipment (e.g. interface probe)]. Field blank samples at 1 per day.

3.2 Seepage Water Sampling Methodology

Seepage water monitoring procedure is detailed in Table 3-2.

Table 3-2 Seepage water Sampling method

Activity	Details
Field parameters	<p>The following field parameters were recorded using a water quality meter:</p> <ul style="list-style-type: none"> pH. electrical conductivity (EC). oxidation reduction potential (ORP). Dissolved oxygen (DO). Temperature. <p>Field observations such as water flow, odours or sheen presence were also recorded on field sampling sheets.</p>
Sampling Method	<p>Sampling was carried out in a two-hour period; one hour each side of the low tide. Sampling protocol involved a shallow excavation in the beach sand; just above where inundation by wave action is occurring.</p> <p>Sampling containers were be lowered into the exposed seepage water and filled.</p>
Decontamination procedure	<p>All re-usable sampling equipment was thoroughly washed using PFAS & phosphate-free detergent, then double rinsed with clean water before the sample collection.</p>
Sample identification, preservation transport and holding times	<p>Each sample was labelled with the sample location, date, project identification number and sampler's initials.</p> <p>Samples were collected directly into appropriately preserved laboratory supplied bottles (Teflon-free) and packed in chilled containers for delivery to the laboratory under CoC documentation.</p>

Activity	Details
	Sample containers, preservation procedures, sample storage requirements and holding times were undertaken in accordance with those recommended by Standards Australia (AS/NZS 5667.1:1998 and AS 4482.1 as appropriate).
Laboratory Testing	<p>Seepage water samples were submitted for the following analysis:</p> <ul style="list-style-type: none"> Full PFAS analytical suite (refer to the SAQP for full list of analytes). Major anions and cations (include calcium, magnesium, sodium, potassium, chloride, sulfate, alkalinity and ionic balance). DOC, TSS, TDS and pH.
Laboratory Testing – Quality Control	<p>Seepage water QC samples were collected at the following frequencies as detailed in the SAQP (Cardno, 2020):</p> <ul style="list-style-type: none"> Field duplicate (intra-laboratory) samples at 1 per 10 water samples or 1 per batch if the batch is less than 10 samples. Field triplicate (inter-laboratory) samples at 1 per 10 water samples and sent to a secondary laboratory.

3.3 Surface Water Sampling Methodology

Surface water monitoring procedure is detailed in Table 3-3.

Table 3-3 Surface water Sampling Method

Activity	Details
Field parameters	<p>The following field parameters were recorded using a water quality meter:</p> <ul style="list-style-type: none"> pH. electrical conductivity (EC). oxidation reduction potential (ORP). Dissolved oxygen (DO). Temperature. <p>Field observations such as water flow, odours or sheen presence were also recorded on field sampling sheets.</p>
Sampling Method	<p>Surface water samples were collected directly into sample containers using a 'Grab' (manual) sample method via a long handled sampling device.</p> <p>Where depth permits, the sample container was positioned at least 10 cm below the surface water level and above the sediment bed and oriented with the capped opening facing downwards to avoid the collection of surface films.</p>
Decontamination procedure	<p>All re-usable sampling equipment was thoroughly washed using PFAS & phosphate-free detergent, then double rinsed with clean water before the sample collection.</p>
Sample identification, preservation transport and holding times	<p>Each sample was labelled with the sample location, date, project identification number and sampler's initials.</p> <p>Samples were collected directly into appropriately preserved laboratory supplied bottles (Teflon-free) and packed in chilled containers for delivery to the laboratory under CoC documentation.</p> <p>Sample containers, preservation procedures, sample storage requirements and holding times were undertaken in accordance with those recommended by Standards Australia (AS/NZS 5667.1:1998 and AS 4482.1 as appropriate).</p>
Laboratory Testing	<p>Surface water samples were submitted for the following analysis:</p> <ul style="list-style-type: none"> Full PFAS analytical suite (refer to the SAQP for full list of analytes). Major anions and cations (include calcium, magnesium, sodium, potassium, chloride, sulfate, alkalinity and ionic balance). DOC, TSS, TDS and pH.
Laboratory Testing – Quality Control	<p>Surface water QC samples were collected at the following frequencies as detailed in the SAQP (Cardno, 2020):</p> <ul style="list-style-type: none"> Field duplicate (intra-laboratory) samples at 1 per 10 water samples or 1 per batch if the batch is less than 10 samples.

Activity	Details
	<ul style="list-style-type: none"> Field triplicate (inter-laboratory) samples at 1 per 10 water samples and sent to a secondary laboratory.

3.4 Sediment Sampling Methodology

Sediment sampling methodology is detailed in Table 3-4.

Table 3-4 Sediment Sampling Method

Activity	Details
Sample Collection	<p>Sediment samples were collected at the sediment/water interface using hand tools (e.g. trowel, hand auger, PVC pipe etc.) with samples placed directly into appropriately labelled, laboratory supplied sample containers and packed in chilled containers for delivery to the laboratory under CoC documentation.</p> <p>At each sampling location, the sediment sample was visually assessed and observations (including physical description) recorded on field data sheets.</p>
Field Records	<p>The following information was recorded on the field data sheets:</p> <ul style="list-style-type: none"> Sampling time, date and name of the sampler. Weather conditions. Sample Collection method. Sampling equipment decontamination procedures where non-disposable sampling equipment is utilised.
Decontamination	<p>All re-usable sampling equipment was thoroughly washed using PFAS & phosphate-free detergent, then double rinsed with clean water before the sample collection.</p>
Laboratory Testing	<p>Sediment samples were submitted for the following analysis:</p> <ul style="list-style-type: none"> Full PFAS analytical suite (refer to the SAQP for full list of analytes). TOC, EC, cation exchange capacity (CEC) and pH
Laboratory Testing – Quality Control	<p>Sediment QC samples were collected at the following frequencies as detailed in the SAQP (Cardno, 2020):</p> <ul style="list-style-type: none"> Field duplicate (intra-laboratory) samples at 1 per 20 sediment samples or 1 per batch if the batch is less than 20 samples. Field triplicate (inter-laboratory) samples at 1 per 20 sediment samples and sent to a secondary laboratory.

3.5 Quality Control / Quality Assurance

A critical aspect of site assessments is the demonstration of the quality of the data used as the basis for the assessment. This is achieved through a Data Validation process which includes a review of the following data quality indicators, as described in the SAQP:

- > QA documentation.
- > Bias.
- > Data Representativeness.
- > Data Precision & Accuracy.
- > Laboratory Performance.
- > Data Comparability.
- > Data Set Completeness.

A detailed review of these aspects has been undertaken, the results of which are presented in Appendix E.

The QA/QC review concluded that there are no significant systematic errors in the data collection process and therefore, the dataset used for the assessment is considered valid and complete.

3.6 Assessment Criteria

3.6.1 Groundwater, Seepage water and surface water

The adopted assessment criteria for groundwater are detailed in Table 3-5.

Table 3-5 Criteria for groundwater, seepage water and surface water

Exposure Scenario	Adopted Assessment Criteria		Guidance
	PFHxS / PFOS µg/L	PFOA	
Human Health – Recreational Water	2 ¹	10	NHMRC 2019, HEPA 2020
Ecological – 99% species protection	0.00023 ²	19	HEPA 2020
<ol style="list-style-type: none"> Sum of PFOS and PFHxS. PFOS only; Practical screening guideline of 0.01 µg/L is based on typical current laboratory limit of reporting. Therefore, it should be noted that warning and action levels would not be relevant until the detection limits are reduced or the screening levels are increased (HEPA 2020). 			

3.6.2 Sediment

The adopted assessment criteria for sediment are detailed in Table 3-6.

Table 3-6 Criteria for Sediment

Exposure Scenario	Adopted Assessment Criteria		Guidance
	PFHxS / PFOS mg/kg	PFOA	
Human Health - Commercial / industrial (on-base activities)	20 ¹	50	HEPA 2020
Ecological – Direct exposure (interim guidelines)	1 ²	10	HEPA 2020
Ecological - indirect exposure (interim guidelines)	0.01 ²	-	HEPA 2020
<ol style="list-style-type: none"> Sum of PFOS and PFHxS. PFOS only 			

4 Field Observations and Results

4.1 General Site Observations

No weather event or Site activities that could have impacted the sampling or results were observed.

4.2 Groundwater

4.2.1 Summary of Field Observations

4.2.1.1 Physicochemical parameters

Stabilised physicochemical parameters, water colour and turbidity observations recorded during the groundwater sampling program are presented in field sampling records, included in Appendix D. Field parameters were generally consistent with the previous monitoring event.

4.2.1.2 Groundwater Elevation and Migration

Groundwater flow direction was interpreted to be easterly, towards the Exmouth Gulf, consistent with the previous monitoring events. Historical investigation indicated that the groundwater table is relatively flat

beneath the Site (low hydraulic gradient). Groundwater elevation in wells closer to the shore might be influenced by tidal effects.

Groundwater elevation contours and flow direction are shown in Figure 2, Appendix A. Gauging records are presented in Appendix D.

4.2.2 Groundwater Laboratory Results

The results of laboratory analysis have been compared against adopted assessment criteria. A summary of results exceeding the adopted criteria is presented in Table 4-1. Laboratory results have also been compared to available historical data, Figure 3 in Appendix A presents the groundwater monitoring locations where a first time detection of Sum of PFOS and PFHxS or PFOA, or a new exceedance of guideline value were reported. The laboratory reports are provided in Appendix C.

Table 4-1 Summary of Groundwater Results Exceeding Adopted Criteria

Analytes	Locations Exceeding Criteria	Lowest Criteria (µg/L)	Max Conc. (µg/L)	No. Analytical Results ¹	No. Results Above Criteria
PFOA	-	10 ²	2.20(MW016)	46	0
PFOS	MW018, MW063, MW102, MW103, MW104, MW105, MW016, MW112, MW115, MW124, MW134, MW138, MW148D, MW148S, MW151, MW159, MW162, MW163, MW164, MW165, MW166, MW167, MW168, MW172, MW175, MW211	0.01 ³	42.2(MW016)	46	26
Sum of PFHxS and PFOS	MW018, MW063, MW016, MW148D, MW148S, MW151, MW162, MW163, MW164, MW167, MW172, MW211.	2 ²	127 (MW016)	46	12

Notes:

1. Non-inclusive of quality control samples
2. HEPA 2020 guideline value for human health – Recreational Use
3. HEPA 2020 guideline value for ecological 99% species protection (LOR adopted)

Findings are summarised as follows:

- > MW102 (on-Site, drainage channels) and MW134 (northern drainage channel) reported a first time detection of PFOS and therefore an new exceedance of the HEPA (2020) ecological criteria for 99% species protection.
- > There was no first time detection above the LOR of PFOA for any of the groundwater monitoring locations.

4.3 Seepage Water

4.3.1 Summary of Field Observations

Stabilised physiochemical parameters, water colour and turbidity observations recorded during the groundwater sampling program are presented in field sampling record sheets, included in Appendix D. Field parameters were generally consistent with the previous monitoring event.

4.3.2 Laboratory Results

The results of laboratory analysis have been compared against adopted assessment criteria. A summary of results exceeding the adopted criteria is presented in Table 4-2. Laboratory results have also been compared to available historical data, Figure 3 in Appendix A presents the seepage water monitoring locations. The laboratory reports are provided in Appendix C.

Table 4-2 Summary of Seepage water Results Exceeding Adopted Criteria

Analytes	Locations Exceeding Criteria	Lowest Criteria (µg/L)	Max Conc. (µg/L)	No. Analytical Results ¹	No. Results Above Criteria
PFOA	-	10 ²	<0.01	6	0
PFOS	-	0.01 ³	<0.01	6	0
Sum of PFHxS and PFOS	-	2 ²	<0.01	6	0

Notes:

1. Non-inclusive of quality control samples
2. HEPA 2020 guideline value for human health – Recreational Use
3. HEPA 2020 guideline value for ecological 99% species protection (LOR adopted)

Findings are summarised as follows:

- > All seepage water samples analysed reported PFAS concentrations below the laboratory LOR.
- > There was no first time detect of PFOA or Sum of PFOS and PFHxS or new exceedance of guideline values at the seepage water monitoring locations during the 2020 post-winter monitoring event.

4.4 Surface water

4.4.1 Summary of Field Observations

Stabilised physiochemical parameters, water colour and turbidity observations recorded during the groundwater sampling program are presented in field sampling record sheets, included in Appendix D. Field parameters were generally consistent with the previous monitoring events.

4.4.2 Laboratory Results

The results of laboratory analysis have been compared against adopted assessment criteria. A summary of results exceeding the adopted criteria is presented in Table 4-3. Laboratory results have also been compared to available historical data, Figure 4 in Appendix A presents the surface water monitoring locations where a first time detection of Sum of PFOS and PFHxS or PFOA, or a new exceedance of guideline value were reported. The laboratory reports are provided in Appendix C.

Table 4-3 Summary of Surface water Results Exceeding Adopted Criteria

Analytes	Locations Exceeding Criteria	Lowest Criteria (µg/L)	Max Conc. (µg/L)	No. Analytical Results ¹	No. Results Above Criteria
PFOA	-	10 ²	<0.01	12	0
PFOS	SW211	0.01 ³	0.02 (SW211)	12	1
Sum of PFHxS and PFOS	-	2 ²	0.02 (SW211)	12	0

Notes:

1. Non-inclusive of quality control samples
2. HEPA 2020 guideline value for human health – Recreational Use
3. HEPA 2020 guideline value for ecological 99% species protection (LOR adopted)

Findings are summarised as follows:

- > With the exception of SW211, all surface water samples reported PFAS concentrations below the laboratory LOR.
- > No first time detect of PFOA or Sum of PFOS and PFHxS or new exceedance of a guideline value were reported for the surface water monitoring locations during the 2020 post-winter monitoring event.

4.5 Sediment

4.5.1 Summary of Field Observations

Observations recorded during the sediment sampling program are provided in the field sampling record sheets within Appendix D.

4.5.2 Laboratory Results

The results of laboratory analysis have been compared against adopted assessment criteria. Soil criteria are adopted in the absence of criteria for sediment for consistency with the SAQP (Cardno, June 2020), DSI (GHD, 2018) and ERA (GHD, 2019). A summary of results exceeding the adopted criteria is presented in Table 4-4. Laboratory results have also been compared to available historical data. Figure 5 in Appendix A presents the sediment monitoring locations where a first time detection of Sum of PFOS and PFHxS or PFOA, or a new exceedance of guideline value were reported.

Table 4-4 Summary of Sediment Results Exceeding Adopted Criteria

Analytes	Locations Exceeding Criteria	Lowest Criteria (mg/kg)	Max Conc. (mg/kg)	No. Analytical Results ¹	No. Results Above Criteria
PFOA	-	10 ²	0.0005 (SS235)	49	0
PFOS	SS121, SS123, SS124, SS125, SS174, SS190, SS227, SS231, SS234, SS235.	0.01 ³	0.188 (SS124)	49	10
Sum of PFHxS and PFOS	-	20 ⁴	0.188 (SS124)	49	0

Notes:

1. Non-inclusive of quality control samples
2. Ecosystems – all land uses – Direct exposure (HEPA, 2020)
3. Ecosystems – all land uses – Indirect exposure (HEPA, 2020)
4. Human health – Commercial/Industrial (HEPA, 2020)

Findings are summarised as follows:

- > SS122, SS231 and SS265 reported a first time detect of PFOA (detectable concentrations ranging 0.0003-0.0004 mg/kg). These monitoring locations had previously reported detectable concentrations of Sum of PFOS and PFHxS.
- > No new exceedance of a guideline value was reported for the sediment monitoring locations during the 2020 post-winter monitoring event.

4.6 Changes to the Monitoring Network Condition

Groundwater monitoring bore MW021 appears to have been covered by recent earthworks. No other changes to the monitoring network condition were noted during this sampling event.

5 Summary and Conclusions

Cardno undertook the 2020 post-winter groundwater, seepage water, surface water and sediment monitoring event at RAAF Base Learmonth as part of the PFAS OMP. Groundwater sampling and testing was undertaken at 46 monitoring bores, 12 surface water locations, six (6) seepage water locations and 49 sediment monitoring locations. 37 surface water monitoring locations could not be sampled as these were found dry. Three groundwater monitoring wells could not be sampled as these were found dry (2) or covered (1).

Groundwater levels were gauged in all wells before sampling. Groundwater flow direction was interpreted to be easterly, towards the Exmouth Gulf, consistent with the previous monitoring events.

The groundwater laboratory results reported the following:

- > Of the 46 samples that were tested, PFOS (26 samples) and Sum of PFHxS and PFOS (12 samples) reported concentrations that exceeded adopted assessment criteria.
- > MW102 (on-Site, drainage channels) and MW134 (northern drainage channel) reported a first time detection of Sum of PFOS and PFHxS, and a new PFOS exceedance of the HEPA (2020) ecological criteria for 99% species protection.
- > There was no first time detection above the LOR of PFOA for any of the groundwater monitoring locations.

The seepage water laboratory results reported the following:

- > All seepage water samples analysed reported PFAS concentrations below the laboratory LOR.
- > There was no first time detect of PFOA or Sum of PFOS and PFHxS or new exceedance of guideline values at the seepage water monitoring locations during the 2020 post-winter monitoring event.

The surface water laboratory results reported the following:

- > Of the 12 surface water samples that were tested, PFOS (1 samples) reported concentrations that exceeded adopted assessment criteria.
- > With the exception of SW211, all surface water samples reported PFAS concentrations below the laboratory LOR.
- > No first time detect of PFOA or Sum of PFOS and PFHxS or new exceedance of a guideline value were reported for the surface water monitoring locations during the 2020 post-winter monitoring event.

The sediment laboratory results reported the following:

- > Of the 49 sediment samples that were tested, PFOS (10 samples) reported concentrations that exceeded the HEPA (2020) ecological indirect exposure criteria.
- > SS122, SS231 and SS265 reported a first time detect of PFOA (detectable concentrations ranging 0.0003-0.0004 mg/kg). These monitoring locations had previously reported detectable concentrations of Sum of PFOS and PFHxS.
- > No new exceedance of a guideline value was reported for the sediment monitoring locations during the 2020 post-winter monitoring event.

PFAS concentrations were generally within the historical range for all media sampled, with the exceptions reported above.

The next OMP sampling event for RAAF Base Learmonth will be the 2021 first flush monitoring event.

6 References

General References

1. Australian Standard AS 4482-2005 Guide to the investigation and sampling of sites with potentially contaminated soils, Part 1 – Non-volatile and semi-volatile compounds.
2. Australian Standard AS 4482-1999 Guide to the investigation and sampling of sites with potentially contaminated soils, Part 2 – Volatile substances.
3. Australian Water Quality Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ, 2000).
4. *Contaminated Sites Act 2003*, Western Australia.
5. Department of the Environment and Energy (2017) in the National Greenhouse and Energy Reporting Scheme Measurement Technical Guidelines for the Estimation of Emissions by Facilities in Australia.
6. Department of Environment Regulation (DER), 2014, *Assessment and Management of Contaminated Sites*.
7. Department of Water and Environment Regulation (DWER), 2018, Perth Groundwater Atlas, (<https://maps.water.wa.gov.au/#/webmap/gwm>).
8. Environmental Protection Agency (United States EPA), November 2002, Reference: EPA/240/R-02/004, 'Guidance on Environmental Data Verification and Data Validation'.
9. The Heads of EPAs Australia and New Zealand (HEPA; 2020) PFAS National Environmental Management Plan (NEMP) 2.0, January 2020.
10. National Environment Protection Council (NEPC), 1999, National Environmental Protection (Assessment of Site Contamination) Measure (as amended), registered May 2013.
11. National Health and Medical Research Council (NHMRC) (2011, as updated 2018) National Water Quality Management Strategy Australian Drinking Water Guidelines 6, August 2018
12. NHMRC, August 2019, Guidance on Per and Polyfluoroalkyl Substances (PFAS) in Recreational Water.
13. Standards Australia/Standards New Zealand (1998) AS5667.1:1998 'Water Quality – Sampling, Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples'.
14. U.S. Environmental Protection Agency (EPA), 2000, 'Guidance for the Data Quality Objectives Process (EPA QA/G-4)'.
15. USEPA, 2002, 'Guidance on Environmental Data Verification and Data Validation (EPA QA/G-8)'.

Site Specific References

16. Cardno, June 2020, Reference: DEF19009, 'PFAS Ongoing Monitoring Plan Sampling and Analysis Quality Plan (SAQP) RAAF Base Learmonth'.
17. Cardno, April 2020, PFAS OMP Biannual Monitoring Event Factual Report RAAF Base Learmonth
18. Cardno, July 2020, PFAS OMP First Flush Sampling Event Factual Report RAAF Base Learmonth
19. Department of Defence, May 2019, RAAF Base Learmonth PFAS Ongoing Monitoring Plan.
20. GHD, December 2018, RAAF Base Learmonth – PFAS Investigations – Preliminary and Detailed Site Investigation Report.
21. GHD, April 2019, RAAF Base Learmonth – PFAS Investigations – Ecological Risk Assessment Preliminary (ERA).


APPENDIX

A

FIGURES



Legend

 Management Area


 RAAF Learmonth

FIGURE 1
1:60,000 Scale at A3



Site Location

BIANNUAL SAMPLING EVENT
RAAF BASE LEARMONTH
DEPARTMENT OF DEFENCE



Map Produced by Cardno WA
Date: 2021-06-13 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0960-GS-001_RegionalLocation 02.mxd
Aerial Imagery Supplied by Google Earth

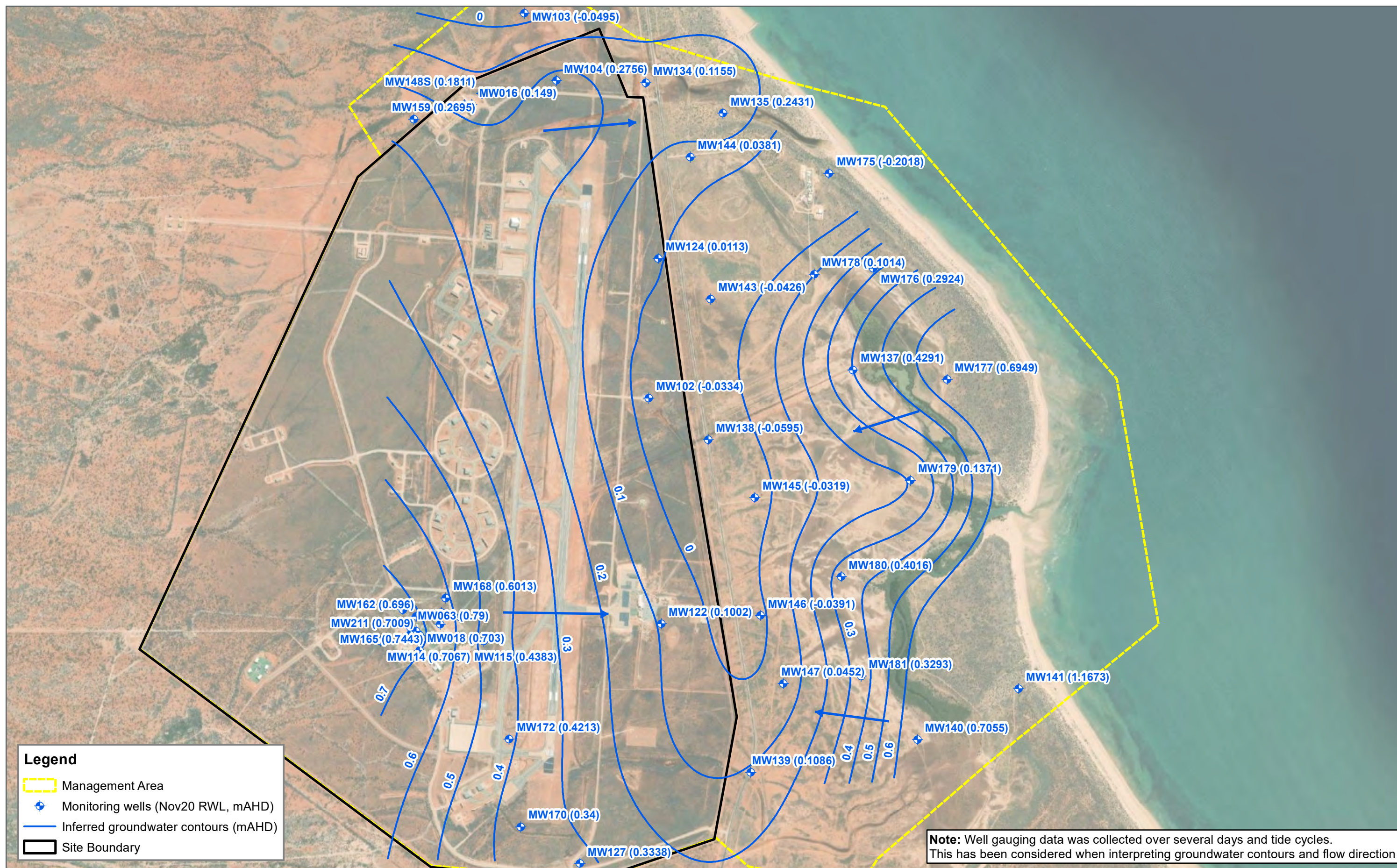


FIGURE 2
1:21,000 Scale at A3



Inferred Groundwater Contours

BIANNUAL SAMPLING EVENT
RAAF BASE LEARMONTH
DEPARTMENT OF DEFENCE



Map Produced by Cardno WA
Date: 2021-06-13 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0960-GS-002_Nov20GWContours 01.mxd
Aerial Imagery Supplied by Google Earth

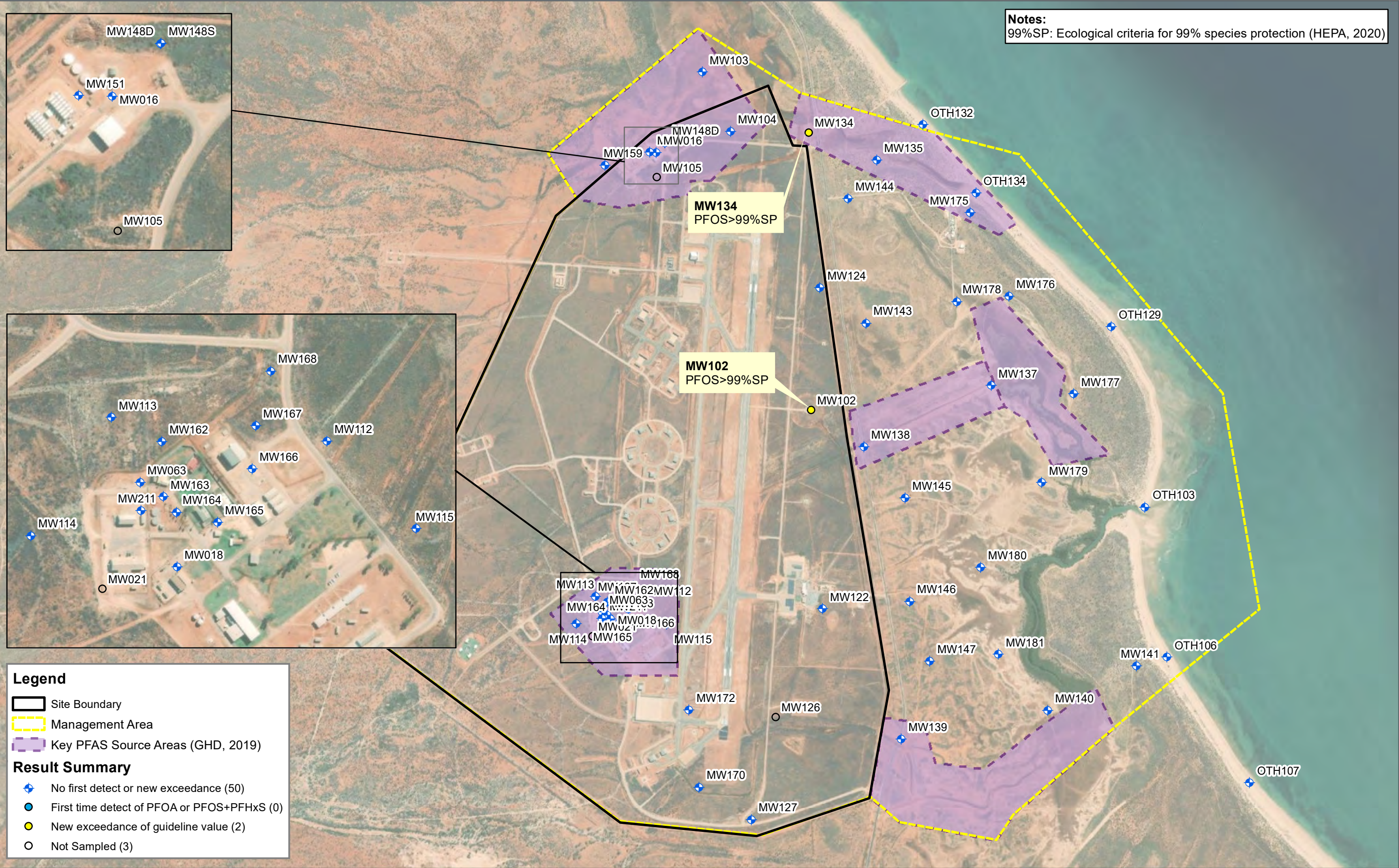


FIGURE 3
1:24,000 Scale at A3



Groundwater & Seepage Monitoring Locations and Results

BIANNUAL SAMPLING EVENT
RAAF BASE LEARMONTH
DEPARTMENT OF DEFENCE



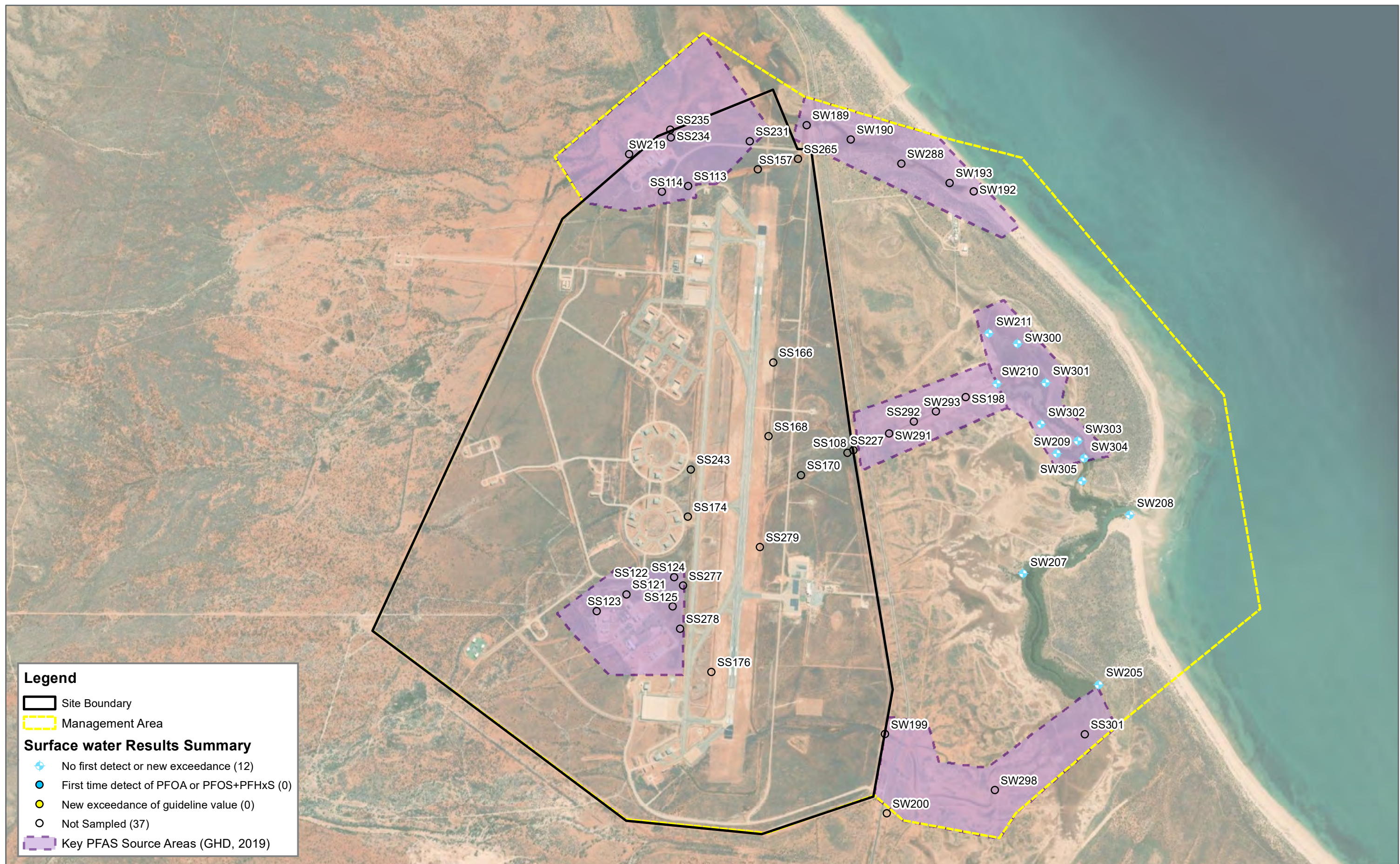


FIGURE 4
1:24,000 Scale at A3

Meters
0 1,000 2,000

Surface Water Monitoring Locations & Results

BIANNUAL SAMPLING EVENT
RAAF BASE LEARMONTH
DEPARTMENT OF DEFENCE



Cardno

Map Produced by Cardno WA
Date: 2021-06-13 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0960-GS-004_SWResults_Nov20 01.mxd
Aerial Imagery Supplied by Google Earth

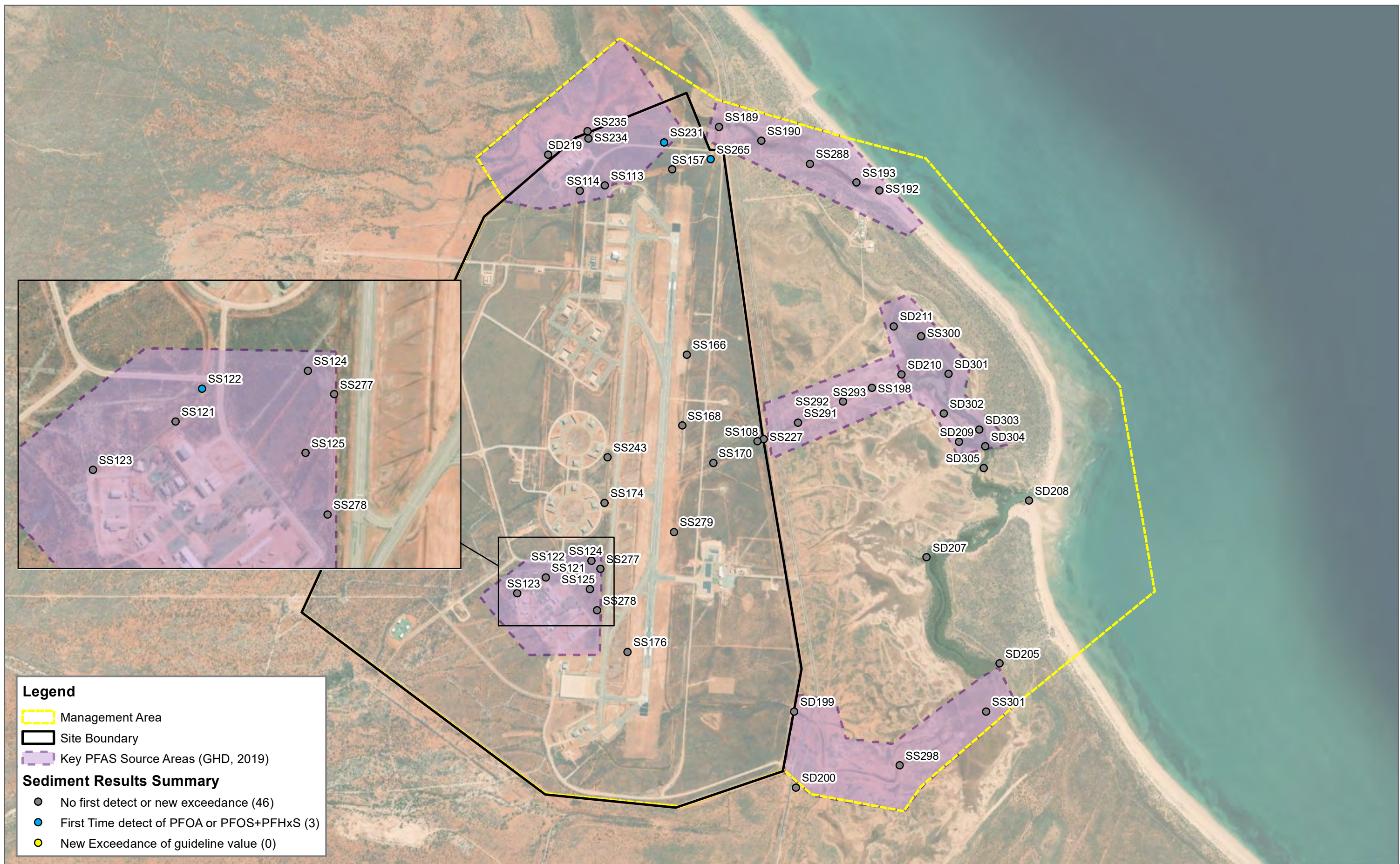
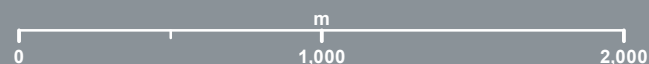


FIGURE 6
1:25,000 Scale at A3



Sediment monitoring locations & Results

BIANNUAL SAMPLING EVENT
RAAF BASE LEARMONTH
DEPARTMENT OF DEFENCE



Map Produced by Cardno WA
Date: 2021-06-13 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0960-GS-005_SDRResults_Nov20 01.mxd

APPENDIX

B

DATA ASSESSMENT TABLES



Table 1: Water Analytical Results

				Perfluoroalkane Sulfonic Acids						Perfluoroalkane Carboxylic Acids								(n:2) Fluorotelomer Sulfonic Acids				
				Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluorohexanoic acid (PFHxA)	Perfluorooctanoic acid (PFPeA)	Perfluorodecanoic acid (PFHpA)	Perfluorododecanoic acid (PFDoDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnDA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)		
EOL				0.02	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.05	0.02	0.02	0.05	0.05	0.05	0.05
Human Health - Recreational Water												10										
Ecological - 99% Species Protection Level								LOR ¹⁾				19										

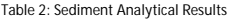
Field ID	Location Code	Date	0.15	0.17	1.32	0.05	0.78	<0.02	<0.1	0.42	0.10	0.06	0.07	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0960_MW018_201119	MW018	19/11/2020	0.15	0.17	1.32	0.05	0.78	<0.02	<0.1	0.42	0.10	0.06	0.07	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0960_MW063_201119	MW063	19/11/2020	0.07	0.20	3.92	0.55	2.61	<0.02	<0.1	0.28	0.05	0.06	0.72	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0960_MW102_201119	MW102	19/11/2020	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0960_MW103_201120	MW103	20/11/2020	0.17	0.06	0.37	<0.02	0.03	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0960_MW104_201119	MW104	19/11/2020	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0960_MW106_201119	MW106	19/11/2020	10.8	12.4	85.2	4.64	42.2	<0.02	2.3	35.1	6.00	1.62	2.20	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0960_MW112_201119	MW112	19/11/2020	0.02	0.03	0.42	<0.02	0.63	<0.02	<0.1	0.08	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0960_MW113_201119	MW113	19/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0960_MW114_201119	MW114	19/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0960_MW115_201119	MW115	19/11/2020	0.04	0.05	0.33	<0.02	0.06	<0.02	<0.1	0.09	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0960_MW122_201121	MW122	21/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0960_MW124_201119	MW124	19/11/2020	<0.02	<0.02	<0.02	<0.02	0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0960_MW127_201119	MW127	19/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0960_MW134_201120	MW134	20/11/2020	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0960_MW135_201121	MW135	21/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0960_MW137_201120	MW137	20/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0960_MW138_201120	MW138	20/11/2020	<0.02	<0.02	0.05	<0.02	0.22	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0960_MW139_201121	MW139	21/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0960_MW140_4.5_201120	MW140	20/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0960_MW141_3.5_201120	MW141	20/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0960_MW143_201120	MW143	20/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	0.06	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0960_MW144_201120	MW144	20/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0960_MW145_201120	MW145	20/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0960_MW146_5.0_201121	MW146	21/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0960_MW147_5.5_201120	MW147	20/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0960_MW148D_201119	MW148_D	19/11/2020	0.72	0.69	2.83	0.20	1.86	<0.02	0.2	1.12	0.22	0.11	0.15	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0960_MW148S_201119	MW148_S	19/11/2020	8.38	7.86	32.8	3.62	24.2	<0.02	1.5	13.2	2.36	1.00	1.44	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0960_MW151_201119	MW151	19/11/2020	2.59	5.18	40.9	3.98	41.9	<0.02	0.9	13.6	1.71	0.74	2.05	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0960_MW159_201120	MW159	20/11/2020	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0960_MW162_201119	MW162	19/11/2020	0.44	0.52	3.48	0.05	0.37	<0.02	0.1	1.07	0.19	0.09	0.08	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0960_MW163_201119	MW163	19/11/2020	0.33	0.53	4.20	0.29	2.44	<0.02	0.1	1.28	0.27	0.13	0.18	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	0.08	<0.05	<0.05
0960_MW164_201119	MW164	19/11/2020	0.19	0.22	1.69	0.08	2.01	<0.02	<0.1	0.45	0.09	0.05	0.07	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	0.37	<0.05	<0.05
0960_MW165_201119	MW165	19/11/2020	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0960_MW166_201119	MW166	19/11/2020	<0.02	<0.02	0.11	<0.02	0.18	<0.02	<0.1	0.07	0.06	0.04	0.03	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0960_MW167_201119	MW167	19/11/2020	0.04	0.06	1.31	0.08	1.22	<0.02	<0.1	0.31	0.16	0.12	0.18	<0.02	<0.02	0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0960_MW168_201119	MW168	19/11/2020	0.06	0.06	0.56	<0.02	0.06	<0.02	<0.1	0.23	0.06	<0.02	0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0960_MW170_201119	MW170	19/11/2020	0.05	0.06	0.39	<0.02	<0.01	<0.02	<0.1	0.04	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0960_MW172_201119	MW172	19/11/2020	1.27	3.40	22.8	0.86	5.46	<0.02	0.3	7.36	1.02	0.57	0.70	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05
0960_MW175_201120	MW175	20/11/2020	<0.02	<0.02	0.02	<0.02	0.04	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05</	



Table 1: Water Analytical Results

			Perfluoroalkyl Sulfonamides								PFAS			Inorganics																Organic
			Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	N-Ethyl perfluorooctane sulfonamide (EFOSA)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EFOSAA)	N-Ethyl perfluorooctane sulfonamidoethanol (EFOSE)	Sum of PFAS (WADER List)	Sum of PFHxS and PFOS	Sum of PFAS	Carbonate Alkalinity (as CaCO3)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3	Anions Total	Cations Total	Calcium (filtered)	Chloride	Ionic Balance	Magnesium (filtered)	pH (Lab)	Potassium (filtered)	Sodium (filtered)	Sulphate as SO4 - Turbidimetric (filtered)	TDS	TOC	Total Suspended Solids	Dissolved Organic Carbon
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	mg/L	mg/L	%	mg/L	pH Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
EQL			0.02	0.05	0.02	0.05	0.05	0.02	0.05	0.01	0.01	0.01	1	1	1	1	0.01	0.01	1	1	0.01	1	0.01	1	1	1	10	1	5	1
Human Health - Recreational Water											2																			
Ecological - 99% Species Protection Level																														

Field ID	Location Code	Date																													
0960_MW018_201119	MW018	19/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	2.90	2.10	3.12	<1	857	<1	857	36.6	35.1	12	475	2.09	16	8.24	27	748	294	2,260	-	1,150	3	
0960_MW063_201119	MW063	19/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	7.71	6.53	8.46	23	578	<1	600	17.2	16.9	4	158	1.08	4	8.44	13	368	38	1,080	-	282	2	
0960_MW102_201119	MW102	19/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.02	0.02	0.02	<1	160	<1	160	1,030	1,100	1,310	33,200	3.57	2,250	7.47	702	19,200	4,220	76,100	-	299	2	
0960_MW103_201120	MW103	20/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.57	0.40	0.63	<1	168	<1	168	802	840	1,270	26,500	2.28	1,960	7.44	585	13,800	2,480	46,300	-	3,370	3	
0960_MW104_201119	MW104	19/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.02	0.02	0.02	<1	180	<1	180	918	1,060	805	29,100	7.38	2,330	7.54	1,100	18,500	4,510	65,500	-	14,100	3	
0960_MW106_201119	MW106	19/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	185	127	202	<1	1,090	<1	1,090	86.0	93.3	40	1,840	4.10	79	8.03	120	1,880	591	5,280	-	14	4	
0960_MW112_201119	MW112	19/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	1.15	1.05	1.18	<1	658	<1	658	141	141	130	3,530	0.04	184	8.04	115	2,680	1,360	8,310	-	59	2	
0960_MW113_201119	MW113	19/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	378	<1	378	99.4	107	216	3,060	3.86	189	7.76	76	1,820	268	6,850	-	2,760	1	
0960_MW114_201119	MW114	19/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	464	<1	464	81.3	84.5	152	2,340	1.92	124	7.91	57	1,500	290	5,050	-	80	3	
0960_MW115_201119	MW115	19/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.52	0.39	0.57	<1	340	<1	340	399	427	637	12,800	3.37	886	7.77	345	7,200	1,490	27,400	-	67	<1	
0960_MW122_201121	MW122	21/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	376	<1	376	435	461	309	13,700	2.91	827	7.81	469	8,410	1,980	25,400	-	398	2	
0960_MW124_201119	MW124	19/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.01	0.01	0.01	<1	162	<1	162	966	1,180	1,020	30,600	10.2	2,650	7.55	1,150	20,400	4,810	67,500	-	401	<1	
0960_MW127_201119	MW127	19/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	145	<1	145	830	898	1,140	26,900	3.94	1,840	7.64	599	15,500	3,270	57,000	-	21	2	
0960_MW134_201120	MW134	20/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.02	0.02	0.02	<1	179	<1	179	619	668	563	19,600	3.83	1,360	7.66	574	11,800	2,990	35,800	-	2,640	2	
0960_MW135_201121	MW135	21/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	262	<1	262	391	390	412	12,400	0.15	881	7.78	371	6,610	1,740	21,200	11	15,100	-	
0960_MW137_201120	MW137	20/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	200	<1	200	956	1,050	728	30,300	4.86	2,310	7.50	1,070	18,400	4,690	59,700	-	3,320	1	
0960_MW138_201120	MW138	20/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.27	0.27	0.27	<1	156	<1	156	782	815	732	24,800	2.06	1,700	7.57	644	14,300	3,810	47,300	-	6,080	4	
0960_MW139_201121	MW139	21/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	197	<1	197	736	691	676	23,500	3.16	1,540	7.63	682	11,800	3,340	39,500	-	296	1	
0960_MW140_4.5_201120	MW140	20/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	210	<1	210	1,310	1,480	977	42,600	6.15	3,180	7.44	1,170	26,200	4,930	73,200	-	252	3	
0960_MW141_3.5_201120	MW141	20/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	306	<1	306	398	409	413	12,600	1.36	950	7.68	401	6,900	1,760	22,100	7	16,000	-	
0960_MW143_201120	MW143	20/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.06	<0.01	0.06	<1	134	<1	134	1,090	1,310	1,250	34,200	9.16	2,790	7.51	1,060	22,700	5,760	68,200	4	2,230	-	
0960_MW144_201120	MW144	20/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	181	<1	181	452	422	739	13,300	3.35	916	7.54	459	6,860	3,500	25,000	4	6,040	-	
0960_MW145_201120	MW145	20/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	118	<1	118	1,230	1,490	1,260	39,000	9.77	3,150	7.46	1,210	26,200	5,980	79,200	-	5,200	2	
0960_MW146_5.0_201121	MW146	21/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	128	<1	128	1,200	1,380	1,130	37,800	7.06	3,020	7.64	1,150	24,000	6,130	75,200	-	126	3	
0960_MW147_5.5_201120	MW147	20/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	<1	124	<1	124	1,350	1,460	1,120	43,500	3.75	3,170	7.46	1,180	25,500	5,830	73,800	-	4,080	4	
0960_MW148D_201119	MW148_D	19/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	7.21	4.69	8.10	<1	207	<1	207	900	1,070	979	28,900	8.56	2,080	7.61	880	19,000	3,890	68,000	-	81	6	
0960_MW148S_201119	MW148_S	19/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	84.9	57.0	96.4	<1	354	<1	354	518	580	600	16,600	5.60	1,140	7.57	480	10,200	2,060	36,000	-	3,040	2	
0960_MW151_201119	MW151	19/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	104	82.8	114	<1	671	<1	671	158	162	151	4,650	0.94	275	7.92	136	2,940	669	9,380	-	2,990	4	
0960_MW159_201120	MW159	20/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.02	0.02	0.02	<1	457	<1	457	314	298	397	9,920	2.58	551	7.62	265	5,200	1,200	17,100	-	7,490	5	
0960_MW162_201119	MW162	19/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	5.82	3.85	6.39	<1	511	<1	511	127	133	187	3,840	1.99	234	7.77	122	2,320	428	7,710	-	627	7	
0960_MW163_201119	MW163	19/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	9.01	6.64	9.83	<1	442	<1	442	121	127	183	3,550	2.47	213	7.89	108	2,250	585	7,350	-	104	8	
0960_MW164_201119	MW164	19/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	4.92	3.70	5.22	<1	766	<1	766	75.6	80.4	44	1,820	3.06	93	8.25	72	1,580	432	4,650	-	174	5	
0960_MW165_201119	MW165	19/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.02	0.02	0.02	123	668	<1	791	24.3	22.8	3	275	3.21	5	8.80	21	498	34	1,370	-	284	3	
0960_MW166_201119	MW166	19/11/2020	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.49	0.29	0.49	51	920	<1	970	31.8	28.1	4	344	6.19	7	8.49	27	612	130	1,900	-</			



Notes:

First Time detect of PFOA or PFHxS+PFOS
New exceedance of guideline value
LOR: Limit of Reporting

Table 2: Sediment Analytical Results

			Perfluoroalkyl Sulfonamides							PFAS			Inorganics															Organic
			Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamideacetic acid (MeFOSAA)	N-Methyl perfluorooctane sulfonamideethanol (MeFOSE)	N-Ethyl perfluorooctane sulfonamide (EFOSA)	N-Ethyl perfluorooctane sulfonamideacetic acid (EFOSAA)	N-Ethyl perfluorooctane sulfonamideethanol (EFOSE)	Sum of PFAS (WA DER List)_	Sum of PFHxS and PFOS	Sum of PFAS	Calcium/Magnesium Ratio	Exchangeable Aluminium	Exchangeable Sodium Percent	Magnesium/Potassium Ratio	Exchangeable Calcium Percentage	Exchangeable Magnesium Percentage	Exchangeable Potassium Percentage	Exchangeable Calcium meq/100g	Exchangeable Magnesium meq/100g	Exchangeable Potassium meq/100g	Exchangeable Sodium meq/100g	CEC meq/100g	Electrical conductivity *(lab) µS/cm	pH (Lab)	Organic Matter %	
LOR - Limit of Reporting			0.0002	0.0005	0.0002	0.0005	0.0005	0.0002	0.0005	0.0002	0.0002	0.0002	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1	0.1	0.5	
PFAS NEMP (HEPA, 2020) Ecological - Direct exposure (Interim guidelines)																												
PFAS NEMP (HEPA, 2020) Ecological - Indirect exposure (Interim guidelines)																												
PFAS NEMP (HEPA, 2020) Human Health- Commercial / Industrial (on-base activities)											20																	
Field ID	Location Code	Date																										
0960_SD199_201120	SD199	20/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0005	0.0005	0.0005	-	-	0.6	-	-	-	-	19.7	2.6	0.5	0.1	22.9	12,200	7.8	1.5	
0960_SD200_201120	SD200	20/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	-	-	0.2	-	-	-	-	12.3	1.1	0.2	<0.1	13.6	302	9.1	<0.5	
0960_SD205_201120	SD205	20/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	-	-	4.2	-	-	-	-	17.6	10.2	1.7	1.3	30.8	10,400	8.8	2.7	
0960_SD207_201120	SD207	20/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	-	-	1.2	-	-	-	-	16.8	2.7	0.1	0.2	19.8	993	9.5	1.5	
0960_SD208_201120	SD208	19/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	-	-	2.0	-	-	-	-	5.5	0.7	<0.1	0.1	6.3	2,920	9.4	1.3	
0960_SD209_201120	SD209	20/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	-	-	1.3	-	-	-	-	16.2	3.3	0.3	0.2	20.0	9,460	8.9	1.7	
0960_SD210_201120	SD210	20/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0010	0.0010	0.0010	-	-	2.5	-	-	-	-	9.0	5.8	0.9	0.4	16.0	9,440	8.7	2.2	
0960_SD211_201120	SD211	20/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0008	0.0008	0.0008	-	-	3.7	-	-	-	-	16.6	11.1	1.5	1.1	30.3	4,500	9.0	2.9	
0960_SD219_201120	SD219	20/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0004	0.0004	0.0004	-	-	2.5	-	-	-	-	19.4	2.4	0.7	0.6	23.0	96	9.2	<0.5	
0960_SD300_201120	SD300	20/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0015	0.0015	0.0015	-	-	2.8	-	-	-	-	22.5	11.8	0.9	1.0	36.2	7,600	8.6	3.2	
0960_SD301_201120	SD301	20/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0005	0.0005	0.0005	-	-	2.2	-	-	-	-	17.6	9.2	1.2	0.6	28.6	5,150	8.8	1.9	
0960_SD302_201120	SD302	20/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	-	-	1.9	-	-	-	-	17.6	7.7	0.6	0.5	26.4	10,700	8.7	2.6	
0960_SD303_201120	SD303	20/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	-	-	2.9	-	-	-	-	16.7	5.3	1.1	0.7	23.7	6,870	8.6	5.0	
0960_SD304_201120	SD304	20/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	-	-	1.5	-	-	-	-	18.1	3.7	0.2	0.3	22.4	4,190	8.9	1.6	
0960_SD305_201120	SD305	20/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	-	-	1.6	-	-	-	-	17.5	2.4	0.2	0.3	20.5	3,590	8.7	1.6	
0960_SS108_201119	SS108	19/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0006	0.0006	0.0006	-	-	1.1	-	-	-	-	14.1	2.2	1.0	0.2	17.5	107	8.7	<0.5	
0960_SS113_201119	SS113	19/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0039	0.0039	0.0039	-	-	0.2	-	-	-	-	20.7	2.9	0.7	<0.1	24.4	359	8.4	1.1	
0960_SS114_201119	SS114	19/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	-	-	0.3	-	-	-	-	17.3	1.6	0.3	<0.1	19.3	1,820	8.7	<0.5	
0960_SS121_0.00-0.10_201119	SS121	19/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0507	0.0507	0.0564	-	-	3.4	-	-	-	-	14.9	1.9	1.2	0.6	18.6	166	8.6	1.0	
0960_SS122_201119	SS122	19/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0091	0.0085	0.0091	-	-	0.7	-	-	-	-	21.3	2.4	0.6	0.2	24.5	1,460	8.9	<0.5	
0960_SS123_0.00-0.10_201119	SS123	19/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.127	0.127	0.131	-	-	1.4	-	-	-	-	10.6	0.8	0.3	0.2	12.0	125	8.8	<0.5	
0960_SS124_201119	SS124	19/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.190	0.188	0.212	-	-	1.2	-	-	-	-	16.0	3.0	1.9	0.3	21.2	208	8.1	<0.5	
0960_SS125_201119	SS125	19/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.141	0.141	0.143	-	-	1.6	-	-	-	-	13.6	2.2	1.6	0.3	17.6	146	8.4	0.8	
0960_SS157_201119	SS157	19/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0036	0.0036	0.0036	-	-	0.4	-	-	-	-	19.9	3.2	0.6	0.1	23.7	1,710	8.5	1.1	
0960_SS166_201119	SS166	19/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0019	0.0019	0.0019	-	-	0.3	-	-	-	-	17.9	2.0	0.6	<0.1	20.6	330	8.6	0.8	
0960_SS168_201119	SS168	19/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0008	0.0008	0.0008	-	-	1.3	-	-	-	-	9.9	1.0	0.4	0.1	11.5	79	8.9	<0.5	
0960_SS170_201119	SS170	19/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0052	0.0052	0.0056	-	-	0.4	-	-	-	-	27.8	4.7	1.3	0.1	34.0	417	8.3	1.0	
0960_SS174_201119	SS174	19/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.155	0.155	0.176	-	-	2.8	-	-	-	-	14.0	1.8	1.6	0.5	17.9	161	8.6	1.1	
0960_SS176_201119	SS176	19/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0075	0.0075	0.0077	-	-	0.4	-	-	-	-	22.7	2.2	1.0	0.1	26.0	426	8.2	1.3	
0960_SS189_201120	SS189	20/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0087	0.0081	0.0087	-	-	1.3	-	-	-	-	24.7	6.9	1.3	0.4	33.4	20,200	8.4	1.2	
0960_SS190_201120	SS190	20/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0293	0.0293	0.0303	-	-	2.4	-	-	-	-	41.8	19.6	2.5	1.6	65.4	66,500	8.8	4.7	
0960_SS192_201120	SS192	20/11/2020	<0.0002	<0.0005	<0.0002	<0.0005																						



Table 3: Rinsates and Blanks Analytical Results

			Perfluoroalkane Sulfonic Acids						Perfluoroalkane Carboxylic Acids											(n:2) Fluorotelom	
			Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluorohexanoic acid (PFHxA)	Perfluoropentanoic acid (PFPeA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorononanoic acid (PFNA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTriDA)	Perfluoroundecanoic acid (PFUnDA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR - Limit of Reporting			0.02	0.02	0.02	0.02	0.01	0.02	0.1	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.05	0.02	0.02	0.05	0.05
Field ID	Date	Sample Type																			
0960_QC401_201119	19/11/2020	Field_B	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05
0960_QC402_201119	19/11/2020	Field_B	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05
0960_QC403_201119	19/11/2020	Field_B	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05
0960_QC301_201119	19/11/2020	Rinsate	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05
0960_QC302_201119	19/11/2020	Rinsate	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05
0960_QC303_201119	19/11/2020	Rinsate	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05
0960_QC401_201120	20/11/2020	Field_B	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05
0960_QC402_201120	20/11/2020	Field_B	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05
0960_QC402_201120	20/11/2020	Field_B	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05
0960_QC301_201120	20/11/2020	Rinsate	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05
0960_QC302_201120	20/11/2020	Rinsate	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05
0960_QC303_201120	20/11/2020	Rinsate	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05
0960_QC401_201121	21/11/2020	Field_B	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05
0960_QC402_201121	21/11/2020	Field_B	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05
0960_QC403_201121	21/11/2020	Field_B	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05
0960_QC303_201121	21/11/2020	Rinsate	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05
0960_QC303_201121	21/11/2020	Rinsate	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05
0970_QC301_201121	21/11/2020	Rinsate	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05



Table 3: Rinsates and Blanks Analytical Results

			er Sulfonic Acids		Perfluoroalkyl Sulfonamides							PFAS		
			8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	Sum of PFAS (WA DER List)_	Sum of PFHxS and PFOS	Sum of PFAS
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR - Limit of Reporting			0.05	0.05	0.02	0.05	0.02	0.05	0.05	0.02	0.05	0.01	0.01	0.01

Field ID	Date	Sample Type													
0960_QC401_201119	19/11/2020	Field_B	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	
0960_QC402_201119	19/11/2020	Field_B	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	
0960_QC403_201119	19/11/2020	Field_B	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	
0960_QC301_201119	19/11/2020	Rinsate	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	
0960_QC302_201119	19/11/2020	Rinsate	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	
0960_QC303_201119	19/11/2020	Rinsate	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	
0960_QC401_201120	20/11/2020	Field_B	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	
0960_QC402_201120	20/11/2020	Field_B	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	
0960_QC402_201120	20/11/2020	Field_B	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	
0960_QC301_201120	20/11/2020	Rinsate	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	
0960_QC302_201120	20/11/2020	Rinsate	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	
0960_QC303_201120	20/11/2020	Rinsate	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	
0960_QC401_201121	21/11/2020	Field_B	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	
0960_QC402_201121	21/11/2020	Field_B	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	
0960_QC403_201121	21/11/2020	Field_B	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	
0960_QC303_201121	21/11/2020	Rinsate	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	
0960_QC303_201121	21/11/2020	Rinsate	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	
0970_QC301_201121	21/11/2020	Rinsate	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01	



Table 4: Relative Percentage Difference (water QC samples)

Lab Report Number			EP2012892		EP2012892		758878		EP2012917		EP2012917		EP2012917		758878	
Field ID			0960_MW063_201119		0960_OC103_201119		0960_MW063_201119		0960_OC203_201119		0960_MW168_201119		0960_OC104_201119		0960_MW168_201119	
Date			19/11/2020		19/11/2020		19/11/2020		19/11/2020		19/11/2020		19/11/2020		19/11/2020	
Matrix Type			Water		Water		Water		Water		Water		Water		Water	
RPD			RPD		RPD		RPD		RPD		RPD		RPD		RPD	
Unit																
LOR																
Perfluoroalkane Sulfonic Acids																
Perfluoropropanesulfonic acid (PFPrS)			-	-	-	-	<0.01	-	-	-	-	-	-	0.021	-	
Perfluorobutane sulfonic acid (PFBS)			0.07	0.08	13	0.07	<0.01	150	0.06	0.06	0	0.06	0.072	18		
Perfluoropentane sulfonic acid (PFPeS)			0.20	0.21	5	0.20	<0.01	181	0.06	0.08	29	0.06	0.078	26		
Perfluorohexane sulfonic acid (PFHxS)			3.92	3.90	1	3.92	0.04	196	0.56	0.59	5	0.56	0.61	9		
Perfluoroheptane sulfonic acid (PFHpS)			0.55	0.62	12	0.55	<0.01	193	<0.02	<0.02	0	<0.02	<0.01	0		
Perfluorooctane sulfonic acid (PFOS)			2.61	3.25	22	2.61	0.018	197	0.06	0.10	50	0.06	0.065	8		
Perfluorononanesulfonic acid (PFNS)			-	-	-	-	<0.01	-	-	-	-	-	<0.01	-		
Perfluorodecane sulfonic acid (PFDS)			<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0		
Perfluoroalkane Carboxylic Acids																
Perfluorobutanoic acid (PFBA)			<0.1	<0.1	0	<0.1	<0.05	0	<0.1	<0.1	0	<0.1	<0.02	0		
Perfluorohexanoic acid (PFHxA)			0.28	0.30	7	0.28	<0.01	186	0.23	0.24	4	0.23	0.23	0		
Perfluoropentanoic acid (PFPeA)			0.05	0.05	0	0.05	<0.01	133	0.06	0.06	0	0.06	0.047	24		
Perfluoroheptanoic acid (PFHpA)			0.06	0.06	0	0.06	<0.01	143	<0.02	0.02	0	<0.02	0.02	0		
Perfluorooctanoic acid (PFOA)			0.72	0.78	8	0.72	<0.01	195	0.01	0.01	0	0.01	0.016	46		
Perfluorodecanoic acid (PFDA)			<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0		
Perfluorododecanoic acid (PFDoDA)			<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0		
Perfluorononanoic acid (PFNA)			<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0		
Perfluorotetradecanoic acid (PFTeDA)			<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0		
Perfluorotridecanoic acid (PFTriDA)			<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0		
Perfluoroundecanoic acid (PFUnDA)			<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0		
(n-2) Fluorotelomer Sulfonic Acids																
4:2 Fluorotelomer sulfonic acid (4:2 FTS)			<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0		
6:2 Fluorotelomer sulfonic acid (6:2 FTS)			<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0		
8:2 Fluorotelomer sulfonic acid (8:2 FTS)			<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0		
10:2 Fluorotelomer sulfonic acid (10:2 FTS)			<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0		
Perfluoroalkyl Sulfonamides																
Perfluorooctane sulfonamide (FOSA)			<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0		
N-Methyl perfluorooctane sulfonamide (MeFOSA)			<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0		
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)			<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0		
N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)			<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0		
N-Ethyl perfluorooctane sulfonamide (EtFOSA)			<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0		
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)			<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0		
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)			<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0		
PFAS																
Sum of PFAS (WA DER List)			7.71	8.42	9	7.71	0.06	197	0.98	1.08	10	0.98	1.07	9		
Sum of PFHxS and PFOS			6.53	7.15	9	6.53	0.06	196	0.62	0.69	11	0.62	0.68	9		
Sum of PFAS			8.46	9.25	9	8.46	<0.1	195	1.04	1.16	11	1.04	1.17	12		
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)			-	-	-	-	0.06	-	-	-	-	-	0.7	-		
Inorganics																
Carbonate Alkalinity (as CaCO3)			23	23	0	23	40	54	<1	<1	0	<1	<10	0		
Alkalinity (Bicarbonate as CaCO3)			578	570	1	578	550	5	545	543	0	545	540	1		
Alkalinity (Hydroxide) as CaCO3			<1	<1	0	<1	<0	0	<1	<1	0	<1	<0	0		
Alkalinity (total) as CaCO3			600	593	1	600	590	2	545	543	0	545	540	1		
Anions Total			17.2	17.0	1	17.2	-	-	143	142	1	143	-	-		
Cations Total			16.9	17.0	1	16.9	-	-	134	136	1	134	-	-		
Calcium			-	-	-	-	15	-	-	-	-	-	210	-		
Calcium (filtered)			4	5	22	4	-	-	218	220	1	218	-	-		
Chloride			158	157	1	158	160	1	4,150	4,140	0	4,150	3,800	9		
Ionic Balance			1.08	<0.01	196	1.08	-	-	3.37	2.47	31	3.37	-	-		
Magnesium			-	-	0	-	6.2	-	-	-	-	-	200	-		
Magnesium (filtered)			4	4	0	4	-	-	231	234	1	231	-	-		
pH (Lab)			8.44	8.41	0	8.44	8.6	2	7.77	7.87	1	7.77	8.1	4		
Potassium			-	-	-	-	11	-	-	-	-	-	83	-		
Potassium (filtered)			13	13	0	13	-	-	107	109	2	107	-	-		
Sodium			-	-	-	-	390	-	-	-	-	-	2,400	-		
Sodium (filtered)			368	371	1	368	-	-	2,320	2,360	2	2,320	-	-		
Sulphate as SO4 - Turbidimetric (filtered)			38	37	3	38	-	-	716	716	0	716	-	-		
Sulphate			-	-	-	-	42	-	-	-	-	-	710	-		
TDS			1,080	1,150	6	1,080	1,300	18	8,030	8,130	1	8,030	6,700	18		
Total Suspended Solids			282	597	72	282	160	55	577	106	138	577	180	105		
Organic																
Dissolved Organic Carbon			2	<1	67	2	-	-	<1	<1	0	<1	-	-		
Dissolved Organic Carbon (filtered)			-	-	-	-	<5	-	-	-	-	-	<5	-		

LOR: Limit of Reporting
*RPDs have only been considered where a concentration is greater than 1 times the EQL.
**Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: No Limit (1 - 10 x EQL); 50 (10 - 20 x EQL); 20 (> 20 x EQL))
***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory



***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory



Table 4: Relative Percentage Difference (water QC samples)

Lab Report Number			EP2012892		EP2012892		RPD		EP2012892		758878		RPD		EP2012917		EP2012917		RPD		EP2012917		758878		RPD	
			Field ID 0960_MW164_201119		0960_OC108_201119				0960_MW164_201119		0960_OC208_201119				0960_MW127_201119		0960_OC109_201119				0960_MW127_201119		0960_OC209_201119			
			Date 19/11/2020		19/11/2020				19/11/2020		19/11/2020				19/11/2020		19/11/2020				19/11/2020		19/11/2020			
			Matrix Type Water		Water				Water		Water				Water		Water				Water		Water			
	Unit	LOR																								
Perfluorooctane Sulfonic Acids																										
Perfluoropropanesulfonic acid (PFPrS)	µg/L	0.01	-	-	-	-	0.063	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01	0.19	0.15	24	0.19	0.19	0	<0.02	<0.02	0	<0.02	<0.01	<0.01	0	<0.02	<0.01	<0.01	0	<0.02	<0.01	<0.01	0	0	0	
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01	0.22	0.20	10	0.22	0.29	27	<0.02	<0.02	0	<0.02	<0.01	<0.01	0	<0.02	<0.01	<0.01	0	<0.02	<0.01	<0.01	0	0	0	
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01	1.69	1.52	11	1.69	2	17	<0.02	<0.02	0	<0.02	<0.01	<0.01	0	<0.02	<0.01	<0.01	0	<0.02	<0.01	<0.01	0	0	0	
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01	0.08	0.06	29	0.08	0.098	20	<0.02	<0.02	0	<0.02	<0.01	<0.01	0	<0.02	<0.01	<0.01	0	<0.02	<0.01	<0.01	0	0	0	
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.01	2.01	1.78	12	2.01	2.5	22	<0.01	<0.01	0	<0.01	<0.01	<0.01	0	<0.01	<0.01	<0.01	0	<0.01	<0.01	<0.01	0	0	0	
Perfluorononanesulfonic acid (PFNS)	µg/L	0.01	-	-	-	-	<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	
Perfluorodecane sulfonic acid (PFDS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	<0.01	0	<0.02	<0.01	<0.01	0	<0.02	<0.01	<0.01	0	0	0	
Perfluorooctane Carboxylic Acids																										
Perfluorobutanoic acid (PFBA)	µg/L	0.05	<0.1	<0.1	0	<0.1	0.1	0	<0.1	<0.1	0	<0.1	<0.05	<0.05	0	<0.1	<0.05	<0.05	0	<0.1	<0.05	<0.05	0	0	0	
Perfluorohexanoic acid (PFHxA)	µg/L	0.01	0.45	0.49	9	0.45	0.56	22	<0.02	<0.02	0	<0.02	<0.01	<0.01	0	<0.02	<0.01	<0.01	0	<0.02	<0.01	<0.01	0	0	0	
Perfluoropentanoic acid (PFPeA)	µg/L	0.01	0.09	0.11	20	0.09	0.11	20	<0.02	<0.02	0	<0.02	<0.01	<0.01	0	<0.02	<0.01	<0.01	0	<0.02	<0.01	<0.01	0	0	0	
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01	0.05	0.04	22	0.05	0.051	2	<0.02	<0.02	0	<0.02	<0.01	<0.01	0	<0.02	<0.01	<0.01	0	<0.02	<0.01	<0.01	0	0	0	
Perfluorooctanoic acid (PFOA)	µg/L	0.01	0.07	0.06	15	0.07	0.075	7	<0.01	<0.01	0	<0.01	<0.01	<0.01	0	<0.01	<0.01	<0.01	0	<0.01	<0.01	<0.01	0	0	0	
Perfluorodecanoic acid (PFDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	<0.01	0	<0.02	<0.01	<0.01	0	<0.02	<0.01	<0.01	0	0	0	
Perfluorododecanoic acid (PFDoDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	<0.01	0	<0.02	<0.01	<0.01	0	<0.02	<0.01	<0.01	0	0	0	
Perfluorononanoic acid (PFNA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	<0.01	0	<0.02	<0.01	<0.01	0	<0.02	<0.01	<0.01	0	0	0	
Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	<0.01	0	<0.05	<0.01	<0.01	0	<0.05	<0.01	<0.01	0	0	0	
Perfluorotridecanoic acid (PFTrDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	<0.01	0	<0.02	<0.01	<0.01	0	<0.02	<0.01	<0.01	0	0	0	
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	<0.01	0	<0.02	<0.01	<0.01	0	<0.02	<0.01	<0.01	0	0	0	
(n-2) Fluorotelomer Sulfonic Acids																										
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	<0.01	0	<0.05	<0.01	<0.01	0	<0.05	<0.01	<0.01	0	0	0	
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	µg/L	0.05	0.37	0.37	0	0.37	0.45	20	<0.05	<0.05	0	<0.05	<0.05	<0.05	0	<0.05	<0.05	<0.05	0	<0.05	<0.05	<0.05	0	0	0	
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	<0.01	0	<0.05	<0.01	<0.01	0	<0.05	<0.01	<0.01	0	0	0	
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	<0.01	0	<0.05	<0.01	<0.01	0	<0.05	<0.01	<0.01	0	0	0	
Perfluoroalkyl Sulfonamides																										
Perfluorooctane sulfonamide (FOSA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	<0.05	0	<0.02	<0.05	<0.05	0	<0.02	<0.05	<0.05	0	0	0	
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	<0.05	0	<0.05	<0.05	<0.05	0	<0.05	<0.05	<0.05	0	0	0	
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	<0.05	0	<0.02	<0.05	<0.05	0	<0.02	<0.05	<0.05	0	0	0	
N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	<0.05	0	<0.05	<0.05	<0.05	0	<0.05	<0.05	<0.05	0	0	0	
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	<0.05	0	<0.05	<0.05	<0.05	0	<0.05	<0.05	<0.05	0	0	0	
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	<0.05	0	<0.02	<0.05	<0.05	0	<0.02	<0.05	<0.05	0	0	0	
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	<0.05	0	<0.05	<0.05	<0.05	0	<0.05	<0.05	<0.05	0	0	0	
PFAS																										
Sum of PFAS (WA DER List)	µg/L	0.01	4.92	4.52	8	4.92	6.04	20	<0.01	<0.01	0	<0.01	<0.05	<0.05	0	<0.01	<0.05	<0.05	0	<0.01	<0.05	<0.05	0	0	0	
Sum of PFHxS and PFOS	µg/L	0.01	3.70	3.30	11	3.70	4.5	20	<0.01	<0.01	0	<0.01	<0.01	<0.01	0	<0.01	<0.01	<0.01	0	<0.01	<0.01	<0.01	0	0	0	
Sum of PFAS	µg/L	0.01	5.22	4.78	9	5.22	6.49	22	<0.01	<0.01	0	<0.01	<0.01	<0.01	0	<0.01	<0.01	<0.01	0	<0.01	<0.01	<0.01	0	0	0	
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)	µg/L	0.01	-	-	-	-	4.58	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	
Inorganics																										
Carbonate Alkalinity (as CaCO3)	mg/L	1	<1	<1	0	<1	33	188	<1	<1	0	<1	<1	<10	<10	0	<1	<1	<10	<10	0	0	0	0	0	
Alkalinity (Bicarbonate as CaCO3)	mg/L	1	766	772	1	766	810	6	145	162	11	145	180	22	22	22	22	22	22	22	22	22	22	22	22	
Alkalinity (Hydroxide) as CaCO3	mg/L	1	<1	<1	0	<1	<20	0	<1	<1	0	<1	<20	0	0	<1	<20	<20	0	<1	<20	<20	0	0	0	
Alkalinity (total) as CaCO3	mg/L	1	766	772	1	766	850	10	145	162	11	145	180	22	22	22	22	22	22	22	22	22	22	22	22	
Anions Total	meq/L	0.01	75.6	76.3	1	75.6	-	-	830	801	4	830	-	-	-	-	-	-	-	-	-	-	-	-	-	
Cations Total	meq/L	0.01	80.4	80.5	0	80.4	-	-	898	899	0	898	-	-	-	-	-	-	-	-	-	-	-	-	-	
Calcium	mg/L	0.5	-	-	-	-	54	-	-	-	-	-	-	1,100	1,100	-	-	-	-	-	-	-	-	-	-	
Calcium (filtered)	mg/L	1	44	39	12	44	-	-	1,140	1,140	0	1,140	-	-	-	-	-	-	-	-	-	-	-	-	-	
Chloride	mg/L	1	1,820	1,840	1	1,820	2,000	9	26,900	26,100	3	26,900	49,000	58	58	58	58	58	58	58	58	58	58	58	58	
Ionic Balance	%	0.01	3.06	2.64	15	3.06	-	-	3.94	5.77	38	3.94	-	-	-	-	-	-	-	-	-	-	-	-	-	
Magnesium	mg/L	0.5	-	-	-	-	86	-	-	-	-	-	-	1,700	1,700	-	-	-	-	-	-	-	-	-	-	
Magnesium (filtered)	mg/L	1	93	91	2	93	-	-	1,840	1,850	1	1,840	-	-	-	-	-	-	-	-	-	-	-	-	-	
pH (Lab)	pH Units	0.01	8.25	8.27	0	8.25	8.5	3	7.64	7.63	0	7.64	7.9	3	3	3	3	3	3	3	3	3	3	3	3	
Potassium	mg/L	0.5	-	-	-	-	52	-	-	-	-	-	440	-	-	-	-	-	-	-	-	-	-	-	-	
Potassium (filtered)	mg/L	1	72	74	3	72	-	-	599	604	1	599	-	-	-	-	-	-	-	-	-	-	-	-	-	
Sodium	mg/L	0.5	-	-	-	-	1,600	-	-	-	-	-	16,000	-	-	-	-	-	-	-	-	-	-	-	-	
Sodium (filtered)	mg/L	1	1,580	1,590	1	1,580	-	-	15,500	15,500	0	15,500	-	-	-	-	-	-	-	-	-	-	-	-	-	
Sulphate as SO4 - Turbidimetric (filtered)	mg/L	1	432	433	0	432	-	-	3,270	2,940	11	3,270	-	-	-	-	-	-	-	-	-	-	-	-	-	
Sulphate	mg/L	5	-	-	-	-	430	-	-	-	-	-	2,700	-	-	-	-	-	-	-	-	-	-	-	-	
TDS	mg/L																									

LOR: Limit of Reporting
*RPDs have only been considered where a concentration is greater than 1 times the EQL.
**Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: No Limit (1 - 10 x EQL); 50 (10 - 20 x EQL); 20 (> 20 x EQL))
***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory



Table 4: Relative Percentage Difference (water QC samples)

Lab Report Number			EP2012897		RPD	EP2012897		RPD	EP2012942		RPD	EP2012942		RPD	759891		RPD
Field ID			0960_SW208_201119	0960_OC110_201119		0960_SW208_201119	0960_OC210_201119		0960_SW207_201120	0960_OC111_201120		0960_SW207_201120	0960_OC211_201121		0960_SW207_201120	0960_OC211_201121	
Date			19/11/2020	19/11/2020		19/11/2020	19/11/2020		20/11/2020	20/11/2020		20/11/2020	21/11/2020		20/11/2020	21/11/2020	
Matrix Type			Water	Water		Water	Water		Water	Water		Water	Water		Water	Water	
	Unit	LOR															
Perfluoroalkane Sulfonic Acids																	
Perfluoropropanesulfonic acid (PFPrS)	µg/L	0.01	-	-	-	-	<0.01	-	-	-	-	-	<0.01	-			
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0			
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0			
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0			
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0			
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0			
Perfluorononanesulfonic acid (PFNS)	µg/L	0.01	-	-	-	-	<0.01	-	-	-	-	-	<0.01	-			
Perfluorodecane sulfonic acid (PFDS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0			
Perfluoroalkane Carboxylic Acids																	
Perfluorobutanoic acid (PFBA)	µg/L	0.05	<0.1	<0.1	0	<0.1	<0.05	0	<0.1	<0.1	0	<0.1	0.06	0			
Perfluorohexanoic acid (PFHxA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0			
Perfluoropentanoic acid (PFPeA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0			
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0			
Perfluorooctanoic acid (PFOA)	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0			
Perfluorodecanoic acid (PFDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0			
Perfluorododecanoic acid (PFDoDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0			
Perfluorononanoic acid (PFNA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0			
Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0			
Perfluorotridecanoic acid (PFTrDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0			
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0			
(n-2) Fluorotelomer Sulfonic Acids																	
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0			
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0			
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0			
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0			
Perfluoroalkyl Sulfonamides																	
Perfluorooctane sulfonamide (FOSA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0			
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0			
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0			
N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0			
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0			
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0			
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0			
PFAS																	
Sum of PFAS (WA DER List)_	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.05	0	<0.01	<0.01	0	<0.01	0.06	143			
Sum of PFHxS and PFOS	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0			
Sum of PFAS	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.1	0	<0.01	<0.01	0	<0.01	<0.1	0			
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)	µg/L	0.01	-	-	-	-	<0.01	-	-	-	-	-	<0.01	-			
Inorganics																	
Carbonate Alkalinity (as CaCO3)	mg/L	1	<1	<1	0	<1	<10	0	<1	<1	0	<1	<10	0			
Alkalinity (Bicarbonate as CaCO3)	mg/L	1	116	114	2	116	110	5	122	120	2	122	110	10			
Alkalinity (Hydroxide) as CaCO3	mg/L	1	<1	<1	0	<1	<20	0	<1	<1	0	<1	<20	0			
Alkalinity (total) as CaCO3	mg/L	1	116	114	2	116	110	5	122	120	2	122	110	10			
Anions Total	meq/L	0.01	600	605	1	600	-	-	610	615	1	610	-	-			
Cations Total	meq/L	0.01	661	671	2	661	-	-	704	680	3	704	-	-			
Calcium	mg/L	0.5	-	-	-	-	520	-	-	-	-	-	570	-			
Calcium (filtered)	mg/L	1	466	472	1	466	-	-	499	477	5	499	-	-			
Chloride	mg/L	1	19,100	19,300	1	19,100	44,000	79	19,400	19,700	2	19,400	22,000	13			
Ionic Balance	%	0.01	4.85	5.19	7	4.85	-	-	7.15	4.97	36	7.15	-	-			
Magnesium	mg/L	0.5	-	-	-	-	1,500	-	-	-	-	-	1,800	-			
Magnesium (filtered)	mg/L	1	1,530	1,540	1	1,530	-	-	1,620	1,560	4	1,620	-	-			
pH (Lab)	pH Units	0.01	8.06	8.06	0	8.06	8.1	0	8.07	8.01	1	8.07	8.1	0			
Potassium	mg/L	0.5	-	-	-	-	490	-	-	-	-	-	530	-			
Potassium (filtered)	mg/L	1	630	640	2	630	-	-	572	550	4	572	-	-			
Sodium	mg/L	0.5	-	-	-	-	11,000	-	-	-	-	-	10,000	-			
Sodium (filtered)	mg/L	1	11,400	11,600	2	11,400	-	-	12,200	11,800	3	12,200	-	-			
Sulphate as SO4 - Turbidimetric (filtered)	mg/L	1	2,830	2,800	1	2,830	-	-	2,880	2,740	5	2,880	-	-			
Sulphate	mg/L	5	-	-	-	-	2,900	-	-	-	-	-	2,500	-			
TDS	mg/L	10	41,400	42,200	2	41,400	40,000	3	39,300	36,400	8	39,300	23,000	52			
Total Suspended Solids	mg/L	1	<5	<5	0	<5	24	131	<5	7	33	<5	14	95			
Organic																	
Dissolved Organic Carbon	mg/L	1	1	1	0	1	-	-	1	1	0	1	-	-			
Dissolved Organic Carbon (filtered)	mg/L	5	-	-	-	-	<5	-	-	-	-	-	<5	-			

LOR: Limit of Reporting
*RPDs have only been considered where a concentration is greater than 1 times the EQL.
**Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: No Limit (1 - 10 x EQL); 50 (10 - 20 x EQL); 20 (> 20 x EQL))
***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory



Table 5: Realtive Percentage Difference (soil QC samples)

Lab Report Number				EP2012893			EP2012893			EP2012893			758878						EP2012893			EP2012893								
Field ID				0960_SS123_0.00-0.10			0960_QC101_201119			0960_SS123_0.00-0.10			0960_QC201_201119						0960_SS122_201119			0960_QC102_201119								
Date				19/11/2020			19/11/2020			19/11/2020			19/11/2020						19/11/2020			19/11/2020								
Matrix Type				Soil			Soil			RPD			Soil			Soil			RPD			Soil			Soil			RPD		
		Unit	LOR																											
Perfluoroalkane Sulfonic Acids																														
Perfluoropropanesulfonic acid (PFPrS)				mg/kg	0.005	-	-	-	-	-	<0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-				
Perfluorobutane sulfonic acid (PFBS)				mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002	<0.0002					
Perfluoropentane sulfonic acid (PFPeS)				mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002	<0.0002	0	<0.0002	<0.0002					
Perfluorohexane sulfonic acid (PFHxS)				mg/kg	0.0002	0.0003	0.0003	0	0.0003	<0.005	0	0.0029	0.0011	90																
Perfluoroheptane sulfonic acid (PFHpS)				mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	0.0002	0																
Perfluorooctane sulfonic acid (PFOS)				mg/kg	0.0002	0.127	0.116	9	0.127	0.19	40	0.0056	0.0084	40																
Perfluorononanesulfonic acid (PFNS)				mg/kg	0.005	-	-	-	-	<0.005	-	-	-	-	-															
Perfluorodecane sulfonic acid (PFDS)				mg/kg	0.0002	0.0032	0.0046	36	0.0032	<0.005	0	<0.0002	<0.0002	0																
Perfluoroalkane Carboxylic Acids																														
Perfluorobutanoic acid (PFBA)				mg/kg	0.001	<0.001	<0.001	0	<0.001	<0.005	0	<0.001	<0.001	0																
Perfluorohexanoic acid (PFHxA)				mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	0.0002	<0.0002	0																
Perfluoropentanoic acid (PFPeA)				mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0																
Perfluoroheptanoic acid (PFHpA)				mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0																
Perfluorooctanoic acid (PFOA)				mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	0.0004	0.0002	67																
Perfluorodecanoic acid (PFDA)				mg/kg	0.0002	0.0003	0.0004	29	0.0003	<0.005	0	<0.0002	<0.0002	0																
Perfluorododecanoic acid (PFDoDA)				mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0																
Perfluorononanoic acid (PFNA)				mg/kg	0.0002	0.0002	<0.0002	0	0.0002	<0.005	0	<0.0002	<0.0002	0																
Perfluorotetradecanoic acid (PFTeDA)				mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0																
Perfluorotridecanoic acid (PFTrDA)				mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0																
Perfluoroundecanoic acid (PFUnDA)				mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0																
(n-2) Fluorotelomer Sulfonic Acids																														
4:2 Fluorotelomer sulfonic acid (4:2 FTS)				mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0																
6:2 Fluorotelomer sulfonic acid (6:2 FTS)				mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.01	0	<0.0005	<0.0005	0																
8:2 Fluorotelomer sulfonic acid (8:2 FTS)				mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0																
10:2 Fluorotelomer sulfonic acid (10:2 FTS)				mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0																
Perfluoroalkyl Sulfonamides																														
Perfluorooctane sulfonamide (FOSA)				mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0																
N-Methyl perfluorooctane sulfonamide (MeFOSA)				mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0																
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)				mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.01	0	<0.0002	<0.0002	0																
N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)				mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0																
N-Ethyl perfluorooctane sulfonamide (EtFOSA)				mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0																
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)				mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.01	0	<0.0002	<0.0002	0																
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)				mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0																
PFAS																														
Sum of PFAS (WA DER List)_				mg/kg	0.0002	0.127	0.116	9	0.127	0.19	40	0.0091	0.0097	6																
Sum of PFHxS and PFOS				mg/kg	0.0002	0.127	0.116	9	0.127	0.19	40	0.0085	0.0095	11																
Sum of PFAS				mg/kg	0.0002	0.131	0.121	8	0.131	0.19	37	0.0091	0.0099	8																
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)				mg/kg	0.005	-	-	-	-	0.19	-	-	-	-																
Inorganics																														
Conductivity (1:5 aqueous extract)				µS/cm	10	-	-	-	-	77	-	-	-	-																
Exchangeable Sodium Percent				%	0.1	1.4	2.2	44	1.4	-	-	0.7	1.0	35																
pH (1:5 Aqueous extract at 25A°C as rec.)				pH Units	0.1	-	-	-	-	8.5	-	-	-	-																
Exchangeable Calcium				meq/100g	0.1	10.6	10.8	2	10.6	-	-	21.3	21.2	0																
Exchangeable Magnesium				meq/100g	0.1	0.8	0.8	0	0.8	-	-	2.4	2.6	8																
Exchangeable Potassium				meq/100g	0.1	0.3	0.3	0	0.3	-	-	0.6	0.6	0																
Exchangeable Sodium				meq/100g	0.1	0.2	0.3	40	0.2	-	-	0.2	0.2	0																
CEC				meq/100g	0.05	12.0	12.2	2	12.0	24	67	24.5	24.7	1																
Electrical conductivity *(lab)				µS/cm	1	125	127	2	125	-	-	1,460	1,060	32																
pH (Lab)				pH Units	0.1	8.8	8.8	0	8.8	-	-	8.9	9.0	1																
TOC				mg/kg	1,000	-	-	-	-	<1,000	-	-	-	-																
Organic																														
Organic Matter				%	0.5	<0.5	<0.5	0	<0.5	-	-	<0.5	0.7	33																

LOR: Limit of Reporting

*RPDs have only been considered where a concentration is greater than 1 times the EQL

**Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: No Limit (1 - 10 x EQL); 50 (10 - 20 x EQL); 20 (> 20 x EQL))

***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory

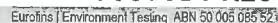


***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory

APPENDIX

C

LABORATORY CERTIFICATES



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Mayfield East NSW 2304
PO Box 60 Wickham 2293
Phone : +61 2 4968 8448

New Zealand

Auckland

35 O'Rorke Road
Penrose, Auckland 1061
Phone : +64 9 526 45 51
IANZ # 1327

Christchurch

43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

Sample Receipt Advice

Company name: Cardno (WA)
Contact name: David James
Project name: LEARMONTH
Project ID: WA_0960_PFASOMP
Turnaround time: 5 Day
Date/Time received: Nov 23, 2020 7:47 PM
Eurofins reference: 758878

Sample Information

- ✓ A detailed list of analytes logged into our LIMS, is included in the attached summary table.
- ✓ All samples have been received as described on the above COC.
- ✓ COC has been completed correctly.
- ✓ Attempt to chill was evident.
- ✓ Appropriately preserved sample containers have been used.
- ✓ All samples were received in good condition.
- ✓ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
- ✓ Appropriate sample containers have been used.
- ✓ Sample containers for volatile analysis received with zero headspace.
- ✗ Split sample sent to requested external lab.
- ✗ Some samples have been subcontracted.
- N/A Custody Seals intact (if used).

Notes

Samples received by the laboratory after 5.30pm are deemed to have been received the following working day.

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Robert Johnston on phone : or by email: EnviroWA@eurofins.com

Results will be delivered electronically via email to David James - David.James@cardno.com.au.

Note: A copy of these results will also be delivered to the general Cardno (WA) email address.

Australia

Melbourne
6 Monterey Road
Dandenong South VIC 3175
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NATA # 1261
Site # 1254 & 14271

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Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

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ABN: 50 005 085 521 web: www.eurofins.com.au email: EnviroSales@eurofins.com

Company Name: Cardno (WA)
Address: 11 Harvest Terrace
West Perth
WA 6005

Project Name: LEARMONTH
Project ID: WA_0960_PFASOMP

Order No.: DEF19009/330
Report #: 758878
Phone: 08 9273 3888
Fax: 08 9388 3831

Received: Nov 23, 2020 7:47 PM
Due: Dec 1, 2020
Priority: 5 Day
Contact Name: David James

Eurofins Analytical Services Manager : Robert Johnston

Sample Detail						Dissolved Organic Carbon	pH (1:5 Aqueous extract at 25°C as rec.)	pH (at 25 °C)	Total Organic Carbon	Total Suspended Solids Dried at 103–105°C	Moisture Set	Cation Exchange Capacity	Eurofins Suite B11E: Cl/SO4/Alkalinity	Per- and Polyfluoroalkyl Substances (PFASs)	Eurofins Suite B11C: Na/K/Ca/Mg	Total Dissolved Solids Dried at 180°C ± 2°C
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	X	X	X	X		X	X
Sydney Laboratory - NATA Site # 18217																
Brisbane Laboratory - NATA Site # 20794														X		
Perth Laboratory - NATA Site # 23736																
Mayfield Laboratory																
External Laboratory																
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID											
1	0960_QC201_201119	Nov 19, 2020		Soil	P20-No41678		X		X		X	X		X		
2	0960_QC202_201119	Nov 19, 2020		Soil	P20-No41679		X		X		X	X		X		
3	0960_QC203_201119	Nov 19, 2020		Water	P20-No41680	X		X		X			X	X	X	X
4	0960_QC204_201119	Nov 19, 2020		Water	P20-No41681	X		X		X			X	X	X	X
5	0960_QC205_201119	Nov 19, 2020		Water	P20-No41682	X		X		X			X	X	X	X
6	0960_QC206_	Nov 19, 2020		Water	P20-No41683	X		X		X			X	X	X	X

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Priority: 5 Day
Contact Name: David James

Eurofins Analytical Services Manager : Robert Johnston

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Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	X	X	X	X		X	X
Sydney Laboratory - NATA Site # 18217																
Brisbane Laboratory - NATA Site # 20794														X		
Perth Laboratory - NATA Site # 23736																
Mayfield Laboratory																
External Laboratory																
	201119															
7	0960_QC207_201119	Nov 19, 2020		Soil	P20-No41684		X		X		X	X		X		
8	0960_QC208_201119	Nov 19, 2020		Water	P20-No41685	X		X		X			X	X	X	X
9	0960_QC209_201119	Nov 19, 2020		Water	P20-No41686	X		X		X			X	X	X	X
10	0960_QC210_201119	Nov 19, 2020		Water	P20-No41687	X		X		X			X	X	X	X
Test Counts						7	3	7	3	7	3	3	7	10	7	7

Cardno Consulting WA
11 Harvest Terrace
West Perth
WA 6005



NATA Accredited
Accreditation Number 1261
Site Number 23736

Accredited for compliance with ISO/IEC 17025 – Testing
The results of the tests, calibrations and/or
measurements included in this document are traceable
to Australian/national standards.

Attention: David James

Report 758878-S
Project name LEARMONTH
Project ID WA_0960_PFASOMP
Received Date Nov 23, 2020

Client Sample ID			0960_QC201_2 01119	0960_QC202_2 01119	0960_QC207_2 01119
Sample Matrix			Soil	Soil	Soil
Eurofins Sample No.			P20-No41678	P20-No41679	P20-No41684
Date Sampled			Nov 19, 2020	Nov 19, 2020	Nov 19, 2020
Test/Reference	LOR	Unit			
Conductivity (1:5 aqueous extract at 25°C as rec.)	10	uS/cm	77	2200	80
pH (1:5 Aqueous extract at 25°C as rec.)	0.1	pH Units	8.5	8.6	8.5
Total Organic Carbon	0.1	%	< 0.1	0.2	< 0.1
% Moisture	1	%	2.3	1.4	23
Cation Exchange Capacity					
Cation Exchange Capacity	0.05	meq/100g	24	28	30
Perfluoroalkyl carboxylic acids (PFCAs)					
Perfluorobutanoic acid (PFBA) ^{N11}	5	ug/kg	< 5	< 5	< 5
Perfluoropentanoic acid (PFPeA) ^{N11}	5	ug/kg	< 5	< 5	< 5
Perfluorohexanoic acid (PFHxA) ^{N11}	5	ug/kg	< 5	< 5	< 5
Perfluoroheptanoic acid (PFHpA) ^{N11}	5	ug/kg	< 5	< 5	< 5
Perfluorooctanoic acid (PFOA) ^{N11}	5	ug/kg	< 5	< 5	< 5
Perfluorononanoic acid (PFNA) ^{N11}	5	ug/kg	< 5	< 5	< 5
Perfluorodecanoic acid (PFDA) ^{N11}	5	ug/kg	< 5	< 5	< 5
Perfluoroundecanoic acid (PFUnDA) ^{N11}	5	ug/kg	< 5	< 5	< 5
Perfluorododecanoic acid (PFDoDA) ^{N11}	5	ug/kg	< 5	< 5	< 5
Perfluorotridecanoic acid (PFTeDA) ^{N15}	5	ug/kg	< 5	< 5	< 5
Perfluorotetradecanoic acid (PFTeDA) ^{N11}	5	ug/kg	< 5	< 5	< 5
13C4-PFBA (surr.)	1	%	135	109	122
13C5-PFPeA (surr.)	1	%	108	75	94
13C5-PFHxA (surr.)	1	%	112	85	103
13C4-PFHpA (surr.)	1	%	120	81	105
13C8-PFOA (surr.)	1	%	100	84	90
13C5-PFNA (surr.)	1	%	112	104	103
13C6-PFDA (surr.)	1	%	110	102	98
13C2-PFUnDA (surr.)	1	%	98	96	95
13C2-PFDoDA (surr.)	1	%	109	112	104
13C2-PFTeDA (surr.)	1	%	162	146	139
Perfluoroalkyl sulfonamido substances					
Perfluorooctane sulfonamide (FOSA) ^{N11}	5	ug/kg	< 5	< 5	< 5
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA) ^{N11}	5	ug/kg	< 5	< 5	< 5
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA) ^{N11}	5	ug/kg	< 5	< 5	< 5
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE) ^{N11}	5	ug/kg	< 5	< 5	< 5

Client Sample ID			0960_QC201_2 01119	0960_QC202_2 01119	0960_QC207_2 01119
Sample Matrix			Soil	Soil	Soil
Eurofins Sample No.			P20-No41678	P20-No41679	P20-No41684
Date Sampled			Nov 19, 2020	Nov 19, 2020	Nov 19, 2020
Test/Reference	LOR	Unit			
Perfluoroalkyl sulfonamido substances					
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE) ^{N11}	5	ug/kg	< 5	< 5	< 5
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA) ^{N11}	10	ug/kg	< 10	< 10	< 10
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA) ^{N11}	10	ug/kg	< 10	< 10	< 10
13C8-FOSA (surr.)	1	%	97	99	91
D3-N-MeFOSA (surr.)	1	%	102	122	117
D5-N-EtFOSA (surr.)	1	%	129	144	149
D7-N-MeFOSE (surr.)	1	%	110	111	107
D9-N-EtFOSE (surr.)	1	%	120	125	135
D5-N-EtFOSAA (surr.)	1	%	137	133	120
D3-N-MeFOSAA (surr.)	1	%	113	112	100
Perfluoroalkyl sulfonic acids (PFASs)					
Perfluorobutanesulfonic acid (PFBS) ^{N11}	5	ug/kg	< 5	< 5	< 5
Perfluorononanesulfonic acid (PFNS) ^{N15}	5	ug/kg	< 5	< 5	< 5
Perfluoropropanesulfonic acid (PFPrS) ^{N15}	5	ug/kg	< 5	< 5	< 5
Perfluoropentanesulfonic acid (PFPeS) ^{N15}	5	ug/kg	< 5	< 5	< 5
Perfluorohexanesulfonic acid (PFHxS) ^{N11}	5	ug/kg	< 5	< 5	< 5
Perfluoroheptanesulfonic acid (PFHpS) ^{N15}	5	ug/kg	< 5	< 5	< 5
Perfluorooctanesulfonic acid (PFOS) ^{N11}	5	ug/kg	^{N09} 190	^{N09} 9.2	^{N09} 12
Perfluorodecanesulfonic acid (PFDS) ^{N15}	5	ug/kg	< 5	< 5	< 5
13C3-PFBS (surr.)	1	%	141	138	131
18O2-PFHxS (surr.)	1	%	142	133	122
13C8-PFOS (surr.)	1	%	105	132	125
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA) ^{N11}	5	ug/kg	< 5	< 5	< 5
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA) ^{N11}	10	ug/kg	< 10	< 10	< 10
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA) ^{N11}	5	ug/kg	< 5	< 5	< 5
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA) ^{N11}	5	ug/kg	< 5	< 5	< 5
13C2-4:2 FTSA (surr.)	1	%	140	36	98
13C2-6:2 FTSA (surr.)	1	%	171	64	158
13C2-8:2 FTSA (surr.)	1	%	158	102	133
13C2-10:2 FTSA (surr.)	1	%	180	161	147
PFASs Summations					
Sum (PFHxS + PFOS)*	5	ug/kg	190	9.2	12
Sum of US EPA PFAS (PFOS + PFOA)*	5	ug/kg	190	9.2	12
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	5	ug/kg	190	9.2	12
Sum of WA DWER PFAS (n=10)*	10	ug/kg	190	< 10	12
Sum of PFASs (n=30)*	50	ug/kg	190	< 50	< 50

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Conductivity (1:5 aqueous extract at 25°C as rec.) - Method: LTM-INO-4030 Conductivity	Melbourne	Nov 26, 2020	7 Days
Cation Exchange Capacity - Method: LTM-MET-3060 Cation Exchange Capacity by bases & Exchangeable Sodium Percentage	Melbourne	Nov 27, 2020	180 Days
pH (1:5 Aqueous extract at 25°C as rec.) - Method: LTM-GEN-7090 pH in soil by ISE	Melbourne	Nov 26, 2020	7 Days
Total Organic Carbon - Method: LTM-INO-4060 Total Organic Carbon in water and soil	Melbourne	Nov 27, 2020	28 Days
% Moisture - Method: LTM-GEN-7080 Moisture	Melbourne	Nov 24, 2020	14 Days
Per- and Polyfluoroalkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs) - Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)	Brisbane	Nov 27, 2020	180 Days
Perfluoroalkyl sulfonamido substances - Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)	Brisbane	Nov 27, 2020	14 Days
Perfluoroalkyl sulfonic acids (PFSAAs) - Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)	Brisbane	Nov 27, 2020	180 Days
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs) - Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)	Brisbane	Nov 27, 2020	180 Days

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Sample Detail						Dissolved Organic Carbon	pH (1:5 Aqueous extract at 25°C as rec.)	pH (at 25 °C)	Total Organic Carbon	Total Suspended Solids Dried at 103–105°C	Moisture Set	Cation Exchange Capacity	Eurofins Suite B11E: Cl/SO ₄ /Alkalinity	Per- and Polyfluoroalkyl Substances (PFASs)	Eurofins Suite B11C: Na/K/Ca/Mg	Total Dissolved Solids Dried at 180°C ± 2°C
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	X	X	X	X		X	X
Sydney Laboratory - NATA Site # 18217																
Brisbane Laboratory - NATA Site # 20794														X		
Perth Laboratory - NATA Site # 23736																
Mayfield Laboratory																
External Laboratory																
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID											
1	0960_QC201_201119	Nov 19, 2020		Soil	P20-No41678		X		X		X	X		X		
2	0960_QC202_201119	Nov 19, 2020		Soil	P20-No41679		X		X		X	X		X		
3	0960_QC203_201119	Nov 19, 2020		Water	P20-No41680	X		X		X			X	X	X	X
4	0960_QC204_201119	Nov 19, 2020		Water	P20-No41681	X		X		X			X	X	X	X
5	0960_QC205_201119	Nov 19, 2020		Water	P20-No41682	X		X		X			X	X	X	X
6	0960_QC206_	Nov 19, 2020		Water	P20-No41683	X		X		X			X	X	X	X

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Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	X	X	X	X		X	X
Sydney Laboratory - NATA Site # 18217																
Brisbane Laboratory - NATA Site # 20794														X		
Perth Laboratory - NATA Site # 23736																
Mayfield Laboratory																
External Laboratory																
	201119															
7	0960_QC207_201119	Nov 19, 2020		Soil	P20-No41684		X		X		X	X		X		
8	0960_QC208_201119	Nov 19, 2020		Water	P20-No41685	X		X		X			X	X	X	X
9	0960_QC209_201119	Nov 19, 2020		Water	P20-No41686	X		X		X			X	X	X	X
10	0960_QC210_201119	Nov 19, 2020		Water	P20-No41687	X		X		X			X	X	X	X
Test Counts						7	3	7	3	7	3	3	7	10	7	7

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram	mg/L: milligrams per litre	ug/L: micrograms per litre
ppm: Parts per million	ppb: Parts per billion	%: Percentage
org/100mL: Organisms per 100 millilitres	NTU: Nephelometric Turbidity Units	MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NC	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 20-130% Phenols & 50-150% PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " - " in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Conductivity (1:5 aqueous extract at 25°C as rec.)	uS/cm	< 10			10	Pass	
Total Organic Carbon	%	< 0.1			0.1	Pass	
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	ug/kg	< 5			5	Pass	
Perfluoropentanoic acid (PFPeA)	ug/kg	< 5			5	Pass	
Perfluorohexanoic acid (PFHxA)	ug/kg	< 5			5	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/kg	< 5			5	Pass	
Perfluorooctanoic acid (PFOA)	ug/kg	< 5			5	Pass	
Perfluorononanoic acid (PFNA)	ug/kg	< 5			5	Pass	
Perfluorodecanoic acid (PFDA)	ug/kg	< 5			5	Pass	
Perfluoroundecanoic acid (PFUnDA)	ug/kg	< 5			5	Pass	
Perfluorododecanoic acid (PFDoDA)	ug/kg	< 5			5	Pass	
Perfluorotridecanoic acid (PFTTrDA)	ug/kg	< 5			5	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/kg	< 5			5	Pass	
Method Blank							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	ug/kg	< 5			5	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/kg	< 5			5	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/kg	< 5			5	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	ug/kg	< 5			5	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	ug/kg	< 5			5	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/kg	< 10			10	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/kg	< 10			10	Pass	
Method Blank							
Perfluoroalkyl sulfonic acids (PFSA's)							
Perfluorobutanesulfonic acid (PFBS)	ug/kg	< 5			5	Pass	
Perfluorononanesulfonic acid (PFNS)	ug/kg	< 5			5	Pass	
Perfluoropropanesulfonic acid (PFPrS)	ug/kg	< 5			5	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/kg	< 5			5	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/kg	< 5			5	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/kg	< 5			5	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/kg	< 5			5	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/kg	< 5			5	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids (n:2 FTSA's)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	ug/kg	< 5			5	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	ug/kg	< 10			10	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	ug/kg	< 5			5	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	ug/kg	< 5			5	Pass	
LCS - % Recovery							
Conductivity (1:5 aqueous extract at 25°C as rec.)	%	116			70-130	Pass	
Total Organic Carbon	%	98			70-130	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	108			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	112			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	109			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	105			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	113			50-150	Pass	

Test				Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Perfluorononanoic acid (PFNA)				%	110			50-150	Pass	
Perfluorodecanoic acid (PFDA)				%	101			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)				%	99			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)				%	118			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)				%	118			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)				%	104			50-150	Pass	
LCS - % Recovery										
Perfluoroalkyl sulfonamido substances										
Perfluorooctane sulfonamide (FOSA)				%	77			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)				%	129			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)				%	104			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)				%	106			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)				%	83			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)				%	98			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)				%	99			50-150	Pass	
LCS - % Recovery										
Perfluoroalkyl sulfonic acids (PFSA's)										
Perfluorobutanesulfonic acid (PFBS)				%	98			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)				%	91			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)				%	109			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)				%	106			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)				%	108			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)				%	87			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)				%	113			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)				%	95			50-150	Pass	
LCS - % Recovery										
n:2 Fluorotelomer sulfonic acids (n:2 FTSA's)										
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)				%	108			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)				%	90			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)				%	138			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)				%	148			50-150	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1				Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery										
Perfluoroalkyl carboxylic acids (PFCAs)					Result 1					
Perfluorobutanoic acid (PFBA)	S20-No45349	NCP	%	108				50-150	Pass	
Perfluoropentanoic acid (PFPeA)	S20-No45349	NCP	%	113				50-150	Pass	
Perfluorohexanoic acid (PFHxA)	S20-No45349	NCP	%	106				50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	S20-No45349	NCP	%	104				50-150	Pass	
Perfluorooctanoic acid (PFOA)	S20-No45349	NCP	%	112				50-150	Pass	
Perfluorononanoic acid (PFNA)	S20-No45349	NCP	%	112				50-150	Pass	
Perfluorodecanoic acid (PFDA)	S20-No45349	NCP	%	102				50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	S20-No45349	NCP	%	101				50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	S20-No45349	NCP	%	117				50-150	Pass	
Perfluorotridecanoic acid (PFTTrDA)	S20-No45349	NCP	%	110				50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	S20-No45349	NCP	%	97				50-150	Pass	
Spike - % Recovery										
Perfluoroalkyl sulfonamido substances					Result 1					
Perfluorooctane sulfonamide (FOSA)	S20-No45349	NCP	%	81				50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	S20-No45349	NCP	%	114				50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	S20-No45349	NCP	%	94			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	S20-No45349	NCP	%	99			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	S20-No45349	NCP	%	80			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	S20-No45349	NCP	%	104			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	S20-No45349	NCP	%	103			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSA's)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	S20-No45349	NCP	%	99			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	S20-No45349	NCP	%	88			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	S20-No45349	NCP	%	108			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	S20-No45349	NCP	%	104			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	S20-No45349	NCP	%	102			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	S20-No45349	NCP	%	83			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	S20-No45349	NCP	%	108			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	S20-No45349	NCP	%	86			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSA's)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	S20-No45349	NCP	%	94			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	S20-No45349	NCP	%	81			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	S20-No45349	NCP	%	125			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	S20-No45349	NCP	%	142			50-150	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
				Result 1	Result 2	RPD			
Conductivity (1:5 aqueous extract at 25°C as rec.)	M20-No44802	NCP	uS/cm	130	140	5.1	30%	Pass	
pH (1:5 Aqueous extract at 25°C as rec.)	M20-No44802	NCP	pH Units	8.3	8.4	pass	30%	Pass	
Total Organic Carbon	P20-Oc33630	NCP	%	< 0.1	< 0.1	<1	30%	Pass	
% Moisture	P20-No41678	CP	%	2.3	1.7	28	30%	Pass	
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	S20-No45340	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	S20-No45340	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	S20-No45340	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	S20-No45340	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	S20-No45340	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	S20-No45340	NCP	ug/kg	< 5	< 5	<1	30%	Pass	

Duplicate								
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD		
Perfluorodecanoic acid (PFDA)	S20-No45340	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluoroundecanoic acid (PFUnDA)	S20-No45340	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorododecanoic acid (PFDoDA)	S20-No45340	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorotridecanoic acid (PFTrDA)	S20-No45340	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorotetradecanoic acid (PFTeDA)	S20-No45340	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Duplicate								
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD		
Perfluorooctane sulfonamide (FOSA)	S20-No45340	NCP	ug/kg	< 5	< 5	<1	30%	Pass
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	S20-No45340	NCP	ug/kg	< 5	< 5	<1	30%	Pass
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	S20-No45340	NCP	ug/kg	< 5	< 5	<1	30%	Pass
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	S20-No45340	NCP	ug/kg	< 5	< 5	<1	30%	Pass
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	S20-No45340	NCP	ug/kg	< 5	< 5	<1	30%	Pass
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	S20-No45340	NCP	ug/kg	< 10	< 10	<1	30%	Pass
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	S20-No45340	NCP	ug/kg	< 10	< 10	<1	30%	Pass
Duplicate								
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD		
Perfluorobutanesulfonic acid (PFBS)	S20-No45340	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorononanesulfonic acid (PFNS)	S20-No45340	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluoropropanesulfonic acid (PFPrS)	S20-No45340	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluoropentanesulfonic acid (PFPeS)	S20-No45340	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorohexanesulfonic acid (PFHxS)	S20-No45340	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluoroheptanesulfonic acid (PFHpS)	S20-No45340	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorooctanesulfonic acid (PFOS)	S20-No45340	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorodecanesulfonic acid (PFDS)	S20-No45340	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Duplicate								
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)				Result 1	Result 2	RPD		
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	S20-No45340	NCP	ug/kg	< 5	< 5	<1	30%	Pass
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	S20-No45340	NCP	ug/kg	< 10	< 10	<1	30%	Pass
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	S20-No45340	NCP	ug/kg	< 5	< 5	<1	30%	Pass
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	S20-No45340	NCP	ug/kg	< 5	< 5	<1	30%	Pass

Comments
Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N09	Quantification of linear and branched isomers has been conducted as a single total response using the relative response factor for the corresponding linear/branched standard.
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.
N15	Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).

Authorised By

Rhys Thomas	Analytical Services Manager
Emily Rosenberg	Senior Analyst-Metal (VIC)
Sarah McCallion	Senior Analyst-PFAS (QLD)
Scott Beddoes	Senior Analyst-Inorganic (VIC)


Glenn Jackson
General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please [click here](#).

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Site Number 23736

Accredited for compliance with ISO/IEC 17025 – Testing
 The results of the tests, calibrations and/or
 measurements included in this document are traceable
 to Australian/national standards.

Attention: **David James**

Report **758878-W**
Project name **LEARMONTH**
Project ID **WA_0960_PFASOMP**
Received Date **Nov 23, 2020**

Client Sample ID			0960_QC203_2 01119	0960_QC204_2 01119	0960_QC205_2 01119	0960_QC206_2 01119
Sample Matrix			Water	Water	Water	Water
Eurofins Sample No.			P20-No41680	P20-No41681	P20-No41682	P20-No41683
Date Sampled			Nov 19, 2020	Nov 19, 2020	Nov 19, 2020	Nov 19, 2020
Test/Reference	LOR	Unit				
Chloride	1	mg/L	160	3800	1400	580
Dissolved Organic Carbon	5	mg/L	< 5	< 5	< 5	10.0
pH (at 25 °C)	0.1	pH Units	8.6	8.1	8.5	8.4
Sulphate (as SO ₄)	5	mg/L	42	710	370	310
Total Dissolved Solids Dried at 180°C ± 2°C	10	mg/L	1300	6700	3000	1900
Total Suspended Solids Dried at 103–105°C	1	mg/L	160	180	100	1700
Alkalinity (speciated)						
Bicarbonate Alkalinity (as CaCO ₃)	20	mg/L	550	540	770	1200
Carbonate Alkalinity (as CaCO ₃)	10	mg/L	40	< 10	35	29
Hydroxide Alkalinity (as CaCO ₃)	20	mg/L	< 20	< 20	< 20	< 20
Total Alkalinity (as CaCO ₃)	20	mg/L	590	540	810	1200
Eurofins Suite B11C: Na/K/Ca/Mg						
Calcium	0.5	mg/L	15	210	27	24
Magnesium	0.5	mg/L	6.2	200	33	21
Potassium	0.5	mg/L	11	83	35	20
Sodium	0.5	mg/L	390	2400	1200	770
Perfluoroalkyl carboxylic acids (PFCA)						
Perfluorobutanoic acid (PFBA) ^{N11}	0.05	ug/L	< 0.05	< 0.07	0.16	0.15
Perfluoropentanoic acid (PFPeA) ^{N11}	0.01	ug/L	< 0.01	0.05	0.12	0.11
Perfluorohexanoic acid (PFHxA) ^{N11}	0.01	ug/L	< 0.01	^{N09} 0.23	^{N09} 0.29	^{N09} 0.45
Perfluoroheptanoic acid (PFHpA) ^{N11}	0.01	ug/L	< 0.01	^{N09} 0.02	^{N09} 0.10	^{N09} 0.05
Perfluorooctanoic acid (PFOA) ^{N11}	0.01	ug/L	< 0.01	^{N09} 0.02	^{N09} 0.16	^{N09} 0.07
Perfluorononanoic acid (PFNA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	0.02	0.02
Perfluorodecanoic acid (PFDA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluoroundecanoic acid (PFUnDA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorododecanoic acid (PFDoDA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorotridecanoic acid (PFTTrDA) ^{N15}	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorotetradecanoic acid (PFTeDA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
13C4-PFBA (surr.)	1	%	143	104	84	84
13C5-PFPeA (surr.)	1	%	85	79	64	64
13C5-PFHxA (surr.)	1	%	81	75	60	66
13C4-PFHpA (surr.)	1	%	84	85	72	76
13C8-PFOA (surr.)	1	%	78	81	66	75
13C5-PFNA (surr.)	1	%	74	81	72	83
13C6-PFDA (surr.)	1	%	80	83	73	83

Client Sample ID			0960_QC203_2 01119	0960_QC204_2 01119	0960_QC205_2 01119	0960_QC206_2 01119
Sample Matrix			Water	Water	Water	Water
Eurofins Sample No.			P20-No41680	P20-No41681	P20-No41682	P20-No41683
Date Sampled			Nov 19, 2020	Nov 19, 2020	Nov 19, 2020	Nov 19, 2020
Test/Reference	LOR	Unit				
Perfluoroalkyl carboxylic acids (PFCAs)						
13C2-PFUnDA (surr.)	1	%	77	82	77	90
13C2-PFDoDA (surr.)	1	%	78	89	81	96
13C2-PFTeDA (surr.)	1	%	97	96	79	102
Perfluoroalkyl sulfonamido substances						
Perfluorooctane sulfonamide (FOSA) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
13C8-FOSA (surr.)	1	%	86	76	72	79
D3-N-MeFOSA (surr.)	1	%	153	111	113	125
D5-N-EtFOSA (surr.)	1	%	134	111	101	123
D7-N-MeFOSE (surr.)	1	%	98	65	52	71
D9-N-EtFOSE (surr.)	1	%	113	70	63	82
D5-N-EtFOSAA (surr.)	1	%	90	74	54	98
D3-N-MeFOSAA (surr.)	1	%	83	47	34	65
Perfluoroalkyl sulfonic acids (PFASs)						
Perfluorobutanesulfonic acid (PFBS) ^{N11}	0.01	ug/L	< 0.01	0.07	0.04	0.16
Perfluorononanesulfonic acid (PFNS) ^{N15}	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluoropropanesulfonic acid (PFPrS) ^{N15}	0.01	ug/L	< 0.01	0.02	0.01	0.04
Perfluoropentanesulfonic acid (PFPeS) ^{N15}	0.01	ug/L	< 0.01	^{N09} 0.08	^{N09} 0.06	^{N09} 0.19
Perfluorohexanesulfonic acid (PFHxS) ^{N11}	0.01	ug/L	^{N09} 0.04	^{N09} 0.61	^{N09} 1.3	^{N09} 1.5
Perfluoroheptanesulfonic acid (PFHpS) ^{N15}	0.01	ug/L	< 0.01	< 0.01	^{N09} 0.07	^{N09} 0.05
Perfluorooctanesulfonic acid (PFOS) ^{N11}	0.01	ug/L	^{N09} 0.02	^{N09} 0.07	^{N09} 1.2	^{N09} 0.87
Perfluorodecanesulfonic acid (PFDS) ^{N15}	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
13C3-PFBS (surr.)	1	%	82	76	65	72
18O2-PFHxS (surr.)	1	%	80	76	61	60
13C8-PFOS (surr.)	1	%	82	75	66	77
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)						
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
13C2-4:2 FTSA (surr.)	1	%	42	56	43	46
13C2-6:2 FTSA (surr.)	1	%	45	90	101	93
13C2-8:2 FTSA (surr.)	1	%	49	123	103	169
13C2-10:2 FTSA (surr.)	1	%	74	109	96	129

Client Sample ID			0960_QC203_2 01119	0960_QC204_2 01119	0960_QC205_2 01119	0960_QC206_2 01119
Sample Matrix			Water	Water	Water	Water
Eurofins Sample No.			P20-No41680	P20-No41681	P20-No41682	P20-No41683
Date Sampled			Nov 19, 2020	Nov 19, 2020	Nov 19, 2020	Nov 19, 2020
Test/Reference	LOR	Unit				
PFASs Summations						
Sum (PFHxS + PFOS)*	0.01	ug/L	0.06	0.68	2.5	2.37
Sum of US EPA PFAS (PFOS + PFOA)*	0.01	ug/L	0.02	0.09	1.36	0.94
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	0.01	ug/L	0.06	0.7	2.66	2.44
Sum of WA DWER PFAS (n=10)*	0.05	ug/L	0.06	1.07	3.37	3.36
Sum of PFASs (n=30)*	0.1	ug/L	< 0.1	1.17	3.53	3.66

Client Sample ID			0960_QC208_2 01119	0960_QC209_2 01119	0960_QC210_2 01119
Sample Matrix			Water	Water	Water
Eurofins Sample No.			P20-No41685	P20-No41686	P20-No41687
Date Sampled			Nov 19, 2020	Nov 19, 2020	Nov 19, 2020
Test/Reference	LOR	Unit			
Chloride	1	mg/L	2000	49000	44000
Dissolved Organic Carbon	5	mg/L	< 5	< 5	< 5
pH (at 25 °C)	0.1	pH Units	8.5	7.9	8.1
Sulphate (as SO4)	5	mg/L	430	2700	2900
Total Dissolved Solids Dried at 180°C ± 2°C	10	mg/L	2400	46000	40000
Total Suspended Solids Dried at 103–105°C	1	mg/L	190	190	24
Alkalinity (speciated)					
Bicarbonate Alkalinity (as CaCO3)	20	mg/L	810	180	110
Carbonate Alkalinity (as CaCO3)	10	mg/L	33	< 10	< 10
Hydroxide Alkalinity (as CaCO3)	20	mg/L	< 20	< 20	< 20
Total Alkalinity (as CaCO3)	20	mg/L	850	180	110
Eurofins Suite B11C: Na/K/Ca/Mg					
Calcium	0.5	mg/L	54	1100	520
Magnesium	0.5	mg/L	86	1700	1500
Potassium	0.5	mg/L	52	440	490
Sodium	0.5	mg/L	1600	16000	11000
Perfluoroalkyl carboxylic acids (PFCAs)					
Perfluorobutanoic acid (PFBA) ^{N11}	0.05	ug/L	0.10	< 0.05	< 0.05
Perfluoropentanoic acid (PFPeA) ^{N11}	0.01	ug/L	0.11	< 0.01	< 0.01
Perfluorohexanoic acid (PFHxA) ^{N11}	0.01	ug/L	^{N09} 0.56	< 0.01	< 0.01
Perfluoroheptanoic acid (PFHpA) ^{N11}	0.01	ug/L	^{N09} 0.05	< 0.01	< 0.01
Perfluorooctanoic acid (PFOA) ^{N11}	0.01	ug/L	^{N09} 0.08	< 0.01	< 0.01
Perfluorononanoic acid (PFNA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01
Perfluorodecanoic acid (PFDA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01
Perfluoroundecanoic acid (PFUnDA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01
Perfluorododecanoic acid (PFDoDA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01
Perfluorotridecanoic acid (PFTTrDA) ^{N15}	0.01	ug/L	< 0.01	< 0.01	< 0.01
Perfluorotetradecanoic acid (PFTeDA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01
13C4-PFBA (surr.)	1	%	111	87	90
13C5-PFPeA (surr.)	1	%	79	86	100
13C5-PFHxA (surr.)	1	%	81	73	72
13C4-PFHpA (surr.)	1	%	103	97	111
13C8-PFOA (surr.)	1	%	99	102	107
13C5-PFNA (surr.)	1	%	111	90	99
13C6-PFDA (surr.)	1	%	105	81	86

Client Sample ID			0960_QC208_2 01119	0960_QC209_2 01119	0960_QC210_2 01119
Sample Matrix			Water	Water	Water
Eurofins Sample No.			P20-No41685	P20-No41686	P20-No41687
Date Sampled			Nov 19, 2020	Nov 19, 2020	Nov 19, 2020
Test/Reference	LOR	Unit			
Perfluoroalkyl carboxylic acids (PFCAs)					
13C2-PFUnDA (surr.)	1	%	112	85	91
13C2-PFDoDA (surr.)	1	%	112	77	75
13C2-PFTeDA (surr.)	1	%	94	80	87
Perfluoroalkyl sulfonamido substances					
Perfluorooctane sulfonamide (FOSA) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05
13C8-FOSA (surr.)	1	%	104	116	115
D3-N-MeFOSA (surr.)	1	%	148	87	85
D5-N-EtFOSA (surr.)	1	%	144	84	90
D7-N-MeFOSE (surr.)	1	%	99	74	70
D9-N-EtFOSE (surr.)	1	%	108	64	71
D5-N-EtFOSAA (surr.)	1	%	115	79	94
D3-N-MeFOSAA (surr.)	1	%	71	79	88
Perfluoroalkyl sulfonic acids (PFASs)					
Perfluorobutanesulfonic acid (PFBS) ^{N11}	0.01	ug/L	0.19	< 0.01	< 0.01
Perfluorononanesulfonic acid (PFNS) ^{N15}	0.01	ug/L	< 0.01	< 0.01	< 0.01
Perfluoropropanesulfonic acid (PFPrS) ^{N15}	0.01	ug/L	0.06	< 0.01	< 0.01
Perfluoropentanesulfonic acid (PFPeS) ^{N15}	0.01	ug/L	N090.29	< 0.01	< 0.01
Perfluorohexanesulfonic acid (PFHxS) ^{N11}	0.01	ug/L	N092.0	< 0.01	< 0.01
Perfluoroheptanesulfonic acid (PFHpS) ^{N15}	0.01	ug/L	N090.10	< 0.01	< 0.01
Perfluorooctanesulfonic acid (PFOS) ^{N11}	0.01	ug/L	N092.5	< 0.01	< 0.01
Perfluorodecanesulfonic acid (PFDS) ^{N15}	0.01	ug/L	< 0.01	< 0.01	< 0.01
13C3-PFBS (surr.)	1	%	94	109	114
18O2-PFHxS (surr.)	1	%	92	118	127
13C8-PFOS (surr.)	1	%	76	97	105
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA) ^{N11}	0.05	ug/L	0.45	< 0.05	< 0.05
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01
13C2-4:2 FTSA (surr.)	1	%	60	86	95
13C2-6:2 FTSA (surr.)	1	%	164	83	100
13C2-8:2 FTSA (surr.)	1	%	INT	50	55
13C2-10:2 FTSA (surr.)	1	%	172	74	69

Client Sample ID			0960_QC208_2 01119	0960_QC209_2 01119	0960_QC210_2 01119
Sample Matrix			Water	Water	Water
Eurofins Sample No.			P20-No41685	P20-No41686	P20-No41687
Date Sampled			Nov 19, 2020	Nov 19, 2020	Nov 19, 2020
Test/Reference	LOR	Unit			
PFASs Summations					
Sum (PFHxS + PFOS)*	0.01	ug/L	4.5	< 0.01	< 0.01
Sum of US EPA PFAS (PFOS + PFOA)*	0.01	ug/L	2.58	< 0.01	< 0.01
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	0.01	ug/L	4.58	< 0.01	< 0.01
Sum of WA DWER PFAS (n=10)*	0.05	ug/L	6.04	< 0.05	< 0.05
Sum of PFASs (n=30)*	0.1	ug/L	6.49	< 0.1	< 0.1

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Eurofins Suite B11E: Cl/SO₄/Alkalinity			
Chloride	Melbourne	Nov 26, 2020	28 Days
- Method: LTM-INO-4090 Chloride by Discrete Analyser			
Sulphate (as SO ₄)	Melbourne	Nov 26, 2020	28 Days
- Method: LTM-INO-4110 Sulfate by Discrete Analyser			
Alkalinity (speciated)	Melbourne	Nov 26, 2020	14 Days
- Method: LTM-INO-4250 Alkalinity by Electrometric Titration			
Dissolved Organic Carbon	Melbourne	Nov 26, 2020	28 Days
- Method: APHA 5310B Dissolved Organic Carbon			
pH (at 25 °C)	Melbourne	Nov 26, 2020	0 Hours
- Method: LTM-GEN-7090 pH in water by ISE			
Total Suspended Solids Dried at 103–105°C	Melbourne	Nov 26, 2020	7 Days
- Method: LTM-INO-4070 Analysis of Suspended Solids in Water by Gravimetry			
Eurofins Suite B11C: Na/K/Ca/Mg	Melbourne	Nov 26, 2020	180 Days
- Method: LTM-MET-3010 Alkali Metals by ICP-AES			
Total Dissolved Solids Dried at 180°C ± 2°C	Melbourne	Nov 26, 2020	7 Days
- Method: LTM-INO-4170 Total Dissolved Solids in Water			
Per- and Polyfluoroalkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs)	Brisbane	Nov 26, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonamido substances	Brisbane	Nov 26, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonic acids (PFASs)	Brisbane	Nov 26, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)	Brisbane	Nov 26, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			

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Company Name: Cardno (WA)
Address: 11 Harvest Terrace
West Perth
WA 6005

Project Name: LEARMONTH
Project ID: WA_0960_PFASOMP

Order No.: DEF19009/330
Report #: 758878
Phone: 08 9273 3888
Fax: 08 9388 3831

Received: Nov 23, 2020 7:47 PM
Due: Dec 1, 2020
Priority: 5 Day
Contact Name: David James

Eurofins Analytical Services Manager : Robert Johnston

Sample Detail						Dissolved Organic Carbon	pH (1:5 Aqueous extract at 25°C as rec.)	pH (at 25 °C)	Total Organic Carbon	Total Suspended Solids Dried at 103–105°C	Moisture Set	Cation Exchange Capacity	Eurofins Suite B11E: Cl/SO ₄ /Alkalinity	Per- and Polyfluoroalkyl Substances (PFASs)	Eurofins Suite B11C: Na/K/Ca/Mg	Total Dissolved Solids Dried at 180°C ± 2°C
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	X	X	X	X		X	X
Sydney Laboratory - NATA Site # 18217																
Brisbane Laboratory - NATA Site # 20794														X		
Perth Laboratory - NATA Site # 23736																
Mayfield Laboratory																
External Laboratory																
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID											
1	0960_QC201_201119	Nov 19, 2020		Soil	P20-No41678		X		X		X	X		X		
2	0960_QC202_201119	Nov 19, 2020		Soil	P20-No41679		X		X		X	X		X		
3	0960_QC203_201119	Nov 19, 2020		Water	P20-No41680	X		X		X			X	X	X	X
4	0960_QC204_201119	Nov 19, 2020		Water	P20-No41681	X		X		X			X	X	X	X
5	0960_QC205_201119	Nov 19, 2020		Water	P20-No41682	X		X		X			X	X	X	X
6	0960_QC206_	Nov 19, 2020		Water	P20-No41683	X		X		X			X	X	X	X

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Company Name: Cardno (WA)
Address: 11 Harvest Terrace
West Perth
WA 6005

Project Name: LEARMONTH
Project ID: WA_0960_PFASOMP

Order No.: DEF19009/330
Report #: 758878
Phone: 08 9273 3888
Fax: 08 9388 3831

Received: Nov 23, 2020 7:47 PM
Due: Dec 1, 2020
Priority: 5 Day
Contact Name: David James

Eurofins Analytical Services Manager : Robert Johnston

Sample Detail						Dissolved Organic Carbon	pH (1:5 Aqueous extract at 25°C as rec.)	pH (at 25 °C)	Total Organic Carbon	Total Suspended Solids Dried at 103–105°C	Moisture Set	Cation Exchange Capacity	Eurofins Suite B11E: Cl/SO ₄ /Alkalinity	Per- and Polyfluoroalkyl Substances (PFASs)	Eurofins Suite B11C: Na/K/Ca/Mg	Total Dissolved Solids Dried at 180°C ± 2°C
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	X	X	X	X		X	X
Sydney Laboratory - NATA Site # 18217																
Brisbane Laboratory - NATA Site # 20794														X		
Perth Laboratory - NATA Site # 23736																
Mayfield Laboratory																
External Laboratory																
	201119															
7	0960_QC207_201119	Nov 19, 2020		Soil	P20-No41684		X		X		X	X		X		
8	0960_QC208_201119	Nov 19, 2020		Water	P20-No41685	X		X		X			X	X	X	X
9	0960_QC209_201119	Nov 19, 2020		Water	P20-No41686	X		X		X			X	X	X	X
10	0960_QC210_201119	Nov 19, 2020		Water	P20-No41687	X		X		X			X	X	X	X
Test Counts						7	3	7	3	7	3	3	7	10	7	7

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram	mg/L: milligrams per litre	ug/L: micrograms per litre
ppm: Parts per million	ppb: Parts per billion	%: Percentage
org/100mL: Organisms per 100 millilitres	NTU: Nephelometric Turbidity Units	MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NC	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 20-130% Phenols & 50-150% PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " - " in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Chloride	mg/L	< 1			1	Pass	
Sulphate (as SO ₄)	mg/L	< 5			5	Pass	
Total Suspended Solids Dried at 103–105°C	mg/L	< 1			1	Pass	
Method Blank							
Alkalinity (speciated)							
Bicarbonate Alkalinity (as CaCO ₃)	mg/L	< 20			20	Pass	
Carbonate Alkalinity (as CaCO ₃)	mg/L	< 10			10	Pass	
Hydroxide Alkalinity (as CaCO ₃)	mg/L	< 20			20	Pass	
Total Alkalinity (as CaCO ₃)	mg/L	< 20			20	Pass	
Method Blank							
Eurofins Suite B11C: Na/K/Ca/Mg							
Calcium	mg/L	< 0.5			0.5	Pass	
Magnesium	mg/L	< 0.5			0.5	Pass	
Potassium	mg/L	< 0.5			0.5	Pass	
Sodium	mg/L	< 0.5			0.5	Pass	
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	ug/L	< 0.05			0.05	Pass	
Perfluoropentanoic acid (PFPeA)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanoic acid (PFHxA)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanoic acid (PFOA)	ug/L	< 0.01			0.01	Pass	
Perfluorononanoic acid (PFNA)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanoic acid (PFDA)	ug/L	< 0.01			0.01	Pass	
Perfluoroundecanoic acid (PFUnDA)	ug/L	< 0.01			0.01	Pass	
Perfluorododecanoic acid (PFDoDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotridecanoic acid (PFTTrDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/L	< 0.01			0.01	Pass	
Method Blank							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	ug/L	< 0.05			0.05	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/L	< 0.05			0.05	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/L	< 0.05			0.05	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	ug/L	< 0.05			0.05	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	ug/L	< 0.05			0.05	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/L	< 0.05			0.05	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/L	< 0.05			0.05	Pass	
Method Blank							
Perfluoroalkyl sulfonic acids (PFSA)s							
Perfluorobutanesulfonic acid (PFBS)	ug/L	< 0.01			0.01	Pass	
Perfluorononanesulfonic acid (PFNS)	ug/L	< 0.01			0.01	Pass	
Perfluoropropanesulfonic acid (PFPrS)	ug/L	< 0.01			0.01	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/L	< 0.01			0.01	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)s							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	ug/L	< 0.01			0.01	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	ug/L	< 0.05			0.05	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	ug/L	< 0.01			0.01	Pass	
LCS - % Recovery							
Chloride	%	112			70-130	Pass	
Sulphate (as SO ₄)	%	107			70-130	Pass	
Total Suspended Solids Dried at 103–105°C	%	97			70-130	Pass	
LCS - % Recovery							
Alkalinity (speciated)							
Carbonate Alkalinity (as CaCO ₃)	%	93			70-130	Pass	
Total Alkalinity (as CaCO ₃)	%	101			70-130	Pass	
LCS - % Recovery							
Eurofins Suite B11C: Na/K/Ca/Mg							
Calcium	%	113			80-120	Pass	
Magnesium	%	107			80-120	Pass	
Potassium	%	109			80-120	Pass	
Sodium	%	108			80-120	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	132			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	144			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	123			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	127			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	132			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	132			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	129			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	%	132			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	%	130			50-150	Pass	
Perfluorotridecanoic acid (PFTTrDA)	%	112			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	121			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	%	111			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	%	112			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	%	112			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	%	131			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	%	113			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	%	144			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	%	124			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	%	118			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	%	109			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	%	117			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	%	118			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	%	130			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	%	107			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	%	139			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	%	108			50-150	Pass	
LCS - % Recovery							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	%	141			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	%	127			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	%	134			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	%	132			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1		Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery								
				Result 1				
Sulphate (as SO ₄)	M20-No47525	NCP	%	85		70-130	Pass	
Total Suspended Solids Dried at 103–105°C	M20-No41429	NCP	%	96		70-130	Pass	
Spike - % Recovery								
Alkalinity (speciated)				Result 1				
Bicarbonate Alkalinity (as CaCO ₃)	S20-No43651	NCP	%	110		70-130	Pass	
Carbonate Alkalinity (as CaCO ₃)	M20-No44169	NCP	%	115		70-130	Pass	
Total Alkalinity (as CaCO ₃)	S20-No43661	NCP	%	112		70-130	Pass	
Spike - % Recovery								
Eurofins Suite B11C: Na/K/Ca/Mg				Result 1				
Calcium	P20-No41681	CP	%	130		75-125	Fail	
Magnesium	P20-No41681	CP	%	119		75-125	Pass	
Potassium	P20-No41681	CP	%	111		75-125	Pass	
Sodium	P20-No41681	CP	%	118		75-125	Pass	
Spike - % Recovery								
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1				
Perfluorobutanoic acid (PFBA)	P20-No41687	CP	%	106		50-150	Pass	
Perfluoropentanoic acid (PFPeA)	P20-No41687	CP	%	137		50-150	Pass	
Perfluorohexanoic acid (PFHxA)	P20-No41687	CP	%	116		50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	P20-No41687	CP	%	125		50-150	Pass	
Perfluorooctanoic acid (PFOA)	P20-No41687	CP	%	127		50-150	Pass	
Perfluorononanoic acid (PFNA)	P20-No41687	CP	%	126		50-150	Pass	
Perfluorodecanoic acid (PFDA)	P20-No41687	CP	%	116		50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	P20-No41687	CP	%	121		50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	P20-No41687	CP	%	119		50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	P20-No41687	CP	%	114		50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	P20-No41687	CP	%	119		50-150	Pass	
Spike - % Recovery								
Perfluoroalkyl sulfonamido substances				Result 1				
Perfluorooctane sulfonamide (FOSA)	P20-No41687	CP	%	111		50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	P20-No41687	CP	%	114		50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	P20-No41687	CP	%	119		50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	P20-No41687	CP	%	111		50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	P20-No41687	CP	%	108		50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	P20-No41687	CP	%	130		50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	P20-No41687	CP	%	134		50-150	Pass	
Spike - % Recovery								
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1				
Perfluorobutanesulfonic acid (PFBS)	P20-No41687	CP	%	118		50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	P20-No41687	CP	%	104		50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	P20-No41687	CP	%	113		50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Perfluoropentanesulfonic acid (PFPeS)	P20-No41687	CP	%	111			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	P20-No41687	CP	%	130			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	P20-No41687	CP	%	101			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	P20-No41687	CP	%	134			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	P20-No41687	CP	%	81			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	P20-No41687	CP	%	133			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	P20-No41687	CP	%	136			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	P20-No41687	CP	%	119			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	P20-No41687	CP	%	125			50-150	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
				Result 1	Result 2	RPD			
Chloride	B20-No41179	NCP	mg/L	2700	2500	8.0	30%	Pass	
pH (at 25 °C)	M20-No44161	NCP	pH Units	8.0	7.9	pass	30%	Pass	
Sulphate (as SO ₄)	M20-No41380	NCP	mg/L	2000	1900	5	30%	Pass	
Total Dissolved Solids Dried at 180°C ± 2°C	M20-No51771	NCP	mg/L	820	**	16	30%	Pass	
Total Suspended Solids Dried at 103–105°C	M20-No42977	NCP	mg/L	670	590	14	30%	Pass	
Duplicate									
Alkalinity (speciated)				Result 1	Result 2	RPD			
Bicarbonate Alkalinity (as CaCO ₃)	M20-No44161	NCP	mg/L	290	350	21	30%	Pass	
Carbonate Alkalinity (as CaCO ₃)	M20-No44161	NCP	mg/L	< 10	< 10	<1	30%	Pass	
Hydroxide Alkalinity (as CaCO ₃)	M20-No44161	NCP	mg/L	< 20	< 20	<1	30%	Pass	
Total Alkalinity (as CaCO ₃)	M20-No44161	NCP	mg/L	290	350	21	30%	Pass	
Duplicate									
Eurofins Suite B11C: Na/K/Ca/Mg				Result 1	Result 2	RPD			
Calcium	P20-No41681	CP	mg/L	210	200	6.0	30%	Pass	
Magnesium	P20-No41681	CP	mg/L	200	210	2.0	30%	Pass	
Potassium	P20-No41681	CP	mg/L	83	81	2.0	30%	Pass	
Sodium	P20-No41681	CP	mg/L	2400	2300	3.0	30%	Pass	
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	P20-No41686	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	P20-No41686	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	P20-No41686	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	P20-No41686	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	P20-No41686	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	P20-No41686	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	P20-No41686	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	P20-No41686	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorododecanoic acid (PFDoDA)	P20-No41686	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass	

Duplicate								
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD		
Perfluorotridecanoic acid (PFTrDA)	P20-No41686	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorotetradecanoic acid (PFTeDA)	P20-No41686	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Duplicate								
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD		
Perfluorooctane sulfonamide (FOSA)	P20-No41686	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	P20-No41686	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	P20-No41686	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	P20-No41686	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	P20-No41686	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	P20-No41686	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	P20-No41686	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass
Duplicate								
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD		
Perfluorobutanesulfonic acid (PFBS)	P20-No41686	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorononanesulfonic acid (PFNS)	P20-No41686	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluoropropanesulfonic acid (PFPrS)	P20-No41686	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluoropentanesulfonic acid (PFPeS)	P20-No41686	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorohexanesulfonic acid (PFHxS)	P20-No41686	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluoroheptanesulfonic acid (PFHpS)	P20-No41686	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorooctanesulfonic acid (PFOS)	P20-No41686	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorodecanesulfonic acid (PFDS)	P20-No41686	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Duplicate								
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)				Result 1	Result 2	RPD		
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	P20-No41686	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	P20-No41686	CP	ug/L	< 0.05	< 0.05	<1	30%	Pass
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	P20-No41686	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	P20-No41686	CP	ug/L	< 0.01	< 0.01	<1	30%	Pass

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N09	Quantification of linear and branched isomers has been conducted as a single total response using the relative response factor for the corresponding linear/branched standard.
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.
N15	Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).

Authorised By

Rhys Thomas	Analytical Services Manager
Emily Rosenberg	Senior Analyst-Metal (VIC)
Sarah McCallion	Senior Analyst-PFAS (QLD)
Scott Beddoes	Senior Analyst-Inorganic (VIC)



Glenn Jackson General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please [click here](#).

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Submission of samples to the laboratory will be deemed as acceptance of Eurofins | Environment Testing Standard Terms and Conditions unless agreed otherwise. A copy is available on request

Australia

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Sample Receipt Advice

Company name: Cardno (WA)
Contact name: Maelle Bourdais
Project name: LEARMONTH
Project ID: WA_0960_PFASOMP
Turnaround time: 5 Day
Date/Time received: Nov 26, 2020 11:15 AM
Eurofins reference: 759891

Sample Information

- ✓ A detailed list of analytes logged into our LIMS, is included in the attached summary table.
- ✓ All samples have been received as described on the above COC.
- ✓ COC has been completed correctly.
- ✓ Attempt to chill was evident.
- ✓ Appropriately preserved sample containers have been used.
- ✓ All samples were received in good condition.
- ✓ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
- ✓ Appropriate sample containers have been used.
- ✓ Sample containers for volatile analysis received with zero headspace.
- ✗ Split sample sent to requested external lab.
- ✗ Some samples have been subcontracted.
- N/A Custody Seals intact (if used).

Notes

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Robert Johnston on phone : or by email: EnviroWA@eurofins.com

Results will be delivered electronically via email to Maelle Bourdais - Maelle.Bourdais@cardno.com.au.

Note: A copy of these results will also be delivered to the general Cardno (WA) email address.

Australia

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Site # 1254 & 14271

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Phone : +61 2 9900 8400
NATA # 1261 Site # 18217

Brisbane
1/21 Smallwood Place
Murarrie QLD 4172
Phone : +61 7 3902 4600
NATA # 1261 Site # 20794

Perth
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Kewdale WA 6105
Phone : +61 8 9251 9600
NATA # 1261
Site # 23736

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Phone : +61 2 4968 8448

New Zealand

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Penrose, Auckland 1061
Phone : +64 9 526 45 51
IANZ # 1327

Christchurch
43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

ABN: 50 005 085 521 web: www.eurofins.com.au email: EnviroSales@eurofins.com

Company Name: Cardno (WA)
Address: 11 Harvest Terrace
West Perth
WA 6005

Project Name: LEARMONTH
Project ID: WA_0960_PFASOMP

Order No.: DEF19009/430
Report #: 759891
Phone: 08 9273 3888
Fax: 08 9388 3831

Received: Nov 26, 2020 11:15 AM
Due: Dec 3, 2020
Priority: 5 Day
Contact Name: - ALL INVOICES

Eurofins Analytical Services Manager : Robert Johnston

Sample Detail						Dissolved Organic Carbon	pH (at 25 °C)	Total Suspended Solids Dried at 103–105°C	Eurofins Suite B11 E: Cl/SO ₄ /Alkalinity	Per- and Polyfluoroalkyl Substances (PFASs)	Eurofins Suite B11 C: Na/K/Ca/Mg	Total Dissolved Solids Dried at 180°C ± 2°C
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X		X	X
Sydney Laboratory - NATA Site # 18217												
Brisbane Laboratory - NATA Site # 20794										X		
Perth Laboratory - NATA Site # 23736												
Mayfield Laboratory												
External Laboratory												
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID							
1	0960_QC211_201121	Nov 21, 2020		Water	P20-No49805	X	X	X	X	X	X	X
Test Counts						1	1	1	1	1	1	1

Cardno Consulting WA
11 Harvest Terrace
West Perth
WA 6005



NATA Accredited
Accreditation Number 1261
Site Number 23736

Accredited for compliance with ISO/IEC 17025 – Testing
 The results of the tests, calibrations and/or
 measurements included in this document are traceable
 to Australian/national standards.

Attention: **Maelle Bourdais**

Report **759891-W**
 Project name **LEARMONTH**
 Project ID **WA_0960_PFASOMP**
 Received Date **Nov 26, 2020**

Client Sample ID			0960_QC211_2 01121
Sample Matrix			Water
Eurofins Sample No.			P20-No49805
Date Sampled			Nov 21, 2020
Test/Reference	LOR	Unit	
Chloride	1	mg/L	22000
Dissolved Organic Carbon	5	mg/L	< 5
pH (at 25 °C)	0.1	pH Units	8.1
Sulphate (as SO ₄)	5	mg/L	2500
Total Dissolved Solids Dried at 180°C ± 2°C	10	mg/L	23000
Total Suspended Solids Dried at 103–105°C	1	mg/L	14
Alkalinity (speciated)			
Bicarbonate Alkalinity (as CaCO ₃)	20	mg/L	110
Carbonate Alkalinity (as CaCO ₃)	10	mg/L	< 10
Hydroxide Alkalinity (as CaCO ₃)	20	mg/L	< 20
Total Alkalinity (as CaCO ₃)	20	mg/L	110
Eurofins Suite B11C: Na/K/Ca/Mg			
Calcium	0.5	mg/L	570
Magnesium	0.5	mg/L	1800
Potassium	0.5	mg/L	530
Sodium	0.5	mg/L	10000
Perfluoroalkyl carboxylic acids (PFCA's)			
Perfluorobutanoic acid (PFBA) ^{N11}	0.05	ug/L	0.06
Perfluoropentanoic acid (PFPeA) ^{N11}	0.01	ug/L	< 0.01
Perfluorohexanoic acid (PFHxA) ^{N11}	0.01	ug/L	< 0.01
Perfluoroheptanoic acid (PFHpA) ^{N11}	0.01	ug/L	< 0.01
Perfluorooctanoic acid (PFOA) ^{N11}	0.01	ug/L	< 0.01
Perfluorononanoic acid (PFNA) ^{N11}	0.01	ug/L	< 0.01
Perfluorodecanoic acid (PFDA) ^{N11}	0.01	ug/L	< 0.01
Perfluoroundecanoic acid (PFUnDA) ^{N11}	0.01	ug/L	< 0.01
Perfluorododecanoic acid (PFDoDA) ^{N11}	0.01	ug/L	< 0.01
Perfluorotridecanoic acid (PFTeDA) ^{N15}	0.01	ug/L	< 0.01
Perfluorotetradecanoic acid (PFTeDA) ^{N11}	0.01	ug/L	< 0.01
13C4-PFBA (surr.)	1	%	57
13C5-PFPeA (surr.)	1	%	39
13C5-PFHxA (surr.)	1	%	44
13C4-PFHpA (surr.)	1	%	50
13C8-PFOA (surr.)	1	%	49
13C5-PFNA (surr.)	1	%	42
13C6-PFDA (surr.)	1	%	52

Client Sample ID			0960_QC211_2 01121
Sample Matrix			Water
Eurofins Sample No.			P20-No49805
Date Sampled			Nov 21, 2020
Test/Reference	LOR	Unit	
Perfluoroalkyl carboxylic acids (PFCAs)			
13C2-PFUnDA (surr.)	1	%	53
13C2-PFDoDA (surr.)	1	%	52
13C2-PFTeDA (surr.)	1	%	125
Perfluoroalkyl sulfonamido substances			
Perfluorooctane sulfonamide (FOSA) ^{N11}	0.05	ug/L	< 0.05
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA) ^{N11}	0.05	ug/L	< 0.05
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA) ^{N11}	0.05	ug/L	< 0.05
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE) ^{N11}	0.05	ug/L	< 0.05
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE) ^{N11}	0.05	ug/L	< 0.05
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA) ^{N11}	0.05	ug/L	< 0.05
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA) ^{N11}	0.05	ug/L	< 0.05
13C8-FOSA (surr.)	1	%	50
D3-N-MeFOSA (surr.)	1	%	72
D5-N-EtFOSA (surr.)	1	%	94
D7-N-MeFOSE (surr.)	1	%	36
D9-N-EtFOSE (surr.)	1	%	36
D5-N-EtFOSAA (surr.)	1	%	46
D3-N-MeFOSAA (surr.)	1	%	67
Perfluoroalkyl sulfonic acids (PFSA)s			
Perfluorobutanesulfonic acid (PFBS) ^{N11}	0.01	ug/L	< 0.01
Perfluorononanesulfonic acid (PFNS) ^{N15}	0.01	ug/L	< 0.01
Perfluoropropanesulfonic acid (PFPrS) ^{N15}	0.01	ug/L	< 0.01
Perfluoropentanesulfonic acid (PFPeS) ^{N15}	0.01	ug/L	< 0.01
Perfluorohexanesulfonic acid (PFHxS) ^{N11}	0.01	ug/L	< 0.01
Perfluoroheptanesulfonic acid (PFHpS) ^{N15}	0.01	ug/L	< 0.01
Perfluorooctanesulfonic acid (PFOS) ^{N11}	0.01	ug/L	< 0.01
Perfluorodecanesulfonic acid (PFDS) ^{N15}	0.01	ug/L	< 0.01
13C3-PFBS (surr.)	1	%	46
18O2-PFHxS (surr.)	1	%	47
13C8-PFOS (surr.)	1	%	50
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)s			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA) ^{N11}	0.01	ug/L	< 0.01
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA) ^{N11}	0.05	ug/L	< 0.05
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA) ^{N11}	0.01	ug/L	< 0.01
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA) ^{N11}	0.01	ug/L	< 0.01
13C2-4:2 FTSA (surr.)	1	%	29
13C2-6:2 FTSA (surr.)	1	%	45
13C2-8:2 FTSA (surr.)	1	%	47
13C2-10:2 FTSA (surr.)	1	%	52

Client Sample ID			0960_QC211_2 01121
Sample Matrix			Water
Eurofins Sample No.			P20-No49805
Date Sampled			Nov 21, 2020
Test/Reference	LOR	Unit	
PFASs Summations			
Sum (PFHxS + PFOS)*	0.01	ug/L	< 0.01
Sum of US EPA PFAS (PFOS + PFOA)*	0.01	ug/L	< 0.01
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	0.01	ug/L	< 0.01
Sum of WA DWER PFAS (n=10)*	0.05	ug/L	0.06
Sum of PFASs (n=30)*	0.1	ug/L	< 0.1

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.

A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Eurofins Suite B11E: Cl/SO₄/Alkalinity			
Chloride	Melbourne	Nov 30, 2020	28 Days
- Method: LTM-INO-4090 Chloride by Discrete Analyser			
Sulphate (as SO ₄)	Melbourne	Nov 30, 2020	28 Days
- Method: LTM-INO-4110 Sulfate by Discrete Analyser			
Alkalinity (speciated)	Melbourne	Nov 30, 2020	14 Days
- Method: LTM-INO-4250 Alkalinity by Electrometric Titration			
Dissolved Organic Carbon	Melbourne	Nov 30, 2020	28 Days
- Method: APHA 5310B Dissolved Organic Carbon			
pH (at 25 °C)	Melbourne	Nov 30, 2020	0 Hours
- Method: LTM-GEN-7090 pH in water by ISE			
Total Suspended Solids Dried at 103–105°C	Melbourne	Nov 30, 2020	7 Days
- Method: LTM-INO-4070 Analysis of Suspended Solids in Water by Gravimetry			
Eurofins Suite B11C: Na/K/Ca/Mg	Melbourne	Nov 30, 2020	180 Days
- Method: LTM-MET-3010 Alkali Metals by ICP-AES			
Total Dissolved Solids Dried at 180°C ± 2°C	Melbourne	Nov 30, 2020	7 Days
- Method: LTM-INO-4170 Total Dissolved Solids in Water			
Per- and Polyfluoroalkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs)	Brisbane	Nov 30, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonamido substances	Brisbane	Nov 30, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonic acids (PFASs)	Brisbane	Nov 30, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)	Brisbane	Nov 30, 2020	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			

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Brisbane

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Company Name: Cardno (WA)
Address: 11 Harvest Terrace
West Perth
WA 6005

Project Name: LEARMONTH
Project ID: WA_0960_PFASOMP

Order No.: DEF19009/430
Report #: 759891
Phone: 08 9273 3888
Fax: 08 9388 3831

Received: Nov 26, 2020 11:15 AM
Due: Dec 3, 2020
Priority: 5 Day
Contact Name: - ALL INVOICES

Eurofins Analytical Services Manager : Robert Johnston

Sample Detail						Dissolved Organic Carbon	pH (at 25 °C)	Total Suspended Solids Dried at 103–105°C	Eurofins Suite B11 E: Cl/SO ₄ /Alkalinity	Per- and Polyfluoroalkyl Substances (PFASs)	Eurofins Suite B11 C: Na/K/Ca/Mg	Total Dissolved Solids Dried at 180°C ± 2°C
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X		X	X
Sydney Laboratory - NATA Site # 18217												
Brisbane Laboratory - NATA Site # 20794										X		
Perth Laboratory - NATA Site # 23736												
Mayfield Laboratory												
External Laboratory												
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID							
1	0960_QC211_201121	Nov 21, 2020		Water	P20-No49805	X	X	X	X	X	X	X
Test Counts						1	1	1	1	1	1	1

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram

mg/L: milligrams per litre

ug/L: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100mL: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NC	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 20-130% Phenols & 50-150% PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " - " in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Chloride	mg/L	< 1			1	Pass	
Sulphate (as SO ₄)	mg/L	< 5			5	Pass	
Total Dissolved Solids Dried at 180°C ± 2°C	mg/L	< 10			10	Pass	
Total Suspended Solids Dried at 103–105°C	mg/L	< 1			1	Pass	
Method Blank							
Alkalinity (speciated)							
Bicarbonate Alkalinity (as CaCO ₃)	mg/L	< 20			20	Pass	
Carbonate Alkalinity (as CaCO ₃)	mg/L	< 10			10	Pass	
Hydroxide Alkalinity (as CaCO ₃)	mg/L	< 20			20	Pass	
Total Alkalinity (as CaCO ₃)	mg/L	< 20			20	Pass	
Method Blank							
Eurofins Suite B11C: Na/K/Ca/Mg							
Calcium	mg/L	< 0.5			0.5	Pass	
Magnesium	mg/L	< 0.5			0.5	Pass	
Potassium	mg/L	< 0.5			0.5	Pass	
Sodium	mg/L	< 0.5			0.5	Pass	
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	ug/L	< 0.05			0.05	Pass	
Perfluoropentanoic acid (PFPeA)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanoic acid (PFHxA)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanoic acid (PFOA)	ug/L	< 0.01			0.01	Pass	
Perfluorononanoic acid (PFNA)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanoic acid (PFDA)	ug/L	< 0.01			0.01	Pass	
Perfluoroundecanoic acid (PFUnDA)	ug/L	< 0.01			0.01	Pass	
Perfluorododecanoic acid (PFDoDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotridecanoic acid (PFTTrDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/L	< 0.01			0.01	Pass	
Method Blank							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	ug/L	< 0.05			0.05	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/L	< 0.05			0.05	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/L	< 0.05			0.05	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	ug/L	< 0.05			0.05	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	ug/L	< 0.05			0.05	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/L	< 0.05			0.05	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/L	< 0.05			0.05	Pass	
Method Blank							
Perfluoroalkyl sulfonic acids (PFSA's)							
Perfluorobutanesulfonic acid (PFBS)	ug/L	< 0.01			0.01	Pass	
Perfluorononanesulfonic acid (PFNS)	ug/L	< 0.01			0.01	Pass	
Perfluoropropanesulfonic acid (PFPrS)	ug/L	< 0.01			0.01	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/L	< 0.01			0.01	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	ug/L	< 0.05			0.05	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	ug/L	< 0.01			0.01	Pass	
LCS - % Recovery							
Chloride	%	116			70-130	Pass	
Sulphate (as SO ₄)	%	112			70-130	Pass	
Total Dissolved Solids Dried at 180°C ± 2°C	%	95			70-130	Pass	
Total Suspended Solids Dried at 103–105°C	%	97			70-130	Pass	
LCS - % Recovery							
Alkalinity (speciated)							
Carbonate Alkalinity (as CaCO ₃)	%	114			70-130	Pass	
Total Alkalinity (as CaCO ₃)	%	120			70-130	Pass	
LCS - % Recovery							
Eurofins Suite B11C: Na/K/Ca/Mg							
Calcium	%	93			80-120	Pass	
Magnesium	%	87			80-120	Pass	
Potassium	%	83			80-120	Pass	
Sodium	%	92			80-120	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	126			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	132			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	136			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	126			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	128			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	120			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	137			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	%	129			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	%	123			50-150	Pass	
Perfluorotridecanoic acid (PFTriDA)	%	70			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	126			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	%	135			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	%	95			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	%	81			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	%	111			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	%	108			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	%	117			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	%	97			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonic acids (PFSA's)							
Perfluorobutanesulfonic acid (PFBS)	%	119			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	%	123			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	%	116			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	%	121			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	%	125			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	%	89			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	%	122			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	%	107			50-150	Pass	
LCS - % Recovery							
n:2 Fluorotelomer sulfonic acids (n:2 FTSA's)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	%	129			50-150	Pass	

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)			%	139			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)			%	123			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)			%	128			50-150	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
				Result 1					
Sulphate (as SO ₄)	M20-No51065	NCP	%	81			70-130	Pass	
Total Suspended Solids Dried at 103–105°C	B20-No47270	NCP	%	106			70-130	Pass	
Spike - % Recovery									
Eurofins Suite B11C: Na/K/Ca/Mg				Result 1					
Calcium	B20-No47139	NCP	%	131			75-125	Fail	Q08
Magnesium	B20-No47139	NCP	%	121			75-125	Pass	
Potassium	B20-No47139	NCP	%	117			75-125	Pass	
Sodium	B20-No47270	NCP	%	121			75-125	Pass	
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1					
Perfluorobutanoic acid (PFBA)	B20-No46188	NCP	%	114			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	B20-No46188	NCP	%	119			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	B20-No46188	NCP	%	119			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	B20-No46188	NCP	%	105			50-150	Pass	
Perfluorooctanoic acid (PFOA)	B20-No46188	NCP	%	114			50-150	Pass	
Perfluorononanoic acid (PFNA)	B20-No46188	NCP	%	111			50-150	Pass	
Perfluorodecanoic acid (PFDA)	B20-No46188	NCP	%	116			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	B20-No46188	NCP	%	119			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	B20-No46188	NCP	%	106			50-150	Pass	
Perfluorotridecanoic acid (PFTTrDA)	B20-No46188	NCP	%	95			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	B20-No46188	NCP	%	115			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances				Result 1					
Perfluorooctane sulfonamide (FOSA)	B20-No46188	NCP	%	124			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	B20-No46188	NCP	%	118			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	B20-No46188	NCP	%	108			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	B20-No46188	NCP	%	95			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	B20-No46188	NCP	%	107			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	B20-No46188	NCP	%	123			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	B20-No46188	NCP	%	97			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	B20-No46188	NCP	%	115			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	B20-No46188	NCP	%	114			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	B20-No46188	NCP	%	125			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	B20-No46188	NCP	%	130			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Perfluorohexanesulfonic acid (PFHxS)	B20-No46188	NCP	%	117			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	B20-No46188	NCP	%	115			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	B20-No46188	NCP	%	120			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	B20-No46188	NCP	%	98			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	B20-No46188	NCP	%	121			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	B20-No46188	NCP	%	107			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	B20-No46188	NCP	%	118			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	B20-No46188	NCP	%	110			50-150	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
				Result 1	Result 2	RPD			
Chloride	M20-De07215	NCP	mg/L	26000	23000	9.0	30%	Pass	
pH (at 25 °C)	P20-No49523	NCP	pH Units	8.0	7.9	pass	30%	Pass	
Sulphate (as SO ₄)	M20-De07215	NCP	mg/L	1500	1600	4.0	30%	Pass	
Total Dissolved Solids Dried at 180°C ± 2°C	B20-No47138	NCP	mg/L	3900	3700	7.4	30%	Pass	
Total Suspended Solids Dried at 103–105°C	B20-No47270	NCP	mg/L	150	110	27	30%	Pass	
Duplicate									
Alkalinity (speciated)				Result 1	Result 2	RPD			
Bicarbonate Alkalinity (as CaCO ₃)	P20-No49523	NCP	mg/L	180	170	9.0	30%	Pass	
Carbonate Alkalinity (as CaCO ₃)	P20-No49523	NCP	mg/L	< 10	< 10	<1	30%	Pass	
Hydroxide Alkalinity (as CaCO ₃)	P20-No49523	NCP	mg/L	< 20	< 20	<1	30%	Pass	
Total Alkalinity (as CaCO ₃)	P20-No49523	NCP	mg/L	180	170	9.0	30%	Pass	
Duplicate									
Eurofins Suite B11C: Na/K/Ca/Mg				Result 1	Result 2	RPD			
Calcium	B20-No47139	NCP	mg/L	39	35	11	30%	Pass	
Magnesium	B20-No47139	NCP	mg/L	81	74	9.0	30%	Pass	
Potassium	B20-No47139	NCP	mg/L	14	12	10	30%	Pass	
Sodium	B20-No47270	NCP	mg/L	1200	1000	16	30%	Pass	
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	B20-No46187	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	B20-No46187	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	B20-No46187	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	B20-No46187	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	B20-No46187	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	B20-No46187	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	B20-No46187	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	B20-No46187	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorododecanoic acid (PFDoDA)	B20-No46187	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotridecanoic acid (PFTeDA)	B20-No46187	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTEDA)	B20-No46187	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	

Duplicate								
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD		
Perfluorooctane sulfonamide (FOSA)	B20-No46187	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	B20-No46187	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	B20-No46187	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	B20-No46187	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	B20-No46187	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	B20-No46187	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	B20-No46187	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
Duplicate								
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD		
Perfluorobutanesulfonic acid (PFBS)	B20-No46187	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorononanesulfonic acid (PFNS)	B20-No46187	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluoropropanesulfonic acid (PFPrS)	B20-No46187	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluoropentanesulfonic acid (PFPeS)	B20-No46187	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorohexanesulfonic acid (PFHxS)	B20-No46187	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluoroheptanesulfonic acid (PFHpS)	B20-No46187	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorooctanesulfonic acid (PFOS)	B20-No46187	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorodecanesulfonic acid (PFDS)	B20-No46187	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Duplicate								
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)				Result 1	Result 2	RPD		
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	B20-No46187	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	B20-No46187	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	B20-No46187	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	B20-No46187	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass

Comments
Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.
N15	Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).
Q08	The matrix spike recovery is outside of the recommended acceptance criteria. An acceptable recovery was obtained for the laboratory control sample indicating a sample matrix interference.

Authorised By

Rhys Thomas	Analytical Services Manager
Emily Rosenberg	Senior Analyst-Metal (VIC)
Sarah McCallion	Senior Analyst-PFAS (QLD)
Scott Beddoes	Senior Analyst-Inorganic (VIC)


Glenn Jackson
General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please [click here](#).

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CHAIN OF CUSTODY

COC#: 16273 ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: SC-DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

25/11 1500

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	Rinsate WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0960_MW135		21/11/2020 09:21 AM	Water	ALS: 4 Non ALS: 0	No	X			
002	0960_QC303		21/11/2020 10:25 AM	Water	ALS: 2 Non ALS: 0	No		X		
003	0960_QC401		21/11/2020 10:26 AM	Water	ALS: 2 Non ALS: 0	No		X		

Environmental Division
Perth

Work Order Reference

EP2013120



Telephone : + 61-8-9406 1301

**CHAIN OF CUSTODY**

COC#: 16273

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: SC-DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0960_MW135	Clear Plastic Bottle - Natural	250 mL	00070719042020	Green	No	
001	0960_MW135	HDPE (no PTFE)	20 mL	00350019106698	Grey	No	
001	0960_MW135	HDPE (no PTFE)	20 mL	00350019106687	Grey	No	
001	0960_MW135	Amber TOC Vial - Sulfuric Acid	40 mL	00181019023251	Purple	No	
002	0960_QC303	HDPE (no PTFE)	20 mL	00352005006839	Grey	No	
002	0960_QC303	HDPE (no PTFE)	20 mL	00352005006670	Grey	No	
003	0960_QC401	HDPE (no PTFE)	20 mL	00352005007497	Grey	No	
003	0960_QC401	HDPE (no PTFE)	20 mL	00352005002562	Grey	No	

Total Bottle Count: ALS: 8, Non ALS: 0

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : EP2013120

Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: maelle.bourdais@cardno.com.au	E-mail	: nick.courts@alsglobal.com
Telephone	: ----	Telephone	: +61-8-9406 1301
Facsimile	: ----	Facsimile	: +61-8-9406 1399
Project	: WA_0960_PFASOMP	Page	: 1 of 3
Order number	: DEF19009/0960	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 16273	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/Learmonth		
Sampler	: MAELLE BOURDAIS, Shaun Chambers		

Dates

Date Samples Received	: 25-Nov-2020 15:00	Issue Date	: 25-Nov-2020
Client Requested Due Date	: 04-Dec-2020	Scheduled Reporting Date	: 04-Dec-2020

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 4	Temperature	: 23.2 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 3 / 3

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepancies: extra samples, samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.



Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G & PFAS - Full Suite (28 analytes)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2013120-001	21-Nov-2020 09:21	0960_MW135_201121	✓	✓	✓	✓	✓	✓
EP2013120-002	21-Nov-2020 10:25	0960_QC303_201121				✓		
EP2013120-003	21-Nov-2020 10:26	0960_QC401_201121				✓		

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP005 Total Organic Carbon (TOC)
EP2013120-001	21-Nov-2020 09:21	0960_MW135_201121	✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **WATER**

Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method	Container	Due for extraction	Due for analysis	Samples Received		Instructions Received	
Client Sample ID(s)				Date	Evaluation	Date	Evaluation
EA005-P: pH by PC Titrator							
0960_MW135_201121	Clear Plastic Bottle - Natural	----	21-Nov-2020	25-Nov-2020	✗	----	----

ACCOUNTS PAYABLE (WA)

Email claire.armstrong@cardno.com.au

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- [illegible]

Email derp.labreports@esdat.com.au

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- [illegible]

CERTIFICATE OF ANALYSIS

Work Order : **EP2013120**
Client : **CARDNO (WA) PTY LTD**
Contact : **MAELLE BOURDAIS**
Address : **11 HARVEST TERRACE PO BOX 155**
WEST PERTH WA, AUSTRALIA 6006
Telephone : **----**
Project : **WA_0960_PFASOMP**
Order number : **DEF19009/0960**
C-O-C number : **16273**
Sampler : **MAELLE BOURDAIS, Shaun Chambers**
Site : **DEF19009/Learmonth**
Quote number : **SY/139/19**
No. of samples received : **3**
No. of samples analysed : **3**

Page : 1 of 6
Laboratory : Environmental Division Perth
Contact : Nick Courts
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 25-Nov-2020 15:00
Date Analysis Commenced : 27-Nov-2020
Issue Date : 04-Dec-2020 22:33



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0960_MW135_201121	0960_QC303_201121	0960_QC401_201121	----	----
Sampling date / time					21-Nov-2020 09:21	21-Nov-2020 10:25	21-Nov-2020 10:26	----	----
Compound	CAS Number	LOR	Unit		EP2013120-001	EP2013120-002	EP2013120-003	-----	-----
				Result	Result	Result		----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.78	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		21200	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		15100	----	----	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L		<1	----	----	----	----
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L		<1	----	----	----	----
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L		262	----	----	----	----
Total Alkalinity as CaCO ₃	----	1	mg/L		262	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA									
Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L		1740	----	----	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		12400	----	----	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		412	----	----	----	----
Magnesium	7439-95-4	1	mg/L		881	----	----	----	----
Sodium	7440-23-5	1	mg/L		6610	----	----	----	----
Potassium	7440-09-7	1	mg/L		371	----	----	----	----
EN055: Ionic Balance									
∅ Total Anions	----	0.01	meq/L		391	----	----	----	----
∅ Total Cations	----	0.01	meq/L		390	----	----	----	----
∅ Ionic Balance	----	0.01	%		0.15	----	----	----	----
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		11	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	<0.02	----	----



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW135_201121	0960_QC303_201121	0960_QC401_201121	----	----
Sampling date / time				21-Nov-2020 09:21	21-Nov-2020 10:25	21-Nov-2020 10:26	----	----
Compound	CAS Number	LOR	Unit	EP2013120-001	EP2013120-002	EP2013120-003	-----	-----
				Result	Result	Result	----	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	----	----



Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0960_MW135_201121	0960_QC303_201121	0960_QC401_201121	----	----
Sampling date / time					21-Nov-2020 09:21	21-Nov-2020 10:25	21-Nov-2020 10:26	----	----
Compound	CAS Number	LOR	Unit		EP2013120-001	EP2013120-002	EP2013120-003	-----	-----
				Result	Result	Result		----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	<0.01	<0.01	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	<0.01	<0.01	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	<0.01	<0.01	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		91.3	80.9	86.3	----	----
13C8-PFOA	----	0.02	%		93.0	98.8	96.1	----	----



Surrogate Control Limits

Sub-Matrix: GROUNDWATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

QUALITY CONTROL REPORT

Work Order	: EP2013120	Page	: 1 of 6
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 25-Nov-2020
Order number	: DEF19009/0960	Date Analysis Commenced	: 27-Nov-2020
C-O-C number	: 16273	Issue Date	: 04-Dec-2020
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: DEF19009/Learmonth		
Quote number	: SY/139/19		
No. of samples received	: 3		
No. of samples analysed	: 3		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
 CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
 LOR = Limit of reporting
 RPD = Relative Percentage Difference
 # = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA005P: pH by PC Titrator (QC Lot: 3394155)									
EP2013159-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.57	7.58	0.132	0% - 20%
EP2013122-003	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.81	7.83	0.256	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3388017)									
EP2013053-012	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	2270	2260	0.531	0% - 20%
EP2013053-020	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	7080	6990	1.25	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3388018)									
EP2013114-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	566	557	1.56	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3394151)									
EP2012897-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	114	109	4.66	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	114	109	4.66	0% - 20%
EP2012917-010	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	145	146	0.836	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	145	146	0.836	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3384263)									
EP2012946-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2890	2880	0.281	0% - 20%
EP2012957-002	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2480	2410	2.68	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3384264)									
EP2012946-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	24000	23900	0.790	0% - 20%
EP2012957-002	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	26500	25200	4.74	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3385623)									
EP2012956-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	309	300	2.79	0% - 20%

Page : 3 of 6
 Work Order : EP2013120
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
ED093F: Dissolved Major Cations (QC Lot: 3385623) - continued									
EP2012956-001	Anonymous	ED093F: Magnesium	7439-95-4	1	mg/L	827	804	2.87	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	8410	8160	3.00	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	469	457	2.59	0% - 20%
EP2013122-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	38	39	0.00	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	21	21	0.00	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	93	95	1.29	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	10	10	0.00	0% - 50%
EP005: Total Organic Carbon (TOC) (QC Lot: 3400473)									
EP2012943-001	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	4	4	0.00	No Limit
EP2013162-002	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	2	1	0.00	No Limit



Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EA005P: pH by PC Titrator (QCLot: 3394155)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3388017)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	101	88.1	114
				<10	1000 mg/L	101	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3388018)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	112	89.1	120
				<5	1000 mg/L	102	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3394151)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	103	81.2	126
				<1	200 mg/L	99.6	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3384263)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	102	87.7	113
				<1	500 mg/L	103	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3384264)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	105	87.9	114
				<1	1000 mg/L	104	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3385623)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	100	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	101	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	98.8	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	98.1	89.7	108
EP005: Total Organic Carbon (TOC) (QCLot: 3400473)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	100	87.2	116
				<1	100 mg/L	96.7	87.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3392922)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	79.6	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	86.4	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	94.8	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	104	69.0	134



Sub-Matrix: **WATER**

Method: Compound				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
						LCS	Low	High
CAS Number	LOR	Unit	Result					
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3392922) - continued								
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	79.2	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	112	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3392922)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	84.8	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	80.4	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	95.8	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	91.4	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	87.8	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	84.4	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	98.6	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	84.2	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	104	72.0	134
EP231X: Perfluorotridecanoic acid (PFTriDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	94.4	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	80.6	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3392922)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	105	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	72.0	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	107	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	81.6	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	80.5	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	117	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	107	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3392922)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	81.0	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	118	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	70.8	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	99.2	71.4	144

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Laboratory sample ID				Matrix Spike (MS) Report			
				Spike Concentration	Spike Recovery(%)	Recovery Limits (%)	
					MS	Low	High
Sample ID	Method: Compound	CAS Number					

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 Project : WA_0960_PFASOMP



Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3384263)							
EP2012946-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3384264)							
EP2012946-001	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	# Not Determined	70.0	130
EP005: Total Organic Carbon (TOC) (QCLot: 3400473)							
EP2012943-004	Anonymous	EP005: Total Organic Carbon	----	100 mg/L	93.9	70.0	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2013120	Page	: 1 of 6
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 25-Nov-2020
Site	: DEF19009/Learmonth	Issue Date	: 04-Dec-2020
Sampler	: MAELLE BOURDAIS, Shaun Chambers	No. of samples received	: 3
Order number	: DEF19009/0960	No. of samples analysed	: 3

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- Matrix Spike outliers exist - please see following pages for full details.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- Quality Control Sample Frequency Outliers exist - please see following pages for full details.

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 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA	EP2012946--001	Anonymous	Sulfate as SO4 - Turbidimetric	14808-79-8	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
ED045G: Chloride by Discrete Analyser	EP2012946--001	Anonymous	Chloride	16887-00-6	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator						
Clear Plastic Bottle - Natural 0960_MW135_201121	----	----	----	01-Dec-2020	21-Nov-2020	10

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	12	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	12	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for **VOC in soils** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural (EA005-P) 0960_MW135_201121	21-Nov-2020	----	----	----	01-Dec-2020	21-Nov-2020	✖

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 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H) 0960_MW135_201121	21-Nov-2020	----	----	----	27-Nov-2020	28-Nov-2020	✓
EA025: Total Suspended Solids dried at 104 ± 2 °C							
Clear Plastic Bottle - Natural (EA025H) 0960_MW135_201121	21-Nov-2020	----	----	----	27-Nov-2020	28-Nov-2020	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P) 0960_MW135_201121	21-Nov-2020	----	----	----	01-Dec-2020	05-Dec-2020	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G) 0960_MW135_201121	21-Nov-2020	----	----	----	03-Dec-2020	19-Dec-2020	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G) 0960_MW135_201121	21-Nov-2020	----	----	----	03-Dec-2020	19-Dec-2020	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Natural (ED093F) 0960_MW135_201121	21-Nov-2020	----	----	----	27-Nov-2020	28-Nov-2020	✓
EP005: Total Organic Carbon (TOC)							
Amber TOC Vial - Sulfuric Acid (EP005) 0960_MW135_201121	21-Nov-2020	----	----	----	03-Dec-2020	19-Dec-2020	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X) 0960_MW135_201121, 0960_QC303_201121, 0960_QC401_201121	21-Nov-2020	01-Dec-2020	20-May-2021	✓	01-Dec-2020	20-May-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X) 0960_MW135_201121, 0960_QC303_201121, 0960_QC401_201121	21-Nov-2020	01-Dec-2020	20-May-2021	✓	01-Dec-2020	20-May-2021	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X) 0960_MW135_201121, 0960_QC303_201121, 0960_QC401_201121	21-Nov-2020	01-Dec-2020	20-May-2021	✓	01-Dec-2020	20-May-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X) 0960_MW135_201121, 0960_QC303_201121, 0960_QC401_201121	21-Nov-2020	01-Dec-2020	20-May-2021	✓	01-Dec-2020	20-May-2021	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X) 0960_MW135_201121, 0960_QC303_201121, 0960_QC401_201121	21-Nov-2020	01-Dec-2020	20-May-2021	✓	01-Dec-2020	20-May-2021	✓



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	12	0.00	10.00	✗	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	4	25.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	19	10.53	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	12	8.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	4	50.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	19	10.53	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	12	8.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	4	25.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	19	5.26	5.26	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	12	0.00	5.00	✗	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of 'filterable' residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C. This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Total Organic Carbon	EP005	WATER	In house: Referenced to APHA 5310 B, The automated TOC analyzer determines Total and Inorganic Carbon by IR cell. TOC is calculated as the difference. This method is compliant with NEPM Schedule B(3)
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

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Project : WA_0960_PPFASOMP



Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

**CHAIN OF CUSTODY**

COC#: 16274

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: SC-DEF19009/Learmonth SED

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

25/11 1500

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS: 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS**ANALYSIS REQUIRED**

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Sediments SEDIMENT	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0960_SS288		21/11/2020 09:21 AM	Soil	ALS: 2 Non ALS: 0	No	X		

Environmental Division
Perth

Work Order Reference

EP2013121



Telephone: +61-8-9406 1301

**CHAIN OF CUSTODY**

COC#: 16274 ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: SC-DEF19009/Learmonth SED

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:

SAMPLER MOBILE:

QUOTE NO: SY/139/19

/ ES2019CARBSD0002

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0960_SS288	Soil Glass Jar - Unpreserved	150 mL	00260220013131	Orange	No	
001	0960_SS288	HDPE Soil Jar	200 mL	00620719026390	Grey	No	

Total Bottle Count: ALS: 2, Non ALS: 0

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : EP2013121

<p>Client : CARDNO (WA) PTY LTD</p> <p>Contact : MAELLE BOURDAIS</p> <p>Address : 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006</p> <p>E-mail : maelle.bourdais@cardno.com.au</p> <p>Telephone : ----</p> <p>Facsimile : ----</p> <p>Project : WA_0960_PFASOMP</p> <p>Order number : DEF19009/0960</p> <p>C-O-C number : 16274</p> <p>Site : DEF19009/Learmonth</p> <p>Sampler : MAELLE BOURDAIS, Shaun Chambers</p>	<p>Laboratory : Environmental Division Perth</p> <p>Contact : Nick Courts</p> <p>Address : 26 Rigali Way Wangara WA Australia 6065</p> <p>E-mail : nick.courts@alsglobal.com</p> <p>Telephone : +61-8-9406 1301</p> <p>Facsimile : +61-8-9406 1399</p> <p>Page : 1 of 2</p> <p>Quote number : ES2019CARBSD0002 (SY/139/19)</p> <p>QC Level : NEPM 2013 B3 & ALS QC Standard</p>
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Dates

Date Samples Received : 25-Nov-2020 15:00	Issue Date : 25-Nov-2020
Client Requested Due Date : 04-Dec-2020	Scheduled Reporting Date : 04-Dec-2020

Delivery Details

Mode of Delivery : Carrier	Security Seal : Not Available
No. of coolers/boxes : 4	Temperature : 23.2 - Ice present
Receipt Detail :	No. of samples received / analysed : 1 / 1

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepancies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- ### Summary of Sample(s) and Requested Analysis

Laboratory sample ID	Sampling date / time	Sample ID	SOIL - A - Agriculture	SOIL - E - Moisture	SOIL - E - Organic	SOIL - E - PFAS - I
EP2013121-001	21-Nov-2020 09:21	0960_SS288_201121	✓	✓	✓	✓

Sample(s) have been received within the recommended holding times for the requested analysis.

Email maele.bourdais@cardno.com.au

CERTIFICATE OF ANALYSIS

Work Order : **EP2013121**
Client : **CARDNO (WA) PTY LTD**
Contact : **MAELLE BOURDAIS**
Address : **11 HARVEST TERRACE PO BOX 155**
WEST PERTH WA, AUSTRALIA 6006
Telephone : **----**
Project : **WA_0960_PFASOMP**
Order number : **DEF19009/0960**
C-O-C number : **16274**
Sampler : **MAELLE BOURDAIS, Shaun Chambers**
Site : **DEF19009/Learmonth**
Quote number : **SY/139/19**
No. of samples received : **1**
No. of samples analysed : **1**

Page : 1 of 6
Laboratory : Environmental Division Perth
Contact : Nick Courts
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 25-Nov-2020 15:00
Date Analysis Commenced : 30-Nov-2020
Issue Date : 04-Dec-2020 17:05



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H⁺ + Al³⁺).
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)			Sample ID	0960_SS288_201121	----	----	----	----
Sampling date / time				21-Nov-2020 09:21	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2013121-001	-----	-----	-----	-----
Result				----	----	----	----	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	9.5	----	----	----	----
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	5970	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	27.2	----	----	----	----
ED008: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	16.8	----	----	----	----
Exchangeable Magnesium	----	0.1	meq/100g	3.3	----	----	----	----
Exchangeable Potassium	----	0.1	meq/100g	0.2	----	----	----	----
Exchangeable Sodium	----	0.1	meq/100g	0.2	----	----	----	----
Cation Exchange Capacity	----	0.1	meq/100g	20.6	----	----	----	----
Exchangeable Sodium Percent	----	0.1	%	1.2	----	----	----	----
EP004: Organic Matter								
Organic Matter	----	0.5	%	1.0	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0080	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	----	----	----	----



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SS288_201121	----	----	----	----
Sampling date / time				21-Nov-2020 09:21	----	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2013121-001	-----	-----	-----	-----	-----
Result				----	----	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids - Continued									
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	----	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	----	----	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	----	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	----	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	----	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	----	----	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	----	----	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	----	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	----	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	----	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	----	----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	----	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	----	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	----	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	----	----	----	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg	0.0080	----	----	----	----	----



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SS288_201121	----	----	----	----
				Sampling date / time	21-Nov-2020 09:21	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2013121-001	-----	-----	-----	-----
				Result		----	----	----	----
EP231P: PFAS Sums - Continued									
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		0.0080	----	----	----	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		0.0080	----	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		97.0	----	----	----	----
13C8-PFOA	----	0.0002	%		103	----	----	----	----

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Work Order : EP2013121
Client : CARDNO (WA) PTY LTD
Project : WA_0960_PFASOMP



Surrogate Control Limits

Sub-Matrix: **SEDIMENT**

		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

QUALITY CONTROL REPORT

Work Order	: EP2013121	Page	: 1 of 7
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 25-Nov-2020
Order number	: DEF19009/0960	Date Analysis Commenced	: 30-Nov-2020
C-O-C number	: 16274	Issue Date	: 04-Dec-2020
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: DEF19009/Learmonth		
Quote number	: SY/139/19		
No. of samples received	: 1		
No. of samples analysed	: 1		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
= Indicates failed QC

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA002: pH 1:5 (Soils) (QC Lot: 3391232)									
EP2012944-011	Anonymous	EA002: pH Value	----	0.1	pH Unit	8.7	8.7	0.00	0% - 20%
EP2012955-001	Anonymous	EA002: pH Value	----	0.1	pH Unit	8.4	8.4	0.00	0% - 20%
EA010: Conductivity (1:5) (QC Lot: 3391233)									
EP2012944-011	Anonymous	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	9440	9440	0.00	0% - 20%
EP2012955-001	Anonymous	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	20200	20200	0.0991	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3391356)									
EP2013121-001	0960_SS288_201121	EA055: Moisture Content	----	0.1	%	27.2	24.9	8.87	0% - 20%
ED008: Exchangeable Cations (QC Lot: 3391843)									
EP2012945-001	Anonymous	ED008: Exchangeable Sodium Percent	----	0.1	%	2.4	2.8	18.2	0% - 20%
		ED008: Exchangeable Calcium	----	0.1	meq/100g	41.8	38.0	9.46	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	19.6	16.9	14.8	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	2.5	2.4	0.00	0% - 20%
		ED008: Exchangeable Sodium	----	0.1	meq/100g	1.6	1.7	7.92	0% - 50%
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	65.4	59.0	10.3	0% - 20%
EP2012955-005	Anonymous	ED008: Exchangeable Sodium Percent	----	0.1	%	0.6	0.6	0.00	No Limit
		ED008: Exchangeable Calcium	----	0.1	meq/100g	19.7	19.6	0.00	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	2.6	2.6	0.00	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	0.5	0.5	0.00	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	0.1	0.1	0.00	No Limit
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	22.9	22.8	0.00	0% - 20%
EP004: Organic Matter (QC Lot: 3391849)									
EP2012955-001	Anonymous	EP004: Organic Matter	----	0.5	%	1.2	1.2	0.00	No Limit
EP2013240-001	Anonymous	EP004: Organic Matter	----	0.5	%	<0.5	<0.5	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3395357)									



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3395357) - continued									
EP2012945-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	0.0009	0.0008	19.1	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0284	0.0249	12.8	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	0.0010	0.0010	0.00	No Limit
EP2013163-003	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3395357)									
EP2012945-001	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP2013163-003	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3395357)									
EP2012945-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3395357) - continued									
EP2012945-001	Anonymous	EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP2013163-003	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3395357)									
EP2012945-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP2013163-003	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
	Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
		LCS	Low	High
----	4 pH Unit	100	70.0	130
----	7 pH Unit	100	70.0	130
<1	1412 µS/cm	100	93.6	106
<0.1	22.1 meq/100g	94.1	78.7	111
<0.1	1.56 meq/100g	97.5	77.6	111
<0.1	0.91 meq/100g	111	86.9	116
<0.1	0.38 meq/100g	126	72.3	129
<0.1	----	----	----	----
<0.1	24.95 meq/100g	95.4	79.9	110
<0.5	2.3 %	95.6	70.0	120
<0.5	85 %	82.5	70.0	120
<0.0002	0.00125 mg/kg	78.0	72.0	128
<0.0002	0.00125 mg/kg	83.2	73.0	123
<0.0002	0.00125 mg/kg	78.0	67.0	130
<0.0002	0.00125 mg/kg	82.4	70.0	132
<0.0002	0.00125 mg/kg	81.6	68.0	136
<0.0002	0.00125 mg/kg	80.0	59.0	134
<0.001	0.00625 mg/kg	83.1	71.0	135
<0.0002	0.00125 mg/kg	81.2	69.0	132
<0.0002	0.00125 mg/kg	100	70.0	132
<0.0002	0.00125 mg/kg	90.8	71.0	131
<0.0002	0.00125 mg/kg	83.2	69.0	133
<0.0002	0.00125 mg/kg	82.8	72.0	129
<0.0002	0.00125 mg/kg	81.2	69.0	133
<0.0002	0.00125 mg/kg	83.6	64.0	136
<0.0002	0.00125 mg/kg	85.2	69.0	135
<0.0002	0.00125 mg/kg	106	66.0	139
<0.0005	0.00312 mg/kg	124	69.0	133



Sub-Matrix: SOIL				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3395357) - continued								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.0	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	98.7	71.6	129
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	87.2	69.8	131
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	101	68.7	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	105	65.1	134
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	94.4	63.0	144
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	82.8	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3395357)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	79.6	62.0	145
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	89.6	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	84.8	65.0	137
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	103	69.2	143

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: SOIL				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3395357)							
EP2012945-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	82.8	72.0	128
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	97.6	73.0	123
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	80.8	67.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	98.4	70.0	132
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	# Not Determined	68.0	136
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	88.0	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3395357)							
EP2012945-001	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	84.7	71.0	135
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	75.2	69.0	132
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	113	70.0	132
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	96.8	71.0	131
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	99.6	69.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	82.4	72.0	129



Sub-Matrix: **SOIL**

Sub-Matrix: SOIL				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3395357) - continued							
EP2012945-001	Anonymous	EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	102	69.0	133
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	116	64.0	136
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	108	69.0	135
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	106	66.0	139
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	98.2	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3395357)							
EP2012945-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	83.2	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	91.5	71.6	129
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	81.6	69.8	131
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	83.3	68.7	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	76.6	65.1	134
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	77.2	63.0	144
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	78.8	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3395357)							
EP2012945-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	86.0	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	95.6	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	105	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	87.2	69.2	143

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2013121	Page	: 1 of 5
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 25-Nov-2020
Site	: DEF19009/Learmonth	Issue Date	: 04-Dec-2020
Sampler	: MAELLE BOURDAIS, Shaun Chambers	No. of samples received	: 1
Order number	: DEF19009/0960	No. of samples analysed	: 1

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- Matrix Spike outliers exist - please see following pages for full details.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- **NO** Quality Control Sample Frequency Outliers exist.

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 Work Order : EP2013121
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EP231A: Perfluoroalkyl Sulfonic Acids	EP2012945--001	Anonymous	Perfluorooctane sulfonic acid (PFOS)	1763-23-1	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

Outliers : Analysis Holding Time Compliance

Matrix: **SOIL**

Method	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA002: pH 1:5 (Soils)						
Soil Glass Jar - Unpreserved 0960_SS288_201121	30-Nov-2020	28-Nov-2020	2	----	----	----
EA010: Conductivity (1:5)						
Soil Glass Jar - Unpreserved 0960_SS288_201121	30-Nov-2020	28-Nov-2020	2	----	----	----

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA002: pH 1:5 (Soils)							
Soil Glass Jar - Unpreserved (EA002) 0960_SS288_201121	21-Nov-2020	30-Nov-2020	28-Nov-2020	✖	30-Nov-2020	30-Nov-2020	✔
EA010: Conductivity (1:5)							
Soil Glass Jar - Unpreserved (EA010) 0960_SS288_201121	21-Nov-2020	30-Nov-2020	28-Nov-2020	✖	30-Nov-2020	28-Dec-2020	✔
EA055: Moisture Content (Dried @ 105-110°C)							
Soil Glass Jar - Unpreserved (EA055) 0960_SS288_201121	21-Nov-2020	----	----	----	30-Nov-2020	05-Dec-2020	✔
ED008: Exchangeable Cations							
Soil Glass Jar - Unpreserved (ED008) 0960_SS288_201121	21-Nov-2020	03-Dec-2020	19-Dec-2020	✔	03-Dec-2020	19-Dec-2020	✔

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 Work Order : EP2013121
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP004: Organic Matter							
Soil Glass Jar - Unpreserved (EP004) 0960_SS288_201121	21-Nov-2020	03-Dec-2020	19-Dec-2020	✓	03-Dec-2020	19-Dec-2020	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE Soil Jar (EP231X) 0960_SS288_201121	21-Nov-2020	02-Dec-2020	20-May-2021	✓	02-Dec-2020	11-Jan-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE Soil Jar (EP231X) 0960_SS288_201121	21-Nov-2020	02-Dec-2020	20-May-2021	✓	02-Dec-2020	11-Jan-2021	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE Soil Jar (EP231X) 0960_SS288_201121	21-Nov-2020	02-Dec-2020	20-May-2021	✓	02-Dec-2020	11-Jan-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE Soil Jar (EP231X) 0960_SS288_201121	21-Nov-2020	02-Dec-2020	20-May-2021	✓	02-Dec-2020	11-Jan-2021	✓
EP231P: PFAS Sums							
HDPE Soil Jar (EP231X) 0960_SS288_201121	21-Nov-2020	02-Dec-2020	20-May-2021	✓	02-Dec-2020	11-Jan-2021	✓



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Electrical Conductivity (1:5)	EA010	2	19	10.53	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	2	15	13.33	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	1	9	11.11	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	11	18.18	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	18	11.11	10.00	✔	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	19	10.53	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Electrical Conductivity (1:5)	EA010	1	19	5.26	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	15	6.67	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	11	18.18	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	5.56	5.00	✔	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	19	10.53	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Electrical Conductivity (1:5)	EA010	1	19	5.26	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	15	6.67	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	11	9.09	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	5.56	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	5.56	5.00	✔	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	In house: Referenced to Rayment and Lyons 4A1 and APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Electrical Conductivity (1:5)	EA010	SOIL	In house: Referenced to Rayment and Lyons 3A1 and APHA 2510. Conductivity is determined on soil samples using a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Exchangeable Cations with pre-treatment	ED008	SOIL	In house: Referenced to Rayment & Lyons Method 15A2. Soluble salts are removed from the sample prior to analysis. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM Schedule B(3).
Organic Matter	EP004	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3)
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	SOIL	In-house: Analysis of soils by solvent extraction followed by LC-Electrospray-MS-MS, Negative Mode using MRM using internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Exchangeable Cations Preparation Method	ED007PR	SOIL	In house: Referenced to Rayment & Lyons method 15A1. A 1M NH4Cl extraction by end over end tumbling at a ratio of 1:20. There is no pretreatment for soluble salts. Extracts can be run by ICP for cations.
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
Organic Matter	EP004-PR	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3).
Sample Extraction for PFAS in solid matrices	ORG73	SOIL	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

**CHAIN OF CUSTODY**

COC#: 16168

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: SC - DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

23/11 114m

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

SAMPLE DETAILS**ANALYSIS REQUIRED**

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	Rinsate WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0960_MW114		19/11/2020 08:17 AM	Water	ALS: 4 Non ALS: 0	No	X			
002	0960_MW063		19/11/2020 08:59 AM	Water	ALS: 4 Non ALS: 0	No	X			
003	0960_QC103		19/11/2020 09:00 AM	Water	ALS: 4 Non ALS: 0	No	X			
004	0960_MW162		19/11/2020 09:29 AM	Water	ALS: 4 Non ALS: 0	No	X			
005	0960_MW113		19/11/2020 09:57 AM	Water	ALS: 4 Non ALS: 0	No	X			
006	0960_MW018		19/11/2020 10:37 AM	Water	ALS: 4 Non ALS: 0	No	X			
007	0960_QC106		19/11/2020 10:38 AM	Water	ALS: 4 Non ALS: 0	No	X			
008	0960_MW164		19/11/2020 11:24 AM	Water	ALS: 6 Non ALS: 0	No	X			
009	0960_QC108		19/11/2020 11:25 AM	Water	ALS: 4 Non ALS: 0	No	X			

Environmental Division
Perth
Work Order Reference
EP2012892

Telephone : + 61-8-9406 1301



CHAIN OF CUSTODY

COC#: 16168

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: SC - DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	Rinsate WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
010	0960_MW163		19/11/2020 12:48 PM	Water	ALS: 4 Non ALS: 0	No	X			
011	0960_MW211		19/11/2020 01:09 PM	Water	ALS: 6 Non ALS: 0	No	X			
012	0960_MW148D		19/11/2020 01:34 PM	Water	ALS: 4 Non ALS: 0	No	X			
013	0960_QC301		19/11/2020 03:12 PM	Water	ALS: 2 Non ALS: 0	No		X		
014	0960_QC401		19/11/2020 06:27 PM	Water	ALS: 2 Non ALS: 0	No		X		
015	0960_QC302		19/11/2020 06:28 PM	Water	ALS: 2 Non ALS: 0	No		X		
016	0960_QC402		19/11/2020 06:28 PM	Water	ALS: 2 Non ALS: 0	No		X		
017	0960_QC303		19/11/2020 06:29 PM	Water	ALS: 2 Non ALS: 0	No		X		
018	0960_QC403		19/11/2020 06:30 PM	Water	ALS: 2 Non ALS: 0	No		X		

**CHAIN OF CUSTODY**

COC#: 16168

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: SC - DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0960_MW114	Clear Plastic Bottle - Natural	250 mL	00070719062484	Green	No	
001	0960_MW114	HDPE (no PTFE)	20 mL	00352005002542	Grey	No	
001	0960_MW114	HDPE (no PTFE)	20 mL	00352005006693	Grey	No	
001	0960_MW114	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220023800	Purple	No	
002	0960_MW063	Clear Plastic Bottle - Natural	250 mL	00070719062496	Green	No	
002	0960_MW063	HDPE (no PTFE)	20 mL	00352005007519	Grey	No	
002	0960_MW063	HDPE (no PTFE)	20 mL	00352005006623	Grey	No	
002	0960_MW063	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220023919	Purple	No	
003	0960_QC103	Clear Plastic Bottle - Natural	250 mL	00070719062440	Green	No	
003	0960_QC103	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220023771	Purple	No	
003	0960_QC103	HDPE (no PTFE)	20 mL	00352005002694	Grey	No	
003	0960_QC103	HDPE (no PTFE)	20 mL	00352005002594	Grey	No	
004	0960_MW162	Clear Plastic Bottle - Natural	250 mL	00070719062289	Green	No	
004	0960_MW162	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220023942	Purple	No	
004	0960_MW162	HDPE (no PTFE)	20 mL	00352005006739	Grey	No	
004	0960_MW162	HDPE (no PTFE)	20 mL	00352005007507	Grey	No	
005	0960_MW113	Clear Plastic Bottle - Natural	250 mL	00070719062339	Green	No	
005	0960_MW113	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220023818	Purple	No	
005	0960_MW113	HDPE (no PTFE)	20 mL	00352005002645	Grey	No	
005	0960_MW113	HDPE (no PTFE)	20 mL	00352005006597	Grey	No	
006	0960_MW018	Clear Plastic Bottle - Natural	250 mL	00070719062481	Green	No	
006	0960_MW018	HDPE (no PTFE)	20 mL	00352005006665	Grey	No	
006	0960_MW018	HDPE (no PTFE)	20 mL	00352005006745	Grey	No	
006	0960_MW018	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220023587	Purple	No	
007	0960_QC106	Clear Plastic Bottle - Natural	250 mL	00070719062436	Green	No	
007	0960_QC106	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220023885	Purple	No	

**CHAIN OF CUSTODY**

COC#: 16168

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFASOMP

SITE: SC - DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

007	0960_QC106	HDPE (no PTFE)	20 mL	00352005002661	Grey	No	
007	0960_QC106	HDPE (no PTFE)	20 mL	00352005006618	Grey	No	
008	0960_MW164	Clear Plastic Bottle - Natural	250 mL	00070719062562	Green	No	
008	0960_MW164	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023697	Purple	No	
008	0960_MW164	HDPE (no PTFE)	20 mL	00350019106732	Grey	No	
008	0960_MW164	HDPE (no PTFE)	20 mL	00352005006290	Grey	No	
008	0960_MW164	HDPE (no PTFE)	20 mL	00352005005083	Grey	No	
008	0960_MW164	HDPE (no PTFE)	20 mL	00350019106896	Grey	No	
009	0960_QC108	Clear Plastic Bottle - Natural	250 mL	00070719042932	Green	No	
009	0960_QC108	HDPE (no PTFE)	20 mL	00352005006736	Grey	No	
009	0960_QC108	HDPE (no PTFE)	20 mL	00352005006654	Grey	No	
009	0960_QC108	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220058166	Purple	No	
010	0960_MW163	Clear Plastic Bottle - Natural	250 mL	00070719042967	Green	No	
010	0960_MW163	HDPE (no PTFE)	20 mL	00350019106895	Grey	No	
010	0960_MW163	HDPE (no PTFE)	20 mL	00350019106914	Grey	No	
010	0960_MW163	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023771	Purple	No	
011	0960_MW211	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023039	Purple	No	
011	0960_MW211	Clear Plastic Bottle - Natural	250 mL	00070719042961	Green	No	
011	0960_MW211	HDPE (no PTFE)	20 mL	00352005007053	Grey	No	
011	0960_MW211	HDPE (no PTFE)	20 mL	00352005006860	Grey	No	
011	0960_MW211	HDPE (no PTFE)	20 mL	00350019106713	Grey	No	
011	0960_MW211	HDPE (no PTFE)	20 mL	00350019106771	Grey	No	
012	0960_MW148D	Clear Plastic Bottle - Natural	250 mL	00070719042942	Green	No	
012	0960_MW148D	HDPE (no PTFE)	20 mL	00350019106709	Grey	No	
012	0960_MW148D	HDPE (no PTFE)	20 mL	00350019106840	Grey	No	
012	0960_MW148D	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023727	Purple	No	
013	0960_QC301	HDPE (no PTFE)	20 mL	00350019157148	Grey	No	



CHAIN OF CUSTODY

COC#: 16168

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: SC - DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

013	0960_QC301	HDPE (no PTFE)	20 mL	00350019156992	Grey	No	
014	0960_QC401	HDPE (no PTFE)	20 mL	00350019154315	Grey	No	
014	0960_QC401	HDPE (no PTFE)	20 mL	00350019154320	Grey	No	
015	0960_QC302	HDPE (no PTFE)	20 mL	00350019154348	Grey	No	
015	0960_QC302	HDPE (no PTFE)	20 mL	00350019154304	Grey	No	
016	0960_QC402	HDPE (no PTFE)	20 mL	00350019154473	Grey	No	
016	0960_QC402	HDPE (no PTFE)	20 mL	00350019154368	Grey	No	
017	0960_QC303	HDPE (no PTFE)	20 mL	00350019154328	Grey	No	
017	0960_QC303	HDPE (no PTFE)	20 mL	00350019154496	Grey	No	
018	0960_QC403	HDPE (no PTFE)	20 mL	00350019154312	Grey	No	
018	0960_QC403	HDPE (no PTFE)	20 mL	00350019154255	Grey	No	

Total Bottle Count: ALS: 64, Non ALS: 0

**SAMPLE RECEIPT NOTIFICATION (SRN)****Work Order : EP2012892**

Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: maelle.bourdais@cardno.com.au	E-mail	: nick.courts@alsglobal.com
Telephone	: ----	Telephone	: +61-8-9406 1301
Facsimile	: ----	Facsimile	: +61-8-9406 1399
Project	: WA_0960_PFASOMP	Page	: 1 of 4
Order number	: DEF19009/0960	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 16168	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/Learmonth		
Sampler	: MAELLE BOURDAIS, Shaun Chambers		

Dates

Date Samples Received	: 23-Nov-2020 11:00	Issue Date	: 24-Nov-2020
Client Requested Due Date	: 03-Dec-2020	Scheduled Reporting Date	: 03-Dec-2020

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 3	Temperature	: 25.0 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 18 / 18

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepancies: extra samples, samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.



Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2012892-001	19-Nov-2020 08:17	0960_MW114_201119	✓	✓	✓	✓	✓	✓	✓
EP2012892-002	19-Nov-2020 08:59	0960_MW063_201119	✓	✓	✓	✓	✓	✓	✓
EP2012892-003	19-Nov-2020 09:00	0960_QC103_201119	✓	✓	✓	✓	✓	✓	✓
EP2012892-004	19-Nov-2020 09:29	0960_MW162_201119	✓	✓	✓	✓	✓	✓	✓
EP2012892-005	19-Nov-2020 09:57	0960_MW113_201119	✓	✓	✓	✓	✓	✓	✓
EP2012892-006	19-Nov-2020 10:37	0960_MW018_201119	✓	✓	✓	✓	✓	✓	✓
EP2012892-007	19-Nov-2020 10:38	0960_QC106_201119	✓	✓	✓	✓	✓	✓	✓
EP2012892-008	19-Nov-2020 11:24	0960_MW164_201119	✓	✓	✓	✓	✓	✓	✓
EP2012892-009	19-Nov-2020 11:25	0960_QC108_201119	✓	✓	✓	✓	✓	✓	✓
EP2012892-010	19-Nov-2020 12:48	0960_MW163_201119	✓	✓	✓	✓	✓	✓	✓
EP2012892-011	19-Nov-2020 13:09	0960_MW211_201119	✓	✓	✓	✓	✓	✓	✓
EP2012892-012	19-Nov-2020 13:34	0960_MW148D_201119	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2012892-001	19-Nov-2020 08:17	0960_MW114_201119	✓
EP2012892-002	19-Nov-2020 08:59	0960_MW063_201119	✓
EP2012892-003	19-Nov-2020 09:00	0960_QC103_201119	✓
EP2012892-004	19-Nov-2020 09:29	0960_MW162_201119	✓
EP2012892-005	19-Nov-2020 09:57	0960_MW113_201119	✓
EP2012892-006	19-Nov-2020 10:37	0960_MW018_201119	✓
EP2012892-007	19-Nov-2020 10:38	0960_QC106_201119	✓
EP2012892-008	19-Nov-2020 11:24	0960_MW164_201119	✓
EP2012892-009	19-Nov-2020 11:25	0960_QC108_201119	✓
EP2012892-010	19-Nov-2020 12:48	0960_MW163_201119	✓
EP2012892-011	19-Nov-2020 13:09	0960_MW211_201119	✓
EP2012892-012	19-Nov-2020 13:34	0960_MW148D_201119	✓



				WATER - EP231X PFAS - Full Suite (28 analytes)
EP2012892-013	19-Nov-2020 15:12	0960_QC301_201119	✓	
EP2012892-014	19-Nov-2020 18:27	0960_QC401_201119	✓	
EP2012892-015	19-Nov-2020 18:28	0960_QC302_201119	✓	
EP2012892-016	19-Nov-2020 18:28	0960_QC402_201119	✓	
EP2012892-017	19-Nov-2020 18:29	0960_QC303_201119	✓	
EP2012892-018	19-Nov-2020 18:30	0960_QC403_201119	✓	

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **WATER**

Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method Client Sample ID(s)	Container	Due for extraction	Due for analysis	Samples Received		Instructions Received	
				Date	Evaluation	Date	Evaluation
EA005-P: pH by PC Titrator							
0960_MW018_20111	Clear Plastic Bottle - Natural	----	19-Nov-2020	23-Nov-2020	✗	----	----
0960_MW063_20111	Clear Plastic Bottle - Natural	----	19-Nov-2020	23-Nov-2020	✗	----	----
0960_MW113_20111	Clear Plastic Bottle - Natural	----	19-Nov-2020	23-Nov-2020	✗	----	----
0960_MW114_20111	Clear Plastic Bottle - Natural	----	19-Nov-2020	23-Nov-2020	✗	----	----
0960_MW148D_20111	Clear Plastic Bottle - Natural	----	19-Nov-2020	23-Nov-2020	✗	----	----
0960_MW162_20111	Clear Plastic Bottle - Natural	----	19-Nov-2020	23-Nov-2020	✗	----	----
0960_MW163_20111	Clear Plastic Bottle - Natural	----	19-Nov-2020	23-Nov-2020	✗	----	----
0960_MW164_20111	Clear Plastic Bottle - Natural	----	19-Nov-2020	23-Nov-2020	✗	----	----
0960_MW211_20111	Clear Plastic Bottle - Natural	----	19-Nov-2020	23-Nov-2020	✗	----	----
0960_QC103_20111	Clear Plastic Bottle - Natural	----	19-Nov-2020	23-Nov-2020	✗	----	----
0960_QC106_20111	Clear Plastic Bottle - Natural	----	19-Nov-2020	23-Nov-2020	✗	----	----
0960_QC108_20111	Clear Plastic Bottle - Natural	----	19-Nov-2020	23-Nov-2020	✗	----	----

CERTIFICATE OF ANALYSIS

Work Order : **EP2012892**
Client : **CARDNO (WA) PTY LTD**
Contact : **MAELLE BOURDAIS**
Address : **11 HARVEST TERRACE PO BOX 155**
WEST PERTH WA, AUSTRALIA 6006
Telephone : **----**
Project : **WA_0960_PFASOMP**
Order number : **DEF19009/0960**
C-O-C number : **16168**
Sampler : **MAELLE BOURDAIS, Shaun Chambers**
Site : **DEF19009/Learmonth**
Quote number : **SY/139/19**
No. of samples received : **18**
No. of samples analysed : **18**

Page : 1 of 14
Laboratory : Environmental Division Perth
Contact : Nick Courts
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 23-Nov-2020 11:00
Date Analysis Commenced : 25-Nov-2020
Issue Date : 03-Dec-2020 23:15



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Daniel Fisher	Inorganics Analyst	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- TDS by method EA-015 may bias high due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW114_201119	0960_MW063_201119	0960_QC103_201119	0960_MW162_201119	0960_MW113_201119
Sampling date / time				19-Nov-2020 08:17	19-Nov-2020 08:59	19-Nov-2020 09:00	19-Nov-2020 09:29	19-Nov-2020 09:57
Compound	CAS Number	LOR	Unit	EP2012892-001	EP2012892-002	EP2012892-003	EP2012892-004	EP2012892-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.91	8.44	8.41	7.77	7.76
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	5050	1080	1150	7710	6850
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	80	282	597	627	2760
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	23	23	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	464	578	570	511	378
Total Alkalinity as CaCO3	----	1	mg/L	464	600	593	511	378
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	290	38	37	428	268
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	2340	158	157	3840	3060
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	152	4	5	187	216
Magnesium	7439-95-4	1	mg/L	124	4	4	234	189
Sodium	7440-23-5	1	mg/L	1500	368	371	2320	1820
Potassium	7440-09-7	1	mg/L	57	13	13	122	76
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	81.3	17.2	17.0	127	99.4
∅ Total Cations	----	0.01	meq/L	84.5	16.9	17.0	133	107
∅ Ionic Balance	----	0.01	%	1.92	1.08	<0.01	1.99	3.86
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	3	2	<1	7	1
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.07	0.08	0.44	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.20	0.21	0.52	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	3.92	3.90	3.48	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.55	0.62	0.05	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW114_201119	0960_MW063_201119	0960_QC103_201119	0960_MW162_201119	0960_MW113_201119
Sampling date / time				19-Nov-2020 08:17	19-Nov-2020 08:59	19-Nov-2020 09:00	19-Nov-2020 09:29	19-Nov-2020 09:57
Compound	CAS Number	LOR	Unit	EP2012892-001	EP2012892-002	EP2012892-003	EP2012892-004	EP2012892-005
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	2.61	3.25	0.37	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.05	0.05	0.19	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.28	0.30	1.07	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.06	0.06	0.09	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.72	0.78	0.08	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW114_201119	0960_MW063_201119	0960_QC103_201119	0960_MW162_201119	0960_MW113_201119
Sampling date / time				19-Nov-2020 08:17	19-Nov-2020 08:59	19-Nov-2020 09:00	19-Nov-2020 09:29	19-Nov-2020 09:57
Compound	CAS Number	LOR	Unit	EP2012892-001	EP2012892-002	EP2012892-003	EP2012892-004	EP2012892-005
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	8.46	9.25	6.39	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	6.53	7.15	3.85	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	7.71	8.42	5.82	<0.01
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	109	111	114	101	108
13C8-PFOA	----	0.02	%	108	107	105	106	104



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW018_201119	0960_QC106_201119	0960_MW164_201119	0960_QC108_201119	0960_MW163_201119
Sampling date / time				19-Nov-2020 10:37	19-Nov-2020 10:38	19-Nov-2020 11:24	19-Nov-2020 11:25	19-Nov-2020 12:48
Compound	CAS Number	LOR	Unit	EP2012892-006	EP2012892-007	EP2012892-008	EP2012892-009	EP2012892-010
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	8.24	8.12	8.25	8.27	7.89
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	2260	2820	4650	4730	7350
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	1150	399	174	192	104
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L	857	815	766	772	442
Total Alkalinity as CaCO ₃	----	1	mg/L	857	815	766	772	442
ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA								
Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L	294	446	432	433	585
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	475	766	1820	1840	3550
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	12	28	44	39	183
Magnesium	7439-95-4	1	mg/L	16	33	93	91	213
Sodium	7440-23-5	1	mg/L	748	926	1580	1590	2250
Potassium	7440-09-7	1	mg/L	27	35	72	74	108
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	36.6	47.2	75.6	76.3	121
∅ Total Cations	----	0.01	meq/L	35.1	45.3	80.4	80.5	127
∅ Ionic Balance	----	0.01	%	2.09	2.04	3.06	2.64	2.47
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	3	<1	5	4	8
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.15	0.08	0.19	0.15	0.33
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.17	0.10	0.22	0.20	0.53
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	1.32	1.02	1.69	1.52	4.20
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.05	0.03	0.08	0.06	0.29



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0960_MW018_201119	0960_QC106_201119	0960_MW164_201119	0960_QC108_201119	0960_MW163_201119
Sampling date / time				19-Nov-2020 10:37	19-Nov-2020 10:38	19-Nov-2020 11:24	19-Nov-2020 11:25	19-Nov-2020 12:48	
Compound	CAS Number	LOR	Unit	EP2012892-006	EP2012892-007	EP2012892-008	EP2012892-009	EP2012892-010	
				Result	Result	Result	Result	Result	
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.78	0.46	2.01	1.78	2.44	
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	0.1	
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.10	0.07	0.09	0.11	0.27	
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.42	0.28	0.45	0.49	1.28	
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.06	0.04	0.05	0.04	0.13	
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.07	0.05	0.07	0.06	0.18	
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW018_201119	0960_QC106_201119	0960_MW164_201119	0960_QC108_201119	0960_MW163_201119
Sampling date / time				19-Nov-2020 10:37	19-Nov-2020 10:38	19-Nov-2020 11:24	19-Nov-2020 11:25	19-Nov-2020 12:48
Compound	CAS Number	LOR	Unit	EP2012892-006	EP2012892-007	EP2012892-008	EP2012892-009	EP2012892-010
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.37	0.37	0.08
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	3.12	2.13	5.22	4.78	9.83
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	2.10	1.48	3.70	3.30	6.64
Sum of PFAS (WA DER List)	----	0.01	µg/L	2.90	2.00	4.92	4.52	9.01
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	96.1	102	94.8	74.6	77.9
13C8-PFOA	----	0.02	%	106	104	103	75.6	78.6



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW211_201119	0960_MW148D_201119	0960_QC301_201119	0960_QC401_201119	0960_QC302_201119
Sampling date / time				19-Nov-2020 13:09	19-Nov-2020 13:34	19-Nov-2020 15:12	19-Nov-2020 18:27	19-Nov-2020 18:28
Compound	CAS Number	LOR	Unit	EP2012892-011	EP2012892-012	EP2012892-013	EP2012892-014	EP2012892-015
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	8.52	7.61	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	1400	68000	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	216	81	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	49	<1	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	756	207	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	804	207	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	98	3890	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	177	28900	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	2	979	----	----	----
Magnesium	7439-95-4	1	mg/L	6	2080	----	----	----
Sodium	7440-23-5	1	mg/L	479	19000	----	----	----
Potassium	7440-09-7	1	mg/L	20	880	----	----	----
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	23.1	900	----	----	----
∅ Total Cations	----	0.01	meq/L	21.9	1070	----	----	----
∅ Ionic Balance	----	0.01	%	2.57	8.56	----	----	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	5	6	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.18	0.72	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.28	0.69	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	2.65	2.83	<0.02	<0.02	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.09	0.20	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0960_MW211_201119	0960_MW148D_201119 9	0960_QC301_201119	0960_QC401_201119	0960_QC302_201119
Sampling date / time					19-Nov-2020 13:09	19-Nov-2020 13:34	19-Nov-2020 15:12	19-Nov-2020 18:27	19-Nov-2020 18:28
Compound	CAS Number	LOR	Unit	EP2012892-011	EP2012892-012	EP2012892-013	EP2012892-014	EP2012892-015	
				Result	Result	Result	Result	Result	
EP231A: Perfluoroalkyl Sulfonic Acids - Continued									
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	3.27	1.86	<0.01	<0.01	<0.01	
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	0.2	<0.1	<0.1	<0.1	
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.14	0.22	<0.02	<0.02	<0.02	
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.62	1.12	<0.02	<0.02	<0.02	
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.06	0.11	<0.02	<0.02	<0.02	
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.10	0.15	<0.01	<0.01	<0.01	
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW211_201119	0960_MW148D_201119 9	0960_QC301_201119	0960_QC401_201119	0960_QC302_201119
Sampling date / time				19-Nov-2020 13:09	19-Nov-2020 13:34	19-Nov-2020 15:12	19-Nov-2020 18:27	19-Nov-2020 18:28
Compound	CAS Number	LOR	Unit	EP2012892-011	EP2012892-012	EP2012892-013	EP2012892-014	EP2012892-015
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	7.39	8.10	<0.01	<0.01	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	5.92	4.69	<0.01	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L	7.02	7.21	<0.01	<0.01	<0.01
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	74.9	74.2	71.8	79.0	82.7
13C8-PFOA	----	0.02	%	77.9	77.5	80.1	77.3	76.5



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0960_QC402_201119	0960_QC303_201119	0960_QC403_201119	----	----
Sampling date / time				19-Nov-2020 18:28	19-Nov-2020 18:29	19-Nov-2020 18:30	----	----	
Compound	CAS Number	LOR	Unit	EP2012892-016	EP2012892-017	EP2012892-018	-----	-----	
				Result	Result	Result	----	----	
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	----	----	
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	----	----	
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	<0.02	----	----	
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	----	----	
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	----	----	
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	----	----	
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	----	----	
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	----	----	
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	----	----	
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	----	----	
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	----	----	
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	----	----	
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	----	----	
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	----	----	
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	----	----	
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	----	----	
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	----	----	
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	----	----	
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	----	----	
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	----	----	



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_QC402_201119	0960_QC303_201119	0960_QC403_201119	----	----
Sampling date / time				19-Nov-2020 18:28	19-Nov-2020 18:29	19-Nov-2020 18:30	----	----
Compound	CAS Number	LOR	Unit	EP2012892-016	EP2012892-017	EP2012892-018	-----	-----
				Result	Result	Result	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	<0.01	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	<0.01	<0.01	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	77.1	74.2	82.0	----	----
13C8-PFOA	----	0.02	%	76.1	79.9	75.7	----	----



Surrogate Control Limits

Sub-Matrix: GROUNDWATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

QUALITY CONTROL REPORT

Work Order	: EP2012892	Page	: 1 of 8
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 23-Nov-2020
Order number	: DEF19009/0960	Date Analysis Commenced	: 25-Nov-2020
C-O-C number	: 16168	Issue Date	: 03-Dec-2020
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: DEF19009/Learmonth		
Quote number	: SY/139/19		
No. of samples received	: 18		
No. of samples analysed	: 18		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Daniel Fisher	Inorganics Analyst	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
 CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
 LOR = Limit of reporting
 RPD = Relative Percentage Difference
 # = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA005P: pH by PC Titrator (QC Lot: 3394148)									
EP2012802-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.74	7.73	0.129	0% - 20%
EP2012854-007	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.47	7.47	0.00	0% - 20%
EA005P: pH by PC Titrator (QC Lot: 3394150)									
EP2012892-002	0960_MW063_201119	EA005-P: pH Value	----	0.01	pH Unit	8.44	8.43	0.118	0% - 20%
EP2012892-012	0960_MW148D_201119	EA005-P: pH Value	----	0.01	pH Unit	7.61	7.63	0.262	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3385168)									
EP2012892-001	0960_MW114_201119	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	5050	4960	1.80	0% - 20%
EP2012892-009	0960_QC108_201119	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	4730	4670	1.23	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3385169)									
EP2012892-001	0960_MW114_201119	EA025H: Suspended Solids (SS)	----	5	mg/L	80	86	7.50	0% - 50%
EP2012892-011	0960_MW211_201119	EA025H: Suspended Solids (SS)	----	5	mg/L	216	206	4.74	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3394147)									
EP2012802-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	355	375	5.54	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	355	375	5.54	0% - 20%
EP2012854-007	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	208	203	2.11	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	208	203	2.11	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3394149)									
EP2012892-002	0960_MW063_201119	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	23	24	4.74	0% - 20%
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	578	587	1.61	0% - 20%



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
ED037P: Alkalinity by PC Titrator (QC Lot: 3394149) - continued									
EP2012892-002	0960_MW063_201119	ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	600	611	1.73	0% - 20%
EP2012892-012	0960_MW148D_201119	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	207	211	2.16	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	207	211	2.16	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3384177)									
EP2012892-001	0960_MW114_201119	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	290	292	0.490	0% - 20%
EP2012892-011	0960_MW211_201119	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	98	97	0.00	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3384178)									
EP2012892-001	0960_MW114_201119	ED045G: Chloride	16887-00-6	1	mg/L	2340	2380	1.52	0% - 20%
EP2012892-011	0960_MW211_201119	ED045G: Chloride	16887-00-6	1	mg/L	177	179	1.14	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3383137)									
EP2012892-001	0960_MW114_201119	ED093F: Calcium	7440-70-2	1	mg/L	152	157	3.23	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	124	128	3.56	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	1500	1560	4.22	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	57	60	4.68	0% - 20%
EP2012892-011	0960_MW211_201119	ED093F: Calcium	7440-70-2	1	mg/L	2	4	59.2	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	6	9	43.2	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	479	487	1.82	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	20	20	0.00	0% - 50%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3392469)									
EP2012802-001	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	40	40	0.00	0% - 20%
EP2012854-009	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	1	<1	0.00	No Limit
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3392504)									
EP2012892-006	0960_MW018_201119	EP002: Dissolved Organic Carbon	----	1	mg/L	3	5	43.7	No Limit
EP2012894-004	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	4	6	37.2	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3386942)									
EP2012892-008	0960_MW164_201119	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	2.01	2.31	13.9	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.19	0.23	17.7	0% - 50%
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.22	0.24	11.9	0% - 50%
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	1.69	1.96	14.9	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.08	0.09	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3386942)									
EP2012892-008	0960_MW164_201119	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.07	0.08	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.09	0.11	24.1	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.45	0.53	15.0	0% - 20%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.05	0.06	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3386942) - continued									
EP2012892-008	0960_MW164_201119	EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3386942)									
EP2012892-008	0960_MW164_201119	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3386942)									
EP2012892-008	0960_MW164_201119	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	0.37	0.45	20.6	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231P: PFAS Sums (QC Lot: 3386942)									
EP2012892-008	0960_MW164_201119	EP231X: Sum of PFAS	----	0.01	µg/L	5.22	6.06	14.9	0% - 20%



Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result		LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 3394148)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	99.8	98.5	102
				----	7 pH Unit	100	98.5	102
EA005P: pH by PC Titrator (QCLot: 3394150)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3385168)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	99.8	88.1	114
				<10	1000 mg/L	102	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3385169)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	101	89.1	120
				<5	1000 mg/L	102	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3394147)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	109	81.2	126
				<1	200 mg/L	97.5	90.0	110
ED037P: Alkalinity by PC Titrator (QCLot: 3394149)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	107	81.2	126
				<1	200 mg/L	110	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3384177)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	93.6	87.7	113
				<1	500 mg/L	104	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3384178)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	99.2	87.9	114
				<1	1000 mg/L	100	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3383137)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	103	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	107	88.0	110



Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result			Low	High
ED093F: Dissolved Major Cations (QCLot: 3383137) - continued								
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	103	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	100	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3392469)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	113	73.2	116
				<1	100 mg/L	109	73.2	116
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3392504)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	97.6	73.2	116
				<1	100 mg/L	94.3	73.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3386942)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	106	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	104	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	112	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	107	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	101	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	106	53.0	142
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3387598)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	78.2	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	90.2	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	85.6	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	79.8	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	85.6	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	83.0	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3386942)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	85.2	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	93.8	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	110	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	111	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	116	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	108	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	103	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	103	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	127	72.0	134
EP231X: Perfluorotridecanoic acid (PFTriDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	122	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	112	71.0	132
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3387598)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	82.3	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	93.4	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	103	72.0	129



Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3387598) - continued								
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	95.6	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	87.8	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	88.6	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	76.4	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	86.4	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	90.2	72.0	134
EP231X: Perfluorotridecanoic acid (PFTriDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	72.0	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	91.4	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3386942)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	108	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	119	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	130	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	91.4	66.0	1



Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3387598) - continued								
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	111	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	107	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	82.8	71.4	144

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%) Low High	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number				
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3384177)							
EP2012892-001	0960_MW114_201119	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	118	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3384178)							
EP2012892-001	0960_MW114_201119	ED045G: Chloride	16887-00-6	1000 mg/L	98.7	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3392469)							
EP2012802-002	Anonymous	EP002: Dissolved Organic Carbon	----				

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2012892	Page	: 1 of 8
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 23-Nov-2020
Site	: DEF19009/Learmonth	Issue Date	: 03-Dec-2020
Sampler	: MAELLE BOURDAIS, Shaun Chambers	No. of samples received	: 18
Order number	: DEF19009/0960	No. of samples analysed	: 18

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- **NO** Matrix Spike outliers occur.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- Quality Control Sample Frequency Outliers exist - please see following pages for full details.



Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator						
Clear Plastic Bottle - Natural 0960_MW114_201119, 0960_MW063_201119, 0960_QC103_201119, 0960_MW162_201119, 0960_MW113_201119, 0960_MW018_201119, 0960_QC106_201119, 0960_MW164_201119, 0960_QC108_201119, 0960_MW163_201119, 0960_MW211_201119, 0960_MW148D_201119	----	----	----	01-Dec-2020	19-Nov-2020	12

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	1	40	2.50	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	40	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H)							
0960_MW114_201119,	0960_MW063_201119,	19-Nov-2020	----	----	----	26-Nov-2020	26-Nov-2020
0960_QC103_201119,	0960_MW162_201119,						✔
0960_MW113_201119,	0960_MW018_201119,						
0960_QC106_201119,	0960_MW164_201119,						
0960_QC108_201119,	0960_MW163_201119,						
0960_MW211_201119,	0960_MW148D_201119						
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H)							
0960_MW114_201119,	0960_MW063_201119,	19-Nov-2020	----	----	----	26-Nov-2020	26-Nov-2020
0960_QC103_201119,	0960_MW162_201119,						✔
0960_MW113_201119,	0960_MW018_201119,						
0960_QC106_201119,	0960_MW164_201119,						
0960_QC108_201119,	0960_MW163_201119,						
0960_MW211_201119,	0960_MW148D_201119						
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P)							
0960_MW114_201119,	0960_MW063_201119,	19-Nov-2020	----	----	----	01-Dec-2020	03-Dec



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X) 0960_MW114_201119, 0960_QC103_201119, 0960_MW113_201119, 0960_QC106_201119,	0960_MW063_201119, 0960_MW162_201119, 0960_MW018_201119, 0960_MW164_201119	19-Nov-2020	27-Nov-2020	18-May-2021	✔	27-Nov-2020	18-May-2021	✔
HDPE (no PTFE) (EP231X) 0960_QC108_201119, 0960_MW211_201119, 0960_QC301_201119, 0960_QC302_201119, 0960_QC303_201119,	0960_MW163_201119, 0960_MW148D_201119, 0960_QC401_201119, 0960_QC402_201119, 0960_QC403_201119	19-Nov-2020	30-Nov-2020	18-May-2021	✔	30-Nov-2020	18-May-2021	✔
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X) 0960_MW114_201119, 0960_QC103_201119, 0960_MW113_201119, 0960_QC106_201119,	0960_MW063_201119, 0960_MW162_201119, 0960_MW018_201119, 0960_MW164_201119	19-Nov-2020	27-Nov-2020	18-May-2021	✔	27-Nov-2020	18-May-2021	✔
HDPE (no PTFE) (EP231X) 0960_QC108_201119, 0960_MW211_201119, 0960_QC301_201119, 0960_QC302_201119, 0960_QC303_201119,	0960_MW163_201119, 0960_MW148D_201119, 0960_QC401_201119, 0960_QC402_201119, 0960_QC403_201119	19-Nov-2020	30-Nov-2020	18-May-2021	✔	30-Nov-2020	18-May-2021	✔
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X) 0960_MW114_201119, 0960_QC103_20								



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of 'filterable' residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C. This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high temperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.



Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.



CHAIN OF CUSTODY

COC#: 16169

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: SC-DEF19009/Learmonth SED

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

°C

Other comments:

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Sediments SEDIMENT	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0960_SS123_0.00-0.10		19/11/2020 08:26 AM	Soil	ALS: 2 Non ALS: 0	No	X		
002	0960_QC101		19/11/2020 08:27 AM	Soil	ALS: 2 Non ALS: 0	No	X		
003	0960_SS121_0.00-0.10		19/11/2020 10:05 AM	Soil	ALS: 2 Non ALS: 0	No	X		

Environmental Division
Perth

Work Order Reference
EP2012893



Telephone : + 61-8-9406 1301



CHAIN OF CUSTODY

COC#: 16169

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: SC-DEF19009/Learmonth SED

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0960_SS123_0.00-0.10	Soil Glass Jar - Unpreserved	150 mL	00260220013991	Orange	No	
001	0960_SS123_0.00-0.10	HDPE Soil Jar	200 mL	00620719026364	Grey	No	
002	0960_QC101	Soil Glass Jar - Unpreserved	150 mL	00260220014809	Orange	No	
002	0960_QC101	HDPE Soil Jar	200 mL	00620719026338	Grey	No	
003	0960_SS121_0.00-0.10	HDPE Soil Jar	200 mL	00620719008655	Grey	No	
003	0960_SS121_0.00-0.10	Soil Glass Jar - Unpreserved	150 mL	00260220013588	Orange	No	

Total Bottle Count: ALS: 6, Non ALS: 0

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : EP2012893

<p>Client : CARDNO (WA) PTY LTD</p> <p>Contact : MAELLE BOURDAIS</p> <p>Address : 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006</p> <p>E-mail : maelle.bourdais@cardno.com.au</p> <p>Telephone : ----</p> <p>Facsimile : ----</p> <p>Project : WA_0960_PFASOMP</p> <p>Order number : DEF19009/0960</p> <p>C-O-C number : 16169</p> <p>Site : DEF19009/Learmonth</p> <p>Sampler : MAELLE BOURDAIS, Shaun Chambers</p>	<p>Laboratory : Environmental Division Perth</p> <p>Contact : Nick Courts</p> <p>Address : 26 Rigali Way Wangara WA Australia 6065</p> <p>E-mail : nick.courts@alsglobal.com</p> <p>Telephone : +61-8-9406 1301</p> <p>Facsimile : +61-8-9406 1399</p> <p>Page : 1 of 2</p> <p>Quote number : ES2019CARBSD0002 (SY/139/19)</p> <p>QC Level : NEPM 2013 B3 & ALS QC Standard</p>
---	---

Dates

Date Samples Received : 23-Nov-2020 11:00	Issue Date : 24-Nov-2020
Client Requested Due : 03-Dec-2020	Scheduled Reporting Date : 03-Dec-2020
Date	

Delivery Details

Mode of Delivery : Carrier	Security Seal : Not Available
No. of coolers/boxes : 3	Temperature : 25.0 - Ice present
Receipt Detail :	No. of samples received / analysed : 3 / 3

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepancies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- Any sample identifications that cannot be displayed entirely in the analysis summary table will be listed below.

EP2012893-003 : 19-Nov-2020 10:05 : 0960_SS121_0.00-0.10_201119

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Laboratory sample ID	Sampling date / time	Sample ID	SOIL - A - Agriculture	SOIL - E - Moisture	SOIL - F - Organic	SOIL - E - PFAS -
EP2012893-001	19-Nov-2020 08:26	0960_SS123_0.00-0.10...	✓	✓	✓	✓
EP2012893-002	19-Nov-2020 08:27	0960_QC101_201119	✓	✓	✓	✓
EP2012893-003	19-Nov-2020 10:05	0960_SS121_0.00-0.10...	✓	✓	✓	✓

- *AU Certificate of Analysis - NATA (COA)	Email	maelle.bourdais@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	maelle.bourdais@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	maelle.bourdais@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	maelle.bourdais@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	maelle.bourdais@cardno.com.au
- EDI Format - ENMRG (ENMRG)	Email	maelle.bourdais@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	maelle.bourdais@cardno.com.au
- EDI Format - XTab (XTAB)	Email	maelle.bourdais@cardno.com.au

CERTIFICATE OF ANALYSIS

Work Order : **EP2012893**
Client : **CARDNO (WA) PTY LTD**
Contact : **MAELLE BOURDAIS**
Address : **11 HARVEST TERRACE PO BOX 155**
WEST PERTH WA, AUSTRALIA 6006
Telephone : **----**
Project : **WA_0960_PFASOMP**
Order number : **DEF19009/0960**
C-O-C number : **16169**
Sampler : **MAELLE BOURDAIS, Shaun Chambers**
Site : **DEF19009/Learmonth**
Quote number : **SY/139/19**
No. of samples received : **3**
No. of samples analysed : **3**

Page : 1 of 6
Laboratory : Environmental Division Perth
Contact : Nick Courts
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 23-Nov-2020 11:00
Date Analysis Commenced : 24-Nov-2020
Issue Date : 03-Dec-2020 17:49



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X: High Matrix Spike (MS) recovery for analyte "N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE) and N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)" deemed acceptable as all associated analyte results are less than LOR.
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H⁺ + Al³⁺).
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				0960_SS123_0.00-0.1 0_201119	0960_QC101_201119	0960_SS121_0.00-0.1 0_201119	----	----
Sampling date / time				19-Nov-2020 08:26	19-Nov-2020 08:27	19-Nov-2020 10:05	----	----
Compound	CAS Number	LOR	Unit	EP2012893-001	EP2012893-002	EP2012893-003	-----	-----
				Result	Result	Result	----	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	8.8	8.8	8.6	----	----
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	125	127	166	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	0.4	0.8	1.0	----	----
ED007: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	10.6	10.8	14.9	----	----
Exchangeable Magnesium	----	0.1	meq/100g	0.8	0.8	1.9	----	----
Exchangeable Potassium	----	0.1	meq/100g	0.3	0.3	1.2	----	----
Exchangeable Sodium	----	0.1	meq/100g	0.2	0.3	0.6	----	----
Cation Exchange Capacity	----	0.1	meq/100g	12.0	12.2	18.6	----	----
Exchangeable Sodium Percent	----	0.1	%	1.4	2.2	3.4	----	----
EP004: Organic Matter								
Organic Matter	----	0.5	%	<0.5	<0.5	1.0	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	0.0003	0.0003	0.0002	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.127	0.116	0.0505	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	0.0032	0.0046	0.0042	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	<0.001	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	0.0002	<0.0002	<0.0002	----	----

Sub-Matrix: **SEDIMENT**
(Matrix: **SOIL**)

0960_SS123_0.00-0.1
0 201119

0960_SS121_0.00-0.1
0 201119

Sampling date / time

19-Nov-2020 08:26

19-Nov-2020 08:27

19-Nov-2020 10:05

—

—

Compound

CAS Number

LOR

Unit

EP2012893-001

EP2012893-002

EP2012893-003

1000

■■■■■■■■■■

Result

Result

Result

0000-0000-0000-0000

Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	0.0003	0.0004	0.0007	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0005	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.0003	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----

Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----

4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----

EP231P: PFAS Sums



Analytical Results

Sub-Matrix: **SEDIMENT**
 (Matrix: **SOIL**)

Sample ID

				0960_SS123_0.00-0.1 0_201119	0960_QC101_201119	0960_SS121_0.00-0.1 0_201119	----	----
Sampling date / time				19-Nov-2020 08:26	19-Nov-2020 08:27	19-Nov-2020 10:05	----	----
Compound	CAS Number	LOR	Unit	EP2012893-001	EP2012893-002	EP2012893-003	-----	-----
				Result	Result	Result	----	----
EP231P: PFAS Sums - Continued								
Sum of PFAS	----	0.0002	mg/kg	0.131	0.121	0.0564	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	0.127	0.116	0.0507	----	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	0.127	0.116	0.0507	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	102	104	110	----	----
13C8-PFOA	----	0.0002	%	110	118	106	----	----



Surrogate Control Limits

Sub-Matrix: SEDIMENT		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

QUALITY CONTROL REPORT

Work Order	: EP2012893	Page	: 1 of 8
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 23-Nov-2020
Order number	: DEF19009/0960	Date Analysis Commenced	: 24-Nov-2020
C-O-C number	: 16169	Issue Date	: 03-Dec-2020
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: DEF19009/Learmonth		
Quote number	: SY/139/19		
No. of samples received	: 3		
No. of samples analysed	: 3		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key :
 Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
 CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
 LOR = Limit of reporting
 RPD = Relative Percentage Difference
 # = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA002: pH 1:5 (Soils) (QC Lot: 3381257)									
EP2012741-001	Anonymous	EA002: pH Value	----	0.1	pH Unit	9.3	9.6	2.86	0% - 20%
EP2012893-003	0960_SS121_0.00-0.10_20 1119	EA002: pH Value	----	0.1	pH Unit	8.6	8.5	0.00	0% - 20%
EA010: Conductivity (1:5) (QC Lot: 3381256)									
EP2012741-001	Anonymous	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	26400	26600	0.755	0% - 20%
EP2012893-003	0960_SS121_0.00-0.10_20 1119	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	166	166	0.00	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3381261)									
EP2012801-001	Anonymous	EA055: Moisture Content	----	0.1	%	4.9	5.1	4.61	0% - 20%
EP2012895-004	Anonymous	EA055: Moisture Content	----	0.1	%	7.6	7.1	5.76	0% - 20%
ED007: Exchangeable Cations (QC Lot: 3385996)									
EP2012893-001	0960_SS123_0.00-0.10_20 1119	ED007: Exchangeable Sodium Percent	----	0.1	%	1.4	1.4	0.00	0% - 50%
		ED007: Exchangeable Calcium	----	0.1	meq/100g	10.6	9.2	14.8	0% - 20%
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	0.8	0.8	0.00	No Limit
		ED007: Exchangeable Potassium	----	0.1	meq/100g	0.3	0.3	0.00	No Limit
		ED007: Exchangeable Sodium	----	0.1	meq/100g	0.2	0.1	0.00	No Limit
		ED007: Cation Exchange Capacity	----	0.1	meq/100g	12.0	10.4	13.6	0% - 20%
EP2012919-006	Anonymous	ED007: Exchangeable Sodium Percent	----	0.1	%	1.6	1.6	0.00	0% - 50%
		ED007: Exchangeable Calcium	----	0.1	meq/100g	13.6	13.8	1.65	0% - 20%
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	2.2	2.2	0.00	0% - 20%
		ED007: Exchangeable Potassium	----	0.1	meq/100g	1.6	1.6	0.00	0% - 50%
		ED007: Exchangeable Sodium	----	0.1	meq/100g	0.3	0.3	0.00	No Limit
		ED007: Cation Exchange Capacity	----	0.1	meq/100g	17.6	17.9	1.40	0% - 20%



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP004: Organic Matter (QC Lot: 3381248)									
EP2012801-001	Anonymous	EP004: Organic Matter	----	0.5	%	9.7	9.6	1.27	0% - 50%
EP2012895-005	Anonymous	EP004: Organic Matter	----	0.5	%	1.0	1.0	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3386495)									
EP2012801-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	0.0004	0.0004	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	0.0012	0.0009	28.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0073	0.0068	6.91	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP2012895-005	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0052	0.0059	13.1	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	0.0004	0.0003	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3386495)									
EP2012801-001	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	0.0032	0.0036	12.8	0% - 50%
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	0.0020	0.0018	6.90	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	0.0009	0.0008	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	0.0009	0.0009	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	0.0004	0.0004	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTriDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP2012895-005	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTriDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3386495)									
EP2012801-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	0.0003	0.0003	0.00	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3386495) - continued									
EP2012801-001	Anonymous	EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP2012895-005	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3386495)									
EP2012801-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	0.0200	0.0219	9.20	0% - 20%
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	0.0152	0.0150	1.21	0% - 20%
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP2012895-005	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3386495) - continued									
EP2012895-005	Anonymous	EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
	Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
		LCS	Low	High
----	4 pH Unit	102	70.0	130
----	7 pH Unit	100	70.0	130
<1	1412 µS/cm	100	93.6	106
<0.1	21.6 meq/100g	96.1	82.9	117
<0.1	1.76 meq/100g	101	78.4	119
<0.1	1 meq/100g	111	87.9	129
<0.1	0.9 meq/100g	110	92.9	132
<0.1	25.3 meq/100g	97.4	84.7	117
<0.1	----	----	----	----
<0.5	2.3 %	103	70.0	120
<0.5	85 %	87.3	70.0	120
<0.0002	0.00125 mg/kg	86.8	72.0	128
<0.0002	0.00125 mg/kg	79.2	73.0	123
<0.0002	0.00125 mg/kg	94.4	67.0	130
<0.0002	0.00125 mg/kg	95.2	70.0	132
<0.0002	0.00125 mg/kg	80.0	68.0	136
<0.0002	0.00125 mg/kg	79.2	59.0	134
<0.001	0.00625 mg/kg	92.0	71.0	135
<0.0002	0.00125 mg/kg	107	69.0	132
<0.0002	0.00125 mg/kg	90.8	70.0	132
<0.0002	0.00125 mg/kg	76.0	71.0	131
<0.0002	0.00125 mg/kg	88.4	69.0	133
<0.0002	0.00125 mg/kg	88.0	72.0	129
<0.0002	0.00125 mg/kg	80.0	69.0	133
<0.0002	0.00125 mg/kg	96.8	64.0	136
<0.0002	0.00125 mg/kg	90.0	69.0	135
<0.0002	0.00125 mg/kg	88.8	66.0	139
<0.0005	0.00312 mg/kg	113	69.0	133



Sub-Matrix: SOIL				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3386495) - continued								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	113	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	82.7	71.6	129
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	90.4	69.8	131
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	93.9	68.7	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	104	65.1	134
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	65.6	63.0	144
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	72.8	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3386495)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	67.2	62.0	145
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	74.4	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	67.6	65.0	137
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	90.4	69.2	143

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: SOIL				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3386495)							
EP2012801-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	92.0	72.0	128
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	73.6	73.0	123
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	84.4	67.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	89.2	70.0	132
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	# Not Determined	68.0	136
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	71.2	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3386495)							
EP2012801-001	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	104	71.0	135
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	131	69.0	132
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	73.2	70.0	132
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	81.6	71.0	131
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	86.0	69.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	101	72.0	129



Sub-Matrix: **SOIL**

Sub-Matrix: SOIL				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3386495) - continued							
EP2012801-001	Anonymous	EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	73.6	69.0	133
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	90.4	64.0	136
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	104	69.0	135
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	85.2	66.0	139
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	102	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3386495)							
EP2012801-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	71.2	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	91.8	71.6	129
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	105	69.8	131
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	# 219	68.7	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	# 207	65.1	134
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	78.8	63.0	144
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	77.2	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3386495)							
EP2012801-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	84.0	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	# Not Determined	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	# Not Determined	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	97.2	69.2	143

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2012893	Page	: 1 of 5
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 23-Nov-2020
Site	: DEF19009/Learmonth	Issue Date	: 03-Dec-2020
Sampler	: MAELLE BOURDAIS, Shaun Chambers	No. of samples received	: 3
Order number	: DEF19009/0960	No. of samples analysed	: 3

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- Matrix Spike outliers exist - please see following pages for full details.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- **NO** Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- **NO** Quality Control Sample Frequency Outliers exist.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EP231A: Perfluoroalkyl Sulfonic Acids	EP2012801--001	Anonymous	Perfluorooctane sulfonic acid (PFOS)	1763-23-1	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EP231C: Perfluoroalkyl Sulfonamides	EP2012801--001	Anonymous	N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	219 %	68.7-130%	Recovery greater than upper data quality objective
EP231C: Perfluoroalkyl Sulfonamides	EP2012801--001	Anonymous	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	207 %	65.1-134%	Recovery greater than upper data quality objective
EP231D: (n:2) Fluorotelomer Sulfonic Acids	EP2012801--001	Anonymous	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EP231D: (n:2) Fluorotelomer Sulfonic Acids	EP2012801--001	Anonymous	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results. This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein. Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA002: pH 1:5 (Soils)								
Soil Glass Jar - Unpreserved (EA002)								
0960_SS123_0.00-0.10_201119,	0960_QC101_201119,	19-Nov-2020	25-Nov-2020	26-Nov-2020	✓	25-Nov-2020	25-Nov-2020	✓
0960_SS121_0.00-0.10_201119								
EA010: Conductivity (1:5)								
Soil Glass Jar - Unpreserved (EA010)								
0960_SS123_0.00-0.10_201119,	0960_QC101_201119,	19-Nov-2020	25-Nov-2020	26-Nov-2020	✓	25-Nov-2020	23-Dec-2020	✓
0960_SS121_0.00-0.10_201119								



Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA055: Moisture Content (Dried @ 105-110°C)								
Soil Glass Jar - Unpreserved (EA055) 0960_SS123_0.00-0.10_201119, 0960_SS121_0.00-0.10_201119	0960_QC101_201119,	19-Nov-2020	----	----	----	24-Nov-2020	03-Dec-2020	✓
ED007: Exchangeable Cations								
Soil Glass Jar - Unpreserved (ED007) 0960_SS123_0.00-0.10_201119, 0960_SS121_0.00-0.10_201119	0960_QC101_201119,	19-Nov-2020	26-Nov-2020	17-Dec-2020	✓	26-Nov-2020	17-Dec-2020	✓
EP004: Organic Matter								
Soil Glass Jar - Unpreserved (EP004) 0960_SS123_0.00-0.10_201119, 0960_SS121_0.00-0.10_201119	0960_QC101_201119,	19-Nov-2020	30-Nov-2020	17-Dec-2020	✓	30-Nov-2020	17-Dec-2020	✓
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE Soil Jar (EP231X) 0960_SS123_0.00-0.10_201119, 0960_SS121_0.00-0.10_201119	0960_QC101_201119,	19-Nov-2020	26-Nov-2020	18-May-2021	✓	27-Nov-2020	05-Jan-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE Soil Jar (EP231X) 0960_SS123_0.00-0.10_201119, 0960_SS121_0.00-0.10_201119	0960_QC101_201119,	19-Nov-2020	26-Nov-2020	18-May-2021	✓	27-Nov-2020	05-Jan-2021	✓
EP231C: Perfluoroalkyl Sulfonamides								
HDPE Soil Jar (EP231X) 0960_SS123_0.00-0.10_201119, 0960_SS121_0.00-0.10_201119	0960_QC101_201119,	19-Nov-2020	26-Nov-2020	18-May-2021	✓	27-Nov-2020	05-Jan-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE Soil Jar (EP231X) 0960_SS123_0.00-0.10_201119, 0960_SS121_0.00-0.10_201119	0960_QC101_201119,	19-Nov-2020	26-Nov-2020	18-May-2021	✓	27-Nov-2020	05-Jan-2021	✓
EP231P: PFAS Sums								
HDPE Soil Jar (EP231X) 0960_SS123_0.00-0.10_201119, 0960_SS121_0.00-0.10_201119	0960_QC101_201119,	19-Nov-2020	26-Nov-2020	18-May-2021	✓	27-Nov-2020	05-Jan-2021	✓



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Electrical Conductivity (1:5)	EA010	2	20	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	2	12	16.67	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	2	20	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	18	11.11	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	20	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	20	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Electrical Conductivity (1:5)	EA010	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	12	8.33	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	18	11.11	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	20	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Electrical Conductivity (1:5)	EA010	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	12	8.33	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	18	5.56	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	In house: Referenced to Rayment and Lyons 4A1 and APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Electrical Conductivity (1:5)	EA010	SOIL	In house: Referenced to Rayment and Lyons 3A1 and APHA 2510. Conductivity is determined on soil samples using a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Exchangeable Cations	ED007	SOIL	In house: Referenced to Rayment & Lyons Method 15A1. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM Schedule B(3).
Organic Matter	EP004	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3)
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	SOIL	In-house: Analysis of soils by solvent extraction followed by LC-Electrospray-MS-MS, Negative Mode using MRM using internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Exchangeable Cations Preparation Method	ED007PR	SOIL	In house: Referenced to Rayment & Lyons method 15A1. A 1M NH4Cl extraction by end over end tumbling at a ratio of 1:20. There is no pretreatment for soluble salts. Extracts can be run by ICP for cations.
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
Organic Matter	EP004-PR	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3).
Sample Extraction for PFAS in solid matrices	ORG73	SOIL	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.



CHAIN OF CUSTODY

COC#: 16195

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: SPM DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0960_MW170		19/11/2020 11:30 AM	Water	ALS: 4 Non ALS: 0	No	X		
002	0960_MW104		19/11/2020 12:29 PM	Water	ALS: 4 Non ALS: 0	No	X		
003	0960_MW102		19/11/2020 12:30 PM	Water	ALS: 4 Non ALS: 0	No	X		
004	0960_MW106		19/11/2020 12:32 PM	Water	ALS: 4 Non ALS: 0	No	X		
005	0960_MW172		19/11/2020 12:33 PM	Water	ALS: 4 Non ALS: 0	No	X		
006	0960_MW151		19/11/2020 12:35 PM	Water	ALS: 4 Non ALS: 0	No	X		
007	0960_MW124		19/11/2020 01:10 PM	Water	ALS: 4 Non ALS: 0	No	X		
008	0960_MW148S		19/11/2020 01:33 PM	Water	ALS: 4 Non ALS: 0	No	X		

Environmental Division
Perth

Work Order Reference

EP2012894



Telephone : +61-8-9406 1301

**CHAIN OF CUSTODY**

COC#: 16195

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: SPM DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

°C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0960_MW170	Clear Plastic Bottle - Natural	250 mL	00070719042570	Green	No	
001	0960_MW170	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220056620	Purple	No	
001	0960_MW170	HDPE (no PTFE)	20 mL	00352005016139	Grey	No	
001	0960_MW170	HDPE (no PTFE)	20 mL	00352005016145	Grey	No	
002	0960_MW104	Clear Plastic Bottle - Natural	250 mL	00070719042923	Green	No	
002	0960_MW104	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023056	Purple	No	
002	0960_MW104	HDPE (no PTFE)	20 mL	00350019106818	Grey	No	
002	0960_MW104	HDPE (no PTFE)	20 mL	00350019106733	Grey	No	
003	0960_MW102	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023738	Purple	No	
003	0960_MW102	Clear Plastic Bottle - Natural	250 mL	00070719042917	Green	No	
003	0960_MW102	HDPE (no PTFE)	20 mL	00350019106677	Grey	No	
003	0960_MW102	HDPE (no PTFE)	20 mL	00350019106767	Grey	No	
004	0960_MW106	Clear Plastic Bottle - Natural	250 mL	00070719042965	Green	No	
004	0960_MW106	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019022963	Purple	No	
004	0960_MW106	HDPE (no PTFE)	20 mL	00350019106752	Grey	No	
004	0960_MW106	HDPE (no PTFE)	20 mL	00350019106817	Grey	No	
005	0960_MW172	Clear Plastic Bottle - Natural	250 mL	00070719042802	Green	No	
005	0960_MW172	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023764	Purple	No	
005	0960_MW172	HDPE (no PTFE)	20 mL	00352005016277	Grey	No	
005	0960_MW172	HDPE (no PTFE)	20 mL	00352005016062	Grey	No	
006	0960_MW151	Clear Plastic Bottle - Natural	250 mL	00070719042817	Green	No	
006	0960_MW151	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023037	Purple	No	
006	0960_MW151	HDPE (no PTFE)	20 mL	00350019106922	Grey	No	
006	0960_MW151	HDPE (no PTFE)	20 mL	00350019106857	Grey	No	
007	0960_MW124	Clear Plastic Bottle - Natural	250 mL	00070719042826	Green	No	
007	0960_MW124	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220056342	Purple	No	



CHAIN OF CUSTODY

COC#: 16195

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFASOMP

SITE: SPM DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

°C

Other comments:

007	0960_MW124	HDPE (no PTFE)	20 mL	00352005016271	Grey	No	
007	0960_MW124	HDPE (no PTFE)	20 mL	00352005016275	Grey	No	
008	0960_MW148S	Clear Plastic Bottle - Natural	250 mL	00070719042893	Green	No	
008	0960_MW148S	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023733	Purple	No	
008	0960_MW148S	HDPE (no PTFE)	20 mL	00352005016068	Grey	No	
008	0960_MW148S	HDPE (no PTFE)	20 mL	00352005016232	Grey	No	

Total Bottle Count: ALS: 32, Non ALS: 0

**SAMPLE RECEIPT NOTIFICATION (SRN)****Work Order : EP2012894**

Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: maelle.bourdais@cardno.com.au	E-mail	: nick.courts@alsglobal.com
Telephone	: ----	Telephone	: +61-8-9406 1301
Facsimile	: ----	Facsimile	: +61-8-9406 1399
Project	: WA_0960_PFASOMP	Page	: 1 of 3
Order number	: DEF19009/0960	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 16195	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/Learmonth		
Sampler	: MAELLE BOURDAIS, Sarah McCulloch		

Dates

Date Samples Received	: 23-Nov-2020 11:00	Issue Date	: 24-Nov-2020
Client Requested Due Date	: 03-Dec-2020	Scheduled Reporting Date	: 03-Dec-2020

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 3	Temperature	: 25.0 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 8 / 8

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepancies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- ### Summary of Sample(s) and Requested Analysis

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Laboratory sample ID	Sampling date / time	Sample ID
----------------------	----------------------	-----------

EP2012894-001	19-Nov-2020 11:30	0960_MW170_201119	✓	✓	✓	✓	✓	✓	✓
EP2012894-002	19-Nov-2020 12:29	0960_MW104_201119	✓	✓	✓	✓	✓	✓	✓
EP2012894-003	19-Nov-2020 12:30	0960_MW102_201119	✓	✓	✓	✓	✓	✓	✓
EP2012894-004	19-Nov-2020 12:32	0960_MW106_201119	✓	✓	✓	✓	✓	✓	✓
EP2012894-005	19-Nov-2020 12:33	0960_MW172_201119	✓	✓	✓	✓	✓	✓	✓
EP2012894-006	19-Nov-2020 12:35	0960_MW151_201119	✓	✓	✓	✓	✓	✓	✓
EP2012894-007	19-Nov-2020 13:10	0960_MW124_201119	✓	✓	✓	✓	✓	✓	✓
EP2012894-008	19-Nov-2020 13:33	0960_MW148S_201119	✓	✓	✓	✓	✓	✓	✓

Laboratory sample ID	Sampling date / time	Sample ID
-------------------------	-------------------------	-----------

EP2012894-001	19-Nov-2020 11:30	0960_MW170_201119	✓
EP2012894-002	19-Nov-2020 12:29	0960_MW104_201119	✓
EP2012894-003	19-Nov-2020 12:30	0960_MW102_201119	✓
EP2012894-004	19-Nov-2020 12:32	0960_MW106_201119	✓
EP2012894-005	19-Nov-2020 12:33	0960_MW172_201119	✓
EP2012894-006	19-Nov-2020 12:35	0960_MW151_201119	✓
EP2012894-007	19-Nov-2020 13:10	0960_MW124_201119	✓
EP2012894-008	19-Nov-2020 13:33	0960_MW148S_201119	✓

Matrix: WATER

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Container	Due for extraction	Due for analysis	Samples Received		Instructions Received	
				Date	Evaluation	Date	Evaluation
EA005-P: pH by PC Titrator							

CERTIFICATE OF ANALYSIS

Work Order : **EP2012894**
Client : **CARDNO (WA) PTY LTD**
Contact : MAELLE BOURDAIS
Address : 11 HARVEST TERRACE PO BOX 155
 WEST PERTH WA, AUSTRALIA 6006
Telephone : ----
Project : WA_0960_PFASOMP
Order number : DEF19009/0960
C-O-C number : 16195
Sampler : MAELLE BOURDAIS, Sarah McCulloch
Site : DEF19009/Learmonth
Quote number : SY/139/19
No. of samples received : 8
No. of samples analysed : 8

Page : 1 of 9
Laboratory : Environmental Division Perth
Contact : Nick Courts
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 23-Nov-2020 11:00
Date Analysis Commenced : 25-Nov-2020
Issue Date : 04-Dec-2020 15:02



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Daniel Fisher	Inorganics Analyst	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW170_201119	0960_MW104_201119	0960_MW102_201119	0960_MW106_201119	0960_MW172_201119
Sampling date / time				19-Nov-2020 11:30	19-Nov-2020 12:29	19-Nov-2020 12:30	19-Nov-2020 12:32	19-Nov-2020 12:33
Compound	CAS Number	LOR	Unit	EP2012894-001	EP2012894-002	EP2012894-003	EP2012894-004	EP2012894-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.55	7.54	7.47	8.03	7.73
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	35400	65500	76100	5280	24200
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	5030	14100	299	14	318
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	205	180	160	1090	270
Total Alkalinity as CaCO3	----	1	mg/L	205	180	160	1090	270
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1650	4510	4220	591	2610
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	16600	29100	33200	1840	12300
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	868	805	1310	40	482
Magnesium	7439-95-4	1	mg/L	1040	2330	2250	79	680
Sodium	7440-23-5	1	mg/L	9580	18500	19200	1880	7780
Potassium	7440-09-7	1	mg/L	269	1100	702	120	259
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	507	918	1030	86.0	407
∅ Total Cations	----	0.01	meq/L	552	1060	1100	93.3	425
∅ Ionic Balance	----	0.01	%	4.32	7.38	3.57	4.10	2.20
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	2	3	2	4	<1
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.05	<0.02	<0.02	10.8	1.27
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.06	<0.02	<0.02	12.4	3.40
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.39	<0.02	<0.02	85.2	22.8
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	4.64	0.86



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW170_201119	0960_MW104_201119	0960_MW102_201119	0960_MW106_201119	0960_MW172_201119
Sampling date / time				19-Nov-2020 11:30	19-Nov-2020 12:29	19-Nov-2020 12:30	19-Nov-2020 12:32	19-Nov-2020 12:33
Compound	CAS Number	LOR	Unit	EP2012894-001	EP2012894-002	EP2012894-003	EP2012894-004	EP2012894-005
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.02	0.02	42.2	5.46
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	2.3	0.3
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	6.00	1.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.04	<0.02	<0.02	35.1	7.36
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	1.62	0.57
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	2.20	0.70
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW170_201119	0960_MW104_201119	0960_MW102_201119	0960_MW106_201119	0960_MW172_201119
Sampling date / time				19-Nov-2020 11:30	19-Nov-2020 12:29	19-Nov-2020 12:30	19-Nov-2020 12:32	19-Nov-2020 12:33
Compound	CAS Number	LOR	Unit	EP2012894-001	EP2012894-002	EP2012894-003	EP2012894-004	EP2012894-005
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	0.54	0.02	0.02	202	43.7
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	0.39	0.02	0.02	127	28.3
Sum of PFAS (WA DER List)	----	0.01	µg/L	0.48	0.02	0.02	185	39.5
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	74.8	73.9	75.8	74.7	84.2
13C8-PFOA	----	0.02	%	77.8	76.5	74.9	78.1	77.1



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW151_201119	0960_MW124_201119	0960_MW148S_201119	----	----
Sampling date / time				19-Nov-2020 12:35	19-Nov-2020 13:10	19-Nov-2020 13:33	----	----
Compound	CAS Number	LOR	Unit	EP2012894-006	EP2012894-007	EP2012894-008	-----	-----
Result				Result	Result	Result	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.92	7.55	7.57	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	9380	67500	36000	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	2990	401	3040	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	<1	<1	----	----
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	<1	<1	<1	----	----
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L	671	162	354	----	----
Total Alkalinity as CaCO ₃	----	1	mg/L	671	162	354	----	----
ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA								
Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L	669	4810	2060	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	4650	30600	16600	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	151	1020	600	----	----
Magnesium	7439-95-4	1	mg/L	275	2650	1140	----	----
Sodium	7440-23-5	1	mg/L	2940	20400	10200	----	----
Potassium	7440-09-7	1	mg/L	136	1150	480	----	----
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	158	966	518	----	----
∅ Total Cations	----	0.01	meq/L	162	1180	580	----	----
∅ Ionic Balance	----	0.01	%	0.94	10.2	5.60	----	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	4	<1	2	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	2.59	<0.02	8.38	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	5.18	<0.02	7.86	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	40.9	<0.02	32.8	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	3.98	<0.02	3.62	----	----



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW151_201119	0960_MW124_201119	0960_MW148S_201119	----	----
Sampling date / time				19-Nov-2020 12:35	19-Nov-2020 13:10	19-Nov-2020 13:33	----	----
Compound	CAS Number	LOR	Unit	EP2012894-006	EP2012894-007	EP2012894-008	-----	-----
				Result	Result	Result	----	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	41.9	0.01	24.2	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	0.9	<0.1	1.5	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	1.71	<0.02	2.36	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	13.6	<0.02	13.2	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.74	<0.02	1.00	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	2.05	<0.01	1.44	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	----	----



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW151_201119	0960_MW124_201119	0960_MW148S_201119	----	----
Sampling date / time				19-Nov-2020 12:35	19-Nov-2020 13:10	19-Nov-2020 13:33	----	----
Compound	CAS Number	LOR	Unit	EP2012894-006	EP2012894-007	EP2012894-008	-----	-----
				Result	Result	Result	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	114	0.01	96.4	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	82.8	0.01	57.0	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	104	0.01	84.9	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	75.6	73.5	74.3	----	----
13C8-PFOA	----	0.02	%	83.9	77.2	84.2	----	----



Surrogate Control Limits

Sub-Matrix: GROUNDWATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

QUALITY CONTROL REPORT

Work Order	: EP2012894	Page	: 1 of 6
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 23-Nov-2020
Order number	: DEF19009/0960	Date Analysis Commenced	: 25-Nov-2020
C-O-C number	: 16195	Issue Date	: 04-Dec-2020
Sampler	: MAELLE BOURDAIS, Sarah McCulloch		
Site	: DEF19009/Learmonth		
Quote number	: SY/139/19		
No. of samples received	: 8		
No. of samples analysed	: 8		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Daniel Fisher	Inorganics Analyst	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
= Indicates failed QC

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA005P: pH by PC Titrator (QC Lot: 3394150)									
EP2012892-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.44	8.43	0.118	0% - 20%
EP2012892-012	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.61	7.63	0.262	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3385187)									
EP2012894-001	0960_MW170_201119	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	35400	34400	2.72	0% - 20%
EP2012897-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	41400	41800	1.03	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3385188)									
EP2012894-001	0960_MW170_201119	EA025H: Suspended Solids (SS)	----	5	mg/L	5030	4240	17.0	0% - 20%
EP2012917-006	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	244	236	3.54	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3394149)									
EP2012892-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	23	24	4.74	0% - 20%
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	578	587	1.61	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	600	611	1.73	0% - 20%
EP2012892-012	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	207	211	2.16	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	207	211	2.16	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3384177)									
EP2012892-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	290	292	0.490	0% - 20%
EP2012892-011	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	98	97	0.00	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3384178)									
EP2012892-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	2340	2380	1.52	0% - 20%
EP2012892-011	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	177	179	1.14	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3383137)									

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 Work Order : EP2012894
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
ED093F: Dissolved Major Cations (QC Lot: 3383137) - continued									
EP2012892-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	152	157	3.23	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	124	128	3.56	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	1500	1560	4.22	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	57	60	4.68	0% - 20%
EP2012892-011	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	2	4	59.2	No Limit
		ED093F: Magnesium	7439-95-4	1	mg/L	6	9	43.2	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	479	487	1.82	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	20	20	0.00	0% - 50%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3392504)									
EP2012892-006	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	3	5	43.7	No Limit
EP2012894-004	0960_MW106_201119	EP002: Dissolved Organic Carbon	----	1	mg/L	4	6	37.2	No Limit



Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result		LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 3394150)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3385187)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	100	88.1	114
				<10	1000 mg/L	103	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3385188)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	112	89.1	120
				<5	1000 mg/L	103	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3394149)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	107	81.2	126
				<1	200 mg/L	110	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3384177)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	93.6	87.7	113
				<1	500 mg/L	104	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3384178)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	99.2	87.9	114
				<1	1000 mg/L	100	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3383137)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	103	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	107	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	103	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	100	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3392504)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	97.6	73.2	116
				<1	100 mg/L	94.3	73.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3387598)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	78.2	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	90.2	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	85.6	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	79.8	69.0	134



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3387598) - continued								
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	85.6	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	83.0	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3387598)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	82.3	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	93.4	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	103	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	95.6	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	87.8	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	88.6	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	76.4	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	86.4	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	90.2	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	72.0	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	91.4	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3387598)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	115	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	80.1	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	84.6	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	121	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	107	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	116	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	119	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3387598)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	83.2	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	111	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	107	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	82.8	71.4	144

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High



Sub-Matrix: WATER

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3384177)							
EP2012892-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	118	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3384178)							
EP2012892-001	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	98.7	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3392504)							
EP2012892-007	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	92.0	70.0	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2012894	Page	: 1 of 7
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 23-Nov-2020
Site	: DEF19009/Learmonth	Issue Date	: 04-Dec-2020
Sampler	: MAELLE BOURDAIS, Sarah McCulloch	No. of samples received	: 8
Order number	: DEF19009/0960	No. of samples analysed	: 8

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- **NO** Matrix Spike outliers occur.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- Quality Control Sample Frequency Outliers exist - please see following pages for full details.



Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator						
Clear Plastic Bottle - Natural						
0960_MW170_201119, 0960_MW102_201119, 0960_MW172_201119, 0960_MW124_201119,	0960_MW104_201119, 0960_MW106_201119, 0960_MW151_201119, 0960_MW148S_201119	----	----	----	01-Dec-2020 19-Nov-2020	12

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	20	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	20	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for **VOC in soils** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator								
Clear Plastic Bottle - Natural (EA005-P)		19-Nov-2020	----	----	----	01-Dec-2020	19-Nov-2020	✘
0960_MW170_201119,	0960_MW104_201119,							
0960_MW102_201119,	0960_MW106_201119,							
0960_MW172_201119,	0960_MW151_201119,							
0960_MW124_201119,	0960_MW148S_201119							
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Clear Plastic Bottle - Natural (EA015H)		19-Nov-2020	----	----	----	26-Nov-2020	26-Nov-2020	✔
0960_MW170_201119,	0960_MW104_201119,							
0960_MW102_201119,	0960_MW106_201119,							
0960_MW172_201119,	0960_MW151_201119,							
0960_MW124_201119,	0960_MW148S_201119							



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA025: Total Suspended Solids dried at 104 ± 2°C								
Clear Plastic Bottle - Natural (EA025H)		19-Nov-2020	----	----	----	26-Nov-2020	26-Nov-2020	✓
0960_MW170_201119,	0960_MW104_201119,							
0960_MW102_201119,	0960_MW106_201119,							
0960_MW172_201119,	0960_MW151_201119,							
0960_MW124_201119,	0960_MW148S_201119							
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P)		19-Nov-2020	----	----	----	01-Dec-2020	03-Dec-2020	✓
0960_MW170_201119,	0960_MW104_201119,							
0960_MW102_201119,	0960_MW106_201119,							
0960_MW172_201119,	0960_MW151_201119,							
0960_MW124_201119,	0960_MW148S_201119							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G)		19-Nov-2020	----	----	----	03-Dec-2020	17-Dec-2020	✓
0960_MW170_201119,	0960_MW104_201119,							
0960_MW102_201119,	0960_MW106_201119,							
0960_MW172_201119,	0960_MW151_201119,							
0960_MW124_201119,	0960_MW148S_201119							
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G)		19-Nov-2020	----	----	----	03-Dec-2020	17-Dec-2020	✓
0960_MW170_201119,	0960_MW104_201119,							
0960_MW102_201119,	0960_MW106_201119,							
0960_MW172_201119,	0960_MW151_201119,							
0960_MW124_201119,	0960_MW148S_201119							
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F)		19-Nov-2020	----	----	----	25-Nov-2020	26-Nov-2020	✓
0960_MW170_201119,	0960_MW104_201119,							
0960_MW102_201119,	0960_MW106_201119,							
0960_MW172_201119,	0960_MW151_201119,							
0960_MW124_201119,	0960_MW148S_201119							
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002)		19-Nov-2020	----	----	----	30-Nov-2020	17-Dec-2020	✓
0960_MW170_201119,	0960_MW104_201119,							
0960_MW102_201119,	0960_MW106_201119,							
0960_MW172_201119,	0960_MW151_201119,							
0960_MW124_201119,	0960_MW148S_201119							
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X)		19-Nov-2020	30-Nov-2020	18-May-2021	✓	30-Nov-2020	18-May-2021	✓
0960_MW170_201119,	0960_MW104_201119,							
0960_MW102_201119,	0960_MW106_201119,							
0960_MW172_201119,	0960_MW151_201119,							
0960_MW124_201119,	0960_MW148S_201119							



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X)		19-Nov-2020	30-Nov-2020	18-May-2021	✔	30-Nov-2020	18-May-2021	✔
0960_MW170_201119,	0960_MW104_201119,							
0960_MW102_201119,	0960_MW106_201119,							
0960_MW172_201119,	0960_MW151_201119,							
0960_MW124_201119,	0960_MW148S_201119							
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X)		19-Nov-2020	30-Nov-2020	18-May-2021	✔	30-Nov-2020	18-May-2021	✔
0960_MW170_201119,	0960_MW104_201119,							
0960_MW102_201119,	0960_MW106_201119,							
0960_MW172_201119,	0960_MW151_201119,							
0960_MW124_201119,	0960_MW148S_201119							
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X)		19-Nov-2020	30-Nov-2020	18-May-2021	✔	30-Nov-2020	18-May-2021	✔
0960_MW170_201119,	0960_MW104_201119,							
0960_MW102_201119,	0960_MW106_201119,							
0960_MW172_201119,	0960_MW151_201119,							
0960_MW124_201119,	0960_MW148S_201119							
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X)		19-Nov-2020	30-Nov-2020	18-May-2021	✔	30-Nov-2020	18-May-2021	✔
0960_MW170_201119,	0960_MW104_201119,							
0960_MW102_201119,	0960_MW106_201119,							
0960_MW172_201119,	0960_MW151_201119,							
0960_MW124_201119,	0960_MW148S_201119							



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	20	0.00	10.00	✗	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	15	13.33	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	19	10.53	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	15	13.33	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	19	10.53	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	15	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	19	5.26	5.26	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	20	0.00	5.00	✗	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of 'filterable' residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C. This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high temperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.



Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.



CHAIN OF CUSTODY

COC#: 16201

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: SPM DEF19009/Learmonth SED

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Sediments SEDIMENT	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0960_SS168		19/11/2020 12:39 PM	Soil	ALS: 2 Non ALS: 0	No	X		
002	0960_SS273		19/11/2020 12:40 PM	Soil	ALS: 2 Non ALS: 0	No	X		
003	0960_SS231		19/11/2020 12:41 PM	Soil	ALS: 2 Non ALS: 0	No	X		
004	0960_SS265		19/11/2020 12:41 PM	Soil	ALS: 2 Non ALS: 0	No	X		
005	0960_SS170		19/11/2020 12:42 PM	Soil	ALS: 2 Non ALS: 0	No	X		
006	0960_SS176		19/11/2020 12:44 PM	Soil	ALS: 2 Non ALS: 0	No	X		
007	0960_SS243		19/11/2020 12:44 PM	Soil	ALS: 2 Non ALS: 0	No	X		
008	0960_SS166		19/11/2020 12:45 PM	Soil	ALS: 2 Non ALS: 0	No	X		
009	0960_SS157		19/11/2020 12:47 PM	Soil	ALS: 2 Non ALS: 0	No	X		

Environmental Division
Perth

Work Order Reference
EP2012895



Telephone : +61-8-9406 1301

**CHAIN OF CUSTODY**

COC#: 16201

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: SPM DEF19009/Learmonth SED

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS**ANALYSIS REQUIRED**

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Sediments SEDIMENT	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
010	0960_SS113		19/11/2020 12:47 PM	Soil	ALS: 2 Non ALS: 0	No	X		
011	0960_SS174		19/11/2020 12:49 PM	Soil	ALS: 2 Non ALS: 0	No	X		
012	0960_SS108		19/11/2020 01:17 PM	Soil	ALS: 2 Non ALS: 0	No	X		

**CHAIN OF CUSTODY**

COC#: 16201

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: SPM DEF19009/Learmonth SED

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:

SAMPLER MOBILE:

QUOTE NO: SY/139/19

/ ES2019CARBSD0002

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

°C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0960_SS168	Soil Glass Jar - Unpreserved	150 mL	00260220069399	Orange	No	
001	0960_SS168	HDPE Soil Jar	200 mL	00620719042475	Grey	No	
002	0960_SS273	Soil Glass Jar - Unpreserved	150 mL	00260220050331	Orange	No	
002	0960_SS273	HDPE Soil Jar	200 mL	00620719067758	Grey	No	
003	0960_SS231	Soil Glass Jar - Unpreserved	150 mL	00260220069413	Orange	No	
003	0960_SS231	HDPE Soil Jar	200 mL	00620719042377	Grey	No	
004	0960_SS265	HDPE Soil Jar	200 mL	00620719042482	Grey	No	
004	0960_SS265	Soil Glass Jar - Unpreserved	150 mL	00260220069414	Orange	No	
005	0960_SS170	Soil Glass Jar - Unpreserved	150 mL	00260220069388	Orange	No	
005	0960_SS170	HDPE Soil Jar	200 mL	00620719042417	Grey	No	
006	0960_SS176	HDPE Soil Jar	200 mL	00620719042459	Grey	No	
006	0960_SS176	Soil Glass Jar - Unpreserved	150 mL	00260220050334	Orange	No	
007	0960_SS243	Soil Glass Jar - Unpreserved	150 mL	00260220069385	Orange	No	
007	0960_SS243	HDPE Soil Jar	200 mL	00620719042350	Grey	No	
008	0960_SS166	Soil Glass Jar - Unpreserved	150 mL	00260220050362	Orange	No	
008	0960_SS166	HDPE Soil Jar	200 mL	00620719067768	Grey	No	
009	0960_SS157	Soil Glass Jar - Unpreserved	150 mL	00260220069409	Orange	No	
009	0960_SS157	HDPE Soil Jar	200 mL	00620719042484	Grey	No	
010	0960_SS113	Soil Glass Jar - Unpreserved	150 mL	00260220069371	Orange	No	
010	0960_SS113	HDPE Soil Jar	200 mL	00620719067753	Grey	No	
011	0960_SS174	HDPE Soil Jar	200 mL	00620719067697	Grey	No	
011	0960_SS174	Soil Glass Jar - Unpreserved	150 mL	00260220069304	Orange	No	
012	0960_SS108	Soil Glass Jar - Unpreserved	150 mL	00260220050215	Orange	No	
012	0960_SS108	HDPE Soil Jar	200 mL	00620719042370	Grey	No	

Total Bottle Count: ALS: 24, Non ALS: 0

**SAMPLE RECEIPT NOTIFICATION (SRN)****Work Order : EP2012895**

Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: maelle.bourdais@cardno.com.au	E-mail	: nick.courts@alsglobal.com
Telephone	: ----	Telephone	: +61-8-9406 1301
Facsimile	: ----	Facsimile	: +61-8-9406 1399
Project	: WA_0960_PFASOMP	Page	: 1 of 2
Order number	: DEF19009/0960	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 16201	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/Learmonth		
Sampler	: MAELLE BOURDAIS, Sarah McCulloch		

Dates

Date Samples Received	: 23-Nov-2020 11:00	Issue Date	: 24-Nov-2020
Client Requested Due Date	: 03-Dec-2020	Scheduled Reporting Date	: 03-Dec-2020

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 3	Temperature	: 25.0 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 12 / 12

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepancies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- ### Summary of Sample(s) and Requested Analysis

Laboratory sample ID	Sampling date / time	Sample ID	SOIL - A - Agriculture	SOIL - E - Moisture	SOIL - E - Organic	SOIL - E - PFAS -
EP2012895-001	19-Nov-2020 12:39	0960_SS168_201119	✓	✓	✓	✓
EP2012895-002	19-Nov-2020 12:40	0960_SS273_201119	✓	✓	✓	✓
EP2012895-003	19-Nov-2020 12:41	0960_SS231_201119	✓	✓	✓	✓
EP2012895-004	19-Nov-2020 12:41	0960_SS265_201119	✓	✓	✓	✓
EP2012895-005	19-Nov-2020 12:42	0960_SS170_201119	✓	✓	✓	✓
EP2012895-006	19-Nov-2020 12:44	0960_SS176_201119	✓	✓	✓	✓
EP2012895-007	19-Nov-2020 12:44	0960_SS243_201119	✓	✓	✓	✓
EP2012895-008	19-Nov-2020 12:45	0960_SS166_201119	✓	✓	✓	✓
EP2012895-009	19-Nov-2020 12:47	0960_SS157_201119	✓	✓	✓	✓
EP2012895-010	19-Nov-2020 12:47	0960_SS113_201119	✓	✓	✓	✓
EP2012895-011	19-Nov-2020 12:49	0960_SS174_201119	✓	✓	✓	✓
EP2012895-012	19-Nov-2020 13:17	0960_SS108_201119	✓	✓	✓	✓

[illegible]

CERTIFICATE OF ANALYSIS

Work Order : **EP2012895**
Client : **CARDNO (WA) PTY LTD**
Contact : **MAELLE BOURDAIS**
Address : **11 HARVEST TERRACE PO BOX 155**
WEST PERTH WA, AUSTRALIA 6006
Telephone : **----**
Project : **WA_0960_PFASOMP**
Order number : **DEF19009/0960**
C-O-C number : **16201**
Sampler : **MAELLE BOURDAIS, Sarah McCulloch**
Site : **DEF19009/Learmonth**
Quote number : **SY/139/19**
No. of samples received : **12**
No. of samples analysed : **12**

Page : 1 of 12
Laboratory : Environmental Division Perth
Contact : Nick Courts
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 23-Nov-2020 11:00
Date Analysis Commenced : 24-Nov-2020
Issue Date : 03-Dec-2020 18:05



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

Ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X: High Matrix Spike (MS) recovery for analyte "N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE) and N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)" deemed acceptable as all associated analyte results are less than LOR.
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H⁺ + Al³⁺).
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SS168_201119	0960_SS273_201119	0960_SS231_201119	0960_SS265_201119	0960_SS170_201119
Sampling date / time					19-Nov-2020 12:39	19-Nov-2020 12:40	19-Nov-2020 12:41	19-Nov-2020 12:41	19-Nov-2020 12:42
Compound	CAS Number	LOR	Unit		EP2012895-001	EP2012895-002	EP2012895-003	EP2012895-004	EP2012895-005
				Result	Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		8.9	9.4	8.8	8.6	8.3
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		79	405	1560	4980	417
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		0.6	5.4	28.4	7.6	4.0
ED007: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		9.9	----	----	----	----
Exchangeable Magnesium	----	0.1	meq/100g		1.0	----	----	----	----
Exchangeable Potassium	----	0.1	meq/100g		0.4	----	----	----	----
Exchangeable Sodium	----	0.1	meq/100g		0.1	----	----	----	----
Cation Exchange Capacity	----	0.1	meq/100g		11.5	----	----	----	----
Exchangeable Sodium Percent	----	0.1	%		1.3	----	----	----	----
ED008: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		----	18.8	22.9	22.3	27.8
Exchangeable Magnesium	----	0.1	meq/100g		----	2.1	4.4	3.7	4.7
Exchangeable Potassium	----	0.1	meq/100g		----	0.4	1.1	0.6	1.3
Exchangeable Sodium	----	0.1	meq/100g		----	0.1	0.5	0.2	0.1
Cation Exchange Capacity	----	0.1	meq/100g		----	21.5	29.0	26.8	34.0
Exchangeable Sodium Percent	----	0.1	%		----	0.6	1.8	0.9	0.4
EP004: Organic Matter									
Organic Matter	----	0.5	%		<0.5	<0.5	<0.5	<0.5	1.0
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		<0.0002	<0.0002	0.0006	0.0017	<0.0002
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		0.0008	0.0003	0.0538	0.0076	0.0052
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	0.0004



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				0960_SS168_201119	0960_SS273_201119	0960_SS231_201119	0960_SS265_201119	0960_SS170_201119
Sampling date / time				19-Nov-2020 12:39	19-Nov-2020 12:40	19-Nov-2020 12:41	19-Nov-2020 12:41	19-Nov-2020 12:42
Compound	CAS Number	LOR	Unit	EP2012895-001	EP2012895-002	EP2012895-003	EP2012895-004	EP2012895-005
				Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.0004	0.0003	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.0005	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.0004	<0.0002	<0.0002
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				0960_SS168_201119	0960_SS273_201119	0960_SS231_201119	0960_SS265_201119	0960_SS170_201119
Sampling date / time				19-Nov-2020 12:39	19-Nov-2020 12:40	19-Nov-2020 12:41	19-Nov-2020 12:41	19-Nov-2020 12:42
Compound	CAS Number	LOR	Unit	EP2012895-001	EP2012895-002	EP2012895-003	EP2012895-004	EP2012895-005
				Result	Result	Result	Result	Result
EP231D: (n:2) Fluorotelomer Sulfonic Acids - Continued								
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	0.0008	0.0003	0.0557	0.0096	0.0056
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	0.0008	0.0003	0.0544	0.0093	0.0052
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	0.0008	0.0003	0.0548	0.0096	0.0052
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	114	113	109	110	116
13C8-PFOA	----	0.0002	%	120	118	118	120	119



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SS176_201119	0960_SS243_201119	0960_SS166_201119	0960_SS157_201119	0960_SS113_201119
Sampling date / time					19-Nov-2020 12:44	19-Nov-2020 12:44	19-Nov-2020 12:45	19-Nov-2020 12:47	19-Nov-2020 12:47
Compound	CAS Number	LOR	Unit		EP2012895-006	EP2012895-007	EP2012895-008	EP2012895-009	EP2012895-010
				Result	Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		8.2	8.7	8.6	8.5	8.4
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		426	173	330	1710	359
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		0.9	1.4	0.6	2.2	1.6
ED007: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		----	8.6	----	----	----
Exchangeable Magnesium	----	0.1	meq/100g		----	1.5	----	----	----
Exchangeable Potassium	----	0.1	meq/100g		----	0.6	----	----	----
Exchangeable Sodium	----	0.1	meq/100g		----	0.2	----	----	----
Cation Exchange Capacity	----	0.1	meq/100g		----	10.8	----	----	----
Exchangeable Sodium Percent	----	0.1	%		----	1.7	----	----	----
ED008: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		22.7	----	17.9	19.9	20.7
Exchangeable Magnesium	----	0.1	meq/100g		2.2	----	2.0	3.2	2.9
Exchangeable Potassium	----	0.1	meq/100g		1.0	----	0.6	0.6	0.7
Exchangeable Sodium	----	0.1	meq/100g		0.1	----	<0.1	0.1	<0.1
Cation Exchange Capacity	----	0.1	meq/100g		26.0	----	20.6	23.7	24.4
Exchangeable Sodium Percent	----	0.1	%		0.4	----	0.3	0.4	0.2
EP004: Organic Matter									
Organic Matter	----	0.5	%		1.3	1.0	0.8	1.1	1.1
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		0.0075	0.0051	0.0019	0.0036	0.0039
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		0.0002	0.0008	<0.0002	<0.0002	<0.0002



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				0960_SS176_201119	0960_SS243_201119	0960_SS166_201119	0960_SS157_201119	0960_SS113_201119
Sampling date / time				19-Nov-2020 12:44	19-Nov-2020 12:44	19-Nov-2020 12:45	19-Nov-2020 12:47	19-Nov-2020 12:47
Compound	CAS Number	LOR	Unit	EP2012895-006	EP2012895-007	EP2012895-008	EP2012895-009	EP2012895-010
				Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				0960_SS176_201119	0960_SS243_201119	0960_SS166_201119	0960_SS157_201119	0960_SS113_201119
Sampling date / time				19-Nov-2020 12:44	19-Nov-2020 12:44	19-Nov-2020 12:45	19-Nov-2020 12:47	19-Nov-2020 12:47
Compound	CAS Number	LOR	Unit	EP2012895-006	EP2012895-007	EP2012895-008	EP2012895-009	EP2012895-010
				Result	Result	Result	Result	Result
EP231D: (n:2) Fluorotelomer Sulfonic Acids - Continued								
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	0.0077	0.0059	0.0019	0.0036	0.0039
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	0.0075	0.0051	0.0019	0.0036	0.0039
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	0.0075	0.0051	0.0019	0.0036	0.0039
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	116	106	96.5	114	96.0
13C8-PFOA	----	0.0002	%	106	101	103	112	100



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SS174_201119	0960_SS108_201119	----	----	----
Sampling date / time					19-Nov-2020 12:49	19-Nov-2020 13:17	----	----	----
Compound	CAS Number	LOR	Unit		EP2012895-011	EP2012895-012	-----	-----	-----
				Result	Result		----	----	----
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		8.6	8.7	----	----	----
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		161	107	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		14.4	1.0	----	----	----
ED007: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		14.0	14.1	----	----	----
Exchangeable Magnesium	----	0.1	meq/100g		1.8	2.2	----	----	----
Exchangeable Potassium	----	0.1	meq/100g		1.6	1.0	----	----	----
Exchangeable Sodium	----	0.1	meq/100g		0.5	0.2	----	----	----
Cation Exchange Capacity	----	0.1	meq/100g		17.9	17.5	----	----	----
Exchangeable Sodium Percent	----	0.1	%		2.8	1.1	----	----	----
EP004: Organic Matter									
Organic Matter	----	0.5	%		1.1	<0.5	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		0.0003	<0.0002	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		<0.0002	<0.0002	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		0.0008	<0.0002	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		<0.0002	<0.0002	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		0.154	0.0006	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		0.0191	<0.0002	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg		<0.001	<0.001	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		0.0003	<0.0002	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		<0.0002	<0.0002	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		<0.0002	<0.0002	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		<0.0002	<0.0002	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		0.0002	<0.0002	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		0.0005	<0.0002	----	----	----



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				0960_SS174_201119	0960_SS108_201119	----	----	----
Sampling date / time				19-Nov-2020 12:49	19-Nov-2020 13:17	----	----	----
Compound	CAS Number	LOR	Unit	EP2012895-011	EP2012895-012	-----	-----	-----
				Result	Result	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids - Continued								
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	0.0005	<0.0002	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	0.0003	<0.0002	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	----	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	----	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	0.176	0.0006	----	----	----



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SS174_201119	0960_SS108_201119	----	----	----
Sampling date / time					19-Nov-2020 12:49	19-Nov-2020 13:17	----	----	----
Compound	CAS Number	LOR	Unit		EP2012895-011	EP2012895-012	-----	-----	-----
				Result	Result		----	----	----
EP231P: PFAS Sums - Continued									
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		0.155	0.0006	----	----	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		0.155	0.0006	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		99.0	116	----	----	----
13C8-PFOA	----	0.0002	%		104	116	----	----	----



Surrogate Control Limits

Sub-Matrix: SEDIMENT		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

QUALITY CONTROL REPORT

Work Order	: EP2012895	Page	: 1 of 9
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 23-Nov-2020
Order number	: DEF19009/0960	Date Analysis Commenced	: 24-Nov-2020
C-O-C number	: 16201	Issue Date	: 03-Dec-2020
Sampler	: MAELLE BOURDAIS, Sarah McCulloch		
Site	: DEF19009/Learmonth		
Quote number	: SY/139/19		
No. of samples received	: 12		
No. of samples analysed	: 12		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
 CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
 LOR = Limit of reporting
 RPD = Relative Percentage Difference
 # = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA002: pH 1:5 (Soils) (QC Lot: 3381257)									
EP2012741-001	Anonymous	EA002: pH Value	----	0.1	pH Unit	9.3	9.6	2.86	0% - 20%
EP2012893-003	Anonymous	EA002: pH Value	----	0.1	pH Unit	8.6	8.5	0.00	0% - 20%
EA002: pH 1:5 (Soils) (QC Lot: 3381259)									
EP2012895-011	0960_SS174_201119	EA002: pH Value	----	0.1	pH Unit	8.6	8.6	0.00	0% - 20%
EP2012919-008	Anonymous	EA002: pH Value	----	0.1	pH Unit	8.8	8.6	1.15	0% - 20%
EA010: Conductivity (1:5) (QC Lot: 3381256)									
EP2012741-001	Anonymous	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	26400	26600	0.755	0% - 20%
EP2012893-003	Anonymous	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	166	166	0.00	0% - 20%
EA010: Conductivity (1:5) (QC Lot: 3381258)									
EP2012895-011	0960_SS174_201119	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	161	162	0.00	0% - 20%
EP2012919-008	Anonymous	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	110	111	0.00	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3381261)									
EP2012801-001	Anonymous	EA055: Moisture Content	----	0.1	%	4.9	5.1	4.61	0% - 20%
EP2012895-004	0960_SS265_201119	EA055: Moisture Content	----	0.1	%	7.6	7.1	5.76	0% - 20%
ED007: Exchangeable Cations (QC Lot: 3385996)									
EP2012893-001	Anonymous	ED007: Exchangeable Sodium Percent	----	0.1	%	1.4	1.4	0.00	0% - 50%
		ED007: Exchangeable Calcium	----	0.1	meq/100g	10.6	9.2	14.8	0% - 20%
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	0.8	0.8	0.00	No Limit
		ED007: Exchangeable Potassium	----	0.1	meq/100g	0.3	0.3	0.00	No Limit
		ED007: Exchangeable Sodium	----	0.1	meq/100g	0.2	0.1	0.00	No Limit
		ED007: Cation Exchange Capacity	----	0.1	meq/100g	12.0	10.4	13.6	0% - 20%
EP2012919-006	Anonymous	ED007: Exchangeable Sodium Percent	----	0.1	%	1.6	1.6	0.00	0% - 50%
		ED007: Exchangeable Calcium	----	0.1	meq/100g	13.6	13.8	1.65	0% - 20%
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	2.2	2.2	0.00	0% - 20%

Page : 3 of 9
 Work Order : EP2012895
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
ED007: Exchangeable Cations (QC Lot: 3385996) - continued									
EP2012919-006	Anonymous	ED007: Exchangeable Potassium	----	0.1	meq/100g	1.6	1.6	0.00	0% - 50%
		ED007: Exchangeable Sodium	----	0.1	meq/100g	0.3	0.3	0.00	No Limit
		ED007: Cation Exchange Capacity	----	0.1	meq/100g	17.6	17.9	1.40	0% - 20%
ED008: Exchangeable Cations (QC Lot: 3385244)									
EP2012741-001	Anonymous	ED008: Exchangeable Sodium Percent	----	0.1	%	1.4	1.3	7.27	0% - 50%
		ED008: Exchangeable Calcium	----	0.1	meq/100g	54.7	54.9	0.367	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	6.1	7.1	15.3	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	0.1	0.1	0.00	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	0.9	0.8	0.00	No Limit
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	61.8	63.0	1.86	0% - 20%
EP2012895-004	0960_SS265_201119	ED008: Exchangeable Sodium Percent	----	0.1	%	0.9	0.8	0.00	No Limit
		ED008: Exchangeable Calcium	----	0.1	meq/100g	22.3	21.6	3.14	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	3.7	3.4	6.70	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	0.6	0.6	0.00	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	0.2	0.2	0.00	No Limit
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	26.8	25.8	3.70	0% - 20%
ED008: Exchangeable Cations (QC Lot: 3388563)									
EP2012895-003	0960_SS231_201119	ED008: Exchangeable Sodium Percent	----	0.1	%	1.8	1.8	0.00	0% - 50%
		ED008: Exchangeable Calcium	----	0.1	meq/100g	22.9	21.8	4.99	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	4.4	3.9	11.7	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	1.1	1.0	0.00	0% - 50%
		ED008: Exchangeable Sodium	----	0.1	meq/100g	0.5	0.5	0.00	No Limit
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	29.0	27.3	6.04	0% - 20%
EP004: Organic Matter (QC Lot: 3381248)									
EP2012801-001	Anonymous	EP004: Organic Matter	----	0.5	%	9.7	9.6	1.27	0% - 50%
EP2012895-005	0960_SS170_201119	EP004: Organic Matter	----	0.5	%	1.0	1.0	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3386495)									
EP2012801-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	0.0004	0.0004	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	0.0012	0.0009	28.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0073	0.0068	6.91	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP2012895-005	0960_SS170_201119	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0052	0.0059	13.1	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	0.0004	0.0003	0.00	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3386495)									
EP2012801-001	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	0.0032	0.0036	12.8	0% - 50%
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	0.0020	0.0018	6.90	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	0.0009	0.0008	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	0.0009	0.0009	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	0.0004	0.0004	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP2012895-005	0960_SS170_201119	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3386495)									
EP2012801-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	0.0003	0.0003	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP2012895-005	0960_SS170_201119	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3386495) - continued									
EP2012895-005	0960_SS170_201119	EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3386495)									
EP2012801-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	0.0200	0.0219	9.20	0% - 20%
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	0.0152	0.0150	1.21	0% - 20%
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP2012895-005	0960_SS170_201119	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit



Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

Sub-Matrix: SOIL				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EA002: pH 1:5 (Soils) (QCLot: 3381257)								
EA002: pH Value	----	----	pH Unit	----	4 pH Unit	102	70.0	130
				----	7 pH Unit	100	70.0	130
EA002: pH 1:5 (Soils) (QCLot: 3381259)								
EA002: pH Value	----	----	pH Unit	----	4 pH Unit	101	70.0	130
				----	7 pH Unit	100	70.0	130
EA010: Conductivity (1:5) (QCLot: 3381256)								
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	1412 µS/cm	100	93.6	106
EA010: Conductivity (1:5) (QCLot: 3381258)								
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	1412 µS/cm	100	93.6	106
ED007: Exchangeable Cations (QCLot: 3385996)								
ED007: Exchangeable Calcium	----	0.1	meq/100g	<0.1	21.6 meq/100g	96.1	82.9	117
ED007: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.76 meq/100g	101	78.4	119
ED007: Exchangeable Potassium	----	0.1	meq/100g	<0.1	1 meq/100g	111	87.9	129
ED007: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.9 meq/100g	110	92.9	132
ED007: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	25.3 meq/100g	97.4	84.7	117
ED007: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
ED008: Exchangeable Cations (QCLot: 3385244)								
ED008: Exchangeable Calcium	----	0.1	meq/100g	<0.1	22.1 meq/100g	95.7	78.7	111
ED008: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.56 meq/100g	95.6	77.6	111
ED008: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.91 meq/100g	104	86.9	116
ED008: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.38 meq/100g	119	72.3	129
ED008: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
ED008: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	24.95 meq/100g	96.4	79.9	110
ED008: Exchangeable Cations (QCLot: 3388563)								
ED008: Exchangeable Calcium	----	0.1	meq/100g	<0.1	22.1 meq/100g	102	78.7	111
ED008: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.56 meq/100g	101	77.6	111
ED008: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.91 meq/100g	104	86.9	116
ED008: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.38 meq/100g	118	72.3	129
ED008: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
ED008: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	24.95 meq/100g	102	79.9	110
EP004: Organic Matter (QCLot: 3381248)								
EP004: Organic Matter	----	0.5	%	<0.5	2.3 %	103	70.0	120
				<0.5	85 %	87.3	70.0	120



Sub-Matrix: SOIL				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3386495)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	86.8	72.0	128
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	79.2	73.0	123
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	94.4	67.0	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	95.2	70.0	132
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	80.0	68.0	136
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	79.2	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3386495)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	92.0	71.0	135
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	107	69.0	132
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	90.8	70.0	132
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	76.0	71.0	131
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	88.4	69.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	88.0	72.0	129
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	80.0	69.0	133
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	96.8	64.0	136
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	90.0	69.0	135
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	88.8	66.0	139
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	113	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3386495)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	113	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	82.7	71.6	129
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	90.4	69.8	131
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	93.9	68.7	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	104	65.1	134
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	65.6	63.0	144
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	72.8	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3386495)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	67.2	62.0	145
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	74.4	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	67.6	65.0	137
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	90.4	69.2	143



The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Sub-Matrix: SOIL				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3386495)							
EP2012801-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	92.0	72.0	128
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	73.6	73.0	123
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	84.4	67.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	89.2	70.0	132
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	# Not Determined	68.0	136
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	71.2	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3386495)							
EP2012801-001	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	104	71.0	135
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	131	69.0	132
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	73.2	70.0	132
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	81.6	71.0	131
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	86.0	69.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	101	72.0	129
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	73.6	69.0	133
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	90.4	64.0	136
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	104	69.0	135
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.00125 mg/kg	85.2	66.0	139
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	102	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3386495)							
EP2012801-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	71.2	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	91.8	71.6	129
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	105	69.8	131
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	# 219	68.7	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	# 207	65.1	134
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	78.8	63.0	144
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	77.2	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3386495)							
EP2012801-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	84.0	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	# Not Determined	64.0	140



Sub-Matrix: SOIL

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3386495) - continued							
EP2012801-001	Anonymous	EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	# Not Determined	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	97.2	69.2	143

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2012895	Page	: 1 of 6
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 23-Nov-2020
Site	: DEF19009/Learmonth	Issue Date	: 03-Dec-2020
Sampler	: MAELLE BOURDAIS, Sarah McCulloch	No. of samples received	: 12
Order number	: DEF19009/0960	No. of samples analysed	: 12

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- Matrix Spike outliers exist - please see following pages for full details.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- **NO** Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- **NO** Quality Control Sample Frequency Outliers exist.



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EP231A: Perfluoroalkyl Sulfonic Acids	EP2012801--001	Anonymous	Perfluorooctane sulfonic acid (PFOS)	1763-23-1	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EP231C: Perfluoroalkyl Sulfonamides	EP2012801--001	Anonymous	N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	219 %	68.7-130%	Recovery greater than upper data quality objective
EP231C: Perfluoroalkyl Sulfonamides	EP2012801--001	Anonymous	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	207 %	65.1-134%	Recovery greater than upper data quality objective
EP231D: (n:2) Fluorotelomer Sulfonic Acids	EP2012801--001	Anonymous	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EP231D: (n:2) Fluorotelomer Sulfonic Acids	EP2012801--001	Anonymous	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA002: pH 1:5 (Soils)								
Soil Glass Jar - Unpreserved (EA002)		19-Nov-2020	25-Nov-2020	26-Nov-2020	✔	25-Nov-2020	25-Nov-2020	✔
0960_SS168_201119, 0960_SS273_201119,								
0960_SS231_201119, 0960_SS265_201119,								
0960_SS170_201119, 0960_SS176_201119,								
0960_SS243_201119, 0960_SS166_201119,								
0960_SS157_201119, 0960_SS113_201119,								
0960_SS174_201119, 0960_SS108_201119								



Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA010: Conductivity (1:5)								
Soil Glass Jar - Unpreserved (EA010)		19-Nov-2020	25-Nov-2020	26-Nov-2020	✓	25-Nov-2020	23-Dec-2020	✓
0960_SS168_201119,	0960_SS273_201119,							
0960_SS231_201119,	0960_SS265_201119,							
0960_SS170_201119,	0960_SS176_201119,							
0960_SS243_201119,	0960_SS166_201119,							
0960_SS157_201119,	0960_SS113_201119,							
0960_SS174_201119,	0960_SS108_201119							
EA055: Moisture Content (Dried @ 105-110°C)								
Soil Glass Jar - Unpreserved (EA055)		19-Nov-2020	----	----	----	24-Nov-2020	03-Dec-2020	✓
0960_SS168_201119,	0960_SS273_201119,							
0960_SS231_201119,	0960_SS265_201119,							
0960_SS170_201119,	0960_SS176_201119,							
0960_SS243_201119,	0960_SS166_201119,							
0960_SS157_201119,	0960_SS113_201119,							
0960_SS174_201119,	0960_SS108_201119							
ED007: Exchangeable Cations								
Soil Glass Jar - Unpreserved (ED007)		19-Nov-2020	26-Nov-2020	17-Dec-2020	✓	26-Nov-2020	17-Dec-2020	✓
0960_SS168_201119,	0960_SS243_201119,							
0960_SS174_201119,	0960_SS108_201119							
ED008: Exchangeable Cations								
Soil Glass Jar - Unpreserved (ED008)		19-Nov-2020	27-Nov-2020	17-Dec-2020	✓	27-Nov-2020	17-Dec-2020	✓
0960_SS273_201119,	0960_SS231_201119,							
0960_SS265_201119,	0960_SS170_201119,							
0960_SS176_201119,	0960_SS166_201119,							
0960_SS157_201119,	0960_SS113_201119							
EP004: Organic Matter								
Soil Glass Jar - Unpreserved (EP004)		19-Nov-2020	30-Nov-2020	17-Dec-2020	✓	30-Nov-2020	17-Dec-2020	✓
0960_SS168_201119,	0960_SS273_201119,							
0960_SS231_201119,	0960_SS265_201119,							
0960_SS170_201119,	0960_SS176_201119,							
0960_SS243_201119,	0960_SS166_201119,							
0960_SS157_201119,	0960_SS113_201119,							
0960_SS174_201119,	0960_SS108_201119							
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE Soil Jar (EP231X)		19-Nov-2020	26-Nov-2020	18-May-2021	✓	27-Nov-2020	05-Jan-2021	✓
0960_SS168_201119,	0960_SS273_201119,							
0960_SS231_201119,	0960_SS265_201119,							
0960_SS170_201119,	0960_SS176_201119,							
0960_SS243_201119,	0960_SS166_201119,							
0960_SS157_201119,	0960_SS113_201119,							
0960_SS174_201119,	0960_SS108_201119							



Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE Soil Jar (EP231X)		19-Nov-2020	26-Nov-2020	18-May-2021	✓	27-Nov-2020	05-Jan-2021	✓
0960_SS168_201119,	0960_SS273_201119,							
0960_SS231_201119,	0960_SS265_201119,							
0960_SS170_201119,	0960_SS176_201119,							
0960_SS243_201119,	0960_SS166_201119,							
0960_SS157_201119,	0960_SS113_201119,							
0960_SS174_201119,	0960_SS108_201119							
EP231C: Perfluoroalkyl Sulfonamides								
HDPE Soil Jar (EP231X)		19-Nov-2020	26-Nov-2020	18-May-2021	✓	27-Nov-2020	05-Jan-2021	✓
0960_SS168_201119,	0960_SS273_201119,							
0960_SS231_201119,	0960_SS265_201119,							
0960_SS170_201119,	0960_SS176_201119,							
0960_SS243_201119,	0960_SS166_201119,							
0960_SS157_201119,	0960_SS113_201119,							
0960_SS174_201119,	0960_SS108_201119							
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE Soil Jar (EP231X)		19-Nov-2020	26-Nov-2020	18-May-2021	✓	27-Nov-2020	05-Jan-2021	✓
0960_SS168_201119,	0960_SS273_201119,							
0960_SS231_201119,	0960_SS265_201119,							
0960_SS170_201119,	0960_SS176_201119,							
0960_SS243_201119,	0960_SS166_201119,							
0960_SS157_201119,	0960_SS113_201119,							
0960_SS174_201119,	0960_SS108_201119							
EP231P: PFAS Sums								
HDPE Soil Jar (EP231X)		19-Nov-2020	26-Nov-2020	18-May-2021	✓	27-Nov-2020	05-Jan-2021	✓
0960_SS168_201119,	0960_SS273_201119,							
0960_SS231_201119,	0960_SS265_201119,							
0960_SS170_201119,	0960_SS176_201119,							
0960_SS243_201119,	0960_SS166_201119,							
0960_SS157_201119,	0960_SS113_201119,							
0960_SS174_201119,	0960_SS108_201119							



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)		Quality Control Specification	
Analytical Methods	Method	QC	Regular	Actual	Expected		Evaluation
Laboratory Duplicates (DUP)							
Electrical Conductivity (1:5)	EA010	4	30	13.33	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	2	12	16.67	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	3	18	16.67	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	4	30	13.33	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Electrical Conductivity (1:5)	EA010	2	30	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	12	8.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	2	18	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	4	30	13.33	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Electrical Conductivity (1:5)	EA010	2	30	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	12	8.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	2	18	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	In house: Referenced to Rayment and Lyons 4A1 and APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Electrical Conductivity (1:5)	EA010	SOIL	In house: Referenced to Rayment and Lyons 3A1 and APHA 2510. Conductivity is determined on soil samples using a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Exchangeable Cations	ED007	SOIL	In house: Referenced to Rayment & Lyons Method 15A1. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM Schedule B(3).
Exchangeable Cations with pre-treatment	ED008	SOIL	In house: Referenced to Rayment & Lyons Method 15A2. Soluble salts are removed from the sample prior to analysis. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM Schedule B(3).
Organic Matter	EP004	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3)
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	SOIL	In-house: Analysis of soils by solvent extraction followed by LC-Electrospray-MS-MS, Negative Mode using MRM using internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Exchangeable Cations Preparation Method	ED007PR	SOIL	In house: Referenced to Rayment & Lyons method 15A1. A 1M NH4Cl extraction by end over end tumbling at a ratio of 1:20. There is no pretreatment for soluble salts. Extracts can be run by ICP for cations.
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
Organic Matter	EP004-PR	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3).
Sample Extraction for PFAS in solid matrices	ORG73	SOIL	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

**CHAIN OF CUSTODY**

COC#: 16206

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: DEF19009/Learmonth SW - TEMPLATE-1

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

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23/11 11am

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RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS**ANALYSIS REQUIRED**

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Surface Waters Primary WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0960_SW208		19/11/2020 02:15 PM	Water	ALS: 4 Non ALS: 0	No	X		
002	0960_QC110		19/11/2020 02:17 PM	Water	ALS: 4 Non ALS: 0	No	X		

Environmental Division
PerthWork Order Reference
EP2012897

Telephone : + 61-8-9406 1301



CHAIN OF CUSTODY

COC#: 16206

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: DEF19009/Learmonth SW - TEMPLATE-1

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0960_SW208	Clear Plastic Bottle - Natural	250 mL	00070719042272	Green	No	
001	0960_SW208	HDPE (no PTFE)	20 mL	00350019106647	Grey	No	
001	0960_SW208	HDPE (no PTFE)	20 mL	00350019106880	Grey	No	
001	0960_SW208	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023453	Purple	No	
002	0960_QC110	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023683	Purple	No	
002	0960_QC110	HDPE (no PTFE)	20 mL	00350019106745	Grey	No	
002	0960_QC110	HDPE (no PTFE)	20 mL	00350019106736	Grey	No	
002	0960_QC110	Clear Plastic Bottle - Natural	250 mL	00070719042889	Green	No	

Total Bottle Count: ALS: 8, Non ALS: 0

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : EP2012897

<p>Client : CARDNO (WA) PTY LTD</p> <p>Contact : MAELLE BOURDAIS</p> <p>Address : 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006</p> <p>E-mail : maelle.bourdais@cardno.com.au</p> <p>Telephone : ----</p> <p>Facsimile : ----</p> <p>Project : WA_0960_PFASOMP</p> <p>Order number : DEF19009/0960</p> <p>C-O-C number : 16206</p> <p>Site : DEF19009/Learmonth</p> <p>Sampler : MAELLE BOURDAIS, Sarah McCulloch</p>	<p>Laboratory : Environmental Division Perth</p> <p>Contact : Nick Courts</p> <p>Address : 26 Rigali Way Wangara WA Australia 6065</p> <p>E-mail : nick.courts@alsglobal.com</p> <p>Telephone : +61-8-9406 1301</p> <p>Facsimile : +61-8-9406 1399</p> <p>Page : 1 of 3</p> <p>Quote number : ES2019CARBSD0002 (SY/139/19)</p> <p>QC Level : NEPM 2013 B3 & ALS QC Standard</p>
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Dates

Date Samples Received : 23-Nov-2020 11:00	Issue Date : 24-Nov-2020
Client Requested Due : 03-Dec-2020	Scheduled Reporting Date : 03-Dec-2020
Date	

Delivery Details

Mode of Delivery : Carrier	Security Seal : Intact.
No. of coolers/boxes : 3	Temperature : 25.0 - Ice present
Receipt Detail :	No. of samples received / analysed : 2 / 2

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepancies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.



Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2012897-001	19-Nov-2020 14:15	0960_SW208_201119	✓	✓	✓	✓	✓	✓	✓
EP2012897-002	19-Nov-2020 14:17	0960_QC110_201119	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2012897-001	19-Nov-2020 14:15	0960_SW208_201119	✓
EP2012897-002	19-Nov-2020 14:17	0960_QC110_201119	✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **WATER**

Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method	Container	Due for extraction	Due for analysis	Samples Received		Instructions Received	
Client Sample ID(s)				Date	Evaluation	Date	Evaluation
EA005-P: pH by PC Titrator							
0960_QC110_201119	Clear Plastic Bottle - Natural	----	19-Nov-2020	23-Nov-2020	✗	----	----
0960_SW208_201119	Clear Plastic Bottle - Natural	----	19-Nov-2020	23-Nov-2020	✗	----	----

CERTIFICATE OF ANALYSIS

Work Order : **EP2012897**
Client : **CARDNO (WA) PTY LTD**
Contact : **MAELLE BOURDAIS**
Address : **11 HARVEST TERRACE PO BOX 155**
WEST PERTH WA, AUSTRALIA 6006
Telephone : **----**
Project : **WA_0960_PFASOMP**
Order number : **DEF19009/0960**
C-O-C number : **16206**
Sampler : **MAELLE BOURDAIS, Sarah McCulloch**
Site : **DEF19009/Learmonth**
Quote number : **SY/139/19**
No. of samples received : **2**
No. of samples analysed : **2**

Page : 1 of 6
Laboratory : Environmental Division Perth
Contact : Nick Courts
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 23-Nov-2020 11:00
Date Analysis Commenced : 26-Nov-2020
Issue Date : 03-Dec-2020 22:29



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Daniel Fisher	Inorganics Analyst	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)			Sample ID	0960_SW208_201119	0960_QC110_201119	----	----	----
Sampling date / time				19-Nov-2020 14:15	19-Nov-2020 14:17	----	----	----
Compound	CAS Number	LOR	Unit	EP2012897-001	EP2012897-002	-----	-----	-----
Result				Result	Result	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	8.06	8.06	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	41400	42200	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	<5	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	116	114	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	116	114	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2830	2800	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	19100	19300	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	466	472	----	----	----
Magnesium	7439-95-4	1	mg/L	1530	1540	----	----	----
Sodium	7440-23-5	1	mg/L	11400	11600	----	----	----
Potassium	7440-09-7	1	mg/L	630	640	----	----	----
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	600	605	----	----	----
∅ Total Cations	----	0.01	meq/L	661	671	----	----	----
∅ Ionic Balance	----	0.01	%	4.85	5.19	----	----	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	1	1	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	----	----	----



Analytical Results

Sub-Matrix: SURFACE WATER
 (Matrix: WATER)

Sample ID

				0960_SW208_201119	0960_QC110_201119	----	----	----
Sampling date / time				19-Nov-2020 14:15	19-Nov-2020 14:17	----	----	----
Compound	CAS Number	LOR	Unit	EP2012897-001	EP2012897-002	-----	-----	-----
				Result	Result	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	----	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	----	----	----



Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)				Sample ID	0960_SW208_201119	0960_QC110_201119	----	----	----
Sampling date / time					19-Nov-2020 14:15	19-Nov-2020 14:17	----	----	----
Compound	CAS Number	LOR	Unit		EP2012897-001	EP2012897-002	-----	-----	-----
					Result	Result	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	----	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	<0.01	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	<0.01	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	<0.01	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		75.9	72.3	----	----	----
13C8-PFOA	----	0.02	%		78.2	79.2	----	----	----



Surrogate Control Limits

Sub-Matrix: **SURFACE WATER**

		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

QUALITY CONTROL REPORT

Work Order	: EP2012897	Page	: 1 of 6
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 23-Nov-2020
Order number	: DEF19009/0960	Date Analysis Commenced	: 26-Nov-2020
C-O-C number	: 16206	Issue Date	: 03-Dec-2020
Sampler	: MAELLE BOURDAIS, Sarah McCulloch		
Site	: DEF19009/Learmonth		
Quote number	: SY/139/19		
No. of samples received	: 2		
No. of samples analysed	: 2		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Daniel Fisher	Inorganics Analyst	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
 CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
 LOR = Limit of reporting
 RPD = Relative Percentage Difference
 # = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA005P: pH by PC Titrator (QC Lot: 3394150)									
EP2012892-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.44	8.43	0.118	0% - 20%
EP2012892-012	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.61	7.63	0.262	0% - 20%
EA005P: pH by PC Titrator (QC Lot: 3394152)									
EP2012897-002	0960_QC110_201119	EA005-P: pH Value	----	0.01	pH Unit	8.06	8.11	0.618	0% - 20%
EP2012917-010	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.64	7.64	0.00	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3385187)									
EP2012894-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	35400	34400	2.72	0% - 20%
EP2012897-001	0960_SW208_201119	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	41400	41800	1.03	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3385188)									
EP2012894-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	5030	4240	17.0	0% - 20%
EP2012917-006	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	244	236	3.54	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3394149)									
EP2012892-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	23	24	4.74	0% - 20%
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	578	587	1.61	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	600	611	1.73	0% - 20%
EP2012892-012	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	207	211	2.16	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	207	211	2.16	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3394151)									
EP2012897-002	0960_QC110_201119	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	114	109	4.66	0% - 20%

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 Work Order : EP2012897
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
ED037P: Alkalinity by PC Titrator (QC Lot: 3394151) - continued									
EP2012897-002	0960_QC110_201119	ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	114	109	4.66	0% - 20%
EP2012917-010	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	145	146	0.836	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	145	146	0.836	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3384199)									
EP2012897-001	0960_SW208_201119	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2830	2820	0.469	0% - 20%
EP2012947-003	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	3030	3010	0.714	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3384200)									
EP2012897-001	0960_SW208_201119	ED045G: Chloride	16887-00-6	1	mg/L	19100	19500	2.27	0% - 20%
EP2012947-003	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	21000	20400	2.78	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3383138)									
EP2012897-001	0960_SW208_201119	ED093F: Calcium	7440-70-2	1	mg/L	466	485	4.00	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	1530	1570	2.99	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	11400	11800	3.33	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	630	652	3.43	0% - 20%
EP2012917-009	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	1140	1140	0.317	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	1850	1850	0.0675	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	15500	15500	0.0438	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	604	604	0.00	0% - 20%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3392504)									
EP2012892-006	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	3	5	43.7	No Limit
EP2012894-004	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	4	6	37.2	No Limit



Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result		LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 3394150)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.5	102
				----	7 pH Unit	100	98.5	102
EA005P: pH by PC Titrator (QCLot: 3394152)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3385187)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	100	88.1	114
				<10	1000 mg/L	103	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3385188)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	112	89.1	120
				<5	1000 mg/L	103	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3394149)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	107	81.2	126
				<1	200 mg/L	110	90.0	110
ED037P: Alkalinity by PC Titrator (QCLot: 3394151)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	103	81.2	126
				<1	200 mg/L	99.6	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3384199)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	98.2	87.7	113
				<1	500 mg/L	103	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3384200)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	98.9	87.9	114
				<1	1000 mg/L	99.2	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3383138)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	102	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	103	88.0	110



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
ED093F: Dissolved Major Cations (QCLot: 3383138) - continued								
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	100	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	100	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3392504)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	97.6	73.2	116
				<1	100 mg/L	94.3	73.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3387598)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	78.2	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	90.2	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	85.6	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	79.8	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	85.6	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	83.0	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3387598)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	82.3	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	93.4	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	103	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	95.6	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	87.8	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	88.6	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	76.4	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	86.4	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	90.2	72.0	134
EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	72.0	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	91.4	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3387598)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	115	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	80.1	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	84.6	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	121	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	107	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	116	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	119	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3387598)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	83.2	63.0	143



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3387598) - continued								
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	111	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	107	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	82.8	71.4	144

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike Concentration	Spike Recovery (%) MS	Recovery Limits (%) Low High	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number				
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3384199)							
EP2012897-001	0960_SW208_201119	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3384200)							
EP2012897-001	0960_SW208_201119	ED045G: Chloride	16887-00-6	1000 mg/L	# Not Determined	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3392504)							
EP2012892-007	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	92.0	70.0	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2012897	Page	: 1 of 6
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 23-Nov-2020
Site	: DEF19009/Learmonth	Issue Date	: 03-Dec-2020
Sampler	: MAELLE BOURDAIS, Sarah McCulloch	No. of samples received	: 2
Order number	: DEF19009/0960	No. of samples analysed	: 2

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- Matrix Spike outliers exist - please see following pages for full details.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- Quality Control Sample Frequency Outliers exist - please see following pages for full details.



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO ₄ 2- by DA	EP2012897--001	0960_SW208_201119	Sulfate as SO ₄ - Turbidimetric	14808-79-8	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
ED045G: Chloride by Discrete Analyser	EP2012897--001	0960_SW208_201119	Chloride	16887-00-6	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method		Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural							
0960_SW208_201119,	0960_QC110_201119	----	----	----	01-Dec-2020	19-Nov-2020	12

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type Method	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	20	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	20	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for **VOC in soils** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA005P: pH by PC Titrator								
Clear Plastic Bottle - Natural (EA005-P)								
0960_SW208_201119,	0960_QC110_201119	19-Nov-2020	----	----	----	01-Dec-2020	19-Nov-2020	✖



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Clear Plastic Bottle - Natural (EA015H) 0960_SW208_201119,	0960_QC110_201119	19-Nov-2020	----	----	----	26-Nov-2020	26-Nov-2020	✓
EA025: Total Suspended Solids dried at 104 ± 2°C								
Clear Plastic Bottle - Natural (EA025H) 0960_SW208_201119,	0960_QC110_201119	19-Nov-2020	----	----	----	26-Nov-2020	26-Nov-2020	✓
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P) 0960_SW208_201119,	0960_QC110_201119	19-Nov-2020	----	----	----	01-Dec-2020	03-Dec-2020	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G) 0960_SW208_201119,	0960_QC110_201119	19-Nov-2020	----	----	----	03-Dec-2020	17-Dec-2020	✓
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G) 0960_SW208_201119,	0960_QC110_201119	19-Nov-2020	----	----	----	03-Dec-2020	17-Dec-2020	✓
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F) 0960_SW208_201119,	0960_QC110_201119	19-Nov-2020	----	----	----	26-Nov-2020	26-Nov-2020	✓
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002) 0960_SW208_201119,	0960_QC110_201119	19-Nov-2020	----	----	----	30-Nov-2020	17-Dec-2020	✓
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X) 0960_SW208_201119,	0960_QC110_201119	19-Nov-2020	30-Nov-2020	18-May-2021	✓	30-Nov-2020	18-May-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X) 0960_SW208_201119,	0960_QC110_201119	19-Nov-2020	30-Nov-2020	18-May-2021	✓	30-Nov-2020	18-May-2021	✓
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X) 0960_SW208_201119,	0960_QC110_201119	19-Nov-2020	30-Nov-2020	18-May-2021	✓	30-Nov-2020	18-May-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X) 0960_SW208_201119,	0960_QC110_201119	19-Nov-2020	30-Nov-2020	18-May-2021	✓	30-Nov-2020	18-May-2021	✓
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X) 0960_SW208_201119,	0960_QC110_201119	19-Nov-2020	30-Nov-2020	18-May-2021	✓	30-Nov-2020	18-May-2021	✓



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	20	0.00	10.00	✗	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	15	13.33	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	19	10.53	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	15	13.33	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	19	10.53	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	15	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	19	5.26	5.26	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	20	0.00	5.00	✗	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of 'filterable' residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C. This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high temperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.



Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

**CHAIN OF CUSTODY**

COC#: 16170

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: AB DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH:

SAMPLER MOBILE:

QUOTE NO: SY/139/19

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

°C

Other comments:

SAMPLE DETAILS**ANALYSIS REQUIRED**

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0960_MW115		19/11/2020 08:31 AM	Water	ALS: 4 Non ALS: 0	No	X		
002	0960_MW112		19/11/2020 08:51 AM	Water	ALS: 4 Non ALS: 0	No	X		
003	0960_MW168		19/11/2020 09:32 AM	Water	ALS: 4 Non ALS: 0	No	X		
004	0960_QC104		19/11/2020 09:33 AM	Water	ALS: 4 Non ALS: 0	No	X		
005	0960_MW167		19/11/2020 10:27 AM	Water	ALS: 4 Non ALS: 0	No	X		
006	0960_QC105		19/11/2020 10:28 AM	Water	ALS: 4 Non ALS: 0	No	X		
007	0960_MW165		19/11/2020 12:37 PM	Water	ALS: 4 Non ALS: 0	No	X		
008	0960_MW166		19/11/2020 01:00 PM	Water	ALS: 4 Non ALS: 0	No	X		
009	0960_QC109		19/11/2020 01:27 PM	Water	ALS: 4 Non ALS: 0	No	X		

Environmental Division
Perth
Work Order Reference
EP2012917



Telephone : +61-8-9406 1301



CHAIN OF CUSTODY

ALS COC#: 16170

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: AB DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
010	0960_MW127		19/11/2020 01:28 PM	Water	ALS: 4 Non ALS: 0	No	X		

**CHAIN OF CUSTODY**

COC#: 16170

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: AB DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0960_MW115	Clear Plastic Bottle - Natural	250 mL	00070719042709	Green	No	
001	0960_MW115	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220056602	Purple	No	
001	0960_MW115	HDPE (no PTFE)	20 mL	00352005016113	Grey	No	
001	0960_MW115	HDPE (no PTFE)	20 mL	00352005016192	Grey	No	
002	0960_MW112	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220065444	Purple	No	
002	0960_MW112	HDPE (no PTFE)	20 mL	00352005016112	Grey	No	
002	0960_MW112	HDPE (no PTFE)	20 mL	00352005016319	Grey	No	
002	0960_MW112	Clear Plastic Bottle - Natural	250 mL	00070719042824	Green	No	
003	0960_MW168	Clear Plastic Bottle - Natural	250 mL	00070719042793	Green	No	
003	0960_MW168	HDPE (no PTFE)	20 mL	00352005016191	Grey	No	
003	0960_MW168	HDPE (no PTFE)	20 mL	00352005016106	Grey	No	
003	0960_MW168	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220056501	Purple	No	
004	0960_QC104	Clear Plastic Bottle - Natural	250 mL	00070719042804	Green	No	
004	0960_QC104	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023226	Purple	No	
004	0960_QC104	HDPE (no PTFE)	20 mL	00352005016045	Grey	No	
004	0960_QC104	HDPE (no PTFE)	20 mL	00352005016279	Grey	No	
005	0960_MW167	Clear Plastic Bottle - Natural	250 mL	00070719042868	Green	No	
005	0960_MW167	HDPE (no PTFE)	20 mL	00352005016050	Grey	No	
005	0960_MW167	HDPE (no PTFE)	20 mL	00352005016153	Grey	No	
005	0960_MW167	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220055940	Purple	No	
006	0960_QC105	Clear Plastic Bottle - Natural	250 mL	00070719042907	Green	No	
006	0960_QC105	HDPE (no PTFE)	20 mL	00352005016249	Grey	No	
006	0960_QC105	HDPE (no PTFE)	20 mL	00352005016044	Grey	No	
006	0960_QC105	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023723	Purple	No	
007	0960_MW165	Clear Plastic Bottle - Natural	250 mL	00070719042866	Green	No	
007	0960_MW165	HDPE (no PTFE)	20 mL	00350019106855	Grey	No	

**CHAIN OF CUSTODY**

COC#: 16170

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: AB DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:

SAMPLER MOBILE:

QUOTE NO: SY/139/19

/ ES2019CARBSD0002

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

°C

Other comments:

007	0960_MW165	HDPE (no PTFE)	20 mL	00350019106653	Grey	No	
007	0960_MW165	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023712	Purple	No	
008	0960_MW166	Clear Plastic Bottle - Natural	250 mL	00070719042849	Green	No	
008	0960_MW166	HDPE (no PTFE)	20 mL	00350019106643	Grey	No	
008	0960_MW166	HDPE (no PTFE)	20 mL	00350019106882	Grey	No	
008	0960_MW166	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023751	Purple	No	
009	0960_QC109	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023680	Purple	No	
009	0960_QC109	Clear Plastic Bottle - Natural	250 mL	00070719042850	Green	No	
009	0960_QC109	HDPE (no PTFE)	20 mL	00350019106860	Grey	No	
009	0960_QC109	HDPE (no PTFE)	20 mL	00350019106872	Grey	No	
010	0960_MW127	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023774	Purple	No	
010	0960_MW127	HDPE (no PTFE)	20 mL	00350019106689	Grey	No	
010	0960_MW127	HDPE (no PTFE)	20 mL	00350019106646	Grey	No	
010	0960_MW127	Clear Plastic Bottle - Natural	250 mL	00070719042055	Green	No	

Total Bottle Count: ALS: 40, Non ALS: 0

**SAMPLE RECEIPT NOTIFICATION (SRN)****Work Order : EP2012917**

Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: maelle.bourdais@cardno.com.au	E-mail	: nick.courts@alsglobal.com
Telephone	: ----	Telephone	: +61-8-9406 1301
Facsimile	: ----	Facsimile	: +61-8-9406 1399
Project	: WA_0960_PFASOMP	Page	: 1 of 3
Order number	: DEF19009/0960	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 16170	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/Learmonth		
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		

Dates

Date Samples Received	: 23-Nov-2020 11:00	Issue Date	: 24-Nov-2020
Client Requested Due Date	: 03-Dec-2020	Scheduled Reporting Date	: 03-Dec-2020

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 3	Temperature	: 25.0 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 10 / 10

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepancies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.



Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2012917-001	19-Nov-2020 08:31	0960_MW115_201119	✓	✓	✓	✓	✓	✓	✓
EP2012917-002	19-Nov-2020 08:51	0960_MW112_201119	✓	✓	✓	✓	✓	✓	✓
EP2012917-003	19-Nov-2020 09:32	0960_MW168_201119	✓	✓	✓	✓	✓	✓	✓
EP2012917-004	19-Nov-2020 09:33	0960_QC104_201119	✓	✓	✓	✓	✓	✓	✓
EP2012917-005	19-Nov-2020 10:27	0960_MW167_201119	✓	✓	✓	✓	✓	✓	✓
EP2012917-006	19-Nov-2020 10:28	0960_QC105_201119	✓	✓	✓	✓	✓	✓	✓
EP2012917-007	19-Nov-2020 12:37	0960_MW165_201119	✓	✓	✓	✓	✓	✓	✓
EP2012917-008	19-Nov-2020 13:00	0960_MW166_201119	✓	✓	✓	✓	✓	✓	✓
EP2012917-009	19-Nov-2020 13:27	0960_QC109_201119	✓	✓	✓	✓	✓	✓	✓
EP2012917-010	19-Nov-2020 13:28	0960_MW127_201119	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2012917-001	19-Nov-2020 08:31	0960_MW115_201119	✓
EP2012917-002	19-Nov-2020 08:51	0960_MW112_201119	✓
EP2012917-003	19-Nov-2020 09:32	0960_MW168_201119	✓
EP2012917-004	19-Nov-2020 09:33	0960_QC104_201119	✓
EP2012917-005	19-Nov-2020 10:27	0960_MW167_201119	✓
EP2012917-006	19-Nov-2020 10:28	0960_QC105_201119	✓
EP2012917-007	19-Nov-2020 12:37	0960_MW165_201119	✓
EP2012917-008	19-Nov-2020 13:00	0960_MW166_201119	✓
EP2012917-009	19-Nov-2020 13:27	0960_QC109_201119	✓
EP2012917-010	19-Nov-2020 13:28	0960_MW127_201119	✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Requested Deliverables

Email claire.armstrong@cardno.com.au

[illegible]

Email derp.labreports@esdat.com.au

[illegible]

CERTIFICATE OF ANALYSIS

Work Order : **EP2012917**
Client : **CARDNO (WA) PTY LTD**
Contact : **MAELLE BOURDAIS**
Address : **11 HARVEST TERRACE PO BOX 155**
WEST PERTH WA, AUSTRALIA 6006
Telephone : **----**
Project : **WA_0960_PFASOMP**
Order number : **DEF19009/0960**
C-O-C number : **16170**
Sampler : **ASHLEY BROWN, MAELLE BOURDAIS**
Site : **DEF19009/Learmonth**
Quote number : **SY/139/19**
No. of samples received : **10**
No. of samples analysed : **10**

Page : 1 of 9
Laboratory : Environmental Division Perth
Contact : Nick Courts
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 23-Nov-2020 11:00
Date Analysis Commenced : 26-Nov-2020
Issue Date : 03-Dec-2020 18:00



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

Ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- Sample #9 and #10 have been identified as client duplicates, however sample #9 contains visible sediment.
- EA025H: Total suspended solids for sample #3/4, #5/6, #9/10 confirmed to be different by visual inspection.
- TDS by method EA-015 may bias high for sample #7 and #8 due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW115_201119	0960_MW112_201119	0960_MW168_201119	0960_QC104_201119	0960_MW167_201119
Sampling date / time				19-Nov-2020 08:31	19-Nov-2020 08:51	19-Nov-2020 09:32	19-Nov-2020 09:33	19-Nov-2020 10:27
Compound	CAS Number	LOR	Unit	EP2012917-001	EP2012917-002	EP2012917-003	EP2012917-004	EP2012917-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.77	8.04	7.77	7.87	8.28
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	27400	8310	8030	8130	3250
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	67	59	577	106	180
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L	340	658	545	543	859
Total Alkalinity as CaCO ₃	----	1	mg/L	340	658	545	543	859
ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA								
Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L	1490	1360	716	716	366
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	12800	3530	4150	4140	1090
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	637	130	218	220	30
Magnesium	7439-95-4	1	mg/L	886	184	231	234	36
Sodium	7440-23-5	1	mg/L	7200	2680	2320	2360	1140
Potassium	7440-09-7	1	mg/L	345	115	107	109	51
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	399	141	143	142	55.5
∅ Total Cations	----	0.01	meq/L	427	141	134	136	55.4
∅ Ionic Balance	----	0.01	%	3.37	0.04	3.37	2.47	0.16
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	<1	2	<1	<1	2
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.04	0.02	0.06	0.06	0.04
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.05	0.03	0.06	0.08	0.06
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.33	0.42	0.56	0.59	1.31
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	0.08



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW115_201119	0960_MW112_201119	0960_MW168_201119	0960_QC104_201119	0960_MW167_201119
Sampling date / time				19-Nov-2020 08:31	19-Nov-2020 08:51	19-Nov-2020 09:32	19-Nov-2020 09:33	19-Nov-2020 10:27
Compound	CAS Number	LOR	Unit	EP2012917-001	EP2012917-002	EP2012917-003	EP2012917-004	EP2012917-005
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.06	0.63	0.06	0.10	1.22
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.06	0.06	0.16
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.09	0.08	0.23	0.24	0.31
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	0.02	0.12
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.01	0.01	0.18
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW115_201119	0960_MW112_201119	0960_MW168_201119	0960_QC104_201119	0960_MW167_201119
Sampling date / time				19-Nov-2020 08:31	19-Nov-2020 08:51	19-Nov-2020 09:32	19-Nov-2020 09:33	19-Nov-2020 10:27
Compound	CAS Number	LOR	Unit	EP2012917-001	EP2012917-002	EP2012917-003	EP2012917-004	EP2012917-005
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	0.57	1.18	1.04	1.16	3.50
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	0.39	1.05	0.62	0.69	2.53
Sum of PFAS (WA DER List)	----	0.01	µg/L	0.52	1.15	0.98	1.08	3.34
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	86.9	101	98.3	97.0	90.5
13C8-PFOA	----	0.02	%	91.1	97.9	94.7	92.9	97.4



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_QC105_201119	0960_MW165_201119	0960_MW166_201119	0960_QC109_201119	0960_MW127_201119
Sampling date / time				19-Nov-2020 10:28	19-Nov-2020 12:37	19-Nov-2020 13:00	19-Nov-2020 13:27	19-Nov-2020 13:28
Compound	CAS Number	LOR	Unit	EP2012917-006	EP2012917-007	EP2012917-008	EP2012917-009	EP2012917-010
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	8.28	8.80	8.49	7.63	7.64
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	3470	1370	1900	55200	57000
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	244	284	910	278	21
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	<1	123	51	<1	<1
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L	812	668	920	162	145
Total Alkalinity as CaCO ₃	----	1	mg/L	812	791	970	162	145
ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA								
Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L	394	34	130	2940	3270
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	1250	275	344	26100	26900
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	39	3	4	1140	1140
Magnesium	7439-95-4	1	mg/L	48	5	7	1850	1840
Sodium	7440-23-5	1	mg/L	1200	498	612	15500	15500
Potassium	7440-09-7	1	mg/L	56	21	27	604	599
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	59.7	24.3	31.8	801	830
∅ Total Cations	----	0.01	meq/L	59.5	22.8	28.1	899	898
∅ Ionic Balance	----	0.01	%	0.14	3.21	6.19	5.77	3.94
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	<1	3	<1	<1	2
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.03	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.06	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	1.16	<0.02	0.11	<0.02	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.06	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_QC105_201119	0960_MW165_201119	0960_MW166_201119	0960_QC109_201119	0960_MW127_201119
Sampling date / time				19-Nov-2020 10:28	19-Nov-2020 12:37	19-Nov-2020 13:00	19-Nov-2020 13:27	19-Nov-2020 13:28
Compound	CAS Number	LOR	Unit	EP2012917-006	EP2012917-007	EP2012917-008	EP2012917-009	EP2012917-010
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.97	0.02	0.18	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.15	<0.02	0.06	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.29	<0.02	0.07	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.11	<0.02	0.04	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.17	<0.01	0.03	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_QC105_201119	0960_MW165_201119	0960_MW166_201119	0960_QC109_201119	0960_MW127_201119
Sampling date / time				19-Nov-2020 10:28	19-Nov-2020 12:37	19-Nov-2020 13:00	19-Nov-2020 13:27	19-Nov-2020 13:28
Compound	CAS Number	LOR	Unit	EP2012917-006	EP2012917-007	EP2012917-008	EP2012917-009	EP2012917-010
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	3.00	0.02	0.49	<0.01	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	2.13	0.02	0.29	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L	2.88	0.02	0.49	<0.01	<0.01
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	90.0	93.2	98.6	93.7	97.4
13C8-PFOA	----	0.02	%	94.7	96.4	98.9	93.9	95.9



Surrogate Control Limits

Sub-Matrix: GROUNDWATER

		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

QUALITY CONTROL REPORT

Work Order	: EP2012917	Page	: 1 of 6
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 23-Nov-2020
Order number	: DEF19009/0960	Date Analysis Commenced	: 26-Nov-2020
C-O-C number	: 16170	Issue Date	: 03-Dec-2020
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		
Site	: DEF19009/Learmonth		
Quote number	: SY/139/19		
No. of samples received	: 10		
No. of samples analysed	: 10		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
= Indicates failed QC

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA005P: pH by PC Titrator (QC Lot: 3394152)									
EP2012897-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.06	8.11	0.618	0% - 20%
EP2012917-010	0960_MW127_201119	EA005-P: pH Value	----	0.01	pH Unit	7.64	7.64	0.00	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3385168)									
EP2012892-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	5050	4960	1.80	0% - 20%
EP2012892-009	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	4730	4670	1.23	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3385187)									
EP2012894-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	35400	34400	2.72	0% - 20%
EP2012897-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	41400	41800	1.03	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3385169)									
EP2012892-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	80	86	7.50	0% - 50%
EP2012892-011	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	216	206	4.74	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3385188)									
EP2012894-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	5030	4240	17.0	0% - 20%
EP2012917-006	0960_QC105_201119	EA025H: Suspended Solids (SS)	----	5	mg/L	244	236	3.54	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3394151)									
EP2012897-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	114	109	4.66	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	114	109	4.66	0% - 20%
EP2012917-010	0960_MW127_201119	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	145	146	0.836	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	145	146	0.836	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3384202)									

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 Work Order : EP2012917
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3384202) - continued									
EP2013114-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	5130	4720	8.25	0% - 20%
EP2013115-002	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	5160	5170	0.218	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3384203)									
EP2013114-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	31200	29800	4.84	0% - 20%
EP2013115-002	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	34600	34500	0.260	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3383138)									
EP2012897-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	466	485	4.00	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	1530	1570	2.99	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	11400	11800	3.33	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	630	652	3.43	0% - 20%
EP2012917-009	0960_QC109_201119	ED093F: Calcium	7440-70-2	1	mg/L	1140	1140	0.317	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	1850	1850	0.0675	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	15500	15500	0.0438	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	604	604	0.00	0% - 20%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3397199)									
EP2012904-004	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	2	3	0.00	No Limit
EP2012917-008	0960_MW166_201119	EP002: Dissolved Organic Carbon	----	1	mg/L	<1	2	0.00	No Limit

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EA005P: pH by PC Titrator (QCLot: 3394152)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3385168)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	99.8	88.1	114
				<10	1000 mg/L	102	88.1	114
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3385187)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	100	88.1	114
				<10	1000 mg/L	103	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3385169)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	101	89.1	120
				<5	1000 mg/L	102	89.1	120
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3385188)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	112	89.1	120
				<5	1000 mg/L	103	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3394151)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	103	81.2	126
				<1	200 mg/L	99.6	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3384202)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	92.6	87.7	113
				<1	500 mg/L	104	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3384203)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	99.4	87.9	114
				<1	1000 mg/L	101	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3383138)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	102	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	103	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	100	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	100	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3397199)								



Sub-Matrix: **WATER**

Method: Compound				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%)	
							Low	High
CAS Number	LOR	Unit	Result					
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3397199) - continued								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	96.8	73.2	116
				<1	100 mg/L	94.3	73.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3387615)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	84.2	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	95.0	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	89.0	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	89.0	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	90.0	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	85.0	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3387615)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	91.2	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	102	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	109	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	105	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	92.2	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	100	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	92.0	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	98.2	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	98.4	72.0	134
EP231X: Perfluorotridecanoic acid (PFTriDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	125	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	83.8	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3387615)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	117	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	100	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	113	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	122	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	123	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	118	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	124	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3387615)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	91.6	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	120	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	130	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	88.4	71.4	144



Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3384202)							
EP2013115-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3384203)							
EP2013115-001	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	# Not Determined	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3397199)							
EP2012904-005	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	95.8	70.0	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2012917	Page	: 1 of 8
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 23-Nov-2020
Site	: DEF19009/Learmonth	Issue Date	: 03-Dec-2020
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS	No. of samples received	: 10
Order number	: DEF19009/0960	No. of samples analysed	: 10

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- Matrix Spike outliers exist - please see following pages for full details.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- Quality Control Sample Frequency Outliers exist - please see following pages for full details.



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA	EP2013115--001	Anonymous	Sulfate as SO4 - Turbidimetric	14808-79-8	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
ED045G: Chloride by Discrete Analyser	EP2013115--001	Anonymous	Chloride	16887-00-6	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method		<i>Extraction / Preparation</i>			<i>Analysis</i>		
Container / Client Sample ID(s)		<i>Date extracted</i>	<i>Due for extraction</i>	<i>Days overdue</i>	<i>Date analysed</i>	<i>Due for analysis</i>	<i>Days overdue</i>
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural							
0960_MW115_201119,	0960_MW112_201119,	----	----	----	01-Dec-2020	19-Nov-2020	12
0960_MW168_201119,	0960_QC104_201119,						
0960_MW167_201119,	0960_QC105_201119,						
0960_MW165_201119,	0960_MW166_201119,						
0960_QC109_201119,	0960_MW127_201119						

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	19	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	19	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for **VOC in soils** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator								
Clear Plastic Bottle - Natural (EA005-P)		19-Nov-2020	----	----	----	01-Dec-2020	19-Nov-2020	✖
0960_MW115_201119,	0960_MW112_201119,							
0960_MW168_201119,	0960_QC104_201119,							
0960_MW167_201119,	0960_QC105_201119,							
0960_MW165_201119,	0960_MW166_201119,							
0960_QC109_201119,	0960_MW127_201119							
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Clear Plastic Bottle - Natural (EA015H)		19-Nov-2020	----	----	----	26-Nov-2020	26-Nov-2020	✔
0960_MW115_201119,	0960_MW112_201119,							
0960_MW168_201119,	0960_QC104_201119,							
0960_MW167_201119,	0960_QC105_201119,							
0960_MW165_201119,	0960_MW166_201119,							
0960_QC109_201119,	0960_MW127_201119							
EA025: Total Suspended Solids dried at 104 ± 2°C								
Clear Plastic Bottle - Natural (EA025H)		19-Nov-2020	----	----	----	26-Nov-2020	26-Nov-2020	✔
0960_MW115_201119,	0960_MW112_201119,							
0960_MW168_201119,	0960_QC104_201119,							
0960_MW167_201119,	0960_QC105_201119,							
0960_MW165_201119,	0960_MW166_201119,							
0960_QC109_201119,	0960_MW127_201119							
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P)		19-Nov-2020	----	----	----	01-Dec-2020	03-Dec-2020	✔
0960_MW115_201119,	0960_MW112_201119,							
0960_MW168_201119,	0960_QC104_201119,							
0960_MW167_201119,	0960_QC105_201119,							
0960_MW165_201119,	0960_MW166_201119,							
0960_QC109_201119,	0960_MW127_201119							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G)		19-Nov-2020	----	----	----	03-Dec-2020	17-Dec-2020	✔
0960_MW115_201119,	0960_MW112_201119,							
0960_MW168_201119,	0960_QC104_201119,							
0960_MW167_201119,	0960_QC105_201119,							
0960_MW165_201119,	0960_MW166_201119,							
0960_QC109_201119,	0960_MW127_201119							
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G)		19-Nov-2020	----	----	----	03-Dec-2020	17-Dec-2020	✔
0960_MW115_201119,	0960_MW112_201119,							
0960_MW168_201119,	0960_QC104_201119,							
0960_MW167_201119,	0960_QC105_201119,							
0960_MW165_201119,	0960_MW166_201119,							
0960_QC109_201119,	0960_MW127_201119							



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F)		19-Nov-2020	----	----	----	26-Nov-2020	26-Nov-2020	✓
0960_MW115_201119,	0960_MW112_201119,							
0960_MW168_201119,	0960_QC104_201119,							
0960_MW167_201119,	0960_QC105_201119,							
0960_MW165_201119,	0960_MW166_201119,							
0960_QC109_201119,	0960_MW127_201119							
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002)		19-Nov-2020	----	----	----	02-Dec-2020	17-Dec-2020	✓
0960_MW115_201119,	0960_MW112_201119,							
0960_MW168_201119,	0960_QC104_201119,							
0960_MW167_201119,	0960_QC105_201119,							
0960_MW165_201119,	0960_MW166_201119,							
0960_QC109_201119,	0960_MW127_201119							
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X)		19-Nov-2020	30-Nov-2020	18-May-2021	✓	30-Nov-2020	18-May-2021	✓
0960_MW115_201119,	0960_MW112_201119,							
0960_MW168_201119,	0960_QC104_201119,							
0960_MW167_201119,	0960_QC105_201119,							
0960_MW165_201119,	0960_MW166_201119,							
0960_QC109_201119,	0960_MW127_201119							
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X)		19-Nov-2020	30-Nov-2020	18-May-2021	✓	30-Nov-2020	18-May-2021	✓
0960_MW115_201119,	0960_MW112_201119,							
0960_MW168_201119,	0960_QC104_201119,							
0960_MW167_201119,	0960_QC105_201119,							
0960_MW165_201119,	0960_MW166_201119,							
0960_QC109_201119,	0960_MW127_201119							
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X)		19-Nov-2020	30-Nov-2020	18-May-2021	✓	30-Nov-2020	18-May-2021	✓
0960_MW115_201119,	0960_MW112_201119,							
0960_MW168_201119,	0960_QC104_201119,							
0960_MW167_201119,	0960_QC105_201119,							
0960_MW165_201119,	0960_MW166_201119,							
0960_QC109_201119,	0960_MW127_201119							
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X)		19-Nov-2020	30-Nov-2020	18-May-2021	✓	30-Nov-2020	18-May-2021	✓
0960_MW115_201119,	0960_MW112_201119,							
0960_MW168_201119,	0960_QC104_201119,							
0960_MW167_201119,	0960_QC105_201119,							
0960_MW165_201119,	0960_MW166_201119,							
0960_QC109_201119,	0960_MW127_201119							



Matrix: WATER

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X)		19-Nov-2020	30-Nov-2020	18-May-2021	✔	30-Nov-2020	18-May-2021	✔
0960_MW115_201119,								
0960_MW168_201119,								
0960_MW167_201119,								
0960_MW165_201119,								
0960_QC109_201119,								
0960_MW127_201119								



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	19	0.00	10.00	✗	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	4	34	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	4	38	10.53	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	4	34	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	4	38	10.53	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	34	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	38	5.26	5.26	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	19	0.00	5.00	✗	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of 'filterable' residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C. This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high temperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.



Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.



CHAIN OF CUSTODY

COC#: 16171

ALS Laboratory: EP Perth

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: AB DEF19009/Learmonth SED

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Sediments SEDIMENT	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0960_SS122		19/11/2020 09:35 AM	Soil	ALS: 2 Non ALS: 0	No	X		
002	0960_QC102		19/11/2020 09:36 AM	Soil	ALS: 2 Non ALS: 0	No	X		
003	0960_SS114		19/11/2020 10:09 AM	Soil	ALS: 2 Non ALS: 0	No	X		
004	0960_SS124		19/11/2020 11:22 AM	Soil	ALS: 2 Non ALS: 0	No	X		
005	0960_SS277		19/11/2020 11:23 AM	Soil	ALS: 2 Non ALS: 0	No	X		
006	0960_SS125		19/11/2020 11:24 AM	Soil	ALS: 2 Non ALS: 0	No	X		
007	0960_SS278		19/11/2020 11:25 AM	Soil	ALS: 2 Non ALS: 0	No	X		
008	0960_QC107		19/11/2020 11:25 AM	Soil	ALS: 2 Non ALS: 0	No	X		

Environmental Division
Perth
Work Order Reference
EP2012919



Telephone : + 61-8-9406 1301

**CHAIN OF CUSTODY**

COC#: 16171

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: AB DEF19009/Learmonth SED

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0960_SS122	Soil Glass Jar - Unpreserved	150 mL	00260220013317	Orange	No	
001	0960_SS122	HDPE Soil Jar	200 mL	00620719026330	Grey	No	
002	0960_QC102	Soil Glass Jar - Unpreserved	150 mL	00260220014701	Orange	No	
002	0960_QC102	HDPE Soil Jar	200 mL	00621019018406	Grey	No	
003	0960_SS114	Soil Glass Jar - Unpreserved	150 mL	00260220069392	Orange	No	
003	0960_SS114	HDPE Soil Jar	200 mL	00620719042380	Grey	No	
004	0960_SS124	Soil Glass Jar - Unpreserved	150 mL	00260220014936	Orange	No	
004	0960_SS124	HDPE Soil Jar	200 mL	00620719026374	Grey	No	
005	0960_SS277	HDPE Soil Jar	200 mL	00620719008752	Grey	No	
005	0960_SS277	Soil Glass Jar - Unpreserved	150 mL	00260220013814	Orange	No	
006	0960_SS125	HDPE Soil Jar	200 mL	00620719042443	Grey	No	
006	0960_SS125	Soil Glass Jar - Unpreserved	150 mL	00260220069383	Orange	No	
007	0960_SS278	HDPE Soil Jar	200 mL	00620719042490	Grey	No	
007	0960_SS278	Soil Glass Jar - Unpreserved	150 mL	00260220013699	Orange	No	
008	0960_QC107	HDPE Soil Jar	200 mL	00620719008712	Grey	No	
008	0960_QC107	Soil Glass Jar - Unpreserved	150 mL	00260220069401	Orange	No	

Total Bottle Count: ALS: 16, Non ALS: 0

**SAMPLE RECEIPT NOTIFICATION (SRN)****Work Order : EP2012919**

Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: maelle.bourdais@cardno.com.au	E-mail	: nick.courts@alsglobal.com
Telephone	: ----	Telephone	: +61-8-9406 1301
Facsimile	: ----	Facsimile	: +61-8-9406 1399
Project	: WA_0960_PFASOMP	Page	: 1 of 2
Order number	: DEF19009/0960	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 16171	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/Learmonth		
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		

Dates

Date Samples Received	: 23-Nov-2020 11:00	Issue Date	: 24-Nov-2020
Client Requested Due Date	: 03-Dec-2020	Scheduled Reporting Date	: 03-Dec-2020

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 3	Temperature	: 25.0 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 8 / 8

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepancies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- ### Summary of Sample(s) and Requested Analysis

Laboratory sample ID	Sampling date / time	Sample ID	SOIL - A - Agriculture	SOIL - E - Moisture	SOIL - E - Organic	SOIL - E - PFAS -
EP2012919-001	19-Nov-2020 09:35	0960_SS122_201119	✓	✓	✓	✓
EP2012919-002	19-Nov-2020 09:36	0960_QC102_201119	✓	✓	✓	✓
EP2012919-003	19-Nov-2020 10:09	0960_SS114_201119	✓	✓	✓	✓
EP2012919-004	19-Nov-2020 11:22	0960_SS124_201119	✓	✓	✓	✓
EP2012919-005	19-Nov-2020 11:23	0960_SS277_201119	✓	✓	✓	✓
EP2012919-006	19-Nov-2020 11:24	0960_SS125_201119	✓	✓	✓	✓
EP2012919-007	19-Nov-2020 11:25	0960_SS278_201119	✓	✓	✓	✓
EP2012919-008	19-Nov-2020 11:25	0960_QC107_201119	✓	✓	✓	✓

Sample(s) have been received within the recommended holding times for the requested analysis.

Email claire.armstrong@cardno.com.au

Email maelle.bourdais@cardno.com.au

CERTIFICATE OF ANALYSIS

Work Order : **EP2012919**
Client : **CARDNO (WA) PTY LTD**
Contact : **MAELLE BOURDAIS**
Address : **11 HARVEST TERRACE PO BOX 155**
WEST PERTH WA, AUSTRALIA 6006
Telephone : **----**
Project : **WA_0960_PFASOMP**
Order number : **DEF19009/0960**
C-O-C number : **16171**
Sampler : **ASHLEY BROWN, MAELLE BOURDAIS**
Site : **DEF19009/Learmonth**
Quote number : **SY/139/19**
No. of samples received : **8**
No. of samples analysed : **8**

Page : 1 of 9
Laboratory : Environmental Division Perth
Contact : Nick Courts
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 23-Nov-2020 11:00
Date Analysis Commenced : 24-Nov-2020
Issue Date : 03-Dec-2020 17:51



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X: High Matrix Spike (MS) recovery for analyte "N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE) and N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)" deemed acceptable as all associated analyte results are less than LOR.
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H⁺ + Al³⁺).
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SS122_201119	0960_QC102_201119	0960_SS114_201119	0960_SS124_201119	0960_SS277_201119
Sampling date / time					19-Nov-2020 09:35	19-Nov-2020 09:36	19-Nov-2020 10:09	19-Nov-2020 11:22	19-Nov-2020 11:23
Compound	CAS Number	LOR	Unit		EP2012919-001	EP2012919-002	EP2012919-003	EP2012919-004	EP2012919-005
				Result	Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		8.9	9.0	8.7	8.1	8.4
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		1460	1060	1820	208	94
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		24.2	26.2	0.5	1.5	24.6
ED007: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		----	----	----	16.0	13.8
Exchangeable Magnesium	----	0.1	meq/100g		----	----	----	3.0	1.4
Exchangeable Potassium	----	0.1	meq/100g		----	----	----	1.9	0.7
Exchangeable Sodium	----	0.1	meq/100g		----	----	----	0.3	<0.1
Cation Exchange Capacity	----	0.1	meq/100g		----	----	----	21.2	16.0
Exchangeable Sodium Percent	----	0.1	%		----	----	----	1.2	0.3
ED008: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		21.3	21.2	17.3	----	----
Exchangeable Magnesium	----	0.1	meq/100g		2.4	2.6	1.6	----	----
Exchangeable Potassium	----	0.1	meq/100g		0.6	0.6	0.3	----	----
Exchangeable Sodium	----	0.1	meq/100g		0.2	0.2	<0.1	----	----
Cation Exchange Capacity	----	0.1	meq/100g		24.5	24.7	19.3	----	----
Exchangeable Sodium Percent	----	0.1	%		0.7	1.0	0.3	----	----
EP004: Organic Matter									
Organic Matter	----	0.5	%		<0.5	0.7	<0.5	<0.5	0.5
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		0.0029	0.0011	<0.0002	<0.0002	<0.0002
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		<0.0002	0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		0.0056	0.0084	<0.0002	0.188	0.0076
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	0.0147	0.0002



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SS122_201119	0960_QC102_201119	0960_SS114_201119	0960_SS124_201119	0960_SS277_201119
Sampling date / time					19-Nov-2020 09:35	19-Nov-2020 09:36	19-Nov-2020 10:09	19-Nov-2020 11:22	19-Nov-2020 11:23
Compound	CAS Number	LOR	Unit		EP2012919-001	EP2012919-002	EP2012919-003	EP2012919-004	EP2012919-005
					Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg		<0.001	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		0.0002	<0.0002	<0.0002	0.0005	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		0.0004	0.0002	<0.0002	0.0004	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	0.0012	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	0.0036	<0.0002
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	0.0017	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	0.0014	<0.0002
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				0960_SS122_201119	0960_QC102_201119	0960_SS114_201119	0960_SS124_201119	0960_SS277_201119
Sampling date / time				19-Nov-2020 09:35	19-Nov-2020 09:36	19-Nov-2020 10:09	19-Nov-2020 11:22	19-Nov-2020 11:23
Compound	CAS Number	LOR	Unit	EP2012919-001	EP2012919-002	EP2012919-003	EP2012919-004	EP2012919-005
				Result	Result	Result	Result	Result
EP231D: (n:2) Fluorotelomer Sulfonic Acids - Continued								
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	0.0008	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	0.0091	0.0099	<0.0002	0.212	0.0078
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	0.0085	0.0095	<0.0002	0.188	0.0076
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	0.0091	0.0097	<0.0002	0.190	0.0076
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	100	104	84.0	108	100
13C8-PFOA	----	0.0002	%	111	110	104	108	106



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SS125_201119	0960_SS278_201119	0960_QC107_201119	----	----
Sampling date / time					19-Nov-2020 11:24	19-Nov-2020 11:25	19-Nov-2020 11:25	----	----
Compound	CAS Number	LOR	Unit		EP2012919-006	EP2012919-007	EP2012919-008	-----	-----
				Result	Result	Result	Result	----	----
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		8.4	8.6	8.8	----	----
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		146	139	110	----	----
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		1.4	1.2	2.2	----	----
ED007: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		13.6	8.3	9.3	----	----
Exchangeable Magnesium	----	0.1	meq/100g		2.2	1.4	1.4	----	----
Exchangeable Potassium	----	0.1	meq/100g		1.6	0.6	0.6	----	----
Exchangeable Sodium	----	0.1	meq/100g		0.3	0.2	0.2	----	----
Cation Exchange Capacity	----	0.1	meq/100g		17.6	10.5	11.5	----	----
Exchangeable Sodium Percent	----	0.1	%		1.6	1.7	1.6	----	----
EP004: Organic Matter									
Organic Matter	----	0.5	%		0.8	0.6	<0.5	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		0.141	0.0023	0.0033	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		0.0018	<0.0002	<0.0002	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg		<0.001	<0.001	<0.001	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		0.0004	<0.0002	<0.0002	----	----



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				0960_SS125_201119	0960_SS278_201119	0960_QC107_201119	----	----
Sampling date / time				19-Nov-2020 11:24	19-Nov-2020 11:25	19-Nov-2020 11:25	----	----
Compound	CAS Number	LOR	Unit	EP2012919-006	EP2012919-007	EP2012919-008	-----	-----
				Result	Result	Result	----	----
EP231B: Perfluoroalkyl Carboxylic Acids - Continued								
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	0.143	0.0023	0.0033	----	----



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SS125_201119	0960_SS278_201119	0960_QC107_201119	----	----
Sampling date / time					19-Nov-2020 11:24	19-Nov-2020 11:25	19-Nov-2020 11:25	----	----
Compound	CAS Number	LOR	Unit		EP2012919-006	EP2012919-007	EP2012919-008	-----	-----
				Result	Result	Result		----	----
EP231P: PFAS Sums - Continued									
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		0.141	0.0023	0.0033	----	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		0.141	0.0023	0.0033	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		111	102	97.5	----	----
13C8-PFOA	----	0.0002	%		116	116	102	----	----



Surrogate Control Limits

Sub-Matrix: SEDIMENT		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

QUALITY CONTROL REPORT

Work Order	: EP2012919	Page	: 1 of 12
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 23-Nov-2020
Order number	: DEF19009/0960	Date Analysis Commenced	: 24-Nov-2020
C-O-C number	: 16171	Issue Date	: 03-Dec-2020
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		
Site	: DEF19009/Learmonth		
Quote number	: SY/139/19		
No. of samples received	: 8		
No. of samples analysed	: 8		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
= Indicates failed QC

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: SOIL					Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA002: pH 1:5 (Soils) (QC Lot: 3381259)									
EP2012895-011	Anonymous	EA002: pH Value	----	0.1	pH Unit	8.6	8.6	0.00	0% - 20%
EP2012919-008	0960_QC107_201119	EA002: pH Value	----	0.1	pH Unit	8.8	8.6	1.15	0% - 20%
EA010: Conductivity (1:5) (QC Lot: 3381258)									
EP2012895-011	Anonymous	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	161	162	0.00	0% - 20%
EP2012919-008	0960_QC107_201119	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	110	111	0.00	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3381261)									
EP2012801-001	Anonymous	EA055: Moisture Content	----	0.1	%	4.9	5.1	4.61	0% - 20%
EP2012895-004	Anonymous	EA055: Moisture Content	----	0.1	%	7.6	7.1	5.76	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3381262)									
EP2012919-003	0960_SS114_201119	EA055: Moisture Content	----	0.1	%	0.5	0.6	0.00	No Limit
ED007: Exchangeable Cations (QC Lot: 3385996)									
EP2012893-001	Anonymous	ED007: Exchangeable Sodium Percent	----	0.1	%	1.4	1.4	0.00	0% - 50%
		ED007: Exchangeable Calcium	----	0.1	meq/100g	10.6	9.2	14.8	0% - 20%
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	0.8	0.8	0.00	No Limit
		ED007: Exchangeable Potassium	----	0.1	meq/100g	0.3	0.3	0.00	No Limit
		ED007: Exchangeable Sodium	----	0.1	meq/100g	0.2	0.1	0.00	No Limit
		ED007: Cation Exchange Capacity	----	0.1	meq/100g	12.0	10.4	13.6	0% - 20%
EP2012919-006	0960_SS125_201119	ED007: Exchangeable Sodium Percent	----	0.1	%	1.6	1.6	0.00	0% - 50%
		ED007: Exchangeable Calcium	----	0.1	meq/100g	13.6	13.8	1.65	0% - 20%
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	2.2	2.2	0.00	0% - 20%
		ED007: Exchangeable Potassium	----	0.1	meq/100g	1.6	1.6	0.00	0% - 50%
		ED007: Exchangeable Sodium	----	0.1	meq/100g	0.3	0.3	0.00	No Limit
		ED007: Cation Exchange Capacity	----	0.1	meq/100g	17.6	17.9	1.40	0% - 20%
ED008: Exchangeable Cations (QC Lot: 3385244)									



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
ED008: Exchangeable Cations (QC Lot: 3385244) - continued									
EP2012741-001	Anonymous	ED008: Exchangeable Sodium Percent	----	0.1	%	1.4	1.3	7.27	0% - 50%
		ED008: Exchangeable Calcium	----	0.1	meq/100g	54.7	54.9	0.367	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	6.1	7.1	15.3	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	0.1	0.1	0.00	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	0.9	0.8	0.00	No Limit
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	61.8	63.0	1.86	0% - 20%
EP2012895-004	Anonymous	ED008: Exchangeable Sodium Percent	----	0.1	%	0.9	0.8	0.00	No Limit
		ED008: Exchangeable Calcium	----	0.1	meq/100g	22.3	21.6	3.14	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	3.7	3.4	6.70	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	0.6	0.6	0.00	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	0.2	0.2	0.00	No Limit
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	26.8	25.8	3.70	0% - 20%
ED008: Exchangeable Cations (QC Lot: 3388563)									
EP2012895-003	Anonymous	ED008: Exchangeable Sodium Percent	----	0.1	%	1.8	1.8	0.00	0% - 50%
		ED008: Exchangeable Calcium	----	0.1	meq/100g	22.9	21.8	4.99	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	4.4	3.9	11.7	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	1.1	1.0	0.00	0% - 50%
		ED008: Exchangeable Sodium	----	0.1	meq/100g	0.5	0.5	0.00	No Limit
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	29.0	27.3	6.04	0% - 20%
EP004: Organic Matter (QC Lot: 3393604)									
EP2012919-001	0960_SS122_201119	EP004: Organic Matter	----	0.5	%	<0.5	<0.5	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3386495)									
EP2012801-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	0.0004	0.0004	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	0.0012	0.0009	28.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0073	0.0068	6.91	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP2012895-005	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0052	0.0059	13.1	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	0.0004	0.0003	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3393046)									
EP2012919-003	0960_SS114_201119	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3393046) - continued									
EP2012919-003	0960_SS114_201119	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
ES2041982-005	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3386495)									
EP2012801-001	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	0.0032	0.0036	12.8	0% - 50%
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	0.0020	0.0018	6.90	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	0.0009	0.0008	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	0.0009	0.0009	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	0.0004	0.0004	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP2012895-005	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3393046)									
EP2012919-003	0960_SS114_201119	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3393046) - continued									
EP2012919-003	0960_SS114_201119	EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
ES2041982-005	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3386495)									
EP2012801-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	0.0003	0.0003	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP2012895-005	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3393046)									
EP2012919-003	0960_SS114_201119	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
ES2041982-005	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3386495)									
EP2012801-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	0.0200	0.0219	9.20	0% - 20%
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	0.0152	0.0150	1.21	0% - 20%
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP2012895-005	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit

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 Work Order : EP2012919
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3386495) - continued									
EP2012895-005	Anonymous	EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3393046)									
EP2012919-003	0960_SS114_201119	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
ES2041982-005	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit



Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

Sub-Matrix: SOIL				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EA002: pH 1:5 (Soils) (QCLot: 3381259)								
EA002: pH Value	----	----	pH Unit	----	4 pH Unit	101	70.0	130
				----	7 pH Unit	100	70.0	130
EA010: Conductivity (1:5) (QCLot: 3381258)								
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	1412 µS/cm	100	93.6	106
ED007: Exchangeable Cations (QCLot: 3385996)								
ED007: Exchangeable Calcium	----	0.1	meq/100g	<0.1	21.6 meq/100g	96.1	82.9	117
ED007: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.76 meq/100g	101	78.4	119
ED007: Exchangeable Potassium	----	0.1	meq/100g	<0.1	1 meq/100g	111	87.9	129
ED007: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.9 meq/100g	110	92.9	132
ED007: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	25.3 meq/100g	97.4	84.7	117
ED007: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
ED008: Exchangeable Cations (QCLot: 3385244)								
ED008: Exchangeable Calcium	----	0.1	meq/100g	<0.1	22.1 meq/100g	95.7	78.7	111
ED008: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.56 meq/100g	95.6	77.6	111
ED008: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.91 meq/100g	104	86.9	116
ED008: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.38 meq/100g	119	72.3	129
ED008: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
ED008: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	24.95 meq/100g	96.4	79.9	110
ED008: Exchangeable Cations (QCLot: 3388563)								
ED008: Exchangeable Calcium	----	0.1	meq/100g	<0.1	22.1 meq/100g	102	78.7	111
ED008: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.56 meq/100g	101	77.6	111
ED008: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.91 meq/100g	104	86.9	116
ED008: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.38 meq/100g	118	72.3	129
ED008: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
ED008: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	24.95 meq/100g	102	79.9	110
EP004: Organic Matter (QCLot: 3393604)								
EP004: Organic Matter	----	0.5	%	<0.5	2.3 %	107	70.0	120
				<0.5	85 %	87.6	70.0	120
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3386495)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	86.8	72.0	128
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	79.2	73.0	123
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	94.4	67.0	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	95.2	70.0	132
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	80.0	68.0	136



Sub-Matrix: **SOIL**

Sub-Matrix: SOIL				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3386495) - continued								
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	79.2	59.0	134
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3393046)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	88.8	72.0	128
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	98.4	73.0	123
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	96.4	67.0	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	101	70.0	132
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	101	68.0	136
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	106	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3386495)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	92.0	71.0	135
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	107	69.0	132
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	90.8	70.0	132
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	76.0	71.0	131
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	88.4	69.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	88.0	72.0	129
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	80.0	69.0	133
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	96.8	64.0	136
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	90.0	69.0	135
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	88.8	66.0	139
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	113	69.0	133
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3393046)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	98.6	71.0	135
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	97.2	69.0	132
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	102	70.0	132
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	104	71.0	131
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	103	69.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	104	72.0	129
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	100	69.0	133
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	110	64.0	136
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	117	69.0	135
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	94.0	66.0	139
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	82.2	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3386495)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	113	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	82.7	71.6	129
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	90.4	69.8	131
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	93.9	68.7	130



Sub-Matrix: SOIL				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3386495) - continued								
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	104	65.1	134
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	65.6	63.0	144
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	72.8	61.0	139
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3393046)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	94.8	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	107	71.6	129
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	92.1	69.8	131
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	88.1	68.7	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	112	65.1	134
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	92.8	63.0	144
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	93.6	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3386495)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	67.2	62.0	145
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	74.4	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	67.6	65.0	137
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	90.4	69.2	143
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3393046)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	89.6	62.0	145
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	104	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	97.2	65.0	137
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	105	69.2	143

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: SOIL				Matrix Spike (MS) Report			
				Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number			Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3386495)							
EP2012801-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	92.0	72.0	128
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	73.6	73.0	123



Sub-Matrix: SOIL

Sub-Matrix: SOIL				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3386495) - continued							
EP2012801-001	Anonymous	EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	84.4	67.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	89.2	70.0	132
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	# Not Determined	68.0	136
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	71.2	59.0	134
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3393046)							
EP2012919-003	0960_SS114_201119	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	96.4	72.0	128
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	101	73.0	123
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	94.8	67.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	94.4	70.0	132
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	101	68.0	136
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	100	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3386495)							
EP2012801-001	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	104	71.0	135
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	131	69.0	132
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	73.2	70.0	132
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	81.6	71.0	131
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	86.0	69.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	101	72.0	129
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	73.6	69.0	133
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	90.4	64.0	136
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	104	69.0	135
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	85.2	66.0	139
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	102	69.0	133
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3393046)							
EP2012919-003	0960_SS114_201119	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	94.0	71.0	135
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	95.2	69.0	132
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	106	70.0	132
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	104	71.0	131
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	108	69.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	102	72.0	129
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	107	69.0	133
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	108	64.0	136
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	106	69.0	135
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	98.4	66.0	139
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	83.6	69.0	133
		EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3386495)					
EP2012801-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	71.2	67.0	137



Sub-Matrix: **SOIL**

Sub-Matrix: SOIL				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3386495) - continued							
EP2012801-001	Anonymous	EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	91.8	71.6	129
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	105	69.8	131
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	# 219	68.7	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	# 207	65.1	134
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	78.8	63.0	144
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	77.2	61.0	139
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3393046)							
EP2012919-003	0960_SS114_201119	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	93.2	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	105	71.6	129
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	87.5	69.8	131
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	84.1	68.7	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	123	65.1	134
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	96.0	63.0	144
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	88.8	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3386495)							
EP2012801-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	84.0	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	# Not Determined	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	# Not Determined	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	97.2	69.2	143
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3393046)							
EP2012919-003	0960_SS114_201119	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	90.4	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	103	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	95.6	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	103	69.2	143

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2012919	Page	: 1 of 6
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 23-Nov-2020
Site	: DEF19009/Learmonth	Issue Date	: 03-Dec-2020
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS	No. of samples received	: 8
Order number	: DEF19009/0960	No. of samples analysed	: 8

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- Matrix Spike outliers exist - please see following pages for full details.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- **NO** Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- **NO** Quality Control Sample Frequency Outliers exist.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EP231A: Perfluoroalkyl Sulfonic Acids	EP2012801--001	Anonymous	Perfluorooctane sulfonic acid (PFOS)	1763-23-1	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EP231C: Perfluoroalkyl Sulfonamides	EP2012801--001	Anonymous	N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	219 %	68.7-130%	Recovery greater than upper data quality objective
EP231C: Perfluoroalkyl Sulfonamides	EP2012801--001	Anonymous	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	207 %	65.1-134%	Recovery greater than upper data quality objective
EP231D: (n:2) Fluorotelomer Sulfonic Acids	EP2012801--001	Anonymous	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EP231D: (n:2) Fluorotelomer Sulfonic Acids	EP2012801--001	Anonymous	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA002: pH 1:5 (Soils)								
Soil Glass Jar - Unpreserved (EA002)		19-Nov-2020	25-Nov-2020	26-Nov-2020	✓	25-Nov-2020	25-Nov-2020	✓
0960_SS122_201119, 0960_QC102_201119,								
0960_SS114_201119, 0960_SS124_201119,								
0960_SS277_201119, 0960_SS125_201119,								
0960_SS278_201119, 0960_QC107_201119								



Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA010: Conductivity (1:5)								
Soil Glass Jar - Unpreserved (EA010)		19-Nov-2020	25-Nov-2020	26-Nov-2020	✓	25-Nov-2020	23-Dec-2020	✓
0960_SS122_201119,	0960_QC102_201119,							
0960_SS114_201119,	0960_SS124_201119,							
0960_SS277_201119,	0960_SS125_201119,							
0960_SS278_201119,	0960_QC107_201119							
EA055: Moisture Content (Dried @ 105-110°C)								
Soil Glass Jar - Unpreserved (EA055)		19-Nov-2020	----	----	----	24-Nov-2020	03-Dec-2020	✓
0960_SS122_201119,	0960_QC102_201119,							
0960_SS114_201119,	0960_SS124_201119,							
0960_SS277_201119,	0960_SS125_201119,							
0960_SS278_201119,	0960_QC107_201119							
ED007: Exchangeable Cations								
Soil Glass Jar - Unpreserved (ED007)		19-Nov-2020	26-Nov-2020	17-Dec-2020	✓	26-Nov-2020	17-Dec-2020	✓
0960_SS124_201119,	0960_SS277_201119,							
0960_SS125_201119,	0960_SS278_201119,							
0960_QC107_201119								
ED008: Exchangeable Cations								
Soil Glass Jar - Unpreserved (ED008)		19-Nov-2020	27-Nov-2020	17-Dec-2020	✓	27-Nov-2020	17-Dec-2020	✓
0960_SS122_201119,	0960_QC102_201119,							
0960_SS114_201119								
EP004: Organic Matter								
Soil Glass Jar - Unpreserved (EP004)		19-Nov-2020	01-Dec-2020	17-Dec-2020	✓	01-Dec-2020	17-Dec-2020	✓
0960_SS122_201119,	0960_QC102_201119,							
0960_SS114_201119,	0960_SS124_201119,							
0960_SS277_201119,	0960_SS125_201119,							
0960_SS278_201119,	0960_QC107_201119							
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE Soil Jar (EP231X)		19-Nov-2020	01-Dec-2020	18-May-2021	✓	01-Dec-2020	10-Jan-2021	✓
0960_SS114_201119,	0960_SS124_201119,							
0960_SS277_201119,	0960_SS125_201119,							
0960_SS278_201119,	0960_QC107_201119							
HDPE Soil Jar (EP231X)		19-Nov-2020	26-Nov-2020	18-May-2021	✓	27-Nov-2020	05-Jan-2021	✓
0960_SS122_201119,	0960_QC102_201119							
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE Soil Jar (EP231X)		19-Nov-2020	01-Dec-2020	18-May-2021	✓	01-Dec-2020	10-Jan-2021	✓
0960_SS114_201119,	0960_SS124_201119,							
0960_SS277_201119,	0960_SS125_201119,							
0960_SS278_201119,	0960_QC107_201119							
HDPE Soil Jar (EP231X)		19-Nov-2020	26-Nov-2020	18-May-2021	✓	27-Nov-2020	05-Jan-2021	✓
0960_SS122_201119,	0960_QC102_201119							



Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EP231C: Perfluoroalkyl Sulfonamides								
HDPE Soil Jar (EP231X) 0960_SS114_201119, 0960_SS277_201119, 0960_SS278_201119,	0960_SS124_201119, 0960_SS125_201119, 0960_QC107_201119	19-Nov-2020	01-Dec-2020	18-May-2021	✔	01-Dec-2020	10-Jan-2021	✔
HDPE Soil Jar (EP231X) 0960_SS122_201119,	0960_QC102_201119	19-Nov-2020	26-Nov-2020	18-May-2021	✔	27-Nov-2020	05-Jan-2021	✔
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE Soil Jar (EP231X) 0960_SS114_201119, 0960_SS277_201119, 0960_SS278_201119,	0960_SS124_201119, 0960_SS125_201119, 0960_QC107_201119	19-Nov-2020	01-Dec-2020	18-May-2021	✔	01-Dec-2020	10-Jan-2021	✔
HDPE Soil Jar (EP231X) 0960_SS122_201119,	0960_QC102_201119	19-Nov-2020	26-Nov-2020	18-May-2021	✔	27-Nov-2020	05-Jan-2021	✔
EP231P: PFAS Sums								
HDPE Soil Jar (EP231X) 0960_SS114_201119, 0960_SS277_201119, 0960_SS278_201119,	0960_SS124_201119, 0960_SS125_201119, 0960_QC107_201119	19-Nov-2020	01-Dec-2020	18-May-2021	✔	01-Dec-2020	10-Jan-2021	✔
HDPE Soil Jar (EP231X) 0960_SS122_201119,	0960_QC102_201119	19-Nov-2020	26-Nov-2020	18-May-2021	✔	27-Nov-2020	05-Jan-2021	✔



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)		Quality Control Specification	
Analytical Methods	Method	QC	Regular	Actual	Expected		Evaluation
Laboratory Duplicates (DUP)							
Electrical Conductivity (1:5)	EA010	2	10	20.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	2	12	16.67	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	3	18	16.67	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	3	26	11.54	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	8	12.50	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	4	32	12.50	10.00	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	10	20.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Electrical Conductivity (1:5)	EA010	1	10	10.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	12	8.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	2	18	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	8	25.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	32	6.25	5.00	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	10	20.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Electrical Conductivity (1:5)	EA010	1	10	10.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	12	8.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	2	18	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	8	12.50	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	32	6.25	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	32	6.25	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	In house: Referenced to Rayment and Lyons 4A1 and APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Electrical Conductivity (1:5)	EA010	SOIL	In house: Referenced to Rayment and Lyons 3A1 and APHA 2510. Conductivity is determined on soil samples using a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Exchangeable Cations	ED007	SOIL	In house: Referenced to Rayment & Lyons Method 15A1. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM Schedule B(3).
Exchangeable Cations with pre-treatment	ED008	SOIL	In house: Referenced to Rayment & Lyons Method 15A2. Soluble salts are removed from the sample prior to analysis. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM Schedule B(3).
Organic Matter	EP004	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3)
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	SOIL	In-house: Analysis of soils by solvent extraction followed by LC-Electrospray-MS-MS, Negative Mode using MRM using internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Exchangeable Cations Preparation Method	ED007PR	SOIL	In house: Referenced to Rayment & Lyons method 15A1. A 1M NH4Cl extraction by end over end tumbling at a ratio of 1:20. There is no pretreatment for soluble salts. Extracts can be run by ICP for cations.
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
Organic Matter	EP004-PR	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3).
Sample Extraction for PFAS in solid matrices	ORG73	SOIL	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.



ALS COC#: 16252 *ALS Laboratory:* EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA 0960 PFASOMP

SITE: AB DEF19009/Learmonth SW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

C

Other comments:

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Surface Waters Primary WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0960_SW210		20/11/2020 10:45 AM	Water	ALS: 6 Non ALS: 0	No	X		
002	0960_SW302		20/11/2020 11:08 AM	Water	ALS: 6 Non ALS: 0	No	X		
003	0960_SW209		20/11/2020 11:23 AM	Water	ALS: 4 Non ALS: 0	No	X		
004	0960_SW207		20/11/2020 02:17 PM	Water	ALS: 4 Non ALS: 0	No	X		
005	0960_QC111		20/11/2020 02:57 PM	Water	ALS: 4 Non ALS: 0	No	X		
006	0960_SW211		20/11/2020 03:15 PM	Water	ALS: 3 Non ALS: 0	No	X		

Environmental Division
Perth

Work Order Reference

Work Order Reference
EP2012942



Telephone +61-8-9406 1301



RECEIVED BY:

DATE TIME:

Other comments:

2 of 2



CHAIN OF CUSTODY

COC#: 16252

ALS Laboratory: EP Perth

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFASOMP

SITE: AB DEF19009/Learmonth SW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

006

0960_SW211

Amber DOC Filtered- Sulfuric Preserved

40 mL

00181019016541

Purple

No

Total Bottle Count: ALS: 27, Non ALS: 0

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : EP2012942

<p>Client : CARDNO (WA) PTY LTD</p> <p>Contact : MAELLE BOURDAIS</p> <p>Address : 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006</p> <p>E-mail : maelle.bourdais@cardno.com.au</p> <p>Telephone : ----</p> <p>Facsimile : ----</p> <p>Project : WA_0960_PFASOMP</p> <p>Order number : DEF19009/0960</p> <p>C-O-C number : 16252</p> <p>Site : DEF19009/Learmonth</p> <p>Sampler : ASHLEY BROWN, MAELLE BOURDAIS</p>	<p>Laboratory : Environmental Division Perth</p> <p>Contact : Nick Courts</p> <p>Address : 26 Rigali Way Wangara WA Australia 6065</p> <p>E-mail : nick.courts@alsglobal.com</p> <p>Telephone : +61-8-9406 1301</p> <p>Facsimile : +61-8-9406 1399</p> <p>Page : 1 of 3</p> <p>Quote number : ES2019CARBSD0002 (SY/139/19)</p> <p>QC Level : NEPM 2013 B3 & ALS QC Standard</p>
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Dates

Date Samples Received : 25-Nov-2020 11:00	Issue Date : 25-Nov-2020
Client Requested Due : 04-Dec-2020	Scheduled Reporting Date : 04-Dec-2020
Date	

Delivery Details

Mode of Delivery : Carrier	Security Seal : Intact.
No. of coolers/boxes : 4	Temperature : 23.2 - Ice present
Receipt Detail :	No. of samples received / analysed : 6 / 6

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepancies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.



Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2012942-001	20-Nov-2020 10:45	0960_SW210_201120	✓	✓	✓	✓	✓	✓	✓
EP2012942-002	20-Nov-2020 11:08	0960_SW302_201120	✓	✓	✓	✓	✓	✓	✓
EP2012942-003	20-Nov-2020 11:23	0960_SW209_201120	✓	✓	✓	✓	✓	✓	✓
EP2012942-004	20-Nov-2020 14:17	0960_SW207_201120	✓	✓	✓	✓	✓	✓	✓
EP2012942-005	20-Nov-2020 14:57	0960_QC111_201120	✓	✓	✓	✓	✓	✓	✓
EP2012942-006	20-Nov-2020 15:15	0960_SW211_201120	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2012942-001	20-Nov-2020 10:45	0960_SW210_201120	✓
EP2012942-002	20-Nov-2020 11:08	0960_SW302_201120	✓
EP2012942-003	20-Nov-2020 11:23	0960_SW209_201120	✓
EP2012942-004	20-Nov-2020 14:17	0960_SW207_201120	✓
EP2012942-005	20-Nov-2020 14:57	0960_QC111_201120	✓
EP2012942-006	20-Nov-2020 15:15	0960_SW211_201120	✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **WATER**

Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method	Due for extraction	Due for analysis	Samples Received		Instructions Received	
Client Sample ID(s)	Container		Date	Evaluation	Date	Evaluation
EA005-P: pH by PC Titrator						
0960_QC111_201120	Clear Plastic Bottle - Natural	----	20-Nov-2020	25-Nov-2020	✗	----
0960_SW207_201120	Clear Plastic Bottle - Natural	----	20-Nov-2020	25-Nov-2020	✗	----
0960_SW209_201120	Clear Plastic Bottle - Natural	----	20-Nov-2020	25-Nov-2020	✗	----
0960_SW210_201120	Clear Plastic Bottle - Natural	----	20-Nov-2020	25-Nov-2020	✗	----
0960_SW211_201120	Clear Plastic Bottle - Natural	----	20-Nov-2020	25-Nov-2020	✗	----



0960_SW302_20112	Clear Plastic Bottle - Natural	----	20-Nov-2020	25-Nov-2020		----	----
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Requested Deliverables

ACCOUNTS PAYABLE (WA)

- A4 - AU Tax Invoice (INV)

Email claire.armstrong@cardno.com.au

DAVID JAMES

- *AU Certificate of Analysis - NATA (COA)
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)
- Chain of Custody (CoC) (COC)
- EDI Format - ENMRG (ENMRG)
- EDI Format - ESDAT (ESDAT)
- EDI Format - XTab (XTAB)

[illegible]

DERP LAB REPORTS

- EDI Format - ESDAT (ESDAT)

Email derp.labreports@esdat.com.au

MAELLE BOURDAIS

- *AU Certificate of Analysis - NATA (COA)
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)
- Chain of Custody (CoC) (COC)
- EDI Format - ENMRG (ENMRG)
- EDI Format - ESDAT (ESDAT)
- EDI Format - XTab (XTAB)

[illegible]

CERTIFICATE OF ANALYSIS

Work Order : **EP2012942**
Client : **CARDNO (WA) PTY LTD**
Contact : **MAELLE BOURDAIS**
Address : **11 HARVEST TERRACE PO BOX 155**
WEST PERTH WA, AUSTRALIA 6006
Telephone : **----**
Project : **WA_0960_PFASOMP**
Order number : **DEF19009/0960**
C-O-C number : **16252**
Sampler : **ASHLEY BROWN, MAELLE BOURDAIS**
Site : **DEF19009/Learmonth**
Quote number : **SY/139/19**
No. of samples received : **6**
No. of samples analysed : **6**

Page : 1 of 9
Laboratory : Environmental Division Perth
Contact : Nick Courts
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 25-Nov-2020 11:00
Date Analysis Commenced : 26-Nov-2020
Issue Date : 04-Dec-2020 21:17



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Daniel Fisher	Inorganics Analyst	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0960_SW210_201120	0960_SW302_201120	0960_SW209_201120	0960_SW211_201120	----
Sampling date / time					20-Nov-2020 10:45	20-Nov-2020 11:08	20-Nov-2020 11:23	20-Nov-2020 15:15	----
Compound	CAS Number	LOR	Unit		EP2012942-001	EP2012942-002	EP2012942-003	EP2012942-006	-----
					Result	Result	Result	Result	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.74	7.96	8.09	8.22	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		50700	46600	46000	66500	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		848	110	2390	134	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L		<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L		<1	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L		170	154	144	172	----
Total Alkalinity as CaCO ₃	----	1	mg/L		170	154	144	172	----
ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA									
Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L		3730	3410	3360	4830	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		23500	22900	22200	32400	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		604	567	557	899	----
Magnesium	7439-95-4	1	mg/L		1990	1830	1790	2730	----
Sodium	7440-23-5	1	mg/L		15000	13800	13500	21400	----
Potassium	7440-09-7	1	mg/L		704	644	624	1030	----
EN055: Ionic Balance									
∅ Total Anions	----	0.01	meq/L		744	720	699	1020	----
∅ Total Cations	----	0.01	meq/L		864	796	778	1230	----
∅ Ionic Balance	----	0.01	%		7.49	4.99	5.36	9.30	----
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		3	2	2	5	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_SW210_201120	0960_SW302_201120	0960_SW209_201120	0960_SW211_201120	----
Sampling date / time				20-Nov-2020 10:45	20-Nov-2020 11:08	20-Nov-2020 11:23	20-Nov-2020 15:15	----
Compound	CAS Number	LOR	Unit	EP2012942-001	EP2012942-002	EP2012942-003	EP2012942-006	-----
				Result	Result	Result	Result	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	0.02	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_SW210_201120	0960_SW302_201120	0960_SW209_201120	0960_SW211_201120	----
Sampling date / time				20-Nov-2020 10:45	20-Nov-2020 11:08	20-Nov-2020 11:23	20-Nov-2020 15:15	----
Compound	CAS Number	LOR	Unit	EP2012942-001	EP2012942-002	EP2012942-003	EP2012942-006	-----
				Result	Result	Result	Result	----
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	<0.01	0.02	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	0.02	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	<0.01	<0.01	0.02	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	111	116	104	110	----
13C8-PFOA	----	0.02	%	114	113	107	118	----



Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)				Sample ID	0960_SW207_201120	0960_QC111_201120	----	----	----
Sampling date / time					20-Nov-2020 14:17	20-Nov-2020 14:57	----	----	----
Compound	CAS Number	LOR	Unit		EP2012942-004	EP2012942-005	-----	-----	-----
				Result	Result		----	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		8.07	8.01	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		39300	36400	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		<5	7	----	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		122	120	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L		122	120	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		2880	2740	----	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		19400	19700	----	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		499	477	----	----	----
Magnesium	7439-95-4	1	mg/L		1620	1560	----	----	----
Sodium	7440-23-5	1	mg/L		12200	11800	----	----	----
Potassium	7440-09-7	1	mg/L		572	550	----	----	----
EN055: Ionic Balance									
∅ Total Anions	----	0.01	meq/L		610	615	----	----	----
∅ Total Cations	----	0.01	meq/L		704	680	----	----	----
∅ Ionic Balance	----	0.01	%		7.15	4.97	----	----	----
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		1	1	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	----	----	----



Analytical Results

Sub-Matrix: SURFACE WATER
 (Matrix: WATER)

Sample ID

				0960_SW207_201120	0960_QC111_201120	----	----	----
Sampling date / time				20-Nov-2020 14:17	20-Nov-2020 14:57	----	----	----
Compound	CAS Number	LOR	Unit	EP2012942-004	EP2012942-005	-----	-----	-----
				Result	Result	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	----	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	----	----	----



Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)				Sample ID	0960_SW207_201120	0960_QC111_201120	----	----	----
Sampling date / time					20-Nov-2020 14:17	20-Nov-2020 14:57	----	----	----
Compound	CAS Number	LOR	Unit		EP2012942-004	EP2012942-005	-----	-----	-----
					Result	Result	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	----	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	<0.01	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	<0.01	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	<0.01	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		110	120	----	----	----
13C8-PFOA	----	0.02	%		110	112	----	----	----



Surrogate Control Limits

Sub-Matrix: GROUNDWATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Sub-Matrix: SURFACE WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

QUALITY CONTROL REPORT

Work Order	: EP2012942	Page	: 1 of 9
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 25-Nov-2020
Order number	: DEF19009/0960	Date Analysis Commenced	: 26-Nov-2020
C-O-C number	: 16252	Issue Date	: 04-Dec-2020
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		
Site	: DEF19009/Learmonth		
Quote number	: SY/139/19		
No. of samples received	: 6		
No. of samples analysed	: 6		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Daniel Fisher	Inorganics Analyst	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
= Indicates failed QC

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA005P: pH by PC Titrator (QC Lot: 3396936)									
EP2012942-002	0960_SW302_201120	EA005-P: pH Value	----	0.01	pH Unit	7.96	7.95	0.126	0% - 20%
EP2012943-007	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.46	7.48	0.228	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3387883)									
EP2012942-001	0960_SW210_201120	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	50700	50500	0.257	0% - 20%
EP2012943-005	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	67700	68600	1.44	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3387902)									
EP2012942-005	0960_QC111_201120	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	36400	38300	5.00	0% - 20%
EP2012956-002	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	39500	39400	0.253	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3387884)									
EP2012942-001	0960_SW210_201120	EA025H: Suspended Solids (SS)	----	5	mg/L	848	858	1.17	0% - 20%
EP2012943-007	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	5200	5190	0.192	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3387903)									
EP2012942-005	0960_QC111_201120	EA025H: Suspended Solids (SS)	----	5	mg/L	7	9	31.2	No Limit
EP2012957-002	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	3370	3240	3.81	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3396935)									
EP2012942-002	0960_SW302_201120	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	154	150	2.30	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	154	150	2.30	0% - 20%
EP2012943-007	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	118	130	9.59	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	118	130	9.59	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3389009)									

Page : 3 of 9
 Work Order : EP2012942
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFSOMP



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3389009) - continued									
EP2013176-003	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	40	40	0.00	0% - 20%
EP2013176-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	93	92	1.50	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3389010)									
EP2013176-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	1530	1520	0.267	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3385614)									
EP2012942-001	0960_SW210_201120	ED093F: Calcium	7440-70-2	1	mg/L	604	602	0.322	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	1990	1930	2.95	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	15000	14500	2.96	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	704	684	2.98	0% - 20%
EP2012943-005	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	1230	1200	2.83	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	2800	2720	3.04	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	22600	22000	2.78	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	1060	1030	2.54	0% - 20%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3399729)									
EP2012942-001	0960_SW210_201120	EP002: Dissolved Organic Carbon	----	1	mg/L	3	3	0.00	No Limit
EP2012946-001	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	2	2	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3388768)									
EP2012942-001	0960_SW210_201120	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP2012946-003	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.04	0.04	0.00	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.02	0.03	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3388768)									
EP2012942-001	0960_SW210_201120	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3388768) - continued									
EP2012942-001	0960_SW210_201120	EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
EP2012946-003	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3388768)							
EP2012942-001	0960_SW210_201120	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP2012946-003	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9			0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6			0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8			0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2			0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7			0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2			0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3388768)									

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 Work Order : EP2012942
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3388768) - continued									
EP2012942-001	0960_SW210_201120	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP2012946-003	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231P: PFAS Sums (QC Lot: 3388768)									
EP2012942-001	0960_SW210_201120	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.00	No Limit
EP2012946-003	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	0.06	0.07	15.4	No Limit

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
	Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
		LCS	Low	High
----	4 pH Unit	100	98.5	102
----	7 pH Unit	100	98.5	102
<10	2000 mg/L	99.8	88.1	114
<10	1000 mg/L	102	88.1	114
<10	2000 mg/L	99.6	88.1	114
<10	1000 mg/L	102	88.1	114
<5	150 mg/L	114	89.1	120
<5	1000 mg/L	103	89.1	120
<5	150 mg/L	112	89.1	120
<5	1000 mg/L	104	89.1	120
<1	----	----	----	----
<1	----	----	----	----
<1	----	----	----	----
<1	20 mg/L	106	81.2	126
<1	200 mg/L	96.8	90.0	110
<1	25 mg/L	95.8	87.7	113
<1	500 mg/L	102	87.7	113
<1	10 mg/L	98.1	87.9	114
<1	1000 mg/L	99.4	87.9	114
<1	50 mg/L	100	85.9	113
<1	50 mg/L	104	88.0	110
<1	50 mg/L	98.7	87.3	118
<1	50 mg/L	97.9	89.7	108



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3399729) - continued								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	99.7	73.2	116
				<1	100 mg/L	95.4	73.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3388768)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	95.8	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	120	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	104	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	118	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	112	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	121	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3388768)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	78.5	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	86.6	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	113	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	125	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	118	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	120	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	127	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	129	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	126	72.0	134
EP231X: Perfluorotridecanoic acid (PFTriDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	117	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	124	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3388768)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	128	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	122	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	128	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	114	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	128	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	123	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	124	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3388768)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	109	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	120	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	108	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	96.8	71.4	144



Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3389009)							
EP2013176-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	112	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3389010)							
EP2013176-001	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	89.1	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3399729)							
EP2012942-002	0960_SW302_201120	EP002: Dissolved Organic Carbon	----	100 mg/L	96.3	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3388768)							
EP2012942-002	0960_SW302_201120	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	94.0	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	119	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	93.6	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	105	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	99.8	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	103	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3388768)							
EP2012942-002	0960_SW302_201120	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	77.0	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	77.4	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	102	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	115	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	107	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	112	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	116	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	121	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	115	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.25 µg/L	111	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	132	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3388768)							
EP2012942-002	0960_SW302_201120	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	116	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	116	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	129	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	110	66.0	145
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	104	57.6	145

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 Work Order : EP2012942
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3388768) - continued							
EP2012942-002	0960_SW302_201120	EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	111	65.0	136
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	115	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3388768)							
EP2012942-002	0960_SW302_201120	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	96.2	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	113	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	94.0	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	82.2	71.4	144

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2012942	Page	: 1 of 7
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 25-Nov-2020
Site	: DEF19009/Learmonth	Issue Date	: 04-Dec-2020
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS	No. of samples received	: 6
Order number	: DEF19009/0960	No. of samples analysed	: 6

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- **NO** Matrix Spike outliers occur.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- **NO** Quality Control Sample Frequency Outliers exist.



Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method Container / Client Sample ID(s)	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator						
Clear Plastic Bottle - Natural 0960_SW210_201120, 0960_SW209_201120, 0960_QC111_201120, 0960_SW302_201120, 0960_SW207_201120, 0960_SW211_201120	----	----	----	02-Dec-2020	20-Nov-2020	12

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA005P: pH by PC Titrator								
Clear Plastic Bottle - Natural (EA005-P) 0960_SW210_201120, 0960_SW209_201120, 0960_QC111_201120,	0960_SW302_201120, 0960_SW207_201120, 0960_SW211_201120	20-Nov-2020	----	----	----	02-Dec-2020	20-Nov-2020	✖
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Clear Plastic Bottle - Natural (EA015H) 0960_SW210_201120, 0960_SW209_201120, 0960_QC111_201120,	0960_SW302_201120, 0960_SW207_201120, 0960_SW211_201120	20-Nov-2020	----	----	----	27-Nov-2020	27-Nov-2020	✔
EA025: Total Suspended Solids dried at 104 ± 2°C								
Clear Plastic Bottle - Natural (EA025H) 0960_SW210_201120, 0960_SW209_201120, 0960_QC111_201120,	0960_SW302_201120, 0960_SW207_201120, 0960_SW211_201120	20-Nov-2020	----	----	----	27-Nov-2020	27-Nov-2020	✔
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P) 0960_SW210_201120, 0960_SW209_201120, 0960_QC111_201120,	0960_SW302_201120, 0960_SW207_201120, 0960_SW211_201120	20-Nov-2020	----	----	----	02-Dec-2020	04-Dec-2020	✔



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G)		20-Nov-2020	----	----	----	03-Dec-2020	18-Dec-2020	✓
0960_SW210_201120,	0960_SW302_201120,							
0960_SW209_201120,	0960_SW207_201120,							
0960_QC111_201120,	0960_SW211_201120							
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G)		20-Nov-2020	----	----	----	03-Dec-2020	18-Dec-2020	✓
0960_SW210_201120,	0960_SW302_201120,							
0960_SW209_201120,	0960_SW207_201120,							
0960_QC111_201120,	0960_SW211_201120							
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F)		20-Nov-2020	----	----	----	26-Nov-2020	27-Nov-2020	✓
0960_SW210_201120,	0960_SW302_201120,							
0960_SW209_201120,	0960_SW207_201120,							
0960_QC111_201120,	0960_SW211_201120							
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002)		20-Nov-2020	----	----	----	03-Dec-2020	18-Dec-2020	✓
0960_SW210_201120,	0960_SW302_201120,							
0960_SW209_201120,	0960_SW207_201120,							
0960_QC111_201120,	0960_SW211_201120							
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X)		20-Nov-2020	30-Nov-2020	19-May-2021	✓	30-Nov-2020	19-May-2021	✓
0960_SW210_201120,	0960_SW302_201120,							
0960_SW209_201120,	0960_SW207_201120,							
0960_QC111_201120,	0960_SW211_201120							
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X)		20-Nov-2020	30-Nov-2020	19-May-2021	✓	30-Nov-2020	19-May-2021	✓
0960_SW210_201120,	0960_SW302_201120,							
0960_SW209_201120,	0960_SW207_201120,							
0960_QC111_201120,	0960_SW211_201120							
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X)		20-Nov-2020	30-Nov-2020	19-May-2021	✓	30-Nov-2020	19-May-2021	✓
0960_SW210_201120,	0960_SW302_201120,							
0960_SW209_201120,	0960_SW207_201120,							
0960_QC111_201120,	0960_SW211_201120							
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X)		20-Nov-2020	30-Nov-2020	19-May-2021	✓	30-Nov-2020	19-May-2021	✓
0960_SW210_201120,	0960_SW302_201120,							
0960_SW209_201120,	0960_SW207_201120,							
0960_QC111_201120,	0960_SW211_201120							



Matrix: WATER

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X)								
0960_SW210_201120,	0960_SW302_201120,	20-Nov-2020	30-Nov-2020	19-May-2021	✔	30-Nov-2020	19-May-2021	✔
0960_SW209_201120,	0960_SW207_201120,							
0960_QC111_201120,	0960_SW211_201120							



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	10	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	4	36	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	4	37	10.81	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	10	20.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	4	36	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	4	37	10.81	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	10	10.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	36	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	37	5.41	5.26	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	10	10.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of 'filterable' residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C. This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high temperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.



Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

**CHAIN OF CUSTODY**

COC#: 16267

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: AB DEF19009/Learmonth GW 2

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

28/11 11am

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS: 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS**ANALYSIS REQUIRED**

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0960_MW179		20/11/2020 12:03 PM	Water	ALS: 4 Non ALS: 0	No	X		
002	0960_MW137		20/11/2020 10:25 AM	Water	ALS: 4 Non ALS: 0	No	X		
003	0960_MW138		20/11/2020 09:51 AM	Water	ALS: 4 Non ALS: 0	No	X		
004	0960_MW144		20/11/2020 01:07 PM	Water	ALS: 4 Non ALS: 0	No	X		
005	0960_MW178		20/11/2020 01:27 PM	Water	ALS: 4 Non ALS: 0	No	X		
006	0960_MW143		20/11/2020 01:49 PM	Water	ALS: 4 Non ALS: 0	No	X		
007	0960_MW145		20/11/2020 02:41 PM	Water	ALS: 4 Non ALS: 0	No	X		

Environmental Division
Perth

Work Order Reference

EP2012943



Telephone : + 61-8-9406 1301



ALS Laboratory: EP Perth

RECEIVED BY:

DATE TIME:

Other comments:

2 of 2

**CHAIN OF CUSTODY****ALS** COC#: 16267

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: AB DEF19009/Learmonth GW 2

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

007	0960_MW145	HDPE (no PTFE)	20 mL	00350019106640	Grey	No	
007	0960_MW145	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023117	Purple	No	

Total Bottle Count: ALS: 28, Non ALS: 0

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : EP2012943

<p>Client : CARDNO (WA) PTY LTD</p> <p>Contact : MAELLE BOURDAIS</p> <p>Address : 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006</p> <p>E-mail : maelle.bourdais@cardno.com.au</p> <p>Telephone : ----</p> <p>Facsimile : ----</p> <p>Project : WA_0960_PFASOMP</p> <p>Order number : DEF19009/0960</p> <p>C-O-C number : 16267</p> <p>Site : DEF19009/Learmonth</p> <p>Sampler : ASHLEY BROWN, MAELLE BOURDAIS</p>	<p>Laboratory : Environmental Division Perth</p> <p>Contact : Nick Courts</p> <p>Address : 26 Rigali Way Wangara WA Australia 6065</p> <p>E-mail : nick.courts@alsglobal.com</p> <p>Telephone : +61-8-9406 1301</p> <p>Facsimile : +61-8-9406 1399</p> <p>Page : 1 of 3</p> <p>Quote number : ES2019CARBSD0002 (SY/139/19)</p> <p>QC Level : NEPM 2013 B3 & ALS QC Standard</p>
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Dates

Date Samples Received : 25-Nov-2020 11:00	Issue Date : 25-Nov-2020
Client Requested Due : 04-Dec-2020	Scheduled Reporting Date : 04-Dec-2020
Date	

Delivery Details

Mode of Delivery : Carrier	Security Seal : Not Available
No. of coolers/boxes : 4	Temperature : 23.2 - Ice present
Receipt Detail :	No. of samples received / analysed : 7 / 7

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepancies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.



Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G & PFAS - Full Suite (28 analytes)	WATER - EP231X Major Cations (Ca, Mg, Na, K)	WATER - NT-01 Major Anions (Chloride, Sulphate, Alkalinity)
EP2012943-001	20-Nov-2020 12:03	0960_MW179_201120	✓	✓	✓	✓	✓	✓
EP2012943-002	20-Nov-2020 10:25	0960_MW137_201120	✓	✓	✓	✓	✓	✓
EP2012943-003	20-Nov-2020 09:51	0960_MW138_201120	✓	✓	✓	✓	✓	✓
EP2012943-004	20-Nov-2020 13:07	0960_MW144_201120	✓	✓	✓	✓	✓	✓
EP2012943-005	20-Nov-2020 13:27	0960_MW178_201120	✓	✓	✓	✓	✓	✓
EP2012943-006	20-Nov-2020 13:49	0960_MW143_201120	✓	✓	✓	✓	✓	✓
EP2012943-007	20-Nov-2020 14:41	0960_MW145_201120	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - EP005 Total Organic Carbon (TOC)
EP2012943-001	20-Nov-2020 12:03	0960_MW179_201120		✓
EP2012943-002	20-Nov-2020 10:25	0960_MW137_201120	✓	
EP2012943-003	20-Nov-2020 09:51	0960_MW138_201120	✓	
EP2012943-004	20-Nov-2020 13:07	0960_MW144_201120		✓
EP2012943-005	20-Nov-2020 13:27	0960_MW178_201120	✓	
EP2012943-006	20-Nov-2020 13:49	0960_MW143_201120		✓
EP2012943-007	20-Nov-2020 14:41	0960_MW145_201120	✓	

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **WATER**

Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method		Due for extraction	Due for analysis	Samples Received		Instructions Received	
				Date	Evaluation	Date	Evaluation
Client Sample ID(s)	Container						
EA005-P: pH by PC Titrator							
0960_MW137_201120	Clear Plastic Bottle - Natural	----	20-Nov-2020	25-Nov-2020	✗	----	----
0960_MW138_201120	Clear Plastic Bottle - Natural	----	20-Nov-2020	25-Nov-2020	✗	----	----
0960_MW143_201120	Clear Plastic Bottle - Natural	----	20-Nov-2020	25-Nov-2020	✗	----	----

CERTIFICATE OF ANALYSIS

Work Order : **EP2012943**
Client : **CARDNO (WA) PTY LTD**
Contact : **MAELLE BOURDAIS**
Address : **11 HARVEST TERRACE PO BOX 155**
WEST PERTH WA, AUSTRALIA 6006
Telephone : **----**
Project : **WA_0960_PFASOMP**
Order number : **DEF19009/0960**
C-O-C number : **16267**
Sampler : **ASHLEY BROWN, MAELLE BOURDAIS**
Site : **DEF19009/Learmonth**
Quote number : **SY/139/19**
No. of samples received : **7**
No. of samples analysed : **7**

Page : 1 of 9
Laboratory : Environmental Division Perth
Contact : Nick Courts
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 25-Nov-2020 11:00
Date Analysis Commenced : 26-Nov-2020
Issue Date : 04-Dec-2020 17:37



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Daniel Fisher	Inorganics Analyst	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

Ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- ED037-P (Alkalinity): Sample EP2012943-7 was filtered before analysis to reduce possible interference from sediment which may consume the alkalinity titrant.
- Ionic Balance out of acceptable limits for sample #5 due to analytes not quantified in this report. Major cations (ED093F) have been confirmed by re-preparation and re-analysis.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW179_201120	0960_MW137_201120	0960_MW138_201120	0960_MW144_201120	0960_MW178_201120
Sampling date / time				20-Nov-2020 12:03	20-Nov-2020 10:25	20-Nov-2020 09:51	20-Nov-2020 13:07	20-Nov-2020 13:27
Compound	CAS Number	LOR	Unit	EP2012943-001	EP2012943-002	EP2012943-003	EP2012943-004	EP2012943-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.59	7.50	7.57	7.54	7.57
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	57600	59700	47300	25000	67700
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	18400	3320	6080	6040	42
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L	169	200	156	181	128
Total Alkalinity as CaCO ₃	----	1	mg/L	169	200	156	181	128
ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA								
Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L	4500	4690	3810	3500	5730
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	29900	30300	24800	13300	33000
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	745	728	732	739	1230
Magnesium	7439-95-4	1	mg/L	2390	2310	1700	916	2800
Sodium	7440-23-5	1	mg/L	18700	18400	14300	6860	22600
Potassium	7440-09-7	1	mg/L	1060	1070	644	459	1060
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	940	956	782	452	1050
∅ Total Cations	----	0.01	meq/L	1070	1050	815	422	1300
∅ Ionic Balance	----	0.01	%	6.64	4.86	2.06	3.35	10.6
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	----	1	4	----	2
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	4	----	----	4	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.05	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW179_201120	0960_MW137_201120	0960_MW138_201120	0960_MW144_201120	0960_MW178_201120
Sampling date / time				20-Nov-2020 12:03	20-Nov-2020 10:25	20-Nov-2020 09:51	20-Nov-2020 13:07	20-Nov-2020 13:27
Compound	CAS Number	LOR	Unit	EP2012943-001	EP2012943-002	EP2012943-003	EP2012943-004	EP2012943-005
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.22	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW179_201120	0960_MW137_201120	0960_MW138_201120	0960_MW144_201120	0960_MW178_201120
Sampling date / time				20-Nov-2020 12:03	20-Nov-2020 10:25	20-Nov-2020 09:51	20-Nov-2020 13:07	20-Nov-2020 13:27
Compound	CAS Number	LOR	Unit	EP2012943-001	EP2012943-002	EP2012943-003	EP2012943-004	EP2012943-005
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.27	<0.01	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	0.27	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	<0.01	0.27	<0.01	<0.01
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	117	118	114	118	114
13C8-PFOA	----	0.02	%	110	114	112	115	114



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW143_201120	0960_MW145_201120	----	----	----
Sampling date / time				20-Nov-2020 13:49	20-Nov-2020 14:41	----	----	----
Compound	CAS Number	LOR	Unit	EP2012943-006	EP2012943-007	-----	-----	-----
Result				Result	Result	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.51	7.46	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	68200	79200	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	2230	5200	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	<1	----	----	----
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	<1	<1	----	----	----
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L	134	118	----	----	----
Total Alkalinity as CaCO ₃	----	1	mg/L	134	118	----	----	----
ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA								
Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L	5760	5980	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	34200	39000	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	1250	1260	----	----	----
Magnesium	7439-95-4	1	mg/L	2790	3150	----	----	----
Sodium	7440-23-5	1	mg/L	22700	26200	----	----	----
Potassium	7440-09-7	1	mg/L	1060	1210	----	----	----
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	1090	1230	----	----	----
∅ Total Cations	----	0.01	meq/L	1310	1490	----	----	----
∅ Ionic Balance	----	0.01	%	9.16	9.77	----	----	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	----	2	----	----	----
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	4	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	----	----	----



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW143_201120	0960_MW145_201120	----	----	----
Sampling date / time				20-Nov-2020 13:49	20-Nov-2020 14:41	----	----	----
Compound	CAS Number	LOR	Unit	EP2012943-006	EP2012943-007	-----	-----	-----
				Result	Result	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.06	<0.02	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	----	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	----	----	----



Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0960_MW143_201120	0960_MW145_201120	----	----	----
Sampling date / time					20-Nov-2020 13:49	20-Nov-2020 14:41	----	----	----
Compound	CAS Number	LOR	Unit		EP2012943-006	EP2012943-007	-----	-----	-----
					Result	Result	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	----	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		0.06	<0.01	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	<0.01	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		0.06	<0.01	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		113	105	----	----	----
13C8-PFOA	----	0.02	%		112	115	----	----	----



Surrogate Control Limits

Sub-Matrix: GROUNDWATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

QUALITY CONTROL REPORT

Work Order	: EP2012943	Page	: 1 of 9
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 25-Nov-2020
Order number	: DEF19009/0960	Date Analysis Commenced	: 26-Nov-2020
C-O-C number	: 16267	Issue Date	: 04-Dec-2020
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		
Site	: DEF19009/Learmonth		
Quote number	: SY/139/19		
No. of samples received	: 7		
No. of samples analysed	: 7		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Daniel Fisher	Inorganics Analyst	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
= Indicates failed QC

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: WATER					Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA005P: pH by PC Titrator (QC Lot: 3396936)									
EP2012942-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.96	7.95	0.126	0% - 20%
EP2012943-007	0960_MW145_201120	EA005-P: pH Value	----	0.01	pH Unit	7.46	7.48	0.228	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3387883)									
EP2012942-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	50700	50500	0.257	0% - 20%
EP2012943-005	0960_MW178_201120	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	67700	68600	1.44	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3387884)									
EP2012942-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	848	858	1.17	0% - 20%
EP2012943-007	0960_MW145_201120	EA025H: Suspended Solids (SS)	----	5	mg/L	5200	5190	0.192	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3396935)									
EP2012942-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	154	150	2.30	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	154	150	2.30	0% - 20%
EP2012943-007	0960_MW145_201120	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	118	130	9.59	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	118	130	9.59	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3384202)									
EP2013114-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	5130	4720	8.25	0% - 20%
EP2013115-002	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	5160	5170	0.218	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3384203)									
EP2013114-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	31200	29800	4.84	0% - 20%
EP2013115-002	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	34600	34500	0.260	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3385614)									



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
ED093F: Dissolved Major Cations (QC Lot: 3385614) - continued									
EP2012942-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	604	602	0.322	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	1990	1930	2.95	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	15000	14500	2.96	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	704	684	2.98	0% - 20%
EP2012943-005	0960_MW178_201120	ED093F: Calcium	7440-70-2	1	mg/L	1230	1200	2.83	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	2800	2720	3.04	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	22600	22000	2.78	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	1060	1030	2.54	0% - 20%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3399729)									
EP2012942-001	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	3	3	0.00	No Limit
EP2012946-001	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	2	2	0.00	No Limit
EP005: Total Organic Carbon (TOC) (QC Lot: 3400473)									
EP2012943-001	0960_MW179_201120	EP005: Total Organic Carbon	----	1	mg/L	4	4	0.00	No Limit
EP2013162-002	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	2	1	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3388768)									
EP2012942-001	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP2012946-003	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.04	0.04	0.00	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.02	0.03	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3388768)									
EP2012942-001	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3388768) - continued									
EP2012946-003	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTeDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3388768)									
EP2012942-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP2012946-003	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3388768)									
EP2012942-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit

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 Work Order : EP2012943
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3388768) - continued									
EP2012942-001	Anonymous	EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP2012946-003	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231P: PFAS Sums (QC Lot: 3388768)									
EP2012942-001	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.00	No Limit
EP2012946-003	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	0.06	0.07	15.4	No Limit



Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result		LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 3396936)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3387883)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	99.8	88.1	114
				<10	1000 mg/L	102	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3387884)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	114	89.1	120
				<5	1000 mg/L	103	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3396935)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	106	81.2	126
				<1	200 mg/L	96.8	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3384202)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	92.6	87.7	113
				<1	500 mg/L	104	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3384203)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	99.4	87.9	114
				<1	1000 mg/L	101	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3385614)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	100	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	104	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	98.7	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	97.9	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3399729)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	99.7	73.2	116
				<1	100 mg/L	95.4	73.2	116
EP005: Total Organic Carbon (TOC) (QCLot: 3400473)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	100	87.2	116
				<1	100 mg/L	96.7	87.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3388768)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	95.8	72.0	130



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Recovery Limits (%)	
					Concentration	LCS	Low	High
Method: Compound	CAS Number	LOR	Unit	Result				
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3388768) - continued								
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	120	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	104	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	118	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	112	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	121	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3388768)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	78.5	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	86.6	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	113	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	125	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	118	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	120	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	127	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	129	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	126	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	117	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	124	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3388768)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	128	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	122	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	128	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	114	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	128	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	123	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	124	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3388768)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	109	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	120	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	108	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	96.8	71.4	144

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3384202)							
EP2013115-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3384203)							
EP2013115-001	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	# Not Determined	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3399729)							
EP2012942-002	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	96.3	70.0	130
EP005: Total Organic Carbon (TOC) (QCLot: 3400473)							
EP2012943-004	0960_MW144_201120	EP005: Total Organic Carbon	----	100 mg/L	93.9	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3388768)							
EP2012942-002	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	94.0	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	119	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	93.6	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	105	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	99.8	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	103	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3388768)							
EP2012942-002	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	77.0	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	77.4	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	102	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	115	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	107	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	112	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	116	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	121	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	115	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	111	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	132	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3388768)							
EP2012942-002	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	116	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	116	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	129	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	110	66.0	145
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	104	57.6	145

Page : 9 of 9
 Work Order : EP2012943
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3388768) - continued							
EP2012942-002	Anonymous	EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	111	65.0	136
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	115	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3388768)							
EP2012942-002	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	96.2	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	113	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	94.0	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	82.2	71.4	144

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2012943	Page	: 1 of 8
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 25-Nov-2020
Site	: DEF19009/Learmonth	Issue Date	: 04-Dec-2020
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS	No. of samples received	: 7
Order number	: DEF19009/0960	No. of samples analysed	: 7

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- Matrix Spike outliers exist - please see following pages for full details.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- **NO** Quality Control Sample Frequency Outliers exist.



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO ₄ 2- by DA	EP2013115--001	Anonymous	Sulfate as SO₄ - Turbidimetric	14808-79-8	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
ED045G: Chloride by Discrete Analyser	EP2013115--001	Anonymous	Chloride	16887-00-6	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method		Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural							
0960_MW179_201120,	0960_MW137_201120,	----	----	----	02-Dec-2020	20-Nov-2020	12
0960_MW138_201120,	0960_MW144_201120,						
0960_MW178_201120,	0960_MW143_201120,						
0960_MW145_201120							

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator								
Clear Plastic Bottle - Natural (EA005-P)		20-Nov-2020	----	----	----	02-Dec-2020	20-Nov-2020	✖
0960_MW179_201120,	0960_MW137_201120,							
0960_MW138_201120,	0960_MW144_201120,							
0960_MW178_201120,	0960_MW143_201120,							
0960_MW145_201120								



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Clear Plastic Bottle - Natural (EA015H)		20-Nov-2020	----	----	----	27-Nov-2020	27-Nov-2020	✔
0960_MW179_201120,	0960_MW137_201120,							
0960_MW138_201120,	0960_MW144_201120,							
0960_MW178_201120,	0960_MW143_201120,							
0960_MW145_201120								
EA025: Total Suspended Solids dried at 104 ± 2°C								
Clear Plastic Bottle - Natural (EA025H)		20-Nov-2020	----	----	----	27-Nov-2020	27-Nov-2020	✔
0960_MW179_201120,	0960_MW137_201120,							
0960_MW138_201120,	0960_MW144_201120,							
0960_MW178_201120,	0960_MW143_201120,							
0960_MW145_201120								
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P)		20-Nov-2020	----	----	----	02-Dec-2020	04-Dec-2020	✔
0960_MW179_201120,	0960_MW137_201120,							
0960_MW138_201120,	0960_MW144_201120,							
0960_MW178_201120,	0960_MW143_201120,							
0960_MW145_201120								
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G)		20-Nov-2020	----	----	----	03-Dec-2020	18-Dec-2020	✔
0960_MW179_201120,	0960_MW137_201120,							
0960_MW138_201120,	0960_MW144_201120,							
0960_MW178_201120,	0960_MW143_201120,							
0960_MW145_201120								
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G)		20-Nov-2020	----	----	----	03-Dec-2020	18-Dec-2020	✔
0960_MW179_201120,	0960_MW137_201120,							
0960_MW138_201120,	0960_MW144_201120,							
0960_MW178_201120,	0960_MW143_201120,							
0960_MW145_201120								
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F)		20-Nov-2020	----	----	----	26-Nov-2020	27-Nov-2020	✔
0960_MW179_201120,	0960_MW137_201120,							
0960_MW138_201120,	0960_MW144_201120,							
0960_MW178_201120,	0960_MW143_201120,							
0960_MW145_201120								
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002)		20-Nov-2020	----	----	----	03-Dec-2020	18-Dec-2020	✔
0960_MW137_201120,	0960_MW138_201120,							
0960_MW178_201120,	0960_MW145_201120							



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EP005: Total Organic Carbon (TOC)								
Amber TOC Vial - Sulfuric Acid (EP005) 0960_MW179_201120, 0960_MW143_201120	0960_MW144_201120, 20-Nov-2020	----	----	----	03-Dec-2020	18-Dec-2020	✓	
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X) 0960_MW179_201120, 0960_MW138_201120, 0960_MW178_201120, 0960_MW145_201120	0960_MW137_201120, 0960_MW144_201120, 0960_MW143_201120, 20-Nov-2020	30-Nov-2020	19-May-2021	✓	30-Nov-2020	19-May-2021	✓	
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X) 0960_MW179_201120, 0960_MW138_201120, 0960_MW178_201120, 0960_MW145_201120	0960_MW137_201120, 0960_MW144_201120, 0960_MW143_201120, 20-Nov-2020	30-Nov-2020	19-May-2021	✓	30-Nov-2020	19-May-2021	✓	
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X) 0960_MW179_201120, 0960_MW138_201120, 0960_MW178_201120, 0960_MW145_201120	0960_MW137_201120, 0960_MW144_201120, 0960_MW143_201120, 20-Nov-2020	30-Nov-2020	19-May-2021	✓	30-Nov-2020	19-May-2021	✓	
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X) 0960_MW179_201120, 0960_MW138_201120, 0960_MW178_201120, 0960_MW145_201120	0960_MW137_201120, 0960_MW144_201120, 0960_MW143_201120, 20-Nov-2020	30-Nov-2020	19-May-2021	✓	30-Nov-2020	19-May-2021	✓	
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X) 0960_MW179_201120, 0960_MW138_201120, 0960_MW178_201120, 0960_MW145_201120	0960_MW137_201120, 0960_MW144_201120, 0960_MW143_201120, 20-Nov-2020	30-Nov-2020	19-May-2021	✓	30-Nov-2020	19-May-2021	✓	



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	19	10.53	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	19	10.53	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	19	5.26	5.26	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Matrix Spikes (MS) - Continued							
Total Organic Carbon	EP005	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of 'filterable' residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C. This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high temperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.
Total Organic Carbon	EP005	WATER	In house: Referenced to APHA 5310 B, The automated TOC analyzer determines Total and Inorganic Carbon by IR cell. TOC is calculated as the difference. This method is compliant with NEPM Schedule B(3)



Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.



RECEIVED BY:

DATE TIME:

DATE TIME:

ORDER NO: DEF19009/0960

Biohazard info:

Yes No N/A

Yes No N/A

Random Sample Temperature on Receipt:

°C

Other comments:

CONTACT PH:

SAMPLER MOBILE:

PRIMARY SAMPLER: Maelle Bourdais

QUOTE NO: SY/139/19

/ ES2019CARBSD0002

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

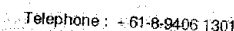
EMAIL INVOICES TO: claire.armstrong@cardno.com.au

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Sediments SEDIMENT	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0960_SD209		20/11/2020 11:24 AM	Soil	ALS: 2 Non ALS: 0	No	X		
002	0960_SD302		20/11/2020 11:09 AM	Soil	ALS: 2 Non ALS: 0	No	X		
003	0960_SS227		20/11/2020 10:22 AM	Soil	ALS: 2 Non ALS: 0	No	X		
004	0960_SS198		20/11/2020 10:18 AM	Soil	ALS: 2 Non ALS: 0	No	X		
005	0960_SS293		20/11/2020 10:12 AM	Soil	ALS: 2 Non ALS: 0	No	X		
006	0960_SS292		20/11/2020 10:09 AM	Soil	ALS: 2 Non ALS: 0	No	X		
007	0960_SS291		20/11/2020 10:03 AM	Soil	ALS: 2 Non ALS: 0	No	X		
008	0960_SD208		19/11/2020 02:16 PM	Soil	ALS: 2 Non ALS: 0	No	X		
009	0960_SD207		20/11/2020 02:16 PM	Soil	ALS: 2 Non ALS: 0	No	X		

Work Order Reference
EP2012944





CHAIN OF CUSTODY

COC#: 16268 ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: AB DEF19009/Learmonth SED 2

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Sediments SEDIMENT	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
010	0960_SD211		20/11/2020 03:17 PM	Soil	ALS: 2 Non ALS: 0	No	X		



CHAIN OF CUSTODY

COC#: 16268

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: AB DEF19009/Learmonth SED 2

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0960_SD209	HDPE Soil Jar	200 mL	00620719026329	Grey	No	
001	0960_SD209	Soil Glass Jar - Unpreserved	150 mL	00260220013649	Orange	No	
002	0960_SD302	HDPE Soil Jar	200 mL	00620719026332	Grey	No	
002	0960_SD302	Soil Glass Jar - Unpreserved	150 mL	00260220014858	Orange	No	
003	0960_SS227	HDPE Soil Jar	200 mL	00620719026343	Grey	No	
003	0960_SS227	Soil Glass Jar - Unpreserved	150 mL	00260220013306	Orange	No	
004	0960_SS198	Soil Glass Jar - Unpreserved	150 mL	00260220014829	Orange	No	
004	0960_SS198	HDPE Soil Jar	200 mL	00620719026352	Grey	No	
005	0960_SS293	HDPE Soil Jar	200 mL	00620719008737	Grey	No	
005	0960_SS293	Soil Glass Jar - Unpreserved	150 mL	00260220013150	Orange	No	
006	0960_SS292	HDPE Soil Jar	200 mL	00620719008765	Grey	No	
006	0960_SS292	Soil Glass Jar - Unpreserved	150 mL	00260220013668	Orange	No	
007	0960_SS291	Soil Glass Jar - Unpreserved	150 mL	00260220013155	Orange	No	
007	0960_SS291	HDPE Soil Jar	200 mL	00620719008772	Grey	No	
008	0960_SD208	HDPE Soil Jar	200 mL	00620719026355	Grey	No	
008	0960_SD208	Soil Glass Jar - Unpreserved	150 mL	00260220013609	Orange	No	
009	0960_SD207	Soil Glass Jar - Unpreserved	150 mL	00260220013149	Orange	No	
009	0960_SD207	HDPE Soil Jar	200 mL	00620719008767	Grey	No	
010	0960_SD211	Soil Glass Jar - Unpreserved	150 mL	00260220014854	Orange	No	
010	0960_SD211	HDPE Soil Jar	200 mL	00620719026376	Grey	No	

Total Bottle Count: ALS: 20, Non ALS: 0

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : EP2012944

<p>Client : CARDNO (WA) PTY LTD</p> <p>Contact : MAELLE BOURDAIS</p> <p>Address : 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006</p> <p>E-mail : maelle.bourdais@cardno.com.au</p> <p>Telephone : ----</p> <p>Facsimile : ----</p> <p>Project : WA_0960_PFASOMP</p> <p>Order number : DEF19009/0960</p> <p>C-O-C number : 16268</p> <p>Site : DEF19009/Learmonth</p> <p>Sampler : ASHLEY BROWN, MAELLE BOURDAIS</p>	<p>Laboratory : Environmental Division Perth</p> <p>Contact : Nick Courts</p> <p>Address : 26 Rigali Way Wangara WA Australia 6065</p> <p>E-mail : nick.courts@alsglobal.com</p> <p>Telephone : +61-8-9406 1301</p> <p>Facsimile : +61-8-9406 1399</p> <p>Page : 1 of 2</p> <p>Quote number : ES2019CARBSD0002 (SY/139/19)</p> <p>QC Level : NEPM 2013 B3 & ALS QC Standard</p>
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Dates

Date Samples Received : 25-Nov-2020 11:00	Issue Date : 26-Nov-2020
Client Requested Due : 04-Dec-2020	Scheduled Reporting Date : 04-Dec-2020
Date	

Delivery Details

Mode of Delivery : Carrier	Security Seal : Intact.
No. of coolers/boxes : 4	Temperature : 23.2 - Ice present
Receipt Detail :	No. of samples received / analysed : 11 / 11

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepancies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- ### Summary of Sample(s) and Requested Analysis

Matrix: **SOIL**

Laboratory sample ID	Sampling date / time	Sample ID	SOIL - A Agriculture	SOIL - E Moisture	SOIL - E Organic	SOIL - E PFAS - I
EP2012944-001	20-Nov-2020 11:24	0960_SD209_201120	✓	✓	✓	✓
EP2012944-002	20-Nov-2020 11:09	0960_SD302_201120	✓	✓	✓	✓
EP2012944-003	20-Nov-2020 10:22	0960_SS227_201120	✓	✓	✓	✓
EP2012944-004	20-Nov-2020 10:18	0960_SS198_201120	✓	✓	✓	✓
EP2012944-005	20-Nov-2020 10:12	0960_SS293_201120	✓	✓	✓	✓
EP2012944-006	20-Nov-2020 10:09	0960_SS292_201120	✓	✓	✓	✓
EP2012944-007	20-Nov-2020 10:03	0960_SS291_201120	✓	✓	✓	✓
EP2012944-008	19-Nov-2020 14:16	0960_SD208_201120	✓	✓	✓	✓
EP2012944-009	20-Nov-2020 14:16	0960_SD207_201120	✓	✓	✓	✓
EP2012944-010	20-Nov-2020 15:17	0960_SD211_201120	✓	✓	✓	✓
EP2012944-011	20-Nov-2020 00:00	0960_SD210_201120	✓	✓	✓	✓

Sample(s) have been received within the recommended holding times for the requested analysis.

DAVID JAMES

- Email david.james@cardno.com.au

Email derp.labreports@esdat.com.au

Email maelle.bourdais@cardno.com.au

CERTIFICATE OF ANALYSIS

Work Order : **EP2012944**
Client : **CARDNO (WA) PTY LTD**
Contact : **MAELLE BOURDAIS**
Address : **11 HARVEST TERRACE PO BOX 155**
WEST PERTH WA, AUSTRALIA 6006
Telephone : **----**
Project : **WA_0960_PFASOMP**
Order number : **DEF19009/0960**
C-O-C number : **16268**
Sampler : **ASHLEY BROWN, MAELLE BOURDAIS**
Site : **DEF19009/Learmonth**
Quote number : **SY/139/19**
No. of samples received : **11**
No. of samples analysed : **11**

Page : 1 of 12
Laboratory : Environmental Division Perth
Contact : Nick Courts
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 25-Nov-2020 11:00
Date Analysis Commenced : 27-Nov-2020
Issue Date : 03-Dec-2020 18:09



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H⁺ + Al³⁺).
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SD209_201120	0960_SD302_201120	0960_SS227_201120	0960_SS198_201120	0960_SS293_201120
Sampling date / time					20-Nov-2020 11:24	20-Nov-2020 11:09	20-Nov-2020 10:22	20-Nov-2020 10:18	20-Nov-2020 10:12
Compound	CAS Number	LOR	Unit		EP2012944-001	EP2012944-002	EP2012944-003	EP2012944-004	EP2012944-005
				Result	Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		8.9	8.7	8.7	9.0	9.2
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		9460	10700	128	1220	132
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		19.4	24.8	2.1	0.6	0.6
ED007: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g	----	----	----	16.7	----	13.6
Exchangeable Magnesium	----	0.1	meq/100g	----	----	----	3.4	----	2.1
Exchangeable Potassium	----	0.1	meq/100g	----	----	----	1.0	----	0.3
Exchangeable Sodium	----	0.1	meq/100g	----	----	----	0.2	----	0.6
Cation Exchange Capacity	----	0.1	meq/100g	----	----	----	21.4	----	16.7
Exchangeable Aluminium	----	0.1	meq/100g	----	----	----	<0.1	----	<0.1
Exchangeable Sodium Percent	----	0.1	%	----	----	----	1.1	----	3.7
Exchangeable Magnesium Percent	----	0.1	%	----	----	----	16.1	----	12.6
Exchangeable Potassium Percent	----	0.1	%	----	----	----	4.8	----	2.1
Exchangeable Calcium Percent	----	0.1	%	----	----	----	78.0	----	81.6
Calcium/Magnesium Ratio	----	0.1	-	----	----	----	4.9	----	6.5
Magnesium/Potassium Ratio	----	0.1	-	----	----	----	3.3	----	6.1
ED008: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		16.2	17.6	----	14.5	----
Exchangeable Magnesium	----	0.1	meq/100g		3.3	7.7	----	3.5	----
Exchangeable Potassium	----	0.1	meq/100g		0.3	0.6	----	0.3	----
Exchangeable Sodium	----	0.1	meq/100g		0.2	0.5	----	<0.1	----
Cation Exchange Capacity	----	0.1	meq/100g		20.0	26.4	----	18.3	----
Exchangeable Sodium Percent	----	0.1	%		1.3	1.9	----	0.4	----
EP004: Organic Matter									
Organic Matter	----	0.5	%		1.7	2.6	1.5	0.8	<0.5
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				0960_SD209_201120	0960_SD302_201120	0960_SS227_201120	0960_SS198_201120	0960_SS293_201120
Sampling date / time				20-Nov-2020 11:24	20-Nov-2020 11:09	20-Nov-2020 10:22	20-Nov-2020 10:18	20-Nov-2020 10:12
Compound	CAS Number	LOR	Unit	EP2012944-001	EP2012944-002	EP2012944-003	EP2012944-004	EP2012944-005
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.0127	0.0012	0.0017
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.0003	<0.0002	<0.0002
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SD209_201120	0960_SD302_201120	0960_SS227_201120	0960_SS198_201120	0960_SS293_201120
Sampling date / time					20-Nov-2020 11:24	20-Nov-2020 11:09	20-Nov-2020 10:22	20-Nov-2020 10:18	20-Nov-2020 10:12
Compound	CAS Number	LOR	Unit		EP2012944-001	EP2012944-002	EP2012944-003	EP2012944-004	EP2012944-005
				Result	Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg		<0.0002	<0.0002	0.0130	0.0012	0.0017
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		<0.0002	<0.0002	0.0127	0.0012	0.0017
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		<0.0002	<0.0002	0.0127	0.0012	0.0017
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		95.0	89.0	94.0	92.0	99.5
13C8-PFOA	----	0.0002	%		108	113	108	108	110



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SS292_201120	0960_SS291_201120	0960_SD208_201120	0960_SD207_201120	0960_SD211_201120
Sampling date / time					20-Nov-2020 10:09	20-Nov-2020 10:03	19-Nov-2020 14:16	20-Nov-2020 14:16	20-Nov-2020 15:17
Compound	CAS Number	LOR	Unit		EP2012944-006	EP2012944-007	EP2012944-008	EP2012944-009	EP2012944-010
				Result	Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		8.6	9.0	9.4	9.5	9.0
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		178	83	2920	993	4500
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		1.8	0.6	19.7	18.8	33.2
ED007: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		16.2	10.3	----	----	----
Exchangeable Magnesium	----	0.1	meq/100g		4.7	1.7	----	----	----
Exchangeable Potassium	----	0.1	meq/100g		0.9	0.3	----	----	----
Exchangeable Sodium	----	0.1	meq/100g		0.2	<0.1	----	----	----
Cation Exchange Capacity	----	0.1	meq/100g		22.0	12.4	----	----	----
Exchangeable Aluminium	----	0.1	meq/100g		<0.1	<0.1	----	----	----
Exchangeable Sodium Percent	----	0.1	%		1.1	0.6	----	----	----
Exchangeable Magnesium Percent	----	0.1	%		21.5	13.8	----	----	----
Exchangeable Potassium Percent	----	0.1	%		4.0	2.4	----	----	----
Exchangeable Calcium Percent	----	0.1	%		73.4	83.1	----	----	----
Calcium/Magnesium Ratio	----	0.1	-		3.4	6.0	----	----	----
Magnesium/Potassium Ratio	----	0.1	-		5.4	5.7	----	----	----
ED008: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		----	----	5.5	16.8	16.6
Exchangeable Magnesium	----	0.1	meq/100g		----	----	0.7	2.7	11.1
Exchangeable Potassium	----	0.1	meq/100g		----	----	<0.1	0.1	1.5
Exchangeable Sodium	----	0.1	meq/100g		----	----	0.1	0.2	1.1
Cation Exchange Capacity	----	0.1	meq/100g		----	----	6.3	19.8	30.3
Exchangeable Sodium Percent	----	0.1	%		----	----	2.0	1.2	3.7
EP004: Organic Matter									
Organic Matter	----	0.5	%		1.0	1.2	1.3	1.5	2.9
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				0960_SS292_201120	0960_SS291_201120	0960_SD208_201120	0960_SD207_201120	0960_SD211_201120
Sampling date / time				20-Nov-2020 10:09	20-Nov-2020 10:03	19-Nov-2020 14:16	20-Nov-2020 14:16	20-Nov-2020 15:17
Compound	CAS Number	LOR	Unit	EP2012944-006	EP2012944-007	EP2012944-008	EP2012944-009	EP2012944-010
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0025	0.0006	<0.0002	<0.0002	0.0008
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SS292_201120	0960_SS291_201120	0960_SD208_201120	0960_SD207_201120	0960_SD211_201120
Sampling date / time					20-Nov-2020 10:09	20-Nov-2020 10:03	19-Nov-2020 14:16	20-Nov-2020 14:16	20-Nov-2020 15:17
Compound	CAS Number	LOR	Unit		EP2012944-006	EP2012944-007	EP2012944-008	EP2012944-009	EP2012944-010
				Result	Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg		0.0025	0.0006	<0.0002	<0.0002	0.0008
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		0.0025	0.0006	<0.0002	<0.0002	0.0008
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		0.0025	0.0006	<0.0002	<0.0002	0.0008
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		102	94.0	93.0	93.0	102
13C8-PFOA	----	0.0002	%		114	105	110	110	105



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)		Sample ID		0960_SD210_201120	----	----	----	----
		Sampling date / time		20-Nov-2020 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2012944-011	-----	-----	-----	-----
Result				----	----	----	----	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	8.7	----	----	----	----
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	9440	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	23.2	----	----	----	----
ED008: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	9.0	----	----	----	----
Exchangeable Magnesium	----	0.1	meq/100g	5.8	----	----	----	----
Exchangeable Potassium	----	0.1	meq/100g	0.9	----	----	----	----
Exchangeable Sodium	----	0.1	meq/100g	0.4	----	----	----	----
Cation Exchange Capacity	----	0.1	meq/100g	16.0	----	----	----	----
Exchangeable Sodium Percent	----	0.1	%	2.5	----	----	----	----
EP004: Organic Matter								
Organic Matter	----	0.5	%	2.2	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0010	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	----	----	----	----



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

0960_SD210_201120

Sampling date / time				20-Nov-2020 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2012944-011	-----	-----	-----	-----
Result				----	----	----	----	----

EP231B: Perfluoroalkyl Carboxylic Acids - Continued

Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	----	----	----	----

EP231C: Perfluoroalkyl Sulfonamides

Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	----	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	----	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	----	----	----	----

EP231D: (n:2) Fluorotelomer Sulfonic Acids

4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	----	----	----	----

EP231P: PFAS Sums

Sum of PFAS	----	0.0002	mg/kg	0.0010	----	----	----	----
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Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SD210_201120	----	----	----	----
				Sampling date / time	20-Nov-2020 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2012944-011	-----	-----	-----	-----
				Result		----	----	----	----
EP231P: PFAS Sums - Continued									
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		0.0010	----	----	----	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		0.0010	----	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		89.5	----	----	----	----
13C8-PFOA	----	0.0002	%		112	----	----	----	----



Surrogate Control Limits

Sub-Matrix: SEDIMENT		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

QUALITY CONTROL REPORT

Work Order	: EP2012944	Page	: 1 of 8
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 25-Nov-2020
Order number	: DEF19009/0960	Date Analysis Commenced	: 27-Nov-2020
C-O-C number	: 16268	Issue Date	: 03-Dec-2020
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		
Site	: DEF19009/Learmonth		
Quote number	: SY/139/19		
No. of samples received	: 11		
No. of samples analysed	: 11		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
= Indicates failed QC

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: SOIL					Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA002: pH 1:5 (Soils) (QC Lot: 3387886)									
EP2012944-001	0960_SD209_201120	EA002: pH Value	----	0.1	pH Unit	8.9	9.0	0.00	0% - 20%
EP2012944-010	0960_SD211_201120	EA002: pH Value	----	0.1	pH Unit	9.0	9.0	0.00	0% - 20%
EA002: pH 1:5 (Soils) (QC Lot: 3391232)									
EP2012944-011	0960_SD210_201120	EA002: pH Value	----	0.1	pH Unit	8.7	8.7	0.00	0% - 20%
EP2012955-001	Anonymous	EA002: pH Value	----	0.1	pH Unit	8.4	8.4	0.00	0% - 20%
EA010: Conductivity (1:5) (QC Lot: 3387885)									
EP2012944-001	0960_SD209_201120	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	9460	9510	0.527	0% - 20%
EP2012944-010	0960_SD211_201120	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	4500	4520	0.443	0% - 20%
EA010: Conductivity (1:5) (QC Lot: 3391233)									
EP2012944-011	0960_SD210_201120	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	9440	9440	0.00	0% - 20%
EP2012955-001	Anonymous	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	20200	20200	0.0991	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3391311)									
EP2012944-001	0960_SD209_201120	EA055: Moisture Content	----	0.1	%	19.4	20.3	4.74	0% - 20%
EP2012944-010	0960_SD211_201120	EA055: Moisture Content	----	0.1	%	33.2	33.5	0.842	0% - 20%
ED007: Exchangeable Cations (QC Lot: 3392645)									
EP2012944-003	0960_SS227_201120	ED007: Calcium/Magnesium Ratio	----	0.1	-	4.9	4.8	0.00	0% - 20%
		ED007: Exchangeable Sodium Percent	----	0.1	%	1.1	1.1	0.00	0% - 50%
		ED007: Exchangeable Calcium	----	0.1	meq/100g	16.7	16.5	1.30	0% - 20%
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	3.4	3.4	0.00	0% - 20%
		ED007: Exchangeable Potassium	----	0.1	meq/100g	1.0	1.1	0.00	0% - 50%
		ED007: Exchangeable Sodium	----	0.1	meq/100g	0.2	0.2	0.00	No Limit
		ED007: Cation Exchange Capacity	----	0.1	meq/100g	21.4	21.2	0.801	0% - 20%
		ED007: Exchangeable Aluminium	----	0.1	meq/100g	<0.1	<0.1	0.00	No Limit
ED008: Exchangeable Cations (QC Lot: 3396610)									



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
ED008: Exchangeable Cations (QC Lot: 3396610) - continued									
EP2012944-001	0960_SD209_201120	ED008: Exchangeable Sodium Percent	----	0.1	%	1.3	1.2	0.00	0% - 50%
		ED008: Exchangeable Calcium	----	0.1	meq/100g	16.2	16.4	1.09	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	3.3	3.4	3.26	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	0.3	0.3	0.00	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	0.2	0.2	0.00	No Limit
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	20.0	20.3	1.42	0% - 20%
EP004: Organic Matter (QC Lot: 3391847)									
EP2012944-001	0960_SD209_201120	EP004: Organic Matter	----	0.5	%	1.7	1.9	10.2	No Limit
EP2012944-011	0960_SD210_201120	EP004: Organic Matter	----	0.5	%	2.2	2.2	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3395351)									
EP2012944-001	0960_SD209_201120	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP2012955-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	0.0004	0.0005	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0077	0.0080	4.09	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3395351)									
EP2012944-001	0960_SD209_201120	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP2012955-001	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	0.0003	0.0003	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	0.0003	0.0003	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3395351) - continued									
EP2012955-001	Anonymous	EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3395351)									
EP2012944-001	0960_SD209_201120	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP2012955-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3395351)									
EP2012944-001	0960_SD209_201120	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit

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 Work Order : EP2012944
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3395351) - continued									
EP2012955-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit



Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

Sub-Matrix: SOIL				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EA002: pH 1:5 (Soils) (QCLot: 3387886)								
EA002: pH Value	----	----	pH Unit	----	4 pH Unit	101	70.0	130
				----	7 pH Unit	99.8	70.0	130
EA002: pH 1:5 (Soils) (QCLot: 3391232)								
EA002: pH Value	----	----	pH Unit	----	4 pH Unit	100	70.0	130
				----	7 pH Unit	100	70.0	130
EA010: Conductivity (1:5) (QCLot: 3387885)								
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	1412 µS/cm	100	93.6	106
EA010: Conductivity (1:5) (QCLot: 3391233)								
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	1412 µS/cm	100	93.6	106
ED007: Exchangeable Cations (QCLot: 3392645)								
ED007: Exchangeable Calcium	----	0.1	meq/100g	<0.1	21.6 meq/100g	92.0	82.9	117
ED007: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.76 meq/100g	95.4	78.4	119
ED007: Exchangeable Potassium	----	0.1	meq/100g	<0.1	1 meq/100g	103	87.9	129
ED007: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.9 meq/100g	101	92.9	132
ED007: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	25.3 meq/100g	92.8	84.7	117
ED007: Exchangeable Aluminium	----	0.1	meq/100g	<0.1	----	----	----	----
ED007: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
ED007: Calcium/Magnesium Ratio	----	0.1	-	<0.1	----	----	----	----
ED008: Exchangeable Cations (QCLot: 3396610)								
ED008: Exchangeable Calcium	----	0.1	meq/100g	<0.1	22.1 meq/100g	81.5	78.7	111
ED008: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.56 meq/100g	82.8	77.6	111
ED008: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.91 meq/100g	93.0	86.9	116
ED008: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.38 meq/100g	94.2	72.3	129
ED008: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
ED008: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	24.95 meq/100g	82.2	79.9	110
EP004: Organic Matter (QCLot: 3391847)								
EP004: Organic Matter	----	0.5	%	<0.5	2.3 %	112	70.0	120
				<0.5	85 %	95.0	70.0	120
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3395351)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	82.0	72.0	128
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.0	73.0	123
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.4	67.0	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	88.0	70.0	132
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	85.2	68.0	136



Sub-Matrix: SOIL				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result		LCS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3395351) - continued								
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	89.2	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3395351)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	92.6	71.0	135
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	89.2	69.0	132
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	112	70.0	132
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	92.8	71.0	131
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	95.2	69.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	94.0	72.0	129
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	88.0	69.0	133
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	98.4	64.0	136
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	98.0	69.0	135
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	80.4	66.0	139
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	127	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3395351)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	93.2	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	101	71.6	129
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	96.0	69.8	131
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	106	68.7	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	112	65.1	134
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	86.8	63.0	144
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	109	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3395351)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	94.8	62.0	145
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	100	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	112	65.0	137
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	87.6	69.2	143

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: SOIL				Matrix Spike (MS) Report			
				Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number		MS	Low	High



Sub-Matrix: SOIL

Sub-Matrix: SOIL				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3395351)							
EP2012944-001	0960_SD209_201120	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	83.6	72.0	128
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	85.6	73.0	123
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	82.4	67.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	88.0	70.0	132
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	96.0	68.0	136
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	95.2	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3395351)							
EP2012944-001	0960_SD209_201120	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	74.4	71.0	135
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	78.4	69.0	132
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	110	70.0	132
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	87.2	71.0	131
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	99.2	69.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	86.0	72.0	129
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	86.8	69.0	133
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	101	64.0	136
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	101	69.0	135
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	82.0	66.0	139
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	92.3	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3395351)							
EP2012944-001	0960_SD209_201120	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	90.0	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	113	71.6	129
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	91.2	69.8	131
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	118	68.7	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	117	65.1	134
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	83.6	63.0	144
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	81.6	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3395351)							
EP2012944-001	0960_SD209_201120	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	86.8	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	90.8	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	110	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	99.6	69.2	143

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2012944	Page	: 1 of 7
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 25-Nov-2020
Site	: DEF19009/Learmonth	Issue Date	: 03-Dec-2020
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS	No. of samples received	: 11
Order number	: DEF19009/0960	No. of samples analysed	: 11

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- **NO** Matrix Spike outliers occur.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- **NO** Quality Control Sample Frequency Outliers exist.



Outliers : Analysis Holding Time Compliance

Matrix: **SOIL**

Method	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA002: pH 1:5 (Soils)						
Soil Glass Jar - Unpreserved 0960_SD208_201120	27-Nov-2020	26-Nov-2020	1	----	----	----
Soil Glass Jar - Unpreserved 0960_SD210_201120	30-Nov-2020	27-Nov-2020	3	----	----	----
EA010: Conductivity (1:5)						
Soil Glass Jar - Unpreserved 0960_SD208_201120	27-Nov-2020	26-Nov-2020	1	----	----	----
Soil Glass Jar - Unpreserved 0960_SD210_201120	30-Nov-2020	27-Nov-2020	3	----	----	----

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA002: pH 1:5 (Soils)							
Soil Glass Jar - Unpreserved (EA002) 0960_SD208_201120	19-Nov-2020	27-Nov-2020	26-Nov-2020	✖	27-Nov-2020	27-Nov-2020	✓
Soil Glass Jar - Unpreserved (EA002) 0960_SD209_201120, 0960_SS227_201120, 0960_SS293_201120, 0960_SS291_201120, 0960_SD211_201120	20-Nov-2020	27-Nov-2020	27-Nov-2020	✓	27-Nov-2020	27-Nov-2020	✓
Soil Glass Jar - Unpreserved (EA002) 0960_SD210_201120	20-Nov-2020	30-Nov-2020	27-Nov-2020	✖	30-Nov-2020	30-Nov-2020	✓



Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA010: Conductivity (1:5)								
Soil Glass Jar - Unpreserved (EA010) 0960_SD208_201120		19-Nov-2020	27-Nov-2020	26-Nov-2020	✖	27-Nov-2020	25-Dec-2020	✓
Soil Glass Jar - Unpreserved (EA010) 0960_SD209_201120, 0960_SS227_201120, 0960_SS293_201120, 0960_SS291_201120, 0960_SD211_201120	0960_SD302_201120, 0960_SS198_201120, 0960_SS292_201120, 0960_SD207_201120,	20-Nov-2020	27-Nov-2020	27-Nov-2020	✓	27-Nov-2020	25-Dec-2020	✓
Soil Glass Jar - Unpreserved (EA010) 0960_SD210_201120		20-Nov-2020	30-Nov-2020	27-Nov-2020	✖	30-Nov-2020	28-Dec-2020	✓
EA055: Moisture Content (Dried @ 105-110°C)								
Soil Glass Jar - Unpreserved (EA055) 0960_SD208_201120		19-Nov-2020	----	----	----	30-Nov-2020	03-Dec-2020	✓
Soil Glass Jar - Unpreserved (EA055) 0960_SD209_201120, 0960_SS227_201120, 0960_SS293_201120, 0960_SS291_201120, 0960_SD211_201120,	0960_SD302_201120, 0960_SS198_201120, 0960_SS292_201120, 0960_SD207_201120, 0960_SD210_201120	20-Nov-2020	----	----	----	30-Nov-2020	04-Dec-2020	✓
ED007: Exchangeable Cations								
Soil Glass Jar - Unpreserved (ED007) 0960_SS227_201120, 0960_SS292_201120,	0960_SS293_201120, 0960_SS291_201120	20-Nov-2020	02-Dec-2020	18-Dec-2020	✓	02-Dec-2020	18-Dec-2020	✓
ED008: Exchangeable Cations								
Soil Glass Jar - Unpreserved (ED008) 0960_SD208_201120		19-Nov-2020	02-Dec-2020	17-Dec-2020	✓	02-Dec-2020	17-Dec-2020	✓
Soil Glass Jar - Unpreserved (ED008) 0960_SD209_201120, 0960_SS198_201120, 0960_SD211_201120,	0960_SD302_201120, 0960_SD207_201120, 0960_SD210_201120	20-Nov-2020	02-Dec-2020	18-Dec-2020	✓	02-Dec-2020	18-Dec-2020	✓
EP004: Organic Matter								
Soil Glass Jar - Unpreserved (EP004) 0960_SD208_201120		19-Nov-2020	02-Dec-2020	17-Dec-2020	✓	02-Dec-2020	17-Dec-2020	✓
Soil Glass Jar - Unpreserved (EP004) 0960_SD209_201120, 0960_SS227_201120, 0960_SS293_201120, 0960_SS291_201120, 0960_SD211_201120,	0960_SD302_201120, 0960_SS198_201120, 0960_SS292_201120, 0960_SD207_201120, 0960_SD210_201120	20-Nov-2020	02-Dec-2020	18-Dec-2020	✓	02-Dec-2020	18-Dec-2020	✓



Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE Soil Jar (EP231X) 0960_SD208_201120	19-Nov-2020	02-Dec-2020	18-May-2021	✓	02-Dec-2020	11-Jan-2021	✓
HDPE Soil Jar (EP231X) 0960_SD209_201120, 0960_SS227_201120, 0960_SS293_201120, 0960_SS291_201120, 0960_SD211_201120, 0960_SD302_201120, 0960_SS198_201120, 0960_SS292_201120, 0960_SD207_201120, 0960_SD210_201120	20-Nov-2020	02-Dec-2020	19-May-2021	✓	02-Dec-2020	11-Jan-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE Soil Jar (EP231X) 0960_SD208_201120	19-Nov-2020	02-Dec-2020	18-May-2021	✓	02-Dec-2020	11-Jan-2021	✓
HDPE Soil Jar (EP231X) 0960_SD209_201120, 0960_SS227_201120, 0960_SS293_201120, 0960_SS291_201120, 0960_SD211_201120, 0960_SD302_201120, 0960_SS198_201120, 0960_SS292_201120, 0960_SD207_201120, 0960_SD210_201120	20-Nov-2020	02-Dec-2020	19-May-2021	✓	02-Dec-2020	11-Jan-2021	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE Soil Jar (EP231X) 0960_SD208_201120	19-Nov-2020	02-Dec-2020	18-May-2021	✓	02-Dec-2020	11-Jan-2021	✓
HDPE Soil Jar (EP231X) 0960_SD209_201120, 0960_SS227_201120, 0960_SS293_201120, 0960_SS291_201120, 0960_SD211_201120, 0960_SD302_201120, 0960_SS198_201120, 0960_SS292_201120, 0960_SD207_201120, 0960_SD210_201120	20-Nov-2020	02-Dec-2020	19-May-2021	✓	02-Dec-2020	11-Jan-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE Soil Jar (EP231X) 0960_SD208_201120	19-Nov-2020	02-Dec-2020	18-May-2021	✓	02-Dec-2020	11-Jan-2021	✓
HDPE Soil Jar (EP231X) 0960_SD209_201120, 0960_SS227_201120, 0960_SS293_201120, 0960_SS291_201120, 0960_SD211_201120, 0960_SD302_201120, 0960_SS198_201120, 0960_SS292_201120, 0960_SD207_201120, 0960_SD210_201120	20-Nov-2020	02-Dec-2020	19-May-2021	✓	02-Dec-2020	11-Jan-2021	✓



Matrix: SOIL

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231P: PFAS Sums							
HDPE Soil Jar (EP231X) 0960_SD208_201120	19-Nov-2020	02-Dec-2020	18-May-2021	✔	02-Dec-2020	11-Jan-2021	✔
HDPE Soil Jar (EP231X) 0960_SD209_201120, 0960_SS227_201120, 0960_SS293_201120, 0960_SS291_201120, 0960_SD211_201120, 0960_SD302_201120, 0960_SS198_201120, 0960_SS292_201120, 0960_SD207_201120, 0960_SD210_201120	20-Nov-2020	02-Dec-2020	19-May-2021	✔	02-Dec-2020	11-Jan-2021	✔



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)		Quality Control Specification	
Analytical Methods	Method	QC	Regular	Actual	Expected		Evaluation
Laboratory Duplicates (DUP)							
Electrical Conductivity (1:5)	EA010	4	30	13.33	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	7	14.29	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	9	11.11	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	2	11	18.18	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	11	18.18	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	20	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	4	32	12.50	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Electrical Conductivity (1:5)	EA010	2	30	6.67	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	7	14.29	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	9	11.11	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	11	18.18	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	4	32	12.50	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Electrical Conductivity (1:5)	EA010	2	30	6.67	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	7	14.29	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	9	11.11	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	11	9.09	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	In house: Referenced to Rayment and Lyons 4A1 and APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Electrical Conductivity (1:5)	EA010	SOIL	In house: Referenced to Rayment and Lyons 3A1 and APHA 2510. Conductivity is determined on soil samples using a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Exchangeable Cations	ED007	SOIL	In house: Referenced to Rayment & Lyons Method 15A1. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM Schedule B(3).
Exchangeable Cations with pre-treatment	ED008	SOIL	In house: Referenced to Rayment & Lyons Method 15A2. Soluble salts are removed from the sample prior to analysis. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM Schedule B(3).
Organic Matter	EP004	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3)
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	SOIL	In-house: Analysis of soils by solvent extraction followed by LC-Electrospray-MS-MS, Negative Mode using MRM using internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Exchangeable Cations Preparation Method	ED007PR	SOIL	In house: Referenced to Rayment & Lyons method 15A1. A 1M NH4Cl extraction by end over end tumbling at a ratio of 1:20. There is no pretreatment for soluble salts. Extracts can be run by ICP for cations.
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
Organic Matter	EP004-PR	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3).
Sample Extraction for PFAS in solid matrices	ORG73	SOIL	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

**CHAIN OF CUSTODY**

COC#: 16247 ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: SC-DEF19009/Learmonth SED

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0960_SS190	HDPE Soil Jar	200 mL	00620719008749	Grey	No	
001	0960_SS190	Soil Glass Jar - Unpreserved	150 mL	00260220013862	Orange	No	
002	0960_SS192	Soil Glass Jar - Unpreserved	150 mL	00260220014714	Orange	No	
002	0960_SS192	HDPE Soil Jar	200 mL	00620719008629	Grey	No	
003	0960_SS193	HDPE Soil Jar	200 mL	00620719008699	Grey	No	
003	0960_SS193	Soil Glass Jar - Unpreserved	150 mL	00260220014932	Orange	No	
004	0960_SD300	Soil Glass Jar - Unpreserved	150 mL	00260220013939	Orange	No	
004	0960_SD300	HDPE Soil Jar	200 mL	00620719008651	Grey	No	
005	0960_SD301	Soil Glass Jar - Unpreserved	150 mL	00260220013889	Orange	No	
005	0960_SD301	HDPE Soil Jar	200 mL	00620719008698	Grey	No	
006	0960_SD303	Soil Glass Jar - Unpreserved	150 mL	00260220013299	Orange	No	
006	0960_SD303	HDPE Soil Jar	200 mL	00620719026380	Grey	No	
007	0960_SD304	Soil Glass Jar - Unpreserved	150 mL	00260220013628	Orange	No	
007	0960_SD304	HDPE Soil Jar	200 mL	00620719008173	Grey	No	
008	0960_SD305	Soil Glass Jar - Unpreserved	150 mL	00260220074372	Orange	No	
008	0960_SD305	HDPE Soil Jar	200 mL	00620719026359	Grey	No	

Total Bottle Count: ALS: 16, Non ALS: 0

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : EP2012945

<p>Client : CARDNO (WA) PTY LTD</p> <p>Contact : MAELLE BOURDAIS</p> <p>Address : 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006</p> <p>E-mail : maelle.bourdais@cardno.com.au</p> <p>Telephone : ----</p> <p>Facsimile : ----</p> <p>Project : WA_0960_PFASOMP</p> <p>Order number : DEF19009/0960</p> <p>C-O-C number : 16247</p> <p>Site : DEF19009/Learmonth</p> <p>Sampler : MAELLE BOURDAIS, Shaun Chambers</p>	<p>Laboratory : Environmental Division Perth</p> <p>Contact : Nick Courts</p> <p>Address : 26 Rigali Way Wangara WA Australia 6065</p> <p>E-mail : nick.courts@alsglobal.com</p> <p>Telephone : +61-8-9406 1301</p> <p>Facsimile : +61-8-9406 1399</p> <p>Page : 1 of 2</p> <p>Quote number : ES2019CARBSD0002 (SY/139/19)</p> <p>QC Level : NEPM 2013 B3 & ALS QC Standard</p>
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Dates

Date Samples Received : 23-Nov-2020 11:00	Issue Date : 25-Nov-2020
Client Requested Due Date : 04-Dec-2020	Scheduled Reporting Date : 04-Dec-2020

Delivery Details

Mode of Delivery : Carrier	Security Seal : Intact.
No. of coolers/boxes : 4	Temperature : 23.2 - Ice present
Receipt Detail :	No. of samples received / analysed : 8 / 8

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepancies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- ### Summary of Sample(s) and Requested Analysis

Matrix: **SOIL**

Laboratory sample ID	Sampling date / time	Sample ID	SOIL - A Agriculture	SOIL - E Moisture	SOIL - E Organic	SOIL - E PFAS - F
EP2012945-001	20-Nov-2020 09:36	0960_SS190_201120	✓	✓	✓	✓
EP2012945-002	20-Nov-2020 09:59	0960_SS192_201120	✓	✓	✓	✓
EP2012945-003	20-Nov-2020 12:56	0960_SS193_201120	✓	✓	✓	✓
EP2012945-004	20-Nov-2020 13:49	0960_SD300_201120	✓	✓	✓	✓
EP2012945-005	20-Nov-2020 14:19	0960_SD301_201120	✓	✓	✓	✓
EP2012945-006	20-Nov-2020 14:37	0960_SD303_201120	✓	✓	✓	✓
EP2012945-007	20-Nov-2020 14:58	0960_SD304_201120	✓	✓	✓	✓
EP2012945-008	20-Nov-2020 15:13	0960_SD305_201120	✓	✓	✓	✓

- *AU Certificate of Analysis - NATA (COA)	Email	maelle.bourdais@cardno.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	maelle.bourdais@cardno.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	maelle.bourdais@cardno.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	maelle.bourdais@cardno.com.au
- Chain of Custody (CoC) (COC)	Email	maelle.bourdais@cardno.com.au
- EDI Format - ENMRG (ENMRG)	Email	maelle.bourdais@cardno.com.au
- EDI Format - ESDAT (ESDAT)	Email	maelle.bourdais@cardno.com.au
- EDI Format - XTab (XTAB)	Email	maelle.bourdais@cardno.com.au

CERTIFICATE OF ANALYSIS

Work Order : **EP2012945**
Client : **CARDNO (WA) PTY LTD**
Contact : **MAELLE BOURDAIS**
Address : **11 HARVEST TERRACE PO BOX 155**
WEST PERTH WA, AUSTRALIA 6006
Telephone : **----**
Project : **WA_0960_PFASOMP**
Order number : **DEF19009/0960**
C-O-C number : **16247**
Sampler : **MAELLE BOURDAIS, Shaun Chambers**
Site : **DEF19009/Learmonth**
Quote number : **SY/139/19**
No. of samples received : **8**
No. of samples analysed : **8**

Page : 1 of 9
Laboratory : Environmental Division Perth
Contact : Nick Courts
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 23-Nov-2020 11:00
Date Analysis Commenced : 30-Nov-2020
Issue Date : 04-Dec-2020 17:02



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H⁺ + Al³⁺).
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SS190_201120	0960_SS192_201120	0960_SS193_201120	0960_SD300_201120	0960_SD301_201120
Sampling date / time					20-Nov-2020 09:36	20-Nov-2020 09:59	20-Nov-2020 12:56	20-Nov-2020 13:49	20-Nov-2020 14:19
Compound	CAS Number	LOR	Unit		EP2012945-001	EP2012945-002	EP2012945-003	EP2012945-004	EP2012945-005
				Result	Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		8.8	9.4	8.7	8.6	8.8
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		66500	10900	22400	7600	5150
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		7.7	5.1	28.3	29.5	29.0
ED008: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		41.8	7.2	18.0	22.5	17.6
Exchangeable Magnesium	----	0.1	meq/100g		19.6	1.0	5.6	11.8	9.2
Exchangeable Potassium	----	0.1	meq/100g		2.5	0.1	1.6	0.9	1.2
Exchangeable Sodium	----	0.1	meq/100g		1.6	0.2	0.8	1.0	0.6
Cation Exchange Capacity	----	0.1	meq/100g		65.4	8.6	26.1	36.2	28.6
Exchangeable Sodium Percent	----	0.1	%		2.4	2.6	3.0	2.8	2.2
EP004: Organic Matter									
Organic Matter	----	0.5	%		4.7	1.6	2.8	3.2	1.9
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		0.0009	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		0.0284	<0.0002	0.0005	0.0015	0.0005
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		0.0010	<0.0002	<0.0002	<0.0002	<0.0002
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg		<0.001	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				0960_SS190_201120	0960_SS192_201120	0960_SS193_201120	0960_SD300_201120	0960_SD301_201120
Sampling date / time				20-Nov-2020 09:36	20-Nov-2020 09:59	20-Nov-2020 12:56	20-Nov-2020 13:49	20-Nov-2020 14:19
Compound	CAS Number	LOR	Unit	EP2012945-001	EP2012945-002	EP2012945-003	EP2012945-004	EP2012945-005
				Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids - Continued								
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	0.0303	<0.0002	0.0005	0.0015	0.0005



Analytical Results

Sub-Matrix: **SEDIMENT**
 (Matrix: **SOIL**)

Sample ID

				0960_SS190_201120	0960_SS192_201120	0960_SS193_201120	0960_SD300_201120	0960_SD301_201120
Sampling date / time				20-Nov-2020 09:36	20-Nov-2020 09:59	20-Nov-2020 12:56	20-Nov-2020 13:49	20-Nov-2020 14:19
Compound	CAS Number	LOR	Unit	EP2012945-001	EP2012945-002	EP2012945-003	EP2012945-004	EP2012945-005
				Result	Result	Result	Result	Result
EP231P: PFAS Sums - Continued								
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	0.0293	<0.0002	0.0005	0.0015	0.0005
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	0.0293	<0.0002	0.0005	0.0015	0.0005
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	86.5	99.5	100	103	98.5
13C8-PFOA	----	0.0002	%	102	111	105	113	104



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SD303_201120	0960_SD304_201120	0960_SD305_201120	----	----
Sampling date / time					20-Nov-2020 14:37	20-Nov-2020 14:58	20-Nov-2020 15:13	----	----
Compound	CAS Number	LOR	Unit		EP2012945-006	EP2012945-007	EP2012945-008	-----	-----
					Result	Result	Result	----	----
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		8.6	8.9	8.7	----	----
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		6870	4190	3590	----	----
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		34.4	25.6	26.2	----	----
ED008: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		16.7	18.1	17.5	----	----
Exchangeable Magnesium	----	0.1	meq/100g		5.3	3.7	2.4	----	----
Exchangeable Potassium	----	0.1	meq/100g		1.1	0.2	0.2	----	----
Exchangeable Sodium	----	0.1	meq/100g		0.7	0.3	0.3	----	----
Cation Exchange Capacity	----	0.1	meq/100g		23.7	22.4	20.5	----	----
Exchangeable Sodium Percent	----	0.1	%		2.9	1.5	1.6	----	----
EP004: Organic Matter									
Organic Matter	----	0.5	%		5.0	1.6	1.6	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg		<0.001	<0.001	<0.001	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				0960_SD303_201120	0960_SD304_201120	0960_SD305_201120	----	----
Sampling date / time				20-Nov-2020 14:37	20-Nov-2020 14:58	20-Nov-2020 15:13	----	----
Compound	CAS Number	LOR	Unit	EP2012945-006	EP2012945-007	EP2012945-008	-----	-----
				Result	Result	Result	----	----
EP231B: Perfluoroalkyl Carboxylic Acids - Continued								
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SD303_201120	0960_SD304_201120	0960_SD305_201120	----	----
Sampling date / time					20-Nov-2020 14:37	20-Nov-2020 14:58	20-Nov-2020 15:13	----	----
Compound	CAS Number	LOR	Unit		EP2012945-006	EP2012945-007	EP2012945-008	-----	-----
				Result	Result	Result	Result	----	----
EP231P: PFAS Sums - Continued									
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		94.0	102	101	----	----
13C8-PFOA	----	0.0002	%		116	113	104	----	----



Surrogate Control Limits

Sub-Matrix: SEDIMENT		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

QUALITY CONTROL REPORT

Work Order	: EP2012945	Page	: 1 of 7
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 23-Nov-2020
Order number	: DEF19009/0960	Date Analysis Commenced	: 30-Nov-2020
C-O-C number	: 16247	Issue Date	: 04-Dec-2020
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: DEF19009/Learmonth		
Quote number	: SY/139/19		
No. of samples received	: 8		
No. of samples analysed	: 8		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key :
 Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
 CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
 LOR = Limit of reporting
 RPD = Relative Percentage Difference
 # = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA002: pH 1:5 (Soils) (QC Lot: 3391232)									
EP2012944-011	Anonymous	EA002: pH Value	----	0.1	pH Unit	8.7	8.7	0.00	0% - 20%
EP2012955-001	Anonymous	EA002: pH Value	----	0.1	pH Unit	8.4	8.4	0.00	0% - 20%
EA010: Conductivity (1:5) (QC Lot: 3391233)									
EP2012944-011	Anonymous	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	9440	9440	0.00	0% - 20%
EP2012955-001	Anonymous	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	20200	20200	0.0991	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3391317)									
EP2012945-001	0960_SS190_201120	EA055: Moisture Content	----	0.1	%	7.7	7.9	3.06	0% - 20%
ED008: Exchangeable Cations (QC Lot: 3391843)									
EP2012945-001	0960_SS190_201120	ED008: Exchangeable Sodium Percent	----	0.1	%	2.4	2.8	18.2	0% - 20%
		ED008: Exchangeable Calcium	----	0.1	meq/100g	41.8	38.0	9.46	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	19.6	16.9	14.8	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	2.5	2.4	0.00	0% - 20%
		ED008: Exchangeable Sodium	----	0.1	meq/100g	1.6	1.7	7.92	0% - 50%
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	65.4	59.0	10.3	0% - 20%
EP2012955-005	Anonymous	ED008: Exchangeable Sodium Percent	----	0.1	%	0.6	0.6	0.00	No Limit
		ED008: Exchangeable Calcium	----	0.1	meq/100g	19.7	19.6	0.00	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	2.6	2.6	0.00	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	0.5	0.5	0.00	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	0.1	0.1	0.00	No Limit
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	22.9	22.8	0.00	0% - 20%
EP004: Organic Matter (QC Lot: 3391848)									
EP2012945-001	0960_SS190_201120	EP004: Organic Matter	----	0.5	%	4.7	4.6	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3395357)									
EP2012945-001	0960_SS190_201120	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3395357) - continued									
EP2012945-001	0960_SS190_201120	EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	0.0009	0.0008	19.1	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0284	0.0249	12.8	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	0.0010	0.0010	0.00	No Limit
EP2013163-003	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3395357)							
EP2012945-001	0960_SS190_201120	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP2013163-003	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3395357)									
EP2012945-001	0960_SS190_201120	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3395357) - continued									
EP2012945-001	0960_SS190_201120	EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP2013163-003	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3395357)							
EP2012945-001	0960_SS190_201120	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP2013163-003	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
	Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
Result				
----	4 pH Unit	100	70.0	130
----	7 pH Unit	100	70.0	130
<1	1412 µS/cm	100	93.6	106
<0.1	22.1 meq/100g	94.1	78.7	111
<0.1	1.56 meq/100g	97.5	77.6	111
<0.1	0.91 meq/100g	111	86.9	116
<0.1	0.38 meq/100g	126	72.3	129
<0.1	----	----	----	----
<0.1	24.95 meq/100g	95.4	79.9	110
<0.5	2.3 %	118	70.0	120
<0.5	85 %	92.1	70.0	120
<0.0002	0.00125 mg/kg	78.0	72.0	128
<0.0002	0.00125 mg/kg	83.2	73.0	123
<0.0002	0.00125 mg/kg	78.0	67.0	130
<0.0002	0.00125 mg/kg	82.4	70.0	132
<0.0002	0.00125 mg/kg	81.6	68.0	136
<0.0002	0.00125 mg/kg	80.0	59.0	134
<0.001	0.00625 mg/kg	83.1	71.0	135
<0.0002	0.00125 mg/kg	81.2	69.0	132
<0.0002	0.00125 mg/kg	100	70.0	132
<0.0002	0.00125 mg/kg	90.8	71.0	131
<0.0002	0.00125 mg/kg	83.2	69.0	133
<0.0002	0.00125 mg/kg	82.8	72.0	129
<0.0002	0.00125 mg/kg	81.2	69.0	133
<0.0002	0.00125 mg/kg	83.6	64.0	136
<0.0002	0.00125 mg/kg	85.2	69.0	135
<0.0002	0.00125 mg/kg	106	66.0	139
<0.0005	0.00312 mg/kg	124	69.0	133



Sub-Matrix: SOIL				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3395357) - continued								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.0	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	98.7	71.6	129
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	87.2	69.8	131
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	101	68.7	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	105	65.1	134
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	94.4	63.0	144
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	82.8	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3395357)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	79.6	62.0	145
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	89.6	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	84.8	65.0	137
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	103	69.2	143

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: SOIL				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3395357)							
EP2012945-001	0960_SS190_201120	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	82.8	72.0	128
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	97.6	73.0	123
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	80.8	67.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	98.4	70.0	132
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	# Not Determined	68.0	136
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	88.0	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3395357)							
EP2012945-001	0960_SS190_201120	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	84.7	71.0	135
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	75.2	69.0	132
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	113	70.0	132
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	96.8	71.0	131
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	99.6	69.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	82.4	72.0	129



Sub-Matrix: **SOIL**

Sub-Matrix: SOIL				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3395357) - continued							
EP2012945-001	0960_SS190_201120	EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	102	69.0	133
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	116	64.0	136
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	108	69.0	135
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	106	66.0	139
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	98.2	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3395357)							
EP2012945-001	0960_SS190_201120	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	83.2	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	91.5	71.6	129
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	81.6	69.8	131
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	83.3	68.7	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	76.6	65.1	134
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	77.2	63.0	144
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	78.8	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3395357)							
EP2012945-001	0960_SS190_201120	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	86.0	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	95.6	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	105	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	87.2	69.2	143

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2012945	Page	: 1 of 6
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 23-Nov-2020
Site	: DEF19009/Learmonth	Issue Date	: 04-Dec-2020
Sampler	: MAELLE BOURDAIS, Shaun Chambers	No. of samples received	: 8
Order number	: DEF19009/0960	No. of samples analysed	: 8

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- Matrix Spike outliers exist - please see following pages for full details.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- **NO** Quality Control Sample Frequency Outliers exist.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EP231A: Perfluoroalkyl Sulfonic Acids	EP2012945--001	0960_SS190_201120	Perfluorooctane sulfonic acid (PFOS)	1763-23-1	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

Method	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA002: pH 1:5 (Soils)						
Soil Glass Jar - Unpreserved						
0960_SS190_201120, 0960_SS193_201120, 0960_SD301_201120, 0960_SD304_201120,	0960_SS192_201120, 0960_SD300_201120, 0960_SD303_201120, 0960_SD305_201120	30-Nov-2020	27-Nov-2020	3	----	----
EA010: Conductivity (1:5)						
Soil Glass Jar - Unpreserved						
0960_SS190_201120, 0960_SS193_201120, 0960_SD301_201120, 0960_SD304_201120,	0960_SS192_201120, 0960_SD300_201120, 0960_SD303_201120, 0960_SD305_201120	30-Nov-2020	27-Nov-2020	3	----	----

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA002: pH 1:5 (Soils)								
Soil Glass Jar - Unpreserved (EA002)								
0960_SS190_201120,	0960_SS192_201120,	20-Nov-2020	30-Nov-2020	27-Nov-2020	✖	30-Nov-2020	30-Nov-2020	✔
0960_SS193_201120,	0960_SD300_201120,							
0960_SD301_201120,	0960_SD303_201120,							
0960_SD304_201120,	0960_SD305_201120							



Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA010: Conductivity (1:5)								
Soil Glass Jar - Unpreserved (EA010)		20-Nov-2020	30-Nov-2020	27-Nov-2020	✖	30-Nov-2020	28-Dec-2020	✓
0960_SS190_201120,	0960_SS192_201120,							
0960_SS193_201120,	0960_SD300_201120,							
0960_SD301_201120,	0960_SD303_201120,							
0960_SD304_201120,	0960_SD305_201120							
EA055: Moisture Content (Dried @ 105-110°C)								
Soil Glass Jar - Unpreserved (EA055)		20-Nov-2020	----	----	----	30-Nov-2020	04-Dec-2020	✓
0960_SS190_201120,	0960_SS192_201120,							
0960_SS193_201120,	0960_SD300_201120,							
0960_SD301_201120,	0960_SD303_201120,							
0960_SD304_201120,	0960_SD305_201120							
ED008: Exchangeable Cations								
Soil Glass Jar - Unpreserved (ED008)		20-Nov-2020	03-Dec-2020	18-Dec-2020	✓	03-Dec-2020	18-Dec-2020	✓
0960_SS190_201120,	0960_SS192_201120,							
0960_SS193_201120,	0960_SD300_201120,							
0960_SD301_201120,	0960_SD303_201120,							
0960_SD304_201120,	0960_SD305_201120							
EP004: Organic Matter								
Soil Glass Jar - Unpreserved (EP004)		20-Nov-2020	02-Dec-2020	18-Dec-2020	✓	02-Dec-2020	18-Dec-2020	✓
0960_SS190_201120,	0960_SS192_201120,							
0960_SS193_201120,	0960_SD300_201120,							
0960_SD301_201120,	0960_SD303_201120,							
0960_SD304_201120,	0960_SD305_201120							
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE Soil Jar (EP231X)		20-Nov-2020	02-Dec-2020	19-May-2021	✓	02-Dec-2020	11-Jan-2021	✓
0960_SS190_201120,	0960_SS192_201120,							
0960_SS193_201120,	0960_SD300_201120,							
0960_SD301_201120,	0960_SD303_201120,							
0960_SD304_201120,	0960_SD305_201120							
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE Soil Jar (EP231X)		20-Nov-2020	02-Dec-2020	19-May-2021	✓	02-Dec-2020	11-Jan-2021	✓
0960_SS190_201120,	0960_SS192_201120,							
0960_SS193_201120,	0960_SD300_201120,							
0960_SD301_201120,	0960_SD303_201120,							
0960_SD304_201120,	0960_SD305_201120							
EP231C: Perfluoroalkyl Sulfonamides								
HDPE Soil Jar (EP231X)		20-Nov-2020	02-Dec-2020	19-May-2021	✓	02-Dec-2020	11-Jan-2021	✓
0960_SS190_201120,	0960_SS192_201120,							
0960_SS193_201120,	0960_SD300_201120,							
0960_SD301_201120,	0960_SD303_201120,							
0960_SD304_201120,	0960_SD305_201120							



Matrix: SOIL

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE Soil Jar (EP231X) 0960_SS190_201120, 0960_SS193_201120, 0960_SD301_201120, 0960_SD304_201120,	0960_SS192_201120, 0960_SD300_201120, 0960_SD303_201120, 0960_SD305_201120	20-Nov-2020	02-Dec-2020	19-May-2021	✔	02-Dec-2020	11-Jan-2021	✔
EP231P: PFAS Sums								
HDPE Soil Jar (EP231X) 0960_SS190_201120, 0960_SS193_201120, 0960_SD301_201120, 0960_SD304_201120,	0960_SS192_201120, 0960_SD300_201120, 0960_SD303_201120, 0960_SD305_201120	20-Nov-2020	02-Dec-2020	19-May-2021	✔	02-Dec-2020	11-Jan-2021	✔



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Electrical Conductivity (1:5)	EA010	2	19	10.53	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	2	15	13.33	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	1	8	12.50	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	8	12.50	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	18	11.11	10.00	✔	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	19	10.53	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Electrical Conductivity (1:5)	EA010	1	19	5.26	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	15	6.67	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	8	25.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	5.56	5.00	✔	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	19	10.53	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Electrical Conductivity (1:5)	EA010	1	19	5.26	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	15	6.67	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	8	12.50	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	5.56	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	5.56	5.00	✔	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	In house: Referenced to Rayment and Lyons 4A1 and APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Electrical Conductivity (1:5)	EA010	SOIL	In house: Referenced to Rayment and Lyons 3A1 and APHA 2510. Conductivity is determined on soil samples using a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Exchangeable Cations with pre-treatment	ED008	SOIL	In house: Referenced to Rayment & Lyons Method 15A2. Soluble salts are removed from the sample prior to analysis. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM Schedule B(3).
Organic Matter	EP004	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3)
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	SOIL	In-house: Analysis of soils by solvent extraction followed by LC-Electrospray-MS-MS, Negative Mode using MRM using internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Exchangeable Cations Preparation Method	ED007PR	SOIL	In house: Referenced to Rayment & Lyons method 15A1. A 1M NH4Cl extraction by end over end tumbling at a ratio of 1:20. There is no pretreatment for soluble salts. Extracts can be run by ICP for cations.
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
Organic Matter	EP004-PR	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3).
Sample Extraction for PFAS in solid matrices	ORG73	SOIL	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

**CHAIN OF CUSTODY**

ALS COC#: 16249

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: SC-DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

Handwritten signature and date/time: 28/11 11am

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS: 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

SAMPLE DETAILS**ANALYSIS REQUIRED**

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0960_OTH132		20/11/2020 09:52 AM	Water	ALS: 4 Non ALS: 0	No	X		
002	0960_OTH134		20/11/2020 10:26 AM	Water	ALS: 4 Non ALS: 0	No	X		
003	0960_MW175		20/11/2020 10:53 AM	Water	ALS: 6 Non ALS: 0	No	X		
004	0960_OTH129		20/11/2020 11:20 AM	Water	ALS: 4 Non ALS: 0	No	X		
005	0960_OTH103		20/11/2020 11:39 AM	Water	ALS: 4 Non ALS: 0	No	X		
006	0960_MW177		20/11/2020 11:58 AM	Water	ALS: 4 Non ALS: 0	No	X		
007	0960_MW176		20/11/2020 01:26 PM	Water	ALS: 4 Non ALS: 0	No	X		

Environmental Division
Perth

Work Order Reference

EP2012946



Telephone : + 61-8-9406 1301

**CHAIN OF CUSTODY**

COC#: 16249

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: SC-DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:

DATE TIME:

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DATE TIME:

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RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

°C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0960_OTH132	Clear Plastic Bottle - Natural	250 mL	00071119011652	Green	No	
001	0960_OTH132	HDPE (no PTFE)	20 mL	00350019008212	Grey	No	
001	0960_OTH132	HDPE (no PTFE)	20 mL	00350019030725	Grey	No	
001	0960_OTH132	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181018076525	Purple	No	
002	0960_OTH134	Clear Plastic Bottle - Natural	250 mL	00071119011727	Green	No	
002	0960_OTH134	Amber TOC Vial - Sulfuric Acid	40 mL	00181018076550	Purple	No	
002	0960_OTH134	HDPE (no PTFE)	20 mL	00350019008207	Grey	No	
002	0960_OTH134	HDPE (no PTFE)	20 mL	00350019030686	Grey	No	
003	0960_MW175	Amber TOC Vial - Sulfuric Acid	40 mL	00181019064758	Purple	No	
003	0960_MW175	Clear Plastic Bottle - Natural	250 mL	00071119011696	Green	No	
003	0960_MW175	HDPE (no PTFE)	20 mL	00352005020511	Grey	No	
003	0960_MW175	HDPE (no PTFE)	20 mL	00350019008261	Grey	No	
003	0960_MW175	HDPE (no PTFE)	20 mL	00352005020380	Grey	No	
003	0960_MW175	HDPE (no PTFE)	20 mL	00350019008187	Grey	No	
004	0960_OTH129	Clear Plastic Bottle - Natural	250 mL	00071119011702	Green	No	
004	0960_OTH129	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019065076	Purple	No	
004	0960_OTH129	HDPE (no PTFE)	20 mL	00350019030694	Grey	No	
004	0960_OTH129	HDPE (no PTFE)	20 mL	00350019030729	Grey	No	
005	0960_OTH103	Clear Plastic Bottle - Natural	250 mL	00071119011682	Green	No	
005	0960_OTH103	HDPE (no PTFE)	20 mL	00352005006616	Grey	No	
005	0960_OTH103	HDPE (no PTFE)	20 mL	00352005006759	Grey	No	
005	0960_OTH103	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181018076506	Purple	No	
006	0960_MW177	Clear Plastic Bottle - Natural	250 mL	00070719042927	Green	No	
006	0960_MW177	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023746	Purple	No	
006	0960_MW177	HDPE (no PTFE)	20 mL	00350019106807	Grey	No	
006	0960_MW177	HDPE (no PTFE)	20 mL	00350019106877	Grey	No	

**CHAIN OF CUSTODY**

COC#: 16249 ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFASOMP

SITE: SC-DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

007	0960_MW176	Amber TOC Vial - Sulfuric Acid	40 mL	00181019023686	Purple	No	
007	0960_MW176	Clear Plastic Bottle - Natural	250 mL	00070719042891	Green	No	
007	0960_MW176	HDPE (no PTFE)	20 mL	00350019106758	Grey	No	
007	0960_MW176	HDPE (no PTFE)	20 mL	00350019106883	Grey	No	

Total Bottle Count: ALS: 30, Non ALS: 0

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : EP2012946

<p>Client : CARDNO (WA) PTY LTD</p> <p>Contact : MAELLE BOURDAIS</p> <p>Address : 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006</p> <p>E-mail : maelle.bourdais@cardno.com.au</p> <p>Telephone : ----</p> <p>Facsimile : ----</p> <p>Project : WA_0960_PFASOMP</p> <p>Order number : DEF19009/0960</p> <p>C-O-C number : 16249</p> <p>Site : DEF19009/Learmonth</p> <p>Sampler : MAELLE BOURDAIS, Shaun Chambers</p>	<p>Laboratory : Environmental Division Perth</p> <p>Contact : Nick Courts</p> <p>Address : 26 Rigali Way Wangara WA Australia 6065</p> <p>E-mail : nick.courts@alsglobal.com</p> <p>Telephone : +61-8-9406 1301</p> <p>Facsimile : +61-8-9406 1399</p> <p>Page : 1 of 3</p> <p>Quote number : ES2019CARBSD0002 (SY/139/19)</p> <p>QC Level : NEPM 2013 B3 & ALS QC Standard</p>
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Dates

Date Samples Received : 25-Nov-2020 11:00	Issue Date : 25-Nov-2020
Client Requested Due : 04-Dec-2020	Scheduled Reporting Date : 04-Dec-2020
Date	

Delivery Details

Mode of Delivery : Carrier	Security Seal : Intact.
No. of coolers/boxes : 4	Temperature : 23.2 - Ice present
Receipt Detail :	No. of samples received / analysed : 7 / 7

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepancies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.



Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2012946-001	20-Nov-2020 09:52	0960_OTH132_201120	✓	✓	✓	✓	✓	✓	✓
EP2012946-002	20-Nov-2020 10:26	0960_OTH134_201120	✓	✓	✓	✓	✓	✓	✓
EP2012946-003	20-Nov-2020 10:53	0960_MW175_201120	✓	✓	✓	✓	✓	✓	✓
EP2012946-004	20-Nov-2020 11:20	0960_OTH129_201120	✓	✓	✓	✓	✓	✓	✓
EP2012946-005	20-Nov-2020 11:39	0960_OTH103_201120	✓	✓	✓	✓	✓	✓	✓
EP2012946-006	20-Nov-2020 11:58	0960_MW177_201120	✓	✓	✓	✓	✓	✓	✓
EP2012946-007	20-Nov-2020 13:26	0960_MW176_201120	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP005 Total Organic Carbon (TOC)	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2012946-001	20-Nov-2020 09:52	0960_OTH132_201120	✓	✓
EP2012946-002	20-Nov-2020 10:26	0960_OTH134_201120	✓	✓
EP2012946-003	20-Nov-2020 10:53	0960_MW175_201120	✓	✓
EP2012946-004	20-Nov-2020 11:20	0960_OTH129_201120	✓	✓
EP2012946-005	20-Nov-2020 11:39	0960_OTH103_201120	✓	✓
EP2012946-006	20-Nov-2020 11:58	0960_MW177_201120	✓	✓
EP2012946-007	20-Nov-2020 13:26	0960_MW176_201120	✓	✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **WATER**

Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method		Due for extraction	Due for analysis	Samples Received		Instructions Received	
				Date	Evaluation	Date	Evaluation
Client Sample ID(s)	Container						
EA005-P: pH by PC Titrator							
0960_MW175_201120	Clear Plastic Bottle - Natural	----	20-Nov-2020	25-Nov-2020	✗	----	----
0960_MW176_201120	Clear Plastic Bottle - Natural	----	20-Nov-2020	25-Nov-2020	✗	----	----
0960_MW177_201120	Clear Plastic Bottle - Natural	----	20-Nov-2020	25-Nov-2020	✗	----	----

CERTIFICATE OF ANALYSIS

Work Order : **EP2012946**
Client : **CARDNO (WA) PTY LTD**
Contact : **MAELLE BOURDAIS**
Address : **11 HARVEST TERRACE PO BOX 155**
WEST PERTH WA, AUSTRALIA 6006
Telephone : **----**
Project : **WA_0960_PFASOMP**
Order number : **DEF19009/0960**
C-O-C number : **16249**
Sampler : **MAELLE BOURDAIS, Shaun Chambers**
Site : **DEF19009/Learmonth**
Quote number : **SY/139/19**
No. of samples received : **7**
No. of samples analysed : **7**

Page : 1 of 9
Laboratory : Environmental Division Perth
Contact : Nick Courts
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 25-Nov-2020 11:00
Date Analysis Commenced : 26-Nov-2020
Issue Date : 04-Dec-2020 22:30



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Daniel Fisher	Inorganics Analyst	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

Ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- TDS by method EA-015 may bias high for sample #2 due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_OTH132_20112 0	0960_OTH134_20112 0	0960_MW175_201120	0960_OTH129_20112 0	0960_OTH103_20112 0
Sampling date / time				20-Nov-2020 09:52	20-Nov-2020 10:26	20-Nov-2020 10:53	20-Nov-2020 11:20	20-Nov-2020 11:39
Compound	CAS Number	LOR	Unit	EP2012946-001	EP2012946-002	EP2012946-003	EP2012946-004	EP2012946-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.70	7.62	7.88	7.61	7.69
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	41200	42200	1970	43700	40600
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	370	14300	8760	3490	4810
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	142	202	367	160	131
Total Alkalinity as CaCO3	----	1	mg/L	142	202	367	160	131
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2890	2970	114	3060	2890
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	24000	24300	881	24900	23000
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	515	539	58	516	487
Magnesium	7439-95-4	1	mg/L	1670	1680	147	1660	1590
Sodium	7440-23-5	1	mg/L	12600	12700	406	12500	12000
Potassium	7440-09-7	1	mg/L	588	594	39	586	560
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	740	751	34.6	769	712
∅ Total Cations	----	0.01	meq/L	726	733	33.6	721	691
∅ Ionic Balance	----	0.01	%	0.94	1.25	1.33	3.24	1.44
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	2	----	----	2	1
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	----	6	5	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_OTH132_20112 0	0960_OTH134_20112 0	0960_MW175_201120	0960_OTH129_20112 0	0960_OTH103_20112 0
Sampling date / time				20-Nov-2020 09:52	20-Nov-2020 10:26	20-Nov-2020 10:53	20-Nov-2020 11:20	20-Nov-2020 11:39
Compound	CAS Number	LOR	Unit	EP2012946-001	EP2012946-002	EP2012946-003	EP2012946-004	EP2012946-005
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.02	<0.02	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.04	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_OTH132_20112 0	0960_OTH134_20112 0	0960_MW175_201120	0960_OTH129_20112 0	0960_OTH103_20112 0
Sampling date / time				20-Nov-2020 09:52	20-Nov-2020 10:26	20-Nov-2020 10:53	20-Nov-2020 11:20	20-Nov-2020 11:39
Compound	CAS Number	LOR	Unit	EP2012946-001	EP2012946-002	EP2012946-003	EP2012946-004	EP2012946-005
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.06	<0.01	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	0.06	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	<0.01	0.06	<0.01	<0.01
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	117	118	118	117	118
13C8-PFOA	----	0.02	%	115	116	111	114	111



Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0960_MW177_201120	0960_MW176_201120	----	----	----
Sampling date / time					20-Nov-2020 11:58	20-Nov-2020 13:26	----	----	----
Compound	CAS Number	LOR	Unit		EP2012946-006	EP2012946-007	-----	-----	-----
				Result	Result		----	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.50	7.63	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		59000	30500	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		4660	30000	----	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L		<1	<1	----	----	----
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L		<1	<1	----	----	----
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L		204	224	----	----	----
Total Alkalinity as CaCO ₃	----	1	mg/L		204	224	----	----	----
ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA									
Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L		4010	2630	----	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		34200	16400	----	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		890	519	----	----	----
Magnesium	7439-95-4	1	mg/L		2460	1200	----	----	----
Sodium	7440-23-5	1	mg/L		19500	9170	----	----	----
Potassium	7440-09-7	1	mg/L		1140	605	----	----	----
EN055: Ionic Balance									
∅ Total Anions	----	0.01	meq/L		1050	522	----	----	----
∅ Total Cations	----	0.01	meq/L		1120	539	----	----	----
∅ Ionic Balance	----	0.01	%		3.30	1.62	----	----	----
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		3	----	----	----	----
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		----	5	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.02	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		<0.02	<0.02	----	----	----



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW177_201120	0960_MW176_201120	----	----	----
Sampling date / time				20-Nov-2020 11:58	20-Nov-2020 13:26	----	----	----
Compound	CAS Number	LOR	Unit	EP2012946-006	EP2012946-007	-----	-----	-----
				Result	Result	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	----	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	----	----	----



Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0960_MW177_201120	0960_MW176_201120	----	----	----
Sampling date / time					20-Nov-2020 11:58	20-Nov-2020 13:26	----	----	----
Compound	CAS Number	LOR	Unit		EP2012946-006	EP2012946-007	-----	-----	-----
					Result	Result	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	----	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	<0.01	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	<0.01	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	<0.01	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		109	113	----	----	----
13C8-PFOA	----	0.02	%		113	115	----	----	----



Surrogate Control Limits

Sub-Matrix: GROUNDWATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

QUALITY CONTROL REPORT

Work Order	: EP2012946	Page	: 1 of 10
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 25-Nov-2020
Order number	: DEF19009/0960	Date Analysis Commenced	: 26-Nov-2020
C-O-C number	: 16249	Issue Date	: 04-Dec-2020
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: DEF19009/Learmonth		
Quote number	: SY/139/19		
No. of samples received	: 7		
No. of samples analysed	: 7		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Daniel Fisher	Inorganics Analyst	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
= Indicates failed QC

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: WATER					Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA005P: pH by PC Titrator (QC Lot: 3396936)									
EP2012942-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.96	7.95	0.126	0% - 20%
EP2012943-007	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.46	7.48	0.228	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3387883)									
EP2012942-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	50700	50500	0.257	0% - 20%
EP2012943-005	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	67700	68600	1.44	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3387884)									
EP2012942-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	848	858	1.17	0% - 20%
EP2012943-007	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	5200	5190	0.192	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3396935)									
EP2012942-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	154	150	2.30	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	154	150	2.30	0% - 20%
EP2012943-007	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	118	130	9.59	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	118	130	9.59	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3384263)									
EP2012946-001	0960_OTH132_201120	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2890	2880	0.281	0% - 20%
EP2012957-002	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2480	2410	2.68	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3384264)									
EP2012946-001	0960_OTH132_201120	ED045G: Chloride	16887-00-6	1	mg/L	24000	23900	0.790	0% - 20%
EP2012957-002	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	26500	25200	4.74	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3385614)									



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
ED093F: Dissolved Major Cations (QC Lot: 3385614) - continued									
EP2012942-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	604	602	0.322	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	1990	1930	2.95	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	15000	14500	2.96	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	704	684	2.98	0% - 20%
EP2012943-005	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	1230	1200	2.83	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	2800	2720	3.04	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	22600	22000	2.78	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	1060	1030	2.54	0% - 20%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3399729)									
EP2012942-001	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	3	3	0.00	No Limit
EP2012946-001	0960_OTH132_201120	EP002: Dissolved Organic Carbon	----	1	mg/L	2	2	0.00	No Limit
EP005: Total Organic Carbon (TOC) (QC Lot: 3400473)									
EP2012943-001	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	4	4	0.00	No Limit
EP2013162-002	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	2	1	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3388768)									
EP2012942-001	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP2012946-003	0960_MW175_201120	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.04	0.04	0.00	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.02	0.03	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3388768)									
EP2012942-001	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTeDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3388768) - continued									
EP2012946-003	0960_MW175_201120	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit		
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3388768)									
EP2012942-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP2012946-003	0960_MW175_201120	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3388768)									
EP2012942-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit

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 Work Order : EP2012946
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3388768) - continued									
EP2012942-001	Anonymous	EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP2012946-003	0960_MW175_201120	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231P: PFAS Sums (QC Lot: 3388768)									
EP2012942-001	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.00	No Limit
EP2012946-003	0960_MW175_201120	EP231X: Sum of PFAS	----	0.01	µg/L	0.06	0.07	15.4	No Limit



Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result		LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 3396936)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3387883)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	99.8	88.1	114
				<10	1000 mg/L	102	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3387884)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	114	89.1	120
				<5	1000 mg/L	103	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3396935)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	106	81.2	126
				<1	200 mg/L	96.8	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3384263)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	102	87.7	113
				<1	500 mg/L	103	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3384264)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	105	87.9	114
				<1	1000 mg/L	104	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3385614)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	100	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	104	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	98.7	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	97.9	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3399729)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	99.7	73.2	116
				<1	100 mg/L	95.4	73.2	116
EP005: Total Organic Carbon (TOC) (QCLot: 3400473)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	100	87.2	116
				<1	100 mg/L	96.7	87.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3388768)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	95.8	72.0	130



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3388768) - continued								
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	120	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	104	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	118	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	112	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	121	53.0	142
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3388769)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	101	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	95.6	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	90.0	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	92.6	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	111	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	124	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3388768)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	78.5	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	86.6	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	113	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	125	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	118	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	120	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	127	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	129	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	126	72.0	134
EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	117	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	124	71.0	132
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3388769)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	94.3	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	119	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	81.6	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	98.2	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	116	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	120	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	118	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	118	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	107	72.0	134
EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	97.6	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	74.8	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3388768)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	128	67.0	137



Sub-Matrix: **WATER**

Method: Compound				Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
						LCS	Low	High
CAS Number	LOR	Unit						
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3388768) - continued								
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	122	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	128	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	114	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	128	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	123	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	124	61.0	135
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3388769)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	67.4	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	76.0	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	77.4	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	82.3	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	86.6	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	101	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	102	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3388768)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	109	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	120	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	108	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	96.8	71.4	144
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3388769)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	107	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	83.6	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	72.8	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	74.4	71.4	144

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Matrix Spike (MS) Report		
Spike	Spike Recovery(%)	Recovery Limits (%)



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3384263)							
EP2012946-001	0960_OTH132_201120	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3384264)							
EP2012946-001	0960_OTH132_201120	ED045G: Chloride	16887-00-6	1000 mg/L	# Not Determined	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3399729)							
EP2012942-002	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	96.3	70.0	130
EP005: Total Organic Carbon (TOC) (QCLot: 3400473)							
EP2012943-004	Anonymous	EP005: Total Organic Carbon	----	100 mg/L	93.9	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3388768)							
EP2012942-002	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	94.0	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	119	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	93.6	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	105	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	99.8	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	103	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3388768)							
EP2012942-002	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	77.0	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	77.4	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	102	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	115	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	107	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	112	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	116	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	121	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	115	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	111	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	132	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3388768)							
EP2012942-002	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	116	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	116	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	129	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	110	66.0	145
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	104	57.6	145

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 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3388768) - continued							
EP2012942-002	Anonymous	EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	111	65.0	136
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	115	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3388768)							
EP2012942-002	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	96.2	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	113	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	94.0	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	82.2	71.4	144

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2012946	Page	: 1 of 8
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 25-Nov-2020
Site	: DEF19009/Learmonth	Issue Date	: 04-Dec-2020
Sampler	: MAELLE BOURDAIS, Shaun Chambers	No. of samples received	: 7
Order number	: DEF19009/0960	No. of samples analysed	: 7

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- Matrix Spike outliers exist - please see following pages for full details.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- Quality Control Sample Frequency Outliers exist - please see following pages for full details.



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO ₄ 2- by DA	EP2012946--001	0960_OTH132_201120	Sulfate as SO ₄ - Turbidimetric	14808-79-8	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
ED045G: Chloride by Discrete Analyser	EP2012946--001	0960_OTH132_201120	Chloride	16887-00-6	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method		Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural							
0960_OTH132_201120,	0960_OTH134_201120,	----	----	----	02-Dec-2020	20-Nov-2020	12
0960_MW175_201120,	0960_OTH129_201120,						
0960_OTH103_201120,	0960_MW177_201120,						
0960_MW176_201120							

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	2	38	5.26	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	1	38	2.63	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation

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 Work Order : EP2012946
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator								
Clear Plastic Bottle - Natural (EA005-P)								
0960_OTH132_201120,	0960_OTH134_201120,	20-Nov-2020	----	----	----	02-Dec-2020	20-Nov-2020	✖
0960_MW175_201120,	0960_OTH129_201120,							
0960_OTH103_201120,	0960_MW177_201120,							
0960_MW176_201120								
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Clear Plastic Bottle - Natural (EA015H)								
0960_OTH132_201120,	0960_OTH134_201120,	20-Nov-2020	----	----	----	27-Nov-2020	27-Nov-2020	✔
0960_MW175_201120,	0960_OTH129_201120,							
0960_OTH103_201120,	0960_MW177_201120,							
0960_MW176_201120								
EA025: Total Suspended Solids dried at 104 ± 2°C								
Clear Plastic Bottle - Natural (EA025H)								
0960_OTH132_201120,	0960_OTH134_201120,	20-Nov-2020	----	----	----	27-Nov-2020	27-Nov-2020	✔
0960_MW175_201120,	0960_OTH129_201120,							
0960_OTH103_201120,	0960_MW177_201120,							
0960_MW176_201120								
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P)								
0960_OTH132_201120,	0960_OTH134_201120,	20-Nov-2020	----	----	----	02-Dec-2020	04-Dec-2020	✔
0960_MW175_201120,	0960_OTH129_201120,							
0960_OTH103_201120,	0960_MW177_201120,							
0960_MW176_201120								
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G)								
0960_OTH132_201120,	0960_OTH134_201120,	20-Nov-2020	----	----	----	03-Dec-2020	18-Dec-2020	✔
0960_MW175_201120,	0960_OTH129_201120,							
0960_OTH103_201120,	0960_MW177_201120,							
0960_MW176_201120								
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G)								
0960_OTH132_201120,	0960_OTH134_201120,	20-Nov-2020	----	----	----	03-Dec-2020	18-Dec-2020	✔
0960_MW175_201120,	0960_OTH129_201120,							
0960_OTH103_201120,	0960_MW177_201120,							
0960_MW176_201120								
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F)								
0960_OTH132_201120,	0960_OTH134_201120,	20-Nov-2020	----	----	----	26-Nov-2020	27-Nov-2020	✔
0960_MW175_201120,	0960_OTH129_201120,							
0960_OTH103_201120,	0960_MW177_201120,							
0960_MW176_201120								



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002)								
0960_OTH132_201120, 0960_OTH103_201120,	0960_OTH129_201120, 0960_MW177_201120	20-Nov-2020	----	----	----	03-Dec-2020	18-Dec-2020	✓
EP005: Total Organic Carbon (TOC)								
Amber TOC Vial - Sulfuric Acid (EP005)								
0960_OTH134_201120, 0960_MW176_201120	0960_MW175_201120,	20-Nov-2020	----	----	----	03-Dec-2020	18-Dec-2020	✓
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X)								
0960_OTH132_201120, 0960_MW175_201120, 0960_OTH103_201120, 0960_MW176_201120	0960_OTH134_201120, 0960_OTH129_201120, 0960_MW177_201120,	20-Nov-2020	30-Nov-2020	19-May-2021	✓	30-Nov-2020	19-May-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X)								
0960_OTH132_201120, 0960_MW175_201120, 0960_OTH103_201120, 0960_MW176_201120	0960_OTH134_201120, 0960_OTH129_201120, 0960_MW177_201120,	20-Nov-2020	30-Nov-2020	19-May-2021	✓	30-Nov-2020	19-May-2021	✓
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X)								
0960_OTH132_201120, 0960_MW175_201120, 0960_OTH103_201120, 0960_MW176_201120	0960_OTH134_201120, 0960_OTH129_201120, 0960_MW177_201120,	20-Nov-2020	30-Nov-2020	19-May-2021	✓	30-Nov-2020	19-May-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X)								
0960_OTH132_201120, 0960_MW175_201120, 0960_OTH103_201120, 0960_MW176_201120	0960_OTH134_201120, 0960_OTH129_201120, 0960_MW177_201120,	20-Nov-2020	30-Nov-2020	19-May-2021	✓	30-Nov-2020	19-May-2021	✓
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X)								
0960_OTH132_201120, 0960_MW175_201120, 0960_OTH103_201120, 0960_MW176_201120	0960_OTH134_201120, 0960_OTH129_201120, 0960_MW177_201120,	20-Nov-2020	30-Nov-2020	19-May-2021	✓	30-Nov-2020	19-May-2021	✓



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	38	5.26	10.00	✗	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	19	10.53	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	38	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	19	10.53	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	38	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	19	5.26	5.26	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	38	2.63	5.00	✗	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Matrix Spikes (MS) - Continued							
Total Organic Carbon	EP005	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of 'filterable' residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high temperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.
Total Organic Carbon	EP005	WATER	In house: Referenced to APHA 5310 B, The automated TOC analyzer determines Total and Inorganic Carbon by IR cell. TOC is calculated as the difference. This method is compliant with NEPM Schedule B(3)



Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.



CHAIN OF CUSTODY

COC#: 16270

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: SC-DEF19009/Learmonth SW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

AN
28/11 11am

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Rinsate WATER	Surface Waters Primary WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0960_SW300		20/11/2020 01:48 PM	Water	ALS: 4 Non ALS: 0	No		X		
002	0960_SW301		20/11/2020 02:20 PM	Water	ALS: 4 Non ALS: 0	No		X		
003	0960_SW303		20/11/2020 02:37 PM	Water	ALS: 4 Non ALS: 0	No		X		
004	0960_SW304		20/11/2020 02:57 PM	Water	ALS: 4 Non ALS: 0	No		X		
005	0960_SW305		20/11/2020 03:14 PM	Water	ALS: 4 Non ALS: 0	No		X		
006	0960_QC402		20/11/2020 03:59 PM	Water	ALS: 2 Non ALS: 0	No	X			

Environmental Division
Perth

Work Order Reference

EP2012947



Telephone : + 61-8-9406 1301

**CHAIN OF CUSTODY**

COC#: 16270

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFASOMP

SITE: SC-DEF19009/Learmonth SW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:

SAMPLER MOBILE:

QUOTE NO: SY/139/19

/ ES2019CARBSD0002

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

°C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0960_SW300	Clear Plastic Bottle - Natural	250 mL	00070719042989	Green	No	
001	0960_SW300	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023406	Purple	No	
001	0960_SW300	HDPE (no PTFE)	20 mL	00350019106729	Grey	No	
001	0960_SW300	HDPE (no PTFE)	20 mL	00350019106856	Grey	No	
002	0960_SW301	Clear Plastic Bottle - Natural	250 mL	00070719042924	Green	No	
002	0960_SW301	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023754	Purple	No	
002	0960_SW301	HDPE (no PTFE)	20 mL	00350019106906	Grey	No	
002	0960_SW301	HDPE (no PTFE)	20 mL	00350019106755	Grey	No	
003	0960_SW303	Clear Plastic Bottle - Natural	250 mL	00070719042250	Green	No	
003	0960_SW303	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023722	Purple	No	
003	0960_SW303	HDPE (no PTFE)	20 mL	00350019106797	Grey	No	
003	0960_SW303	HDPE (no PTFE)	20 mL	00350019106714	Grey	No	
004	0960_SW304	Clear Plastic Bottle - Natural	250 mL	00070719042059	Green	No	
004	0960_SW304	HDPE (no PTFE)	20 mL	00350019106778	Grey	No	
004	0960_SW304	HDPE (no PTFE)	20 mL	00350019106844	Grey	No	
004	0960_SW304	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023609	Purple	No	
005	0960_SW305	Clear Plastic Bottle - Natural	250 mL	00070719043010	Green	No	
005	0960_SW305	HDPE (no PTFE)	20 mL	00350019106682	Grey	No	
005	0960_SW305	HDPE (no PTFE)	20 mL	00350019106808	Grey	No	
005	0960_SW305	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023287	Purple	No	
006	0960_QC402	HDPE (no PTFE)	20 mL	00350019154274	Grey	No	
006	0960_QC402	HDPE (no PTFE)	20 mL	00350019154352	Grey	No	

Total Bottle Count: ALS: 22, Non ALS: 0

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : EP2012947

<p>Client : CARDNO (WA) PTY LTD</p> <p>Contact : MAELLE BOURDAIS</p> <p>Address : 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006</p> <p>E-mail : maelle.bourdais@cardno.com.au</p> <p>Telephone : ----</p> <p>Facsimile : ----</p> <p>Project : WA_0960_PFASOMP</p> <p>Order number : DEF19009/0960</p> <p>C-O-C number : 16270</p> <p>Site : DEF19009/Learmonth</p> <p>Sampler : MAELLE BOURDAIS, Shaun Chambers</p>	<p>Laboratory : Environmental Division Perth</p> <p>Contact : Nick Courts</p> <p>Address : 26 Rigali Way Wangara WA Australia 6065</p> <p>E-mail : nick.courts@alsglobal.com</p> <p>Telephone : +61-8-9406 1301</p> <p>Facsimile : +61-8-9406 1399</p> <p>Page : 1 of 3</p> <p>Quote number : ES2019CARBSD0002 (SY/139/19)</p> <p>QC Level : NEPM 2013 B3 & ALS QC Standard</p>
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Dates

Date Samples Received : 25-Nov-2020 11:00	Issue Date : 25-Nov-2020
Client Requested Due : 04-Dec-2020	Scheduled Reporting Date : 04-Dec-2020
Date	

Delivery Details

Mode of Delivery : Carrier	Security Seal : Intact.
No. of coolers/boxes : 4	Temperature : 23.2 - Ice present
Receipt Detail :	No. of samples received / analysed : 6 / 6

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepancies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.



Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2012947-001	20-Nov-2020 13:48	0960_SW300_201120	✓	✓	✓	✓	✓	✓	✓
EP2012947-002	20-Nov-2020 14:20	0960_SW301_201120	✓	✓	✓	✓	✓	✓	✓
EP2012947-003	20-Nov-2020 14:37	0960_SW303_201120	✓	✓	✓	✓	✓	✓	✓
EP2012947-004	20-Nov-2020 14:57	0960_SW304_201120	✓	✓	✓	✓	✓	✓	✓
EP2012947-005	20-Nov-2020 15:14	0960_SW305_201120	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2012947-001	20-Nov-2020 13:48	0960_SW300_201120	✓
EP2012947-002	20-Nov-2020 14:20	0960_SW301_201120	✓
EP2012947-003	20-Nov-2020 14:37	0960_SW303_201120	✓
EP2012947-004	20-Nov-2020 14:57	0960_SW304_201120	✓
EP2012947-005	20-Nov-2020 15:14	0960_SW305_201120	✓
EP2012947-006	20-Nov-2020 15:59	0960_QC402_201120	✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **WATER**

Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method	Container	Due for extraction	Due for analysis	Samples Received		Instructions Received	
				Date	Evaluation	Date	Evaluation
Client Sample ID(s)							
EA005-P: pH by PC Titrator							
0960_SW300_201120	Clear Plastic Bottle - Natural	----	20-Nov-2020	25-Nov-2020	✗	----	----
0960_SW301_201120	Clear Plastic Bottle - Natural	----	20-Nov-2020	25-Nov-2020	✗	----	----
0960_SW303_201120	Clear Plastic Bottle - Natural	----	20-Nov-2020	25-Nov-2020	✗	----	----
0960_SW304_201120	Clear Plastic Bottle - Natural	----	20-Nov-2020	25-Nov-2020	✗	----	----
0960_SW305_201120	Clear Plastic Bottle - Natural	----	20-Nov-2020	25-Nov-2020	✗	----	----

[illegible]

CERTIFICATE OF ANALYSIS

Work Order : **EP2012947**
Client : **CARDNO (WA) PTY LTD**
Contact : **MAELLE BOURDAIS**
Address : **11 HARVEST TERRACE PO BOX 155**
WEST PERTH WA, AUSTRALIA 6006
Telephone : **----**
Project : **WA_0960_PFASOMP**
Order number : **DEF19009/0960**
C-O-C number : **16270**
Sampler : **MAELLE BOURDAIS, Shaun Chambers**
Site : **DEF19009/Learmonth**
Quote number : **SY/139/19**
No. of samples received : **6**
No. of samples analysed : **6**

Page : 1 of 8
Laboratory : Environmental Division Perth
Contact : Nick Courts
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 25-Nov-2020 11:00
Date Analysis Commenced : 26-Nov-2020
Issue Date : 04-Dec-2020 17:03



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Daniel Fisher	Inorganics Analyst	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

Ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)				Sample ID	0960_SW300_201120	0960_SW301_201120	0960_SW303_201120	0960_SW304_201120	0960_SW305_201120
Sampling date / time					20-Nov-2020 13:48	20-Nov-2020 14:20	20-Nov-2020 14:37	20-Nov-2020 14:57	20-Nov-2020 15:14
Compound	CAS Number	LOR	Unit		EP2012947-001	EP2012947-002	EP2012947-003	EP2012947-004	EP2012947-005
				Result	Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		8.55	8.03	7.87	8.06	8.17
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		70900	46800	39300	43000	46000
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		11	76	6	27	<5
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		33	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		70	171	172	149	138
Total Alkalinity as CaCO3	----	1	mg/L		103	171	172	149	138
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		5700	3630	3030	3370	3370
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		34100	24100	21000	22400	23500
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		1100	583	493	568	576
Magnesium	7439-95-4	1	mg/L		2890	1850	1600	1810	1910
Sodium	7440-23-5	1	mg/L		21500	13800	12000	13700	14200
Potassium	7440-09-7	1	mg/L		1250	806	568	646	671
EN055: Ionic Balance									
∅ Total Anions	----	0.01	meq/L		1080	759	659	705	736
∅ Total Cations	----	0.01	meq/L		1260	802	693	790	821
∅ Ionic Balance	----	0.01	%		7.57	2.78	2.51	5.67	5.46
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		9	3	2	3	4
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: SURFACE WATER
 (Matrix: WATER)

Sample ID

				0960_SW300_201120	0960_SW301_201120	0960_SW303_201120	0960_SW304_201120	0960_SW305_201120
Sampling date / time				20-Nov-2020 13:48	20-Nov-2020 14:20	20-Nov-2020 14:37	20-Nov-2020 14:57	20-Nov-2020 15:14
Compound	CAS Number	LOR	Unit	EP2012947-001	EP2012947-002	EP2012947-003	EP2012947-004	EP2012947-005
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: SURFACE WATER
 (Matrix: WATER)

Sample ID

				0960_SW300_201120	0960_SW301_201120	0960_SW303_201120	0960_SW304_201120	0960_SW305_201120
Sampling date / time				20-Nov-2020 13:48	20-Nov-2020 14:20	20-Nov-2020 14:37	20-Nov-2020 14:57	20-Nov-2020 15:14
Compound	CAS Number	LOR	Unit	EP2012947-001	EP2012947-002	EP2012947-003	EP2012947-004	EP2012947-005
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	112	113	104	108	105
13C8-PFOA	----	0.02	%	120	110	108	103	104



Analytical Results

Sub-Matrix: SURFACE WATER
 (Matrix: WATER)

Sample ID

0960_QC402_201120

Sampling date / time				20-Nov-2020 15:59	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2012947-006	-----	-----	-----	-----
Result				----	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	----	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	----	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	----	----	----	----



Analytical Results

Sub-Matrix: SURFACE WATER
 (Matrix: WATER)

Sample ID

0960_QC402_201120

Sampling date / time				20-Nov-2020 15:59	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2012947-006	-----	-----	-----	-----
Result				----	----	----	----	----

EP231C: Perfluoroalkyl Sulfonamides - Continued

N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	----	----	----	----

EP231D: (n:2) Fluorotelomer Sulfonic Acids

4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	----	----	----	----

EP231P: PFAS Sums

Sum of PFAS	----	0.01	µg/L	<0.01	----	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	----	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	----	----	----	----

EP231S: PFAS Surrogate

13C4-PFOS	----	0.02	%	103	----	----	----	----
13C8-PFOA	----	0.02	%	100	----	----	----	----



Surrogate Control Limits

Sub-Matrix: **SURFACE WATER**

		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

QUALITY CONTROL REPORT

Work Order	: EP2012947	Page	: 1 of 6
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 25-Nov-2020
Order number	: DEF19009/0960	Date Analysis Commenced	: 26-Nov-2020
C-O-C number	: 16270	Issue Date	: 04-Dec-2020
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: DEF19009/Learmonth		
Quote number	: SY/139/19		
No. of samples received	: 6		
No. of samples analysed	: 6		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Daniel Fisher	Inorganics Analyst	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
= Indicates failed QC

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA005P: pH by PC Titrator (QC Lot: 3396938)									
EP2012947-002	0960_SW301_201120	EA005-P: pH Value	----	0.01	pH Unit	8.03	8.04	0.124	0% - 20%
EP2013106-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.86	7.86	0.00	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3387902)									
EP2012942-005	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	36400	38300	5.00	0% - 20%
EP2012956-002	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	39500	39400	0.253	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3387903)									
EP2012942-005	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	7	9	31.2	No Limit
EP2012957-002	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	3370	3240	3.81	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3396937)									
EP2012947-002	0960_SW301_201120	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	171	173	0.756	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	171	173	0.756	0% - 20%
EP2013106-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	587	585	0.418	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	587	585	0.418	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3384199)									
EP2012897-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2830	2820	0.469	0% - 20%
EP2012947-003	0960_SW303_201120	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	3030	3010	0.714	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3384200)									
EP2012897-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	19100	19500	2.27	0% - 20%
EP2012947-003	0960_SW303_201120	ED045G: Chloride	16887-00-6	1	mg/L	21000	20400	2.78	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3385615)									

Page : 3 of 6
 Work Order : EP2012947
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
ED093F: Dissolved Major Cations (QC Lot: 3385615) - continued									
EP2012947-001	0960_SW300_201120	ED093F: Calcium	7440-70-2	1	mg/L	1100	1170	6.08	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	2890	3070	6.09	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	21500	22800	5.87	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	1250	1340	6.96	0% - 20%
EP2012957-006	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	413	404	2.14	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	950	937	1.31	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	6900	6800	1.43	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	401	394	1.77	0% - 20%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3399729)									
EP2012942-001	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	3	3	0.00	No Limit
EP2012946-001	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	2	2	0.00	No Limit



Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit			Result	LCS	Low
EA005P: pH by PC Titrator (QCLot: 3396938)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3387902)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	99.6	88.1	114
				<10	1000 mg/L	102	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3387903)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	112	89.1	120
				<5	1000 mg/L	104	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3396937)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	103	81.2	126
				<1	200 mg/L	97.7	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3384199)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	98.2	87.7	113
				<1	500 mg/L	103	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3384200)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	98.9	87.9	114
				<1	1000 mg/L	99.2	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3385615)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	99.3	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	102	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	98.1	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	95.2	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3399729)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	99.7	73.2	116
				<1	100 mg/L	95.4	73.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3388769)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	101	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	95.6	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	90.0	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	92.6	69.0	134



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3388769) - continued								
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	111	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	124	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3388769)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	94.3	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	119	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	81.6	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	98.2	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	116	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	120	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	118	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	118	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	107	72.0	134
EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	97.6	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	74.8	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3388769)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	67.4	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	76.0	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	77.4	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	82.3	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	86.6	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	101	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	102	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3388769)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	107	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	83.6	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	72.8	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	74.4	71.4	144

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High

Page : 6 of 6
 Work Order : EP2012947
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3384199)							
EP2012897-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3384200)							
EP2012897-001	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	# Not Determined	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3399729)							
EP2012942-002	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	96.3	70.0	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2012947	Page	: 1 of 7
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 25-Nov-2020
Site	: DEF19009/Learmonth	Issue Date	: 04-Dec-2020
Sampler	: MAELLE BOURDAIS, Shaun Chambers	No. of samples received	: 6
Order number	: DEF19009/0960	No. of samples analysed	: 6

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- Matrix Spike outliers exist - please see following pages for full details.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- Quality Control Sample Frequency Outliers exist - please see following pages for full details.



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO ₄ 2- by DA	EP2012897--001	Anonymous	Sulfate as SO₄ - Turbidimetric	14808-79-8	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
ED045G: Chloride by Discrete Analyser	EP2012897--001	Anonymous	Chloride	16887-00-6	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method		<i>Extraction / Preparation</i>			<i>Analysis</i>		
Container / Client Sample ID(s)		<i>Date extracted</i>	<i>Due for extraction</i>	Days overdue	<i>Date analysed</i>	<i>Due for analysis</i>	Days overdue
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural							
0960_SW300_201120,	0960_SW301_201120,	----	----	----	02-Dec-2020	20-Nov-2020	12
0960_SW303_201120,	0960_SW304_201120,						
0960_SW305_201120							

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type Method	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	19	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	19	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator								
Clear Plastic Bottle - Natural (EA005-P)								
0960_SW300_201120,	0960_SW301_201120,	20-Nov-2020	----	----	----	02-Dec-2020	20-Nov-2020	✖
0960_SW303_201120,	0960_SW304_201120,							
0960_SW305_201120								
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Clear Plastic Bottle - Natural (EA015H)								
0960_SW300_201120,	0960_SW301_201120,	20-Nov-2020	----	----	----	27-Nov-2020	27-Nov-2020	✔
0960_SW303_201120,	0960_SW304_201120,							
0960_SW305_201120								
EA025: Total Suspended Solids dried at 104 ± 2°C								
Clear Plastic Bottle - Natural (EA025H)								
0960_SW300_201120,	0960_SW301_201120,	20-Nov-2020	----	----	----	27-Nov-2020	27-Nov-2020	✔
0960_SW303_201120,	0960_SW304_201120,							
0960_SW305_201120								
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P)								
0960_SW300_201120,	0960_SW301_201120,	20-Nov-2020	----	----	----	02-Dec-2020	04-Dec-2020	✔
0960_SW303_201120,	0960_SW304_201120,							
0960_SW305_201120								
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G)								
0960_SW300_201120,	0960_SW301_201120,	20-Nov-2020	----	----	----	03-Dec-2020	18-Dec-2020	✔
0960_SW303_201120,	0960_SW304_201120,							
0960_SW305_201120								
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G)								
0960_SW300_201120,	0960_SW301_201120,	20-Nov-2020	----	----	----	03-Dec-2020	18-Dec-2020	✔
0960_SW303_201120,	0960_SW304_201120,							
0960_SW305_201120								
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F)								
0960_SW300_201120,	0960_SW301_201120,	20-Nov-2020	----	----	----	26-Nov-2020	27-Nov-2020	✔
0960_SW303_201120,	0960_SW304_201120,							
0960_SW305_201120								
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002)								
0960_SW300_201120,	0960_SW301_201120,	20-Nov-2020	----	----	----	03-Dec-2020	18-Dec-2020	✔
0960_SW303_201120,	0960_SW304_201120,							
0960_SW305_201120								



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X) 0960_SW300_201120, 0960_SW303_201120, 0960_SW305_201120,	0960_SW301_201120, 0960_SW304_201120, 0960_QC402_201120	20-Nov-2020	30-Nov-2020	19-May-2021	✔	30-Nov-2020	19-May-2021	✔
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X) 0960_SW300_201120, 0960_SW303_201120, 0960_SW305_201120,	0960_SW301_201120, 0960_SW304_201120, 0960_QC402_201120	20-Nov-2020	30-Nov-2020	19-May-2021	✔	30-Nov-2020	19-May-2021	✔
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X) 0960_SW300_201120, 0960_SW303_201120, 0960_SW305_201120,	0960_SW301_201120, 0960_SW304_201120, 0960_QC402_201120	20-Nov-2020	30-Nov-2020	19-May-2021	✔	30-Nov-2020	19-May-2021	✔
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X) 0960_SW300_201120, 0960_SW303_201120, 0960_SW305_201120,	0960_SW301_201120, 0960_SW304_201120, 0960_QC402_201120	20-Nov-2020	30-Nov-2020	19-May-2021	✔	30-Nov-2020	19-May-2021	✔
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X) 0960_SW300_201120, 0960_SW303_201120, 0960_SW305_201120,	0960_SW301_201120, 0960_SW304_201120, 0960_QC402_201120	20-Nov-2020	30-Nov-2020	19-May-2021	✔	30-Nov-2020	19-May-2021	✔



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	19	0.00	10.00	✗	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	18	11.11	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	18	11.11	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	18	5.56	5.26	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	19	0.00	5.00	✗	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of 'filterable' residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C. This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high temperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.



Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

**CHAIN OF CUSTODY**

COC#: 16248

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: SPM DEF19009/Learmonth SED

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

28/11 11am

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS**ANALYSIS REQUIRED**

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Sediments SEDIMENT	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0960_SS189		20/11/2020 09:48 AM	Soil	ALS: 2 Non ALS: 0	No	X		
002	0960_SS235		20/11/2020 10:23 AM	Soil	ALS: 2 Non ALS: 0	No	X		
003	0960_SS234		20/11/2020 10:26 AM	Soil	ALS: 2 Non ALS: 0	No	X		
004	0960_SD219		20/11/2020 10:32 AM	Soil	ALS: 2 Non ALS: 0	No	X		
005	0960_SD199		20/11/2020 11:21 AM	Soil	ALS: 2 Non ALS: 0	No	X		
006	0960_SD200		20/11/2020 11:31 AM	Soil	ALS: 2 Non ALS: 0	No	X		
007	0960_SS298		20/11/2020 11:49 AM	Soil	ALS: 2 Non ALS: 0	No	X		
008	0960_SS301		20/11/2020 12:02 PM	Soil	ALS: 2 Non ALS: 0	No	X		
009	0960_SD205		20/11/2020 12:16 PM	Soil	ALS: 2 Non ALS: 0	No	X		

Environmental Division
Perth

Work Order Reference

EP2012955



Telephone : + 61-8-9406 1301

**CHAIN OF CUSTODY**

COC#: 16248 ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: SPM DEF19009/Learmonth SED

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0960_SS189	Soil Glass Jar - Unpreserved	150 mL	00260220013603	Orange	No	
001	0960_SS189	HDPE Soil Jar	200 mL	00620719008703	Grey	No	
002	0960_SS235	Soil Glass Jar - Unpreserved	150 mL	00260220013386	Orange	No	
002	0960_SS235	HDPE Soil Jar	200 mL	00620719026370	Grey	No	
003	0960_SS234	Soil Glass Jar - Unpreserved	150 mL	00260220013583	Orange	No	
003	0960_SS234	HDPE Soil Jar	200 mL	00620719008634	Grey	No	
004	0960_SD219	Soil Glass Jar - Unpreserved	150 mL	00260220013574	Orange	No	
004	0960_SD219	HDPE Soil Jar	200 mL	00620719008644	Grey	No	
005	0960_SD199	Soil Glass Jar - Unpreserved	150 mL	00260220014941	Orange	No	
005	0960_SD199	HDPE Soil Jar	200 mL	00620719008732	Grey	No	
006	0960_SD200	Soil Glass Jar - Unpreserved	150 mL	00260220013579	Orange	No	
006	0960_SD200	HDPE Soil Jar	200 mL	00620719008706	Grey	No	
007	0960_SS298	Soil Glass Jar - Unpreserved	150 mL	00260220013842	Orange	No	
007	0960_SS298	HDPE Soil Jar	200 mL	00620719008733	Grey	No	
008	0960_SS301	Soil Glass Jar - Unpreserved	150 mL	00260220014929	Orange	No	
008	0960_SS301	HDPE Soil Jar	200 mL	00620719026334	Grey	No	
009	0960_SD205	HDPE Soil Jar	200 mL	00620719008764	Grey	No	
009	0960_SD205	Soil Glass Jar - Unpreserved	150 mL	00260220014937	Orange	No	

Total Bottle Count: ALS: 18, Non ALS: 0

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : EP2012955

<p>Client : CARDNO (WA) PTY LTD</p> <p>Contact : MAELLE BOURDAIS</p> <p>Address : 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006</p> <p>E-mail : maelle.bourdais@cardno.com.au</p> <p>Telephone : ----</p> <p>Facsimile : ----</p> <p>Project : WA_0960_PFASOMP</p> <p>Order number : DEF19009/0960</p> <p>C-O-C number : 16248</p> <p>Site : DEF19009/Learmonth</p> <p>Sampler : MAELLE BOURDAIS, Sarah McCulloch</p>	<p>Laboratory : Environmental Division Perth</p> <p>Contact : Nick Courts</p> <p>Address : 26 Rigali Way Wangara WA Australia 6065</p> <p>E-mail : nick.courts@alsglobal.com</p> <p>Telephone : +61-8-9406 1301</p> <p>Facsimile : +61-8-9406 1399</p> <p>Page : 1 of 2</p> <p>Quote number : ES2019CARBSD0002 (SY/139/19)</p> <p>QC Level : NEPM 2013 B3 & ALS QC Standard</p>
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Dates

Date Samples Received : 25-Nov-2020 11:00	Issue Date : 25-Nov-2020
Client Requested Due : 04-Dec-2020	Scheduled Reporting Date : 04-Dec-2020
Date	

Delivery Details

Mode of Delivery : Carrier	Security Seal : Intact.
No. of coolers/boxes : 4	Temperature : 23.2 - Ice present
Receipt Detail :	No. of samples received / analysed : 9 / 9

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepancies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- ### Summary of Sample(s) and Requested Analysis

Matrix: SOIL

Laboratory sample ID	Sampling date / time	Sample ID	SOIL - A Agriculture	SOIL - E Moisture	SOIL - E Organic	SOIL - E PFAS - F
EP2012955-001	20-Nov-2020 09:48	0960_SS189_201120	✓	✓	✓	✓
EP2012955-002	20-Nov-2020 10:23	0960_SS235_201120	✓	✓	✓	✓
EP2012955-003	20-Nov-2020 10:26	0960_SS234_201120	✓	✓	✓	✓
EP2012955-004	20-Nov-2020 10:32	0960_SD219_201120	✓	✓	✓	✓
EP2012955-005	20-Nov-2020 11:21	0960_SD199_201120	✓	✓	✓	✓
EP2012955-006	20-Nov-2020 11:31	0960_SD200_201120	✓	✓	✓	✓
EP2012955-007	20-Nov-2020 11:49	0960_SS298_201120	✓	✓	✓	✓
EP2012955-008	20-Nov-2020 12:02	0960_SS301_201120	✓	✓	✓	✓
EP2012955-009	20-Nov-2020 12:16	0960_SD205_201120	✓	✓	✓	✓

[illegible]

CERTIFICATE OF ANALYSIS

Work Order : **EP2012955**
Client : **CARDNO (WA) PTY LTD**
Contact : **MAELLE BOURDAIS**
Address : **11 HARVEST TERRACE PO BOX 155**
WEST PERTH WA, AUSTRALIA 6006
Telephone : **----**
Project : **WA_0960_PFASOMP**
Order number : **DEF19009/0960**
C-O-C number : **16248**
Sampler : **MAELLE BOURDAIS, Sarah McCulloch**
Site : **DEF19009/Learmonth**
Quote number : **SY/139/19**
No. of samples received : **9**
No. of samples analysed : **9**

Page : 1 of 9
Laboratory : Environmental Division Perth
Contact : Nick Courts
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 25-Nov-2020 11:00
Date Analysis Commenced : 30-Nov-2020
Issue Date : 04-Dec-2020 17:04



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H⁺ + Al³⁺).
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SS189_201120	0960_SS235_201120	0960_SS234_201120	0960_SD219_201120	0960_SD199_201120
Sampling date / time					20-Nov-2020 09:48	20-Nov-2020 10:23	20-Nov-2020 10:26	20-Nov-2020 10:32	20-Nov-2020 11:21
Compound	CAS Number	LOR	Unit		EP2012955-001	EP2012955-002	EP2012955-003	EP2012955-004	EP2012955-005
				Result	Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		8.4	8.9	9.0	9.2	7.8
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		20200	275	115	96	12200
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		5.2	24.4	28.8	18.7	3.3
ED007: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		----	20.8	20.2	19.4	----
Exchangeable Magnesium	----	0.1	meq/100g		----	3.0	2.3	2.4	----
Exchangeable Potassium	----	0.1	meq/100g		----	0.7	0.7	0.7	----
Exchangeable Sodium	----	0.1	meq/100g		----	1.3	0.5	0.6	----
Cation Exchange Capacity	----	0.1	meq/100g		----	25.8	23.6	23.0	----
Exchangeable Sodium Percent	----	0.1	%		----	5.0	2.2	2.5	----
ED008: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		24.7	----	----	----	19.7
Exchangeable Magnesium	----	0.1	meq/100g		6.9	----	----	----	2.6
Exchangeable Potassium	----	0.1	meq/100g		1.3	----	----	----	0.5
Exchangeable Sodium	----	0.1	meq/100g		0.4	----	----	----	0.1
Cation Exchange Capacity	----	0.1	meq/100g		33.4	----	----	----	22.9
Exchangeable Sodium Percent	----	0.1	%		1.3	----	----	----	0.6
EP004: Organic Matter									
Organic Matter	----	0.5	%		1.2	<0.5	0.7	<0.5	1.5
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	0.0006	<0.0002	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		0.0004	0.0017	<0.0002	<0.0002	<0.0002
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		0.0077	0.0284	0.0204	0.0004	0.0005
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				0960_SS189_201120	0960_SS235_201120	0960_SS234_201120	0960_SD219_201120	0960_SD199_201120
Sampling date / time				20-Nov-2020 09:48	20-Nov-2020 10:23	20-Nov-2020 10:26	20-Nov-2020 10:32	20-Nov-2020 11:21
Compound	CAS Number	LOR	Unit	EP2012955-001	EP2012955-002	EP2012955-003	EP2012955-004	EP2012955-005
				Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	0.0003	0.0005	<0.0002	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	0.0003	0.0005	<0.0002	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				0960_SS189_201120	0960_SS235_201120	0960_SS234_201120	0960_SD219_201120	0960_SD199_201120
Sampling date / time				20-Nov-2020 09:48	20-Nov-2020 10:23	20-Nov-2020 10:26	20-Nov-2020 10:32	20-Nov-2020 11:21
Compound	CAS Number	LOR	Unit	EP2012955-001	EP2012955-002	EP2012955-003	EP2012955-004	EP2012955-005
				Result	Result	Result	Result	Result
EP231D: (n:2) Fluorotelomer Sulfonic Acids - Continued								
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.0009	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	0.0087	0.0317	0.0213	0.0004	0.0005
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	0.0081	0.0301	0.0204	0.0004	0.0005
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	0.0087	0.0317	0.0213	0.0004	0.0005
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	88.5	92.0	97.0	101	87.5
13C8-PFOA	----	0.0002	%	111	108	106	108	105



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SD200_201120	0960_SS298_201120	0960_SS301_201120	0960_SD205_201120	----
Sampling date / time					20-Nov-2020 11:31	20-Nov-2020 11:49	20-Nov-2020 12:02	20-Nov-2020 12:16	----
Compound	CAS Number	LOR	Unit		EP2012955-006	EP2012955-007	EP2012955-008	EP2012955-009	-----
				Result	Result	Result	Result	Result	----
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		9.1	8.9	8.6	8.8	----
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		302	23100	16400	10400	----
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		0.7	1.3	16.3	37.5	----
ED008: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		12.3	18.8	24.2	17.6	----
Exchangeable Magnesium	----	0.1	meq/100g		1.1	3.3	5.2	10.2	----
Exchangeable Potassium	----	0.1	meq/100g		0.2	0.4	0.4	1.7	----
Exchangeable Sodium	----	0.1	meq/100g		<0.1	0.2	0.2	1.3	----
Cation Exchange Capacity	----	0.1	meq/100g		13.6	22.7	30.0	30.8	----
Exchangeable Sodium Percent	----	0.1	%		0.2	0.7	0.8	4.2	----
EP004: Organic Matter									
Organic Matter	----	0.5	%		<0.5	1.4	1.2	2.7	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		<0.0002	0.0004	<0.0002	<0.0002	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg		<0.001	<0.001	<0.001	<0.001	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	----



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SD200_201120	0960_SS298_201120	0960_SS301_201120	0960_SD205_201120	----
Sampling date / time					20-Nov-2020 11:31	20-Nov-2020 11:49	20-Nov-2020 12:02	20-Nov-2020 12:16	----
Compound	CAS Number	LOR	Unit		EP2012955-006	EP2012955-007	EP2012955-008	EP2012955-009	-----
				Result	Result	Result	Result	Result	----
EP231B: Perfluoroalkyl Carboxylic Acids - Continued									
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	----
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg	<0.0002	0.0004	<0.0002	<0.0002	<0.0002	----



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SD200_201120	0960_SS298_201120	0960_SS301_201120	0960_SD205_201120	----
Sampling date / time					20-Nov-2020 11:31	20-Nov-2020 11:49	20-Nov-2020 12:02	20-Nov-2020 12:16	----
Compound	CAS Number	LOR	Unit		EP2012955-006	EP2012955-007	EP2012955-008	EP2012955-009	-----
				Result	Result	Result	Result	Result	----
EP231P: PFAS Sums - Continued									
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		<0.0002	0.0004	<0.0002	<0.0002	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		<0.0002	0.0004	<0.0002	<0.0002	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		93.5	99.5	115	98.0	----
13C8-PFOA	----	0.0002	%		100	102	99.5	106	----



Surrogate Control Limits

Sub-Matrix: **SEDIMENT**

		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

QUALITY CONTROL REPORT

Work Order	: EP2012955	Page	: 1 of 8
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 25-Nov-2020
Order number	: DEF19009/0960	Date Analysis Commenced	: 30-Nov-2020
C-O-C number	: 16248	Issue Date	: 04-Dec-2020
Sampler	: MAELLE BOURDAIS, Sarah McCulloch		
Site	: DEF19009/Learmonth		
Quote number	: SY/139/19		
No. of samples received	: 9		
No. of samples analysed	: 9		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key :
 Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
 CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
 LOR = Limit of reporting
 RPD = Relative Percentage Difference
 # = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA002: pH 1:5 (Soils) (QC Lot: 3391232)									
EP2012944-011	Anonymous	EA002: pH Value	----	0.1	pH Unit	8.7	8.7	0.00	0% - 20%
EP2012955-001	0960_SS189_201120	EA002: pH Value	----	0.1	pH Unit	8.4	8.4	0.00	0% - 20%
EA010: Conductivity (1:5) (QC Lot: 3391233)									
EP2012944-011	Anonymous	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	9440	9440	0.00	0% - 20%
EP2012955-001	0960_SS189_201120	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	20200	20200	0.0991	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3391318)									
EP2012955-001	0960_SS189_201120	EA055: Moisture Content	----	0.1	%	5.2	5.5	5.09	0% - 20%
ED007: Exchangeable Cations (QC Lot: 3392645)									
EP2012944-003	Anonymous	ED007: Exchangeable Sodium Percent	----	0.1	%	1.1	1.1	0.00	0% - 50%
		ED007: Exchangeable Calcium	----	0.1	meq/100g	16.7	16.5	1.30	0% - 20%
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	3.4	3.4	0.00	0% - 20%
		ED007: Exchangeable Potassium	----	0.1	meq/100g	1.0	1.1	0.00	0% - 50%
		ED007: Exchangeable Sodium	----	0.1	meq/100g	0.2	0.2	0.00	No Limit
		ED007: Cation Exchange Capacity	----	0.1	meq/100g	21.4	21.2	0.801	0% - 20%
ED008: Exchangeable Cations (QC Lot: 3391843)									
EP2012945-001	Anonymous	ED008: Exchangeable Sodium Percent	----	0.1	%	2.4	2.8	18.2	0% - 20%
		ED008: Exchangeable Calcium	----	0.1	meq/100g	41.8	38.0	9.46	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	19.6	16.9	14.8	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	2.5	2.4	0.00	0% - 20%
		ED008: Exchangeable Sodium	----	0.1	meq/100g	1.6	1.7	7.92	0% - 50%
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	65.4	59.0	10.3	0% - 20%
EP2012955-005	0960_SD199_201120	ED008: Exchangeable Sodium Percent	----	0.1	%	0.6	0.6	0.00	No Limit
		ED008: Exchangeable Calcium	----	0.1	meq/100g	19.7	19.6	0.00	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	2.6	2.6	0.00	0% - 20%



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
ED008: Exchangeable Cations (QC Lot: 3391843) - continued									
EP2012955-005	0960_SD199_201120	ED008: Exchangeable Potassium	----	0.1	meq/100g	0.5	0.5	0.00	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	0.1	0.1	0.00	No Limit
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	22.9	22.8	0.00	0% - 20%
EP004: Organic Matter (QC Lot: 3391849)									
EP2012955-001	0960_SS189_201120	EP004: Organic Matter	----	0.5	%	1.2	1.2	0.00	No Limit
EP2013240-001	Anonymous	EP004: Organic Matter	----	0.5	%	<0.5	<0.5	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3395351)									
EP2012944-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP2012955-001	0960_SS189_201120	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	0.0004	0.0005	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0077	0.0080	4.09	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3395351)									
EP2012944-001	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
		EP2012955-001	0960_SS189_201120	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4			0.0002	mg/kg	0.0003	0.0003	0.00	No Limit
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9			0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1			0.0002	mg/kg	0.0003	0.0003	0.00	No Limit
EP231X: Perfluorononanoic acid (PFNA)	375-95-1			0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2			0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8			0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1			0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8			0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3395351) - continued									
EP2012955-001	0960_SS189_201120	EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3395351)									
EP2012944-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP2012955-001	0960_SS189_201120	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3395351)									
EP2012944-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP2012955-001	0960_SS189_201120	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3395351) - continued									
EP2012955-001	0960_SS189_201120	EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit



Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

Sub-Matrix: SOIL				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EA002: pH 1:5 (Soils) (QCLot: 3391232)								
EA002: pH Value	----	----	pH Unit	----	4 pH Unit	100	70.0	130
				----	7 pH Unit	100	70.0	130
EA010: Conductivity (1:5) (QCLot: 3391233)								
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	1412 µS/cm	100	93.6	106
ED007: Exchangeable Cations (QCLot: 3392645)								
ED007: Exchangeable Calcium	----	0.1	meq/100g	<0.1	21.6 meq/100g	92.0	82.9	117
ED007: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.76 meq/100g	95.4	78.4	119
ED007: Exchangeable Potassium	----	0.1	meq/100g	<0.1	1 meq/100g	103	87.9	129
ED007: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.9 meq/100g	101	92.9	132
ED007: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	25.3 meq/100g	92.8	84.7	117
ED007: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
ED008: Exchangeable Cations (QCLot: 3391843)								
ED008: Exchangeable Calcium	----	0.1	meq/100g	<0.1	22.1 meq/100g	94.1	78.7	111
ED008: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.56 meq/100g	97.5	77.6	111
ED008: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.91 meq/100g	111	86.9	116
ED008: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.38 meq/100g	126	72.3	129
ED008: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
ED008: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	24.95 meq/100g	95.4	79.9	110
EP004: Organic Matter (QCLot: 3391849)								
EP004: Organic Matter	----	0.5	%	<0.5	2.3 %	95.6	70.0	120
				<0.5	85 %	82.5	70.0	120
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3395351)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	82.0	72.0	128
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.0	73.0	123
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.4	67.0	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	88.0	70.0	132
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	85.2	68.0	136
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	89.2	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3395351)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	92.6	71.0	135
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	89.2	69.0	132
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	112	70.0	132
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	92.8	71.0	131
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	95.2	69.0	133



Sub-Matrix: **SOIL**

Sub-Matrix: SOIL				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3395351) - continued								
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	94.0	72.0	129
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	88.0	69.0	133
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	98.4	64.0	136
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	98.0	69.0	135
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	80.4	66.0	139
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	127	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3395351)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	93.2	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	101	71.6	129
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	96.0	69.8	131
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	106	68.7	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	112	65.1	134
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	86.8	63.0	144
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	109	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3395351)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	94.8	62.0	145
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	100	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	112	65.0	137
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	87.6	69.2	143

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike Concentration	SpikeRecovery(%) MS	Recovery Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number			Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3395351)							
EP2012944-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	83.6	72.0	128
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	85.6	73.0	123
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	82.4	67.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	88.0	70.0	132
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	96.0	68.0	136
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	95.2	59.0	134



Sub-Matrix: **SOIL**

Sub-Matrix: SOIL				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3395351)							
EP2012944-001	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	74.4	71.0	135
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	78.4	69.0	132
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	110	70.0	132
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	87.2	71.0	131
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	99.2	69.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	86.0	72.0	129
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	86.8	69.0	133
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	101	64.0	136
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	101	69.0	135
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	82.0	66.0	139
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	92.3	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3395351)							
EP2012944-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	90.0	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	113	71.6	129
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	91.2	69.8	131
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	118	68.7	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	117	65.1	134
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	83.6	63.0	144
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	81.6	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3395351)							
EP2012944-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	86.8	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	90.8	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	110	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	99.6	69.2	143

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2012955	Page	: 1 of 6
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 25-Nov-2020
Site	: DEF19009/Learmonth	Issue Date	: 04-Dec-2020
Sampler	: MAELLE BOURDAIS, Sarah McCulloch	No. of samples received	: 9
Order number	: DEF19009/0960	No. of samples analysed	: 9

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- **NO** Matrix Spike outliers occur.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- **NO** Quality Control Sample Frequency Outliers exist.

Matrix: SOIL

Analysis Holding Time Compliance

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: SOIL

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA002: pH 1:5 (Soils)								
Soil Glass Jar - Unpreserved (EA002)		20-Nov-2020	30-Nov-2020	27-Nov-2020	✖	30-Nov-2020	30-Nov-2020	✔
0960_SS189_201120,								
0960_SS234_201120,								
0960_SD199_201120,								
0960_SS298_201120,								
0960_SD205_201120								



Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA010: Conductivity (1:5)								
Soil Glass Jar - Unpreserved (EA010) 0960_SS189_201120, 0960_SS234_201120, 0960_SD199_201120, 0960_SS298_201120, 0960_SD205_201120	0960_SS235_201120, 0960_SD219_201120, 0960_SD200_201120, 0960_SS301_201120,	20-Nov-2020	30-Nov-2020	27-Nov-2020	✖	30-Nov-2020	28-Dec-2020	✓
EA055: Moisture Content (Dried @ 105-110°C)								
Soil Glass Jar - Unpreserved (EA055) 0960_SS189_201120, 0960_SS234_201120, 0960_SD199_201120, 0960_SS298_201120, 0960_SD205_201120	0960_SS235_201120, 0960_SD219_201120, 0960_SD200_201120, 0960_SS301_201120,	20-Nov-2020	----	----	----	30-Nov-2020	04-Dec-2020	✓
ED007: Exchangeable Cations								
Soil Glass Jar - Unpreserved (ED007) 0960_SS235_201120, 0960_SD219_201120	0960_SS234_201120,	20-Nov-2020	02-Dec-2020	18-Dec-2020	✓	02-Dec-2020	18-Dec-2020	✓
ED008: Exchangeable Cations								
Soil Glass Jar - Unpreserved (ED008) 0960_SS189_201120, 0960_SD200_201120, 0960_SS301_201120,	0960_SD199_201120, 0960_SS298_201120, 0960_SD205_201120	20-Nov-2020	03-Dec-2020	18-Dec-2020	✓	03-Dec-2020	18-Dec-2020	✓
EP004: Organic Matter								
Soil Glass Jar - Unpreserved (EP004) 0960_SS189_201120, 0960_SS234_201120, 0960_SD199_201120, 0960_SS298_201120, 0960_SD205_201120	0960_SS235_201120, 0960_SD219_201120, 0960_SD200_201120, 0960_SS301_201120,	20-Nov-2020	03-Dec-2020	18-Dec-2020	✓	03-Dec-2020	18-Dec-2020	✓
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE Soil Jar (EP231X) 0960_SS189_201120, 0960_SS234_201120, 0960_SD199_201120, 0960_SS298_201120, 0960_SD205_201120	0960_SS235_201120, 0960_SD219_201120, 0960_SD200_201120, 0960_SS301_201120,	20-Nov-2020	02-Dec-2020	19-May-2021	✓	02-Dec-2020	11-Jan-2021	✓



Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE Soil Jar (EP231X)								
0960_SS189_201120,	0960_SS235_201120,	20-Nov-2020	02-Dec-2020	19-May-2021	✔	02-Dec-2020	11-Jan-2021	✔
0960_SS234_201120,	0960_SD219_201120,							
0960_SD199_201120,	0960_SD200_201120,							
0960_SS298_201120,	0960_SS301_201120,							
0960_SD205_201120								
EP231C: Perfluoroalkyl Sulfonamides								
HDPE Soil Jar (EP231X)								
0960_SS189_201120,	0960_SS235_201120,	20-Nov-2020	02-Dec-2020	19-May-2021	✔	02-Dec-2020	11-Jan-2021	✔
0960_SS234_201120,	0960_SD219_201120,							
0960_SD199_201120,	0960_SD200_201120,							
0960_SS298_201120,	0960_SS301_201120,							
0960_SD205_201120								
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE Soil Jar (EP231X)								
0960_SS189_201120,	0960_SS235_201120,	20-Nov-2020	02-Dec-2020	19-May-2021	✔	02-Dec-2020	11-Jan-2021	✔
0960_SS234_201120,	0960_SD219_201120,							
0960_SD199_201120,	0960_SD200_201120,							
0960_SS298_201120,	0960_SS301_201120,							
0960_SD205_201120								
EP231P: PFAS Sums								
HDPE Soil Jar (EP231X)								
0960_SS189_201120,	0960_SS235_201120,	20-Nov-2020	02-Dec-2020	19-May-2021	✔	02-Dec-2020	11-Jan-2021	✔
0960_SS234_201120,	0960_SD219_201120,							
0960_SD199_201120,	0960_SD200_201120,							
0960_SS298_201120,	0960_SS301_201120,							
0960_SD205_201120								



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)		Quality Control Specification	
Analytical Methods	Method	QC	Regular	Actual	Expected		Evaluation
Laboratory Duplicates (DUP)							
Electrical Conductivity (1:5)	EA010	2	19	10.53	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	7	14.29	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	2	15	13.33	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	1	9	11.11	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	11	18.18	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	20	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	19	10.53	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Electrical Conductivity (1:5)	EA010	1	19	5.26	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	7	14.29	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	15	6.67	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	11	18.18	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	19	10.53	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Electrical Conductivity (1:5)	EA010	1	19	5.26	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	7	14.29	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	15	6.67	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	11	9.09	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	In house: Referenced to Rayment and Lyons 4A1 and APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Electrical Conductivity (1:5)	EA010	SOIL	In house: Referenced to Rayment and Lyons 3A1 and APHA 2510. Conductivity is determined on soil samples using a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Exchangeable Cations	ED007	SOIL	In house: Referenced to Rayment & Lyons Method 15A1. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM Schedule B(3).
Exchangeable Cations with pre-treatment	ED008	SOIL	In house: Referenced to Rayment & Lyons Method 15A2. Soluble salts are removed from the sample prior to analysis. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM Schedule B(3).
Organic Matter	EP004	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3)
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	SOIL	In-house: Analysis of soils by solvent extraction followed by LC-Electrospray-MS-MS, Negative Mode using MRM using internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Exchangeable Cations Preparation Method	ED007PR	SOIL	In house: Referenced to Rayment & Lyons method 15A1. A 1M NH4Cl extraction by end over end tumbling at a ratio of 1:20. There is no pretreatment for soluble salts. Extracts can be run by ICP for cations.
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
Organic Matter	EP004-PR	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3).
Sample Extraction for PFAS in solid matrices	ORG73	SOIL	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.



ALS Laboratory: EP Perth

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA 0960 PFASOMP

SITE: AB DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact?	Yes	No	N/A
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Free ice / frozen ice bricks present upon receipt?	Yes	No	N/A
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Random Sample Temperature on Receipt: °C

Other comments:

Environmental Division
Perth

Work Order Reference

Work Order Reference
EP2012956



Telephone : - 61-8-9406 1301

**CHAIN OF CUSTODY**

COC#: 16275 ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: AB DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0960_MW122	Clear Plastic Bottle - Natural	250 mL	00070519189754	Green	No	
001	0960_MW122	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019016595	Purple	No	
001	0960_MW122	HDPE (no PTFE)	20 mL	00350719048821	Grey	No	
002	0960_MW139	HDPE (no PTFE)	20 mL	00350719048970	Grey	No	
002	0960_MW139	Clear Plastic Bottle - Natural	250 mL	00070519189710	Green	No	
002	0960_MW139	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019016458	Purple	No	
003	0970_QC301	HDPE (no PTFE)	20 mL	00352005002647	Grey	No	
003	0970_QC301	HDPE (no PTFE)	20 mL	00352005002570	Grey	No	

Total Bottle Count: ALS: 8, Non ALS: 0

**SAMPLE RECEIPT NOTIFICATION (SRN)****Work Order : EP2012956**

Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: maelle.bourdais@cardno.com.au	E-mail	: nick.courts@alsglobal.com
Telephone	: ----	Telephone	: +61-8-9406 1301
Facsimile	: ----	Facsimile	: +61-8-9406 1399
Project	: WA_0960_PFASOMP	Page	: 1 of 3
Order number	: DEF19009/0960	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 16275	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/Learmonth		
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		

Dates

Date Samples Received	: 25-Nov-2020 11:00	Issue Date	: 25-Nov-2020
Client Requested Due Date	: 04-Dec-2020	Scheduled Reporting Date	: 04-Dec-2020

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 4	Temperature	: 23.2 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 3 / 3

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepancies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.



Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2012956-001	21-Nov-2020 09:11	0960_MW122_201121	✓	✓	✓	✓	✓	✓	✓
EP2012956-002	21-Nov-2020 09:27	0960_MW139_201121	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2012956-001	21-Nov-2020 09:11	0960_MW122_201121	✓
EP2012956-002	21-Nov-2020 09:27	0960_MW139_201121	✓
EP2012956-003	21-Nov-2020 10:27	0970_QC301_201121	✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **WATER**

Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method	Container	Due for extraction	Due for analysis	Samples Received		Instructions Received	
				Date	Evaluation	Date	Evaluation
EA005-P: pH by PC Titrator							
0960_MW122_20112	Clear Plastic Bottle - Natural	----	21-Nov-2020	25-Nov-2020	✗	----	----
0960_MW139_20112	Clear Plastic Bottle - Natural	----	21-Nov-2020	25-Nov-2020	✗	----	----

ACCOUNTS PAYABLE (WA)

Email claire.armstrong@cardno.com.au

Email david.james@cardno.com.au

- [illegible]

Email derp.labreports@esdat.com.au

- [illegible]

CERTIFICATE OF ANALYSIS

Work Order : **EP2012956**
Client : **CARDNO (WA) PTY LTD**
Contact : **MAELLE BOURDAIS**
Address : **11 HARVEST TERRACE PO BOX 155**
WEST PERTH WA, AUSTRALIA 6006
Telephone : **----**
Project : **WA_0960_PFASOMP**
Order number : **DEF19009/0960**
C-O-C number : **16275**
Sampler : **ASHLEY BROWN, MAELLE BOURDAIS**
Site : **DEF19009/Learmonth**
Quote number : **SY/139/19**
No. of samples received : **3**
No. of samples analysed : **3**

Page : 1 of 6
Laboratory : Environmental Division Perth
Contact : Nick Courts
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 25-Nov-2020 11:00
Date Analysis Commenced : 27-Nov-2020
Issue Date : 04-Dec-2020 22:31



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Daniel Fisher	Inorganics Analyst	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0960_MW122_201121	0960_MW139_201121	0970_QC301_201121	----	----
Sampling date / time					21-Nov-2020 09:11	21-Nov-2020 09:27	21-Nov-2020 10:27	----	----
Compound	CAS Number	LOR	Unit		EP2012956-001	EP2012956-002	EP2012956-003	-----	-----
					Result	Result	Result	----	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.81	7.63	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		25400	39500	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		398	296	----	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		376	197	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L		376	197	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		1980	3340	----	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		13700	23500	----	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		309	676	----	----	----
Magnesium	7439-95-4	1	mg/L		827	1540	----	----	----
Sodium	7440-23-5	1	mg/L		8410	11800	----	----	----
Potassium	7440-09-7	1	mg/L		469	682	----	----	----
EN055: Ionic Balance									
∅ Total Anions	----	0.01	meq/L		435	736	----	----	----
∅ Total Cations	----	0.01	meq/L		461	691	----	----	----
∅ Ionic Balance	----	0.01	%		2.91	3.16	----	----	----
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		2	1	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		<0.02	<0.02	<0.02	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	<0.02	----	----



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW122_201121	0960_MW139_201121	0970_QC301_201121	----	----
Sampling date / time				21-Nov-2020 09:11	21-Nov-2020 09:27	21-Nov-2020 10:27	----	----
Compound	CAS Number	LOR	Unit	EP2012956-001	EP2012956-002	EP2012956-003	-----	-----
				Result	Result	Result	----	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	----	----



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW122_201121	0960_MW139_201121	0970_QC301_201121	----	----
Sampling date / time				21-Nov-2020 09:11	21-Nov-2020 09:27	21-Nov-2020 10:27	----	----
Compound	CAS Number	LOR	Unit	EP2012956-001	EP2012956-002	EP2012956-003	-----	-----
				Result	Result	Result	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	<0.01	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	<0.01	<0.01	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	101	98.0	109	----	----
13C8-PFOA	----	0.02	%	102	100	100	----	----



Surrogate Control Limits

Sub-Matrix: GROUNDWATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

QUALITY CONTROL REPORT

Work Order	: EP2012956	Page	: 1 of 6
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 25-Nov-2020
Order number	: DEF19009/0960	Date Analysis Commenced	: 27-Nov-2020
C-O-C number	: 16275	Issue Date	: 04-Dec-2020
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		
Site	: DEF19009/Learmonth		
Quote number	: SY/139/19		
No. of samples received	: 3		
No. of samples analysed	: 3		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Daniel Fisher	Inorganics Analyst	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
= Indicates failed QC

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA005P: pH by PC Titrator (QC Lot: 3396938)									
EP2012947-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.03	8.04	0.124	0% - 20%
EP2013106-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.86	7.86	0.00	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3387902)									
EP2012942-005	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	36400	38300	5.00	0% - 20%
EP2012956-002	0960_MW139_201121	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	39500	39400	0.253	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3387903)									
EP2012942-005	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	7	9	31.2	No Limit
EP2012957-002	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	3370	3240	3.81	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3396937)									
EP2012947-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	171	173	0.756	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	171	173	0.756	0% - 20%
EP2013106-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	587	585	0.418	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	587	585	0.418	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3384263)									
EP2012946-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2890	2880	0.281	0% - 20%
EP2012957-002	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2480	2410	2.68	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3384264)									
EP2012946-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	24000	23900	0.790	0% - 20%
EP2012957-002	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	26500	25200	4.74	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3385623)									

Page : 3 of 6
 Work Order : EP2012956
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
ED093F: Dissolved Major Cations (QC Lot: 3385623) - continued									
EP2012956-001	0960_MW122_201121	ED093F: Calcium	7440-70-2	1	mg/L	309	300	2.79	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	827	804	2.87	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	8410	8160	3.00	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	469	457	2.59	0% - 20%
EP2013122-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	38	39	0.00	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	21	21	0.00	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	93	95	1.29	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	10	10	0.00	0% - 50%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3400520)									
EP2012956-001	0960_MW122_201121	EP002: Dissolved Organic Carbon	----	1	mg/L	2	2	0.00	No Limit
EP2013115-001	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	3	3	0.00	No Limit



Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result		LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 3396938)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3387902)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	99.6	88.1	114
				<10	1000 mg/L	102	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3387903)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	112	89.1	120
				<5	1000 mg/L	104	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3396937)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	103	81.2	126
				<1	200 mg/L	97.7	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3384263)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	102	87.7	113
				<1	500 mg/L	103	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3384264)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	105	87.9	114
				<1	1000 mg/L	104	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3385623)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	100	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	101	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	98.8	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	98.1	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3400520)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	90.9	73.2	116
				<1	100 mg/L	95.4	73.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3388769)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	101	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	95.6	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	90.0	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	92.6	69.0	134



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3388769) - continued								
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	111	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	124	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3388769)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	94.3	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	119	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	81.6	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	98.2	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	116	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	120	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	118	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	118	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	107	72.0	134
EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	97.6	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	74.8	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3388769)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	67.4	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	76.0	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	77.4	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	82.3	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	86.6	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	101	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	102	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3388769)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	107	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	83.6	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	72.8	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	74.4	71.4	144

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High

Page : 6 of 6
 Work Order : EP2012956
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3384263)							
EP2012946-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3384264)							
EP2012946-001	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	# Not Determined	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3400520)							
EP2012956-002	0960_MW139_201121	EP002: Dissolved Organic Carbon	----	100 mg/L	94.3	70.0	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2012956	Page	: 1 of 6
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 25-Nov-2020
Site	: DEF19009/Learmonth	Issue Date	: 04-Dec-2020
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS	No. of samples received	: 3
Order number	: DEF19009/0960	No. of samples analysed	: 3

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- Matrix Spike outliers exist - please see following pages for full details.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- Quality Control Sample Frequency Outliers exist - please see following pages for full details.



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA	EP2012946--001	Anonymous	Sulfate as SO4 - Turbidimetric	14808-79-8	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
ED045G: Chloride by Discrete Analyser	EP2012946--001	Anonymous	Chloride	16887-00-6	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator						
Clear Plastic Bottle - Natural 0960_MW122_201121,	0960_MW139_201121	----	----	----	02-Dec-2020	21-Nov-2020
						11

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	19	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	19	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for **VOC in soils** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural (EA005-P)							
0960_MW122_201121,	0960_MW139_201121	21-Nov-2020	----	----	----	02-Dec-2020	21-Nov-2020
							✖



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Clear Plastic Bottle - Natural (EA015H) 0960_MW122_201121,	0960_MW139_201121	21-Nov-2020	----	----	----	27-Nov-2020	28-Nov-2020	✓
EA025: Total Suspended Solids dried at 104 ± 2°C								
Clear Plastic Bottle - Natural (EA025H) 0960_MW122_201121,	0960_MW139_201121	21-Nov-2020	----	----	----	27-Nov-2020	28-Nov-2020	✓
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P) 0960_MW122_201121,	0960_MW139_201121	21-Nov-2020	----	----	----	02-Dec-2020	05-Dec-2020	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G) 0960_MW122_201121,	0960_MW139_201121	21-Nov-2020	----	----	----	03-Dec-2020	19-Dec-2020	✓
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G) 0960_MW122_201121,	0960_MW139_201121	21-Nov-2020	----	----	----	03-Dec-2020	19-Dec-2020	✓
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F) 0960_MW122_201121,	0960_MW139_201121	21-Nov-2020	----	----	----	27-Nov-2020	28-Nov-2020	✓
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002) 0960_MW122_201121,	0960_MW139_201121	21-Nov-2020	----	----	----	03-Dec-2020	19-Dec-2020	✓
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X) 0960_MW122_201121, 0970_QC301_201121	0960_MW139_201121,	21-Nov-2020	30-Nov-2020	20-May-2021	✓	30-Nov-2020	20-May-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X) 0960_MW122_201121, 0970_QC301_201121	0960_MW139_201121,	21-Nov-2020	30-Nov-2020	20-May-2021	✓	30-Nov-2020	20-May-2021	✓
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X) 0960_MW122_201121, 0970_QC301_201121	0960_MW139_201121,	21-Nov-2020	30-Nov-2020	20-May-2021	✓	30-Nov-2020	20-May-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X) 0960_MW122_201121, 0970_QC301_201121	0960_MW139_201121,	21-Nov-2020	30-Nov-2020	20-May-2021	✓	30-Nov-2020	20-May-2021	✓
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X) 0960_MW122_201121, 0970_QC301_201121	0960_MW139_201121,	21-Nov-2020	30-Nov-2020	20-May-2021	✓	30-Nov-2020	20-May-2021	✓



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	19	0.00	10.00	✗	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	18	11.11	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	18	11.11	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	18	5.56	5.26	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	19	0.00	5.00	✗	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of 'filterable' residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C. This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high temperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.



<i>Analytical Methods</i>	<i>Method</i>	<i>Matrix</i>	<i>Method Descriptions</i>
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	<p>In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation.</p> <p>Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.</p>
<i>Preparation Methods</i>	<i>Method</i>	<i>Matrix</i>	<i>Method Descriptions</i>
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	<p>In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.</p>



CHAIN OF CUSTODY

COC#: 16250

ALS Laboratory: EP Perth

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: SPM DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

TURNAROUND REQUIREMENTS: 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	Rinsate WATER	TOC additional WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0960_MW134		20/11/2020 10:01 AM	Water	ALS: 4 Non ALS: 0	No	X				
002	0960_MW103		20/11/2020 10:16 AM	Water	ALS: 4 Non ALS: 0	No	X				
003	0960_MW159		20/11/2020 10:55 AM	Water	ALS: 4 Non ALS: 0	No	X				
004	0960_OTH107		20/11/2020 01:20 PM	Water	ALS: 4 Non ALS: 0	No	X				
005	0960_OTH106		20/11/2020 01:33 PM	Water	ALS: 4 Non ALS: 0	No	X				
006	0960_MW141_3.5		20/11/2020 02:04 PM	Water	ALS: 4 Non ALS: 0	No	Partial 7/8		X		
007	0960_MW140_4.5		20/11/2020 02:35 PM	Water	ALS: 4 Non ALS: 0	No	X				
008	0960_MW181_2.5		20/11/2020 02:52 PM	Water	ALS: 4 Non ALS: 0	No	Partial 7/8		X		
009	0960_MW147_5.5		20/11/2020 03:09 PM	Water	ALS: 4 Non ALS: 0	No	X				

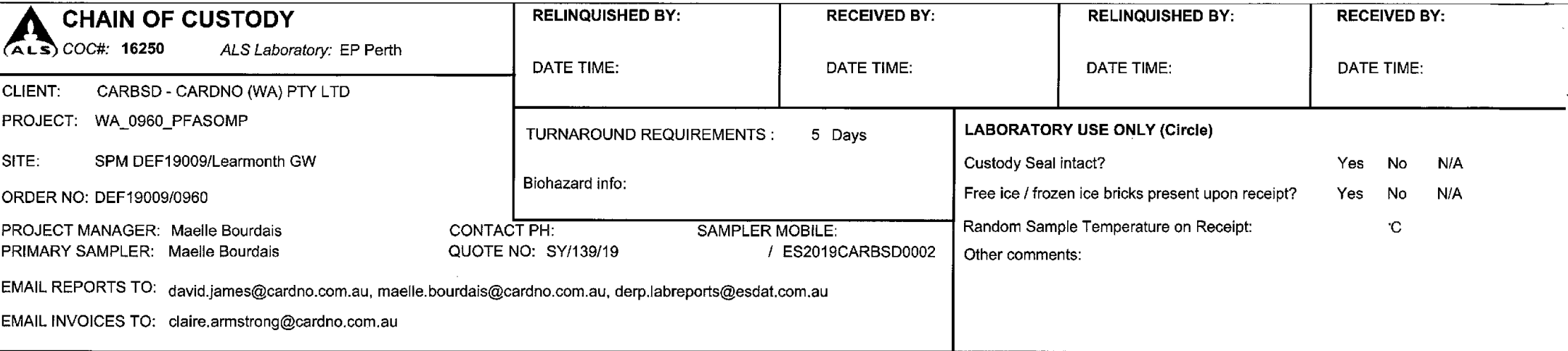
Environmental Division
Perth

Work Order Reference

EP2012957



Telephone : 61-8-9406 1301



**CHAIN OF CUSTODY**

COC#: 16250 ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: SPM DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	PARTIAL ANALYSIS GROUP NAME	MATRIX	SELECTED ANALYSIS NAME
006	0960_MW141_3.5	Ground Waters Primary WATER	Water	<ul style="list-style-type: none">- EA005P pH (PCT)- NT-02 Major Anions (Chloride, Sulphate, Alkalinity)- NT-01 Major Cations (Ca, Mg, Na, K)- EA025H Suspended Solids - Standard Level- EA015H Total Dissolved Solids - Standard Level- EN055 - PG Ionic Balance by ED037P, ED041G, ED045G & ED093F- EP231X PFAS - Full Suite (28 analytes)
008	0960_MW181_2.5	Ground Waters Primary WATER	Water	<ul style="list-style-type: none">- EA005P pH (PCT)- NT-02 Major Anions (Chloride, Sulphate, Alkalinity)- NT-01 Major Cations (Ca, Mg, Na, K)- EA025H Suspended Solids - Standard Level- EA015H Total Dissolved Solids - Standard Level- EN055 - PG Ionic Balance by ED037P, ED041G, ED045G & ED093F- EP231X PFAS - Full Suite (28 analytes)



CHAIN OF CUSTODY

COC#: 16250

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: SPM DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0960_MW134	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019011663	Purple	No	
001	0960_MW134	HDPE (no PTFE)	20 mL	00350019031394	Grey	No	
001	0960_MW134	HDPE (no PTFE)	20 mL	00350019025445	Grey	No	
001	0960_MW134	Clear Plastic Bottle - Natural	250 mL	00070519143698	Green	No	
002	0960_MW103	Clear Plastic Bottle - Natural	250 mL	00070519144047	Green	No	
002	0960_MW103	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019011677	Purple	No	
002	0960_MW103	HDPE (no PTFE)	20 mL	00350019047386	Grey	No	
002	0960_MW103	HDPE (no PTFE)	20 mL	00350019047410	Grey	No	
003	0960_MW159	Clear Plastic Bottle - Natural	250 mL	00070519142823	Green	No	
003	0960_MW159	HDPE (no PTFE)	20 mL	00350019025659	Grey	No	
003	0960_MW159	HDPE (no PTFE)	20 mL	00350019025649	Grey	No	
003	0960_MW159	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019011697	Purple	No	
004	0960_OTH107	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019011654	Purple	No	
004	0960_OTH107	Clear Plastic Bottle - Natural	250 mL	00070519142848	Green	No	
004	0960_OTH107	HDPE (no PTFE)	20 mL	00350019025543	Grey	No	
004	0960_OTH107	HDPE (no PTFE)	20 mL	00350019025632	Grey	No	
005	0960_OTH106	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019011700	Purple	No	
005	0960_OTH106	Clear Plastic Bottle - Natural	250 mL	00070519143693	Green	No	
005	0960_OTH106	HDPE (no PTFE)	20 mL	00350019025593	Grey	No	
005	0960_OTH106	HDPE (no PTFE)	20 mL	00350019025513	Grey	No	
006	0960_MW141_3.5	Amber TOC Vial - Sulfuric Acid	40 mL	00181019011713	Purple	No	
006	0960_MW141_3.5	Clear Plastic Bottle - Natural	250 mL	00070519142787	Green	No	
006	0960_MW141_3.5	HDPE (no PTFE)	20 mL	00350019025625	Grey	No	
006	0960_MW141_3.5	HDPE (no PTFE)	20 mL	00350019025693	Grey	No	
007	0960_MW140_4.5	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019011624	Purple	No	
007	0960_MW140_4.5	Clear Plastic Bottle - Natural	250 mL	00070519143682	Green	No	



CHAIN OF CUSTODY

ALS COC#: 16250

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: SPM DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

007	0960_MW140_4.5	HDPE (no PTFE)	20 mL	00350019025485	Grey	No	
007	0960_MW140_4.5	HDPE (no PTFE)	20 mL	00350019025472	Grey	No	
008	0960_MW181_2.5	Amber TOC Vial - Sulfuric Acid	40 mL	00181019011702	Purple	No	
008	0960_MW181_2.5	Clear Plastic Bottle - Natural	250 mL	00070519142851	Green	No	
008	0960_MW181_2.5	HDPE (no PTFE)	20 mL	00350019025533	Grey	No	
008	0960_MW181_2.5	HDPE (no PTFE)	20 mL	00350019031400	Grey	No	
009	0960_MW147_5.5	Clear Plastic Bottle - Natural	250 mL	00070519144015	Green	No	
009	0960_MW147_5.5	HDPE (no PTFE)	20 mL	00350019025602	Grey	No	
009	0960_MW147_5.5	HDPE (no PTFE)	20 mL	00350019025473	Grey	No	
009	0960_MW147_5.5	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019011710	Purple	No	
010	0960_QC402	HDPE (no PTFE)	20 mL	00350019154330	Grey	No	
010	0960_QC402	HDPE (no PTFE)	20 mL	00350019154453	Grey	No	
011	0960_QC303	HDPE (no PTFE)	20 mL	00350019154226	Grey	No	
011	0960_QC303	HDPE (no PTFE)	20 mL	00350019154477	Grey	No	

Total Bottle Count: ALS: 40, Non ALS: 0

**SAMPLE RECEIPT NOTIFICATION (SRN)****Work Order : EP2012957**

Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: maelle.bourdais@cardno.com.au	E-mail	: nick.courts@alsglobal.com
Telephone	: ----	Telephone	: +61-8-9406 1301
Facsimile	: ----	Facsimile	: +61-8-9406 1399
Project	: WA_0960_PFASOMP	Page	: 1 of 3
Order number	: DEF19009/0960	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 16250	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/Learmonth		
Sampler	: MAELLE BOURDAIS, Sarah McCulloch		

Dates

Date Samples Received	: 25-Nov-2020 11:00	Issue Date	: 26-Nov-2020
Client Requested Due Date	: 04-Dec-2020	Scheduled Reporting Date	: 04-Dec-2020

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 4	Temperature	: 23.2 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 14 / 14

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepancies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.



Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Any sample identifications that cannot be displayed entirely in the analysis summary table will be listed below.

EP2012957-006 : 20-Nov-2020 14:04 : 0960_MW141_3.5_201120
EP2012957-007 : 20-Nov-2020 14:35 : 0960_MW140_4.5_201120
EP2012957-008 : 20-Nov-2020 14:52 : 0960_MW181_2.5_201120
EP2012957-009 : 20-Nov-2020 15:09 : 0960_MW147_5.5_201120

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2012957-001	20-Nov-2020 10:01	0960_MW134_201120	✓	✓	✓	✓	✓	✓	✓
EP2012957-002	20-Nov-2020 10:16	0960_MW103_201120	✓	✓	✓	✓	✓	✓	✓
EP2012957-003	20-Nov-2020 10:55	0960_MW159_201120	✓	✓	✓	✓	✓	✓	✓
EP2012957-004	20-Nov-2020 13:20	0960_OTH107_201120	✓	✓	✓	✓	✓	✓	✓
EP2012957-005	20-Nov-2020 13:33	0960_OTH106_201120	✓	✓	✓	✓	✓	✓	✓
EP2012957-006	20-Nov-2020 14:04	0960_MW141_3.5_201120	✓	✓	✓	✓	✓	✓	✓
EP2012957-007	20-Nov-2020 14:35	0960_MW140_4.5_201120	✓	✓	✓	✓	✓	✓	✓
EP2012957-008	20-Nov-2020 14:52	0960_MW181_2.5_201120	✓	✓	✓	✓	✓	✓	✓
EP2012957-009	20-Nov-2020 15:09	0960_MW147_5.5_201120	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP005 Total Organic Carbon (TOC)	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2012957-001	20-Nov-2020 10:01	0960_MW134_201120		✓
EP2012957-002	20-Nov-2020 10:16	0960_MW103_201120		✓
EP2012957-003	20-Nov-2020 10:55	0960_MW159_201120		✓
EP2012957-004	20-Nov-2020 13:20	0960_OTH107_201120		✓
EP2012957-005	20-Nov-2020 13:33	0960_OTH106_201120		✓
EP2012957-006	20-Nov-2020 14:04	0960_MW141_3.5_201120	✓	✓
EP2012957-007	20-Nov-2020 14:35	0960_MW140_4.5_201120		✓
EP2012957-008	20-Nov-2020 14:52	0960_MW181_2.5_201120	✓	✓
EP2012957-009	20-Nov-2020 15:09	0960_MW147_5.5_201120		✓
EP2012957-010	20-Nov-2020 15:59	0960_QC402_201120		✓

[illegible]

CERTIFICATE OF ANALYSIS

Work Order : **EP2012957**
Client : **CARDNO (WA) PTY LTD**
Contact : **MAELLE BOURDAIS**
Address : **11 HARVEST TERRACE PO BOX 155**
WEST PERTH WA, AUSTRALIA 6006
Telephone : **----**
Project : **WA_0960_PFASOMP**
Order number : **DEF19009/0960**
C-O-C number : **16250**
Sampler : **MAELLE BOURDAIS, Sarah McCulloch**
Site : **DEF19009/Learmonth**
Quote number : **SY/139/19**
No. of samples received : **14**
No. of samples analysed : **14**

Page : 1 of 11
Laboratory : Environmental Division Perth
Contact : Nick Courts
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 25-Nov-2020 11:00
Date Analysis Commenced : 26-Nov-2020
Issue Date : 07-Dec-2020 09:35



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW134_201120	0960_MW103_201120	0960_MW159_201120	0960_OTH107_201120 0	0960_OTH106_201120 0
Sampling date / time				20-Nov-2020 10:01	20-Nov-2020 10:16	20-Nov-2020 10:55	20-Nov-2020 13:20	20-Nov-2020 13:33
Compound	CAS Number	LOR	Unit	EP2012957-001	EP2012957-002	EP2012957-003	EP2012957-004	EP2012957-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.66	7.44	7.62	7.89	8.12
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	35800	46300	17100	37500	37900
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	2640	3370	7490	104	217
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	179	168	457	113	113
Total Alkalinity as CaCO3	----	1	mg/L	179	168	457	113	113
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2990	2480	1200	2770	2880
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	19600	26500	9920	20700	21700
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	563	1270	397	471	490
Magnesium	7439-95-4	1	mg/L	1360	1960	551	1550	1600
Sodium	7440-23-5	1	mg/L	11800	13800	5200	11700	12100
Potassium	7440-09-7	1	mg/L	574	585	265	549	566
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	619	802	314	644	674
∅ Total Cations	----	0.01	meq/L	668	840	298	674	697
∅ Ionic Balance	----	0.01	%	3.83	2.28	2.58	2.29	1.65
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	2	3	5	<1	2
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.17	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.06	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.37	<0.02	<0.02	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW134_201120	0960_MW103_201120	0960_MW159_201120	0960_OTH107_201120 0	0960_OTH106_201120 0
Sampling date / time				20-Nov-2020 10:01	20-Nov-2020 10:16	20-Nov-2020 10:55	20-Nov-2020 13:20	20-Nov-2020 13:33
Compound	CAS Number	LOR	Unit	EP2012957-001	EP2012957-002	EP2012957-003	EP2012957-004	EP2012957-005
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.02	0.03	0.02	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW134_201120	0960_MW103_201120	0960_MW159_201120	0960_OTH107_201120 0	0960_OTH106_201120 0
Sampling date / time				20-Nov-2020 10:01	20-Nov-2020 10:16	20-Nov-2020 10:55	20-Nov-2020 13:20	20-Nov-2020 13:33
Compound	CAS Number	LOR	Unit	EP2012957-001	EP2012957-002	EP2012957-003	EP2012957-004	EP2012957-005
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	0.02	0.63	0.02	<0.01	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	0.02	0.40	0.02	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L	0.02	0.57	0.02	<0.01	<0.01
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	98.6	97.1	105	102	104
13C8-PFOA	----	0.02	%	100	98.2	106	98.5	102



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW141_3.5_20 1120	0960_MW140_4.5_20 1120	0960_MW181_2.5_20 1120	0960_MW147_5.5_20 1120	----
Sampling date / time				20-Nov-2020 14:04	20-Nov-2020 14:35	20-Nov-2020 14:52	20-Nov-2020 15:09	----
Compound	CAS Number	LOR	Unit	EP2012957-006	EP2012957-007	EP2012957-008	EP2012957-009	-----
				Result	Result	Result	Result	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.68	7.44	7.42	7.46	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	22100	73200	77200	73800	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	16000	252	24800	4080	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	<1	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L	306	210	206	124	----
Total Alkalinity as CaCO ₃	----	1	mg/L	306	210	206	124	----
ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA								
Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L	1760	4930	6100	5830	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	12600	42600	44800	43500	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	413	977	1340	1120	----
Magnesium	7439-95-4	1	mg/L	950	3180	3480	3170	----
Sodium	7440-23-5	1	mg/L	6900	26200	27600	25500	----
Potassium	7440-09-7	1	mg/L	401	1170	1240	1180	----
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	398	1310	1390	1350	----
∅ Total Cations	----	0.01	meq/L	409	1480	1580	1460	----
∅ Ionic Balance	----	0.01	%	1.36	6.15	6.40	3.75	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	----	3	----	4	----
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	7	----	8	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW141_3.5_20 1120	0960_MW140_4.5_20 1120	0960_MW181_2.5_20 1120	0960_MW147_5.5_20 1120	----
Sampling date / time				20-Nov-2020 14:04	20-Nov-2020 14:35	20-Nov-2020 14:52	20-Nov-2020 15:09	----
Compound	CAS Number	LOR	Unit	EP2012957-006	EP2012957-007	EP2012957-008	EP2012957-009	-----
				Result	Result	Result	Result	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW141_3.5_20 1120	0960_MW140_4.5_20 1120	0960_MW181_2.5_20 1120	0960_MW147_5.5_20 1120	----
Sampling date / time				20-Nov-2020 14:04	20-Nov-2020 14:35	20-Nov-2020 14:52	20-Nov-2020 15:09	----
Compound	CAS Number	LOR	Unit	EP2012957-006	EP2012957-007	EP2012957-008	EP2012957-009	-----
				Result	Result	Result	Result	----
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	104	94.1	93.6	106	----
13C8-PFOA	----	0.02	%	102	96.5	96.2	97.8	----



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	0960_QC402_201120	0960_QC303_201120	0960_QC301_201120	0960_QC302_201120	0960_QC401_201120
Sampling date / time				20-Nov-2020 15:59	20-Nov-2020 16:00	20-Nov-2020 00:00	20-Nov-2020 00:00	20-Nov-2020 00:00	
Compound	CAS Number	LOR	Unit	EP2012957-010	EP2012957-011	EP2012957-012	EP2012957-013	EP2012957-014	
				Result	Result	Result	Result	Result	
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1	
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	0960_QC402_201120	0960_QC303_201120	0960_QC301_201120	0960_QC302_201120	0960_QC401_201120
Sampling date / time					20-Nov-2020 15:59	20-Nov-2020 16:00	20-Nov-2020 00:00	20-Nov-2020 00:00	20-Nov-2020 00:00
Compound	CAS Number	LOR	Unit		EP2012957-010	EP2012957-011	EP2012957-012	EP2012957-013	EP2012957-014
				Result	Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%	108	112	91.5	104	103	
13C8-PFOA	----	0.02	%	111	112	107	105	110	



Surrogate Control Limits

Sub-Matrix: GROUNDWATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

QUALITY CONTROL REPORT

Work Order	: EP2012957	Page	: 1 of 11
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 25-Nov-2020
Order number	: DEF19009/0960	Date Analysis Commenced	: 26-Nov-2020
C-O-C number	: 16250	Issue Date	: 07-Dec-2020
Sampler	: MAELLE BOURDAIS, Sarah McCulloch		
Site	: DEF19009/Learmonth		
Quote number	: SY/139/19		
No. of samples received	: 14		
No. of samples analysed	: 14		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
= Indicates failed QC

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: WATER					Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA005P: pH by PC Titrator (QC Lot: 3396938)									
EP2012947-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.03	8.04	0.124	0% - 20%
EP2013106-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.86	7.86	0.00	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3387902)									
EP2012942-005	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	36400	38300	5.00	0% - 20%
EP2012956-002	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	39500	39400	0.253	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3387903)									
EP2012942-005	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	7	9	31.2	No Limit
EP2012957-002	0960_MW103_201120	EA025H: Suspended Solids (SS)	----	5	mg/L	3370	3240	3.81	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3396937)									
EP2012947-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	171	173	0.756	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	171	173	0.756	0% - 20%
EP2013106-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	587	585	0.418	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	587	585	0.418	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3384263)									
EP2012946-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2890	2880	0.281	0% - 20%
EP2012957-002	0960_MW103_201120	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2480	2410	2.68	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3384264)									
EP2012946-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	24000	23900	0.790	0% - 20%
EP2012957-002	0960_MW103_201120	ED045G: Chloride	16887-00-6	1	mg/L	26500	25200	4.74	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3385615)									



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
ED093F: Dissolved Major Cations (QC Lot: 3385615) - continued									
EP2012947-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	1100	1170	6.08	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	2890	3070	6.09	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	21500	22800	5.87	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	1250	1340	6.96	0% - 20%
EP2012957-006	0960_MW141_3.5_201120	ED093F: Calcium	7440-70-2	1	mg/L	413	404	2.14	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	950	937	1.31	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	6900	6800	1.43	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	401	394	1.77	0% - 20%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3400520)									
EP2012956-001	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	2	2	0.00	No Limit
EP2013115-001	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	3	3	0.00	No Limit
EP005: Total Organic Carbon (TOC) (QC Lot: 3400473)									
EP2012943-001	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	4	4	0.00	No Limit
EP2013162-002	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	2	1	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3388771)									
ES2041944-001	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
ES2041944-003	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3388771)									
ES2041944-001	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3388771) - continued									
ES2041944-003	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit		
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3388771)									
ES2041944-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
ES2041944-003	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3388771)									
ES2041944-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit

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 Work Order : EP2012957
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3388771) - continued									
ES2041944-001	Anonymous	EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
ES2041944-003	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231P: PFAS Sums (QC Lot: 3388771)									
ES2041944-001	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.00	No Limit
ES2041944-003	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.00	No Limit



Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result		LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 3396938)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3387902)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	99.6	88.1	114
				<10	1000 mg/L	102	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3387903)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	112	89.1	120
				<5	1000 mg/L	104	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3396937)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	103	81.2	126
				<1	200 mg/L	97.7	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3384263)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	102	87.7	113
				<1	500 mg/L	103	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3384264)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	105	87.9	114
				<1	1000 mg/L	104	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3385615)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	99.3	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	102	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	98.1	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	95.2	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3400520)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	90.9	73.2	116
				<1	100 mg/L	95.4	73.2	116
EP005: Total Organic Carbon (TOC) (QCLot: 3400473)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	100	87.2	116
				<1	100 mg/L	96.7	87.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3388769)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	101	72.0	130



Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3388769) - continued								
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	95.6	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	90.0	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	92.6	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	111	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	124	53.0	142
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3388771)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	95.0	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	87.6	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	87.6	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	89.2	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	116	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	116	53.0	142
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3389506)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	81.4	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	102	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	101	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	120	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	102	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	123	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3388769)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	94.3	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	119	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	81.6	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	98.2	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	116	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	120	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	118	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	118	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	107	72.0	134
EP231X: Perfluorotridecanoic acid (PFTriDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	97.6	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	74.8	71.0	132
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3388771)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	95.7	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	117	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	90.2	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	106	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	106	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	121	69.0	130



Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result			Low	High
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3388771) - continued								
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	92.6	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	125	69.0	133
EP231X: Perfluorododecanoic acid (PFDODA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	112	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	105	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	93.0	71.0	132
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3389506)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	86.8	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	96.2	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	114	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	110	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	99.2	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	104	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	100	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	112	69.0	133
EP231X: Perfluorododecanoic acid (PFDODA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	115	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	124	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	98.3	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3388769)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	67.4	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	76.0	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	77.4	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	82.3	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	86.6	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	101	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	102	61.0	135
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3388771)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	79.4	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	107	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	112	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	96.2	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	96.1	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	113	65.0	136

Sub-Matrix: WATER

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3388771) - continued								
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	115	61.0	135
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3389506)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	98.2	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	85.8	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	97.0	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	120	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	121	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	97.6	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	112	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3388769)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	107	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	83.6	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	72.8	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	74.4	71.4	144
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3388771)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	102	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	95.4	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	129	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	134	71.4	144
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3389506)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	87.4	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	103	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	123	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	128	71.4	144

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3384263)							



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3384263) - continued							
EP2012946-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3384264)							
EP2012946-001	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	# Not Determined	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3400520)							
EP2012956-002	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	94.3	70.0	130
EP005: Total Organic Carbon (TOC) (QCLot: 3400473)							
EP2012943-004	Anonymous	EP005: Total Organic Carbon	----	100 mg/L	93.9	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3388771)							
ES2041944-002	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	99.4	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	91.6	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	99.2	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	97.2	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	103	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	110	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3388771)							
ES2041944-002	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	89.4	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	110	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	97.2	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	103	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	96.0	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	112	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	80.8	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	104	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	101	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	103	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	130	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3388771)							
ES2041944-002	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	88.6	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	99.2	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	113	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	84.1	66.0	145
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	105	57.6	145

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 Work Order : EP2012957
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3388771) - continued							
ES2041944-002	Anonymous	EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	104	65.0	136
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	109	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3388771)							
ES2041944-002	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	89.8	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	87.4	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	80.8	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	81.6	71.4	144

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2012957	Page	: 1 of 9
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 25-Nov-2020
Site	: DEF19009/Learmonth	Issue Date	: 07-Dec-2020
Sampler	: MAELLE BOURDAIS, Sarah McCulloch	No. of samples received	: 14
Order number	: DEF19009/0960	No. of samples analysed	: 14

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- Matrix Spike outliers exist - please see following pages for full details.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- Quality Control Sample Frequency Outliers exist - please see following pages for full details.



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA	EP2012946--001	Anonymous	Sulfate as SO4 - Turbidimetric	14808-79-8	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
ED045G: Chloride by Discrete Analyser	EP2012946--001	Anonymous	Chloride	16887-00-6	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method		<i>Extraction / Preparation</i>			<i>Analysis</i>		
Container / Client Sample ID(s)		<i>Date extracted</i>	<i>Due for extraction</i>	<i>Days overdue</i>	<i>Date analysed</i>	<i>Due for analysis</i>	<i>Days overdue</i>
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural							
0960_MW134_201120,	0960_MW103_201120,	----	----	----	02-Dec-2020	20-Nov-2020	12
0960_MW159_201120,	0960_OTH107_201120,						
0960_OTH106_201120,	0960_MW141_3.5_201120,						
0960_MW140_4.5_201120,	0960_MW181_2.5_201120,						
0960_MW147_5.5_201120							

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	2	37	5.41	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	1	37	2.70	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for **VOC in soils** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural (EA005-P) 0960_MW134_201120, 0960_MW159_201120, 0960_OTH106_201120, 0960_MW140_4.5_201120, 0960_MW147_5.5_201120	0960_MW103_201120, 0960_OTH107_201120, 0960_MW141_3.5_201120, 0960_MW181_2.5_201120,	20-Nov-2020	----	----	----	02-Dec-2020 20-Nov-2020	✖
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H) 0960_MW134_201120, 0960_MW159_201120, 0960_OTH106_201120, 0960_MW140_4.5_201120, 0960_MW147_5.5_201120	0960_MW103_201120, 0960_OTH107_201120, 0960_MW141_3.5_201120, 0960_MW181_2.5_201120,	20-Nov-2020	----	----	----	27-Nov-2020 27-Nov-2020	✔
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H) 0960_MW134_201120, 0960_MW159_201120, 0960_OTH106_201120, 0960_MW140_4.5_201120, 0960_MW147_5.5_201120	0960_MW103_201120, 0960_OTH107_201120, 0960_MW141_3.5_201120, 0960_MW181_2.5_201120,	20-Nov-2020	----	----	----	27-Nov-2020 27-Nov-2020	✔
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P) 0960_MW134_201120, 0960_MW159_201120, 0960_OTH106_201120, 0960_MW140_4.5_201120, 0960_MW147_5.5_201120	0960_MW103_201120, 0960_OTH107_201120, 0960_MW141_3.5_201120, 0960_MW181_2.5_201120,	20-Nov-2020	----	----	----	02-Dec-2020 04-Dec-2020	✔
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G) 0960_MW134_201120, 0960_MW159_201120, 0960_OTH106_201120, 0960_MW140_4.5_201120, 0960_MW147_5.5_201120	0960_MW103_201120, 0960_OTH107_201120, 0960_MW141_3.5_201120, 0960_MW181_2.5_201120,	20-Nov-2020	----	----	----	03-Dec-2020 18-Dec-2020	✔
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G) 0960_MW134_201120, 0960_MW159_201120, 0960_OTH106_201120, 0960_MW140_4.5_201120, 0960_MW147_5.5_201120	0960_MW103_201120, 0960_OTH107_201120, 0960_MW141_3.5_201120, 0960_MW181_2.5_201120,	20-Nov-2020	----	----	----	03-Dec-2020 18-Dec-2020	✔



Matrix: **WATER**

Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F) 0960_MW134_201120, 0960_MW159_201120, 0960_OTH106_201120, 0960_MW140_4.5_201120, 0960_MW147_5.5_201120	0960_MW103_201120, 0960_OTH107_201120, 0960_MW141_3.5_201120, 0960_MW181_2.5_201120,	20-Nov-2020	----	----	----	26-Nov-2020	27-Nov-2020	✓
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002) 0960_MW134_201120, 0960_MW159_201120, 0960_OTH106_201120, 0960_MW147_5.5_201120	0960_MW103_201120, 0960_OTH107_201120, 0960_MW140_4.5_201120,	20-Nov-2020	----	----	----	03-Dec-2020	18-Dec-2020	✓
EP005: Total Organic Carbon (TOC)								
Amber TOC Vial - Sulfuric Acid (EP005) 0960_MW141_3.5_201120,	0960_MW181_2.5_201120	20-Nov-2020	----	----	----	03-Dec-2020	18-Dec-2020	✓
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X) 0960_QC301_201120, 0960_QC401_201120	0960_QC302_201120,	20-Nov-2020	01-Dec-2020	19-May-2021	✓	01-Dec-2020	19-May-2021	✓
HDPE (no PTFE) (EP231X) 0960_MW134_201120, 0960_MW159_201120, 0960_OTH106_201120, 0960_MW140_4.5_201120, 0960_MW147_5.5_201120, 0960_QC303_201120	0960_MW103_201120, 0960_OTH107_201120, 0960_MW141_3.5_201120, 0960_MW181_2.5_201120, 0960_QC402_201120,	20-Nov-2020	30-Nov-2020	19-May-2021	✓	30-Nov-2020	19-May-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X) 0960_QC301_201120, 0960_QC401_201120	0960_QC302_201120,	20-Nov-2020	01-Dec-2020	19-May-2021	✓	01-Dec-2020	19-May-2021	✓
HDPE (no PTFE) (EP231X) 0960_MW134_201120, 0960_MW159_201120, 0960_OTH106_201120, 0960_MW140_4.5_201120, 0960_MW147_5.5_201120, 0960_QC303_201120	0960_MW103_201120, 0960_OTH107_201120, 0960_MW141_3.5_201120, 0960_MW181_2.5_201120, 0960_QC402_201120,	20-Nov-2020	30-Nov-2020	19-May-2021	✓	30-Nov-2020	19-May-2021	✓



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X) 0960_QC301_201120, 0960_QC401_201120	0960_QC302_201120,	20-Nov-2020	01-Dec-2020	19-May-2021	✔	01-Dec-2020	19-May-2021	✔
HDPE (no PTFE) (EP231X) 0960_MW134_201120, 0960_MW159_201120, 0960_OTH106_201120, 0960_MW140_4.5_201120, 0960_MW147_5.5_201120, 0960_QC303_201120	0960_MW103_201120, 0960_OTH107_201120, 0960_MW141_3.5_201120, 0960_MW181_2.5_201120, 0960_QC402_201120,	20-Nov-2020	30-Nov-2020	19-May-2021	✔	30-Nov-2020	19-May-2021	✔
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X) 0960_QC301_201120, 0960_QC401_201120	0960_QC302_201120,	20-Nov-2020	01-Dec-2020	19-May-2021	✔	01-Dec-2020	19-May-2021	✔
HDPE (no PTFE) (EP231X) 0960_MW134_201120, 0960_MW159_201120, 0960_OTH106_201120, 0960_MW140_4.5_201120, 0960_MW147_5.5_201120, 0960_QC303_201120	0960_MW103_201120, 0960_OTH107_201120, 0960_MW141_3.5_201120, 0960_MW181_2.5_201120, 0960_QC402_201120,	20-Nov-2020	30-Nov-2020	19-May-2021	✔	30-Nov-2020	19-May-2021	✔
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X) 0960_QC301_201120, 0960_QC401_201120	0960_QC302_201120,	20-Nov-2020	01-Dec-2020	19-May-2021	✔	01-Dec-2020	19-May-2021	✔
HDPE (no PTFE) (EP231X) 0960_MW134_201120, 0960_MW159_201120, 0960_OTH106_201120, 0960_MW140_4.5_201120, 0960_MW147_5.5_201120, 0960_QC303_201120	0960_MW103_201120, 0960_OTH107_201120, 0960_MW141_3.5_201120, 0960_MW181_2.5_201120, 0960_QC402_201120,	20-Nov-2020	30-Nov-2020	19-May-2021	✔	30-Nov-2020	19-May-2021	✔



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	37	5.41	10.00	✗	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	18	11.11	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	3	37	8.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	18	11.11	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	3	37	8.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	18	5.56	5.26	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	37	2.70	5.00	✗	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Matrix Spikes (MS) - Continued							
Total Organic Carbon	EP005	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of 'filterable' residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high temperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.
Total Organic Carbon	EP005	WATER	In house: Referenced to APHA 5310 B, The automated TOC analyzer determines Total and Inorganic Carbon by IR cell. TOC is calculated as the difference. This method is compliant with NEPM Schedule B(3)



Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.



CHAIN OF CUSTODY

COC#: 16265

ALS Laboratory: EP Perth

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

25/11 1500

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFASOMP

SITE: SPM DEF19009/Learmonth SW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Surface Waters Primary WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0960_SW205		20/11/2020 12:17 PM	Water	ALS: 4 Non ALS: 0	No	X		

Environmental Division
Perth

Work Order Reference

EP2013114



Telephone : + 61-8-9406 1301

**CHAIN OF CUSTODY**

COC#: 16265

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: SPM DEF19009/Learmonth SW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0960_SW205	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019011688	Purple	No	
001	0960_SW205	Clear Plastic Bottle - Natural	250 mL	00070519143692	Green	No	
001	0960_SW205	HDPE (no PTFE)	20 mL	00350019025526	Grey	No	
001	0960_SW205	HDPE (no PTFE)	20 mL	00350019025630	Grey	No	

Total Bottle Count: ALS: 4, Non ALS: 0

**SAMPLE RECEIPT NOTIFICATION (SRN)****Work Order : EP2013114**

Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: maelle.bourdais@cardno.com.au	E-mail	: nick.courts@alsglobal.com
Telephone	: ----	Telephone	: +61-8-9406 1301
Facsimile	: ----	Facsimile	: +61-8-9406 1399
Project	: WA_0960_PFASOMP	Page	: 1 of 3
Order number	: DEF19009/0960	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 16265	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/Learmonth		
Sampler	: MAELLE BOURDAIS, Sarah McCulloch		

Dates

Date Samples Received	: 25-Nov-2020 15:00	Issue Date	: 25-Nov-2020
Client Requested Due Date	: 04-Dec-2020	Scheduled Reporting Date	: 04-Dec-2020

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 1	Temperature	: 23.2 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 1 / 1

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepancies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.



Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2013114-001	20-Nov-2020 12:17	0960_SW205_201120	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2013114-001	20-Nov-2020 12:17	0960_SW205_201120	✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **WATER**

Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method	Container	Due for extraction	Due for analysis	Samples Received		Instructions Received	
Client Sample ID(s)				Date	Evaluation	Date	Evaluation
EA005-P: pH by PC Titrator							
0960_SW205_201120	Clear Plastic Bottle - Natural	----	20-Nov-2020	25-Nov-2020	✗	----	----

ACCOUNTS PAYABLE (WA)

Email claire.armstrong@cardno.com.au

Email david.james@cardno.com.au

- [illegible]

Email derp.labreports@esdat.com.au

Email derp.labreports@esdat.com.au

Email maelle.bourdais@cardno.com.au

- [illegible]

CERTIFICATE OF ANALYSIS

Work Order : **EP2013114**
Client : **CARDNO (WA) PTY LTD**
Contact : **MAELLE BOURDAIS**
Address : **11 HARVEST TERRACE PO BOX 155**
WEST PERTH WA, AUSTRALIA 6006
Telephone : **----**
Project : **WA_0960_PFASOMP**
Order number : **DEF19009/0960**
C-O-C number : **16265**
Sampler : **MAELLE BOURDAIS, Sarah McCulloch**
Site : **DEF19009/Learmonth**
Quote number : **SY/139/19**
No. of samples received : **1**
No. of samples analysed : **1**

Page : 1 of 6
Laboratory : Environmental Division Perth
Contact : Nick Courts
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 25-Nov-2020 15:00
Date Analysis Commenced : 26-Nov-2020
Issue Date : 04-Dec-2020 17:33



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)			Sample ID	0960_SW205_201120	----	----	----	----
Sampling date / time				20-Nov-2020 12:17	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2013114-001	-----	-----	-----	-----
Result				----	----	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	8.16	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	61000	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	566	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	190	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	190	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	5130	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	31200	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	919	----	----	----	----
Magnesium	7439-95-4	1	mg/L	2620	----	----	----	----
Sodium	7440-23-5	1	mg/L	20500	----	----	----	----
Potassium	7440-09-7	1	mg/L	1230	----	----	----	----
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	991	----	----	----	----
∅ Total Cations	----	0.01	meq/L	1180	----	----	----	----
∅ Ionic Balance	----	0.01	%	8.91	----	----	----	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	6	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	----	----	----	----



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

0960_SW205_201120

Sampling date / time

20-Nov-2020 12:17

Compound

CAS Number

LOR

Unit

EP2013114-001

Result

EP231A: Perfluoroalkyl Sulfonic Acids - Continued

Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	----	----	----	----

EP231B: Perfluoroalkyl Carboxylic Acids

Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	----	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	----	----	----	----
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	----	----	----	----

EP231C: Perfluoroalkyl Sulfonamides

Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	----	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	----	----	----	----



Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0960_SW205_201120	----	----	----	----
				Sampling date / time	20-Nov-2020 12:17	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2013114-001	-----	-----	-----	-----
				Result		----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	----	----	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	----	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	----	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	----	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		85.0	----	----	----	----
13C8-PFOA	----	0.02	%		101	----	----	----	----



Surrogate Control Limits

Sub-Matrix: GROUNDWATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

QUALITY CONTROL REPORT

Work Order	: EP2013114	Page	: 1 of 6
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 25-Nov-2020
Order number	: DEF19009/0960	Date Analysis Commenced	: 26-Nov-2020
C-O-C number	: 16265	Issue Date	: 04-Dec-2020
Sampler	: MAELLE BOURDAIS, Sarah McCulloch		
Site	: DEF19009/Learmonth		
Quote number	: SY/139/19		
No. of samples received	: 1		
No. of samples analysed	: 1		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key :
 Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
 CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
 LOR = Limit of reporting
 RPD = Relative Percentage Difference
 # = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA005P: pH by PC Titrator (QC Lot: 3394152)									
EP2012897-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.06	8.11	0.618	0% - 20%
EP2012917-010	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.64	7.64	0.00	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3388017)									
EP2013053-012	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	2270	2260	0.531	0% - 20%
EP2013053-020	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	7080	6990	1.25	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3388018)									
EP2013114-001	0960_SW205_201120	EA025H: Suspended Solids (SS)	----	5	mg/L	566	557	1.56	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3394151)									
EP2012897-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	114	109	4.66	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	114	109	4.66	0% - 20%
EP2012917-010	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	145	146	0.836	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	145	146	0.836	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3384202)									
EP2013114-001	0960_SW205_201120	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	5130	4720	8.25	0% - 20%
EP2013115-002	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	5160	5170	0.218	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3384203)									
EP2013114-001	0960_SW205_201120	ED045G: Chloride	16887-00-6	1	mg/L	31200	29800	4.84	0% - 20%
EP2013115-002	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	34600	34500	0.260	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3385615)									
EP2012947-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	1100	1170	6.08	0% - 20%

Page : 3 of 6
 Work Order : EP2013114
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
ED093F: Dissolved Major Cations (QC Lot: 3385615) - continued									
EP2012947-001	Anonymous	ED093F: Magnesium	7439-95-4	1	mg/L	2890	3070	6.09	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	21500	22800	5.87	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	1250	1340	6.96	0% - 20%
EP2012957-006	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	413	404	2.14	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	950	937	1.31	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	6900	6800	1.43	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	401	394	1.77	0% - 20%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3400520)									
EP2012956-001	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	2	2	0.00	No Limit
EP2013115-001	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	3	3	0.00	No Limit



Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EA005P: pH by PC Titrator (QCLot: 3394152)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3388017)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	101	88.1	114
				<10	1000 mg/L	101	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3388018)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	112	89.1	120
				<5	1000 mg/L	102	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3394151)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	103	81.2	126
				<1	200 mg/L	99.6	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3384202)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	92.6	87.7	113
				<1	500 mg/L	104	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3384203)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	99.4	87.9	114
				<1	1000 mg/L	101	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3385615)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	99.3	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	102	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	98.1	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	95.2	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3400520)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	90.9	73.2	116
				<1	100 mg/L	95.4	73.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3392922)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	79.6	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	86.4	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	94.8	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	104	69.0	134



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3392922) - continued								
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	79.2	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	112	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3392922)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	84.8	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	80.4	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	95.8	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	91.4	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	87.8	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	84.4	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	98.6	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	84.2	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	104	72.0	134
EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	94.4	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	80.6	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3392922)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	105	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	72.0	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	107	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	81.6	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	80.5	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	117	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	107	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3392922)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	81.0	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	118	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	70.8	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	99.2	71.4	144

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High

Page : 6 of 6
 Work Order : EP2013114
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3384202)							
EP2013115-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3384203)							
EP2013115-001	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	# Not Determined	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3400520)							
EP2012956-002	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	94.3	70.0	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2013114	Page	: 1 of 6
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 25-Nov-2020
Site	: DEF19009/Learmonth	Issue Date	: 04-Dec-2020
Sampler	: MAELLE BOURDAIS, Sarah McCulloch	No. of samples received	: 1
Order number	: DEF19009/0960	No. of samples analysed	: 1

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- Matrix Spike outliers exist - please see following pages for full details.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- Quality Control Sample Frequency Outliers exist - please see following pages for full details.

Page : 2 of 6
 Work Order : EP2013114
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA	EP2013115--001	Anonymous	Sulfate as SO4 - Turbidimetric	14808-79-8	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
ED045G: Chloride by Discrete Analyser	EP2013115--001	Anonymous	Chloride	16887-00-6	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator						
Clear Plastic Bottle - Natural 0960_SW205_201120	----	----	----	01-Dec-2020	20-Nov-2020	11

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type Method	Count		Rate (%)		Quality Control Specification
	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	12	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	0	12	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for **VOC in soils** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural (EA005-P) 0960_SW205_201120	20-Nov-2020	----	----	----	01-Dec-2020	20-Nov-2020	✖

Page : 3 of 6
 Work Order : EP2013114
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PPFASOMP



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H) 0960_SW205_201120	20-Nov-2020	----	----	----	27-Nov-2020	27-Nov-2020	✓
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H) 0960_SW205_201120	20-Nov-2020	----	----	----	27-Nov-2020	27-Nov-2020	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P) 0960_SW205_201120	20-Nov-2020	----	----	----	01-Dec-2020	04-Dec-2020	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G) 0960_SW205_201120	20-Nov-2020	----	----	----	03-Dec-2020	18-Dec-2020	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G) 0960_SW205_201120	20-Nov-2020	----	----	----	03-Dec-2020	18-Dec-2020	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Natural (ED093F) 0960_SW205_201120	20-Nov-2020	----	----	----	26-Nov-2020	27-Nov-2020	✓
EP002: Dissolved Organic Carbon (DOC)							
Amber DOC Filtered- Sulfuric Preserved (EP002) 0960_SW205_201120	20-Nov-2020	----	----	----	03-Dec-2020	18-Dec-2020	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X) 0960_SW205_201120	20-Nov-2020	01-Dec-2020	19-May-2021	✓	01-Dec-2020	19-May-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X) 0960_SW205_201120	20-Nov-2020	01-Dec-2020	19-May-2021	✓	01-Dec-2020	19-May-2021	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X) 0960_SW205_201120	20-Nov-2020	01-Dec-2020	19-May-2021	✓	01-Dec-2020	19-May-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X) 0960_SW205_201120	20-Nov-2020	01-Dec-2020	19-May-2021	✓	01-Dec-2020	19-May-2021	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X) 0960_SW205_201120	20-Nov-2020	01-Dec-2020	19-May-2021	✓	01-Dec-2020	19-May-2021	✓



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	12	0.00	10.00	✗	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	4	25.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	19	10.53	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	12	8.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	4	50.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	19	10.53	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	12	8.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	4	25.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	19	5.26	5.26	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	0	12	0.00	5.00	✗	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of 'filterable' residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C. This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high temperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.



<i>Analytical Methods</i>	<i>Method</i>	<i>Matrix</i>	<i>Method Descriptions</i>
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	<p>In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation.</p> <p>Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.</p>
<i>Preparation Methods</i>	<i>Method</i>	<i>Matrix</i>	<i>Method Descriptions</i>
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	<p>In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.</p>

**CHAIN OF CUSTODY**

COC#: 16276

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: SPM DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH:

SAMPLER MOBILE:

QUOTE NO: SY/139/19

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

°C

Other comments:

SAMPLE DETAILS**ANALYSIS REQUIRED**

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	Rinsate WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0960_MW146_5.0		21/11/2020 09:16 AM	Water	ALS: 4 Non ALS: 0	No	X			
002	0960_MW180_4.0		21/11/2020 09:41 AM	Water	ALS: 4 Non ALS: 0	No	X			
003	0960_QC402		21/11/2020 10:24 AM	Water	ALS: 2 Non ALS: 0	No		X		
004	0960_QC403		21/11/2020 10:25 AM	Water	ALS: 2 Non ALS: 0	No	X	X		
005	0960_QC303		21/11/2020 10:26 AM	Water	ALS: 2 Non ALS: 0	No		X		

Environmental Division
Perth

Work Order Reference

EP2013115

Telephone : + 61-8-9406 1301

**CHAIN OF CUSTODY**

COC#: 16276

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: SPM DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: david.james@cardno.com.au, maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0960_MW146_5.0	Clear Plastic Bottle - Natural	250 mL	00070519143681	Green	No	
001	0960_MW146_5.0	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019011701	Purple	No	
001	0960_MW146_5.0	HDPE (no PTFE)	20 mL	00350019025466	Grey	No	
001	0960_MW146_5.0	HDPE (no PTFE)	20 mL	00350019031381	Grey	No	
002	0960_MW180_4.0	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019011709	Purple	No	
002	0960_MW180_4.0	Clear Plastic Bottle - Natural	250 mL	00070519142827	Green	No	
002	0960_MW180_4.0	HDPE (no PTFE)	20 mL	00350019031382	Grey	No	
002	0960_MW180_4.0	HDPE (no PTFE)	20 mL	00350019025573	Grey	No	
003	0960_QC402	HDPE (no PTFE)	20 mL	00352005002577	Grey	No	
003	0960_QC402	HDPE (no PTFE)	20 mL	00352005002593	Grey	No	
004	0960_QC403	HDPE (no PTFE)	20 mL	00352005002528	Grey	No	
004	0960_QC403	HDPE (no PTFE)	20 mL	00352005002657	Grey	No	
005	0960_QC303	HDPE (no PTFE)	20 mL	00352005002591	Grey	No	
005	0960_QC303	HDPE (no PTFE)	20 mL	00352005002705	Grey	No	

Total Bottle Count: ALS: 14, Non ALS: 0

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : EP2013115

<p>Client : CARDNO (WA) PTY LTD</p> <p>Contact : MAELLE BOURDAIS</p> <p>Address : 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006</p> <p>E-mail : maelle.bourdais@cardno.com.au</p> <p>Telephone : ----</p> <p>Facsimile : ----</p> <p>Project : WA_0960_PFASOMP</p> <p>Order number : DEF19009/0960</p> <p>C-O-C number : 16276</p> <p>Site : DEF19009/Learmonth</p> <p>Sampler : MAELLE BOURDAIS, Sarah McCulloch</p>	<p>Laboratory : Environmental Division Perth</p> <p>Contact : Nick Courts</p> <p>Address : 26 Rigali Way Wangara WA Australia 6065</p> <p>E-mail : nick.courts@alsglobal.com</p> <p>Telephone : +61-8-9406 1301</p> <p>Facsimile : +61-8-9406 1399</p> <p>Page : 1 of 3</p> <p>Quote number : ES2019CARBSD0002 (SY/139/19)</p> <p>QC Level : NEPM 2013 B3 & ALS QC Standard</p>
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Dates

Date Samples Received : 25-Nov-2020 15:00	Issue Date : 25-Nov-2020
Client Requested Due : 04-Dec-2020	Scheduled Reporting Date : 04-Dec-2020
Date	

Delivery Details

Mode of Delivery : Carrier	Security Seal : Not Available
No. of coolers/boxes : 4	Temperature : 23.2 - Ice present
Receipt Detail :	No. of samples received / analysed : 5 / 5

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepancies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.



Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- No sample container / preservation non-compliance exists.

Any sample identifications that cannot be displayed entirely in the analysis summary table will be listed below.

EP2013115-001 : 21-Nov-2020 09:16 : 0960_MW146_5.0_201121

EP2013115-002 : 21-Nov-2020 09:41 : 0960_MW180_4.0_201121

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2013115-001	21-Nov-2020 09:16	0960_MW146_5.0_201121	✓	✓	✓	✓	✓	✓	✓
EP2013115-002	21-Nov-2020 09:41	0960_MW180_4.0_201121	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2013115-001	21-Nov-2020 09:16	0960_MW146_5.0_201121	✓
EP2013115-002	21-Nov-2020 09:41	0960_MW180_4.0_201121	✓
EP2013115-003	21-Nov-2020 10:24	0960_QC402_201121	✓
EP2013115-004	21-Nov-2020 10:25	0960_QC403_201121	✓
EP2013115-005	21-Nov-2020 10:26	0960_QC303_201121	✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **WATER**

Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method	Client Sample ID(s)	Container	Due for extraction	Due for analysis	Samples Received		Instructions Received	
					Date	Evaluation	Date	Evaluation
EA005-P: pH by PC Titrator								
0960_MW146_5.0_20	Clear Plastic Bottle - Natural	----	21-Nov-2020	25-Nov-2020	✗	----	----	
0960_MW180_4.0_20	Clear Plastic Bottle - Natural	----	21-Nov-2020	25-Nov-2020	✗	----	----	

ACCOUNTS PAYABLE (WA)

Email claire.armstrong@cardno.com.au

Email david.james@cardno.com.au

- [illegible]

Email derp.labreports@esdat.com.au

Email derp.labreports@esdat.com.au

Email maelle.bourdais@cardno.com.au

- [illegible]

CERTIFICATE OF ANALYSIS

Work Order : **EP2013115**
Client : **CARDNO (WA) PTY LTD**
Contact : **MAELLE BOURDAIS**
Address : **11 HARVEST TERRACE PO BOX 155**
WEST PERTH WA, AUSTRALIA 6006
Telephone : **----**
Project : **WA_0960_PFASOMP**
Order number : **DEF19009/0960**
C-O-C number : **16276**
Sampler : **MAELLE BOURDAIS, Sarah McCulloch**
Site : **DEF19009/Learmonth**
Quote number : **SY/139/19**
No. of samples received : **5**
No. of samples analysed : **5**

Page : 1 of 6
Laboratory : Environmental Division Perth
Contact : Nick Courts
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 25-Nov-2020 15:00
Date Analysis Commenced : 27-Nov-2020
Issue Date : 04-Dec-2020 17:37



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

Ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW146_5.0_20 1121	0960_MW180_4.0_20 1121	0960_QC402_201121	0960_QC403_201121	0960_QC303_201121
Sampling date / time				21-Nov-2020 09:16	21-Nov-2020 09:41	21-Nov-2020 10:24	21-Nov-2020 10:25	21-Nov-2020 10:26
Compound	CAS Number	LOR	Unit	EP2013115-001	EP2013115-002	EP2013115-003	EP2013115-004	EP2013115-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.64	7.76	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	75200	67600	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	126	159	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	128	202	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	128	202	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	6130	5160	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	37800	34600	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	1130	886	----	----	----
Magnesium	7439-95-4	1	mg/L	3020	2880	----	----	----
Sodium	7440-23-5	1	mg/L	24000	22700	----	----	----
Potassium	7440-09-7	1	mg/L	1150	1100	----	----	----
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	1200	1090	----	----	----
∅ Total Cations	----	0.01	meq/L	1380	1300	----	----	----
∅ Ionic Balance	----	0.01	%	7.06	8.78	----	----	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	3	25	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW146_5.0_20 1121	0960_MW180_4.0_20 1121	0960_QC402_201121	0960_QC403_201121	0960_QC303_201121
Sampling date / time				21-Nov-2020 09:16	21-Nov-2020 09:41	21-Nov-2020 10:24	21-Nov-2020 10:25	21-Nov-2020 10:26
Compound	CAS Number	LOR	Unit	EP2013115-001	EP2013115-002	EP2013115-003	EP2013115-004	EP2013115-005
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW146_5.0_20 1121	0960_MW180_4.0_20 1121	0960_QC402_201121	0960_QC403_201121	0960_QC303_201121
Sampling date / time				21-Nov-2020 09:16	21-Nov-2020 09:41	21-Nov-2020 10:24	21-Nov-2020 10:25	21-Nov-2020 10:26
Compound	CAS Number	LOR	Unit	EP2013115-001	EP2013115-002	EP2013115-003	EP2013115-004	EP2013115-005
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	109	113	104	103	100
13C8-PFOA	----	0.02	%	106	108	107	106	102



Surrogate Control Limits

Sub-Matrix: GROUNDWATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

QUALITY CONTROL REPORT

Work Order	: EP2013115	Page	: 1 of 9
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 25-Nov-2020
Order number	: DEF19009/0960	Date Analysis Commenced	: 27-Nov-2020
C-O-C number	: 16276	Issue Date	: 04-Dec-2020
Sampler	: MAELLE BOURDAIS, Sarah McCulloch		
Site	: DEF19009/Learmonth		
Quote number	: SY/139/19		
No. of samples received	: 5		
No. of samples analysed	: 5		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

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<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



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Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key :
 Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
 CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
 LOR = Limit of reporting
 RPD = Relative Percentage Difference
 # = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA005P: pH by PC Titrator (QC Lot: 3394152)									
EP2012897-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.06	8.11	0.618	0% - 20%
EP2012917-010	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.64	7.64	0.00	0% - 20%
EA005P: pH by PC Titrator (QC Lot: 3394155)									
EP2013159-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.57	7.58	0.132	0% - 20%
EP2013122-003	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.81	7.83	0.256	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3388017)									
EP2013053-012	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	2270	2260	0.531	0% - 20%
EP2013053-020	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	7080	6990	1.25	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3388018)									
EP2013114-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	566	557	1.56	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3394151)									
EP2012897-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	114	109	4.66	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	114	109	4.66	0% - 20%
EP2012917-010	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	145	146	0.836	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	145	146	0.836	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3384202)									
EP2013114-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	5130	4720	8.25	0% - 20%
EP2013115-002	0960_MW180_4.0_201121	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	5160	5170	0.218	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3384203)									
EP2013114-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	31200	29800	4.84	0% - 20%



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
ED045G: Chloride by Discrete Analyser (QC Lot: 3384203) - continued									
EP2013115-002	0960_MW180_4.0_201121	ED045G: Chloride	16887-00-6	1	mg/L	34600	34500	0.260	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3385623)									
EP2012956-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	309	300	2.79	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	827	804	2.87	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	8410	8160	3.00	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	469	457	2.59	0% - 20%
EP2013122-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	38	39	0.00	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	21	21	0.00	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	93	95	1.29	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	10	10	0.00	0% - 50%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3400520)									
EP2012956-001	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	2	2	0.00	No Limit
EP2013115-001	0960_MW146_5.0_201121	EP002: Dissolved Organic Carbon	----	1	mg/L	3	3	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3388771)									
ES2041944-001	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
ES2041944-003	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3388771)									
ES2041944-001	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		ES2041944-003	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3388771) - continued									
ES2041944-003	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3388771)									
ES2041944-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
ES2041944-003	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3388771)									
ES2041944-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit

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 Work Order : EP2013115
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3388771) - continued									
ES2041944-001	Anonymous	EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
ES2041944-003	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231P: PFAS Sums (QC Lot: 3388771)									
ES2041944-001	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.00	No Limit
ES2041944-003	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.00	No Limit



Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EA005P: pH by PC Titrator (QCLot: 3394152)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.5	102
				----	7 pH Unit	100	98.5	102
EA005P: pH by PC Titrator (QCLot: 3394155)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3388017)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	101	88.1	114
				<10	1000 mg/L	101	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3388018)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	112	89.1	120
				<5	1000 mg/L	102	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3394151)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	103	81.2	126
				<1	200 mg/L	99.6	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3384202)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	92.6	87.7	113
				<1	500 mg/L	104	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3384203)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	99.4	87.9	114
				<1	1000 mg/L	101	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3385623)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	100	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	101	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	98.8	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	98.1	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3400520)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	90.9	73.2	116
				<1	100 mg/L	95.4	73.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3388771)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	95.0	72.0	130



Sub-Matrix: **WATER**

Method: Compound				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
						LCS	Low	High
CAS Number	LOR	Unit	Result					
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3388771) - continued								
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	87.6	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	87.6	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	89.2	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	116	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	116	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3388771)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	95.7	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	117	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	90.2	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	106	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	106	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	121	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	92.6	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	125	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	112	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	105	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	93.0	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3388771)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	79.4	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	107	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	112	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	96.2	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	96.1	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	113	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	115	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3388771)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	102	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	95.4	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	129	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	134	71.4	144

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3384202)							
EP2013115-001	0960_MW146_5.0_201121	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3384203)							
EP2013115-001	0960_MW146_5.0_201121	ED045G: Chloride	16887-00-6	1000 mg/L	# Not Determined	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3400520)							
EP2012956-002	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	94.3	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3388771)							
ES2041944-002	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	99.4	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	91.6	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	99.2	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	97.2	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	103	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	110	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3388771)							
ES2041944-002	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	89.4	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	110	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	97.2	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	103	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	96.0	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	112	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	80.8	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	104	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	101	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	103	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	130	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3388771)							
ES2041944-002	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	88.6	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	99.2	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	113	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	84.1	66.0	145
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	105	57.6	145
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	104	65.0	136



Sub-Matrix: WATER

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Recovery Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3388771) - continued							
ES2041944-002	Anonymous	EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	109	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3388771)							
ES2041944-002	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	89.8	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	87.4	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	80.8	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	81.6	71.4	144

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2013115	Page	: 1 of 6
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 25-Nov-2020
Site	: DEF19009/Learmonth	Issue Date	: 04-Dec-2020
Sampler	: MAELLE BOURDAIS, Sarah McCulloch	No. of samples received	: 5
Order number	: DEF19009/0960	No. of samples analysed	: 5

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- Matrix Spike outliers exist - please see following pages for full details.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- **NO** Quality Control Sample Frequency Outliers exist.



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO ₄ 2- by DA	EP2013115--001	0960_MW146_5.0_201121	Sulfate as SO ₄ - Turbidimetric	14808-79-8	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
ED045G: Chloride by Discrete Analyser	EP2013115--001	0960_MW146_5.0_201121	Chloride	16887-00-6	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator						
Clear Plastic Bottle - Natural						
0960_MW146_5.0_201121, 0960_MW180_4.0_201121	----	----	----	01-Dec-2020	21-Nov-2020	10

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA005P: pH by PC Titrator								
Clear Plastic Bottle - Natural (EA005-P) 0960_MW146_5.0_201121, 0960_MW180_4.0_201121	21-Nov-2020	----	----	----	01-Dec-2020	21-Nov-2020	✘	
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Clear Plastic Bottle - Natural (EA015H) 0960_MW146_5.0_201121, 0960_MW180_4.0_201121	21-Nov-2020	----	----	----	27-Nov-2020	28-Nov-2020	✔	
EA025: Total Suspended Solids dried at 104 ± 2°C								
Clear Plastic Bottle - Natural (EA025H) 0960_MW146_5.0_201121, 0960_MW180_4.0_201121	21-Nov-2020	----	----	----	27-Nov-2020	28-Nov-2020	✔	
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P) 0960_MW146_5.0_201121, 0960_MW180_4.0_201121	21-Nov-2020	----	----	----	01-Dec-2020	05-Dec-2020	✔	

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 Work Order : EP2013115
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G) 0960_MW146_5.0_201121,	0960_MW180_4.0_201121	21-Nov-2020	----	----	----	03-Dec-2020	19-Dec-2020	✓
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G) 0960_MW146_5.0_201121,	0960_MW180_4.0_201121	21-Nov-2020	----	----	----	03-Dec-2020	19-Dec-2020	✓
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F) 0960_MW146_5.0_201121,	0960_MW180_4.0_201121	21-Nov-2020	----	----	----	27-Nov-2020	28-Nov-2020	✓
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002) 0960_MW146_5.0_201121,	0960_MW180_4.0_201121	21-Nov-2020	----	----	----	03-Dec-2020	19-Dec-2020	✓
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X) 0960_MW146_5.0_201121, 0960_QC402_201121, 0960_QC303_201121	0960_MW180_4.0_201121, 0960_QC403_201121,	21-Nov-2020	30-Nov-2020	20-May-2021	✓	30-Nov-2020	20-May-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X) 0960_MW146_5.0_201121, 0960_QC402_201121, 0960_QC303_201121	0960_MW180_4.0_201121, 0960_QC403_201121,	21-Nov-2020	30-Nov-2020	20-May-2021	✓	30-Nov-2020	20-May-2021	✓
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X) 0960_MW146_5.0_201121, 0960_QC402_201121, 0960_QC303_201121	0960_MW180_4.0_201121, 0960_QC403_201121,	21-Nov-2020	30-Nov-2020	20-May-2021	✓	30-Nov-2020	20-May-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X) 0960_MW146_5.0_201121, 0960_QC402_201121, 0960_QC303_201121	0960_MW180_4.0_201121, 0960_QC403_201121,	21-Nov-2020	30-Nov-2020	20-May-2021	✓	30-Nov-2020	20-May-2021	✓
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X) 0960_MW146_5.0_201121, 0960_QC402_201121, 0960_QC303_201121	0960_MW180_4.0_201121, 0960_QC403_201121,	21-Nov-2020	30-Nov-2020	20-May-2021	✓	30-Nov-2020	20-May-2021	✓



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	15	13.33	10.00	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	4	25.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	19	10.53	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	15	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	4	50.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	19	10.53	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	15	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	4	25.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	19	5.26	5.26	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	15	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of 'filterable' residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C. This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high temperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.



Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

APPENDIX

D

FIELD RECORDS & CALIBRATION CERTIFICATES

Monitoring Date	Location ID	Sample_ID	Screen Interval (bgl) (multi-level bores)	Bore Depth (m)	SWL (bTOC)	TOC (mAHD)	RWL (mAHD)	Other Observations on Bore/Site	Purge Method
19/11/2020	MW016	0960_MW016_201119			3.873	4.022	0.149	sample ID MW106 in lab COA	HydroSleeve
19/11/2020	MW018	0960_MW018_201119		8.61	5.7	6.403	0.703		HydroSleeve
19/11/2020	MW021							Well appears to have been covered by recent placement of earth/rockworks	
19/11/2020	MW063	0960_MW063_201119		5.88	5.51	6.3	0.79		HydroSleeve
19/11/2020	MW102	0960_MW102_201119		7.869	4.66	4.6266	-0.0334		HydroSleeve
20/11/2020	MW103	0960_MW103_201120		4.502	2.328	2.2785	-0.0495		HydroSleeve
19/11/2020	MW104	0960_MW104_201119			2.45	2.7256	0.2756		HydroSleeve
19/11/2020	MW105							Dry	
19/11/2020	MW112	0960_MW112_201119			4.55	5.1191	0.5691		HydroSleeve
19/11/2020	MW113	0960_MW113_201119		10.715	6.6	7.3165	0.7165		HydroSleeve
19/11/2020	MW114	0960_MW114_201119		9.11	7.04	7.7467	0.7067		HydroSleeve
19/11/2020	MW115	0960_MW115_201119			4.475	4.9133	0.4383		HydroSleeve
21/11/2020	MW122	0960_MW122_201121			3.87	3.9702	0.1002		HydroSleeve
19/11/2020	MW124	0960_MW124_201119		6.55	2.907	2.9183	0.0113		HydroSleeve
19/11/2020	MW126			4.735				Dry	
19/11/2020	MW127	0960_MW127_201119			5.29	5.6238	0.3338		HydroSleeve
20/11/2020	MW134	0960_MW134_201120		4.578	2.4	2.5155	0.1155		
21/11/2020	MW135	0960_MW135_201121	2.5-3.0	3.35	2.535	2.7781	0.2431		Peri pump
20/11/2020	MW137	0960_MW137_201120	2.5-3.0	3.37	1.74	2.1691	0.4291		Peri pump
20/11/2020	MW138	0960_MW138_201120	7.0-7.5	7.45	3.38	3.3205	-0.0595		HydroSleeve
21/11/2020	MW139	0960_MW139_201121			4.03	4.1386	0.1086		HydroSleeve
20/11/2020	MW140	0960_MW140_201120	3.5-4.0	4.505	1.798	2.5035	0.7055		Peri pump
20/11/2020	MW141	0960_MW141_3.5_201120	3.0-3.5	3.2	1.64	2.8073	1.1673		Peri pump
20/11/2020	MW143	0960_MW143_201120	3.0-3.5	3.5	2.86	2.8174	-0.0426		Peri pump
20/11/2020	MW144	0960_MW144_201120	3.0-3.5	3.85	3.01	3.0481	0.0381		Peri pump
20/11/2020	MW145	0960_MW145_201120	5.0-5.5	5.5	3.18	3.1481	-0.0319		Peri pump
21/11/2020	MW146	0960_MW146_201121	4.5-5.0	4.998	2.84	2.8009	-0.0391		Peri pump
20/11/2020	MW147	0960_MW147_201120	5.0-5.5	5.85	2.87	2.9152	0.0452		Peri pump
19/11/2020	MW148D	0960_MW148D_201119		10.48	3.59	3.5778	-0.0122		HydroSleeve
19/11/2020	MW148S	0960_MW148S_201119		7.97	3.504	3.6851	0.1811		HydroSleeve
19/11/2020	MW151	0960_MW151_201119			3.849	4.0631	0.2141		HydroSleeve
20/11/2020	MW159	0960_MW159_201120		9.056	3.92	4.1895	0.2695		HydroSleeve
19/11/2020	MW162	0960_MW162_201119		18.66	6.16	6.856	0.696		HydroSleeve
19/11/2020	MW163	0960_MW163_201119		19.57	6.09	6.7808	0.6908		HydroSleeve
19/11/2020	MW164	0960_MW164_201119		19.73	6.11	6.7893	0.6793		HydroSleeve
19/11/2020	MW165	0960_MW165_201119			5.36	6.1043	0.7443		HydroSleeve
19/11/2020	MW166	0960_MW166_201119			5.05	5.7441	0.6941		HydroSleeve
19/11/2020	MW167	0960_MW167_201119			5.56	6.2094	0.6494		HydroSleeve
19/11/2020	MW168	0960_MW168_201119			5.57	6.1713	0.6013		HydroSleeve
19/11/2020	MW170	0960_MW170_201119		7.925	5.299	5.639	0.34		HydroSleeve
19/11/2020	MW172	0960_MW172_201119		8.378	5.198	5.6193	0.4213		HydroSleeve
20/11/2020	MW175	0960_MW175_201120	5.5-6.0	6.335	5	4.7982	-0.2018		Peri pump
20/11/2020	MW176	0960_MW176_201120	1.5-2.0	2.47	1.835	2.1274	0.2924		Peri pump
20/11/2020	MW177	0960_MW177_201120	1.5-2.0	2.525	1.535	2.2299	0.6949		Peri pump
20/11/2020	MW178	0960_MW178_201120	4.0-4.5	4.5	2.06	2.1614	0.1014		Peri pump
20/11/2020	MW179	0960_MW179_201120	3.2-3.7	3.63	2.1	2.2371	0.1371		Peri pump
21/11/2020	MW180	0960_MW180_201121	3.5-4.0	4.245	1.521	1.9226	0.4016		Peri pump
20/11/2020	MW181	0960_MW181_201120	1.5-2.0	2.506	1.904	2.2333	0.3293		Peri pump
19/11/2020	MW211	0960_MW211_201119		6.97	5.64	6.3409	0.7009		HydroSleeve
20/11/2020	OTH103	0960_OTH103_201120		0.2					Direct into bottle
20/11/2020	OTH106	0960_OTH106_201120		0.4					Direct into bottle
20/11/2020	OTH107	0960_OTH107_201120		0.6					Direct into bottle
20/11/2020	OTH129	0960_OTH129_201120		0.3					Direct into bottle
20/11/2020	OTH132	0960_OTH132_201120		0.3					Direct into bottle
20/11/2020	OTH134	0960_OTH134_201120		0.4					Direct into bottle

Monitoring Date	Location ID	Temp (Co)	DO (mg/L)	EC (us/Cm)	TDS (mg/L)	pH	Eh (mV)	QC Dup Sample #	Odour ?	colour
19/11/2020	MW016	29.6	1.78	12869	7702.5	7.06	9.3		no	Brown,Cloudy
19/11/2020	MW018	30.8	2.99	5026	2938	7.67	20.8	QC106, QC206	no	Cloudy,Brown
19/11/2020	MW021								no	
19/11/2020	MW063	28.7	4.11	3237	1963	8.22	63.3	QC103, QC203	no	Cloudy,Brown
19/11/2020	MW102	28.9	0.7	98424	59540	6.8	56.4		no	Brown,Cloudy
20/11/2020	MW103	28.9	0.53	79683	48100	6.66	-93.3		no	Cloudy,Brown
19/11/2020	MW104	29.1	4.22	89312	53901	6.83	27.2		no	Brown,Cloudy
19/11/2020	MW105								no	
19/11/2020	MW112	29.2	2.39	15058		7.32	46.6		no	
19/11/2020	MW113	30.3	4.09	12515	7384	7.33	84.5		no	Cloudy,Brown
19/11/2020	MW114	27.7	2.89	10704	6617	7.26	125.3		no	Clear
19/11/2020	MW115	28.3	1.19	36921		7.03	41.3		no	
21/11/2020	MW122	28	0.66	34302		7.44	69.9		no	
19/11/2020	MW124	29.1	1.07	93370	56225	6.79	75.4		no	Cloudy,Brown
19/11/2020	MW126								no	
19/11/2020	MW127	31.4	1.52	66878		7.22	106.8	QC109/209	no	
20/11/2020	MW134	28.7	0.92	63692	38675	6.95	-81.2		no	Cloudy,Brown
21/11/2020	MW135	28.2	1.76	38656	23562.5	7.37	-44.2		no	Cloudy,Brown
20/11/2020	MW137	30.5	0.56	78837		7.51	191.3		no	
20/11/2020	MW138	29.6	1.12	55967		7.71	232.9		no	
21/11/2020	MW139	28.2	0.64	53232	7.34	89.3			no	
20/11/2020	MW140	28	0.93	104111	64024.99	6.62	-83.6		no	Brown,Cloudy
20/11/2020	MW141	28.3	0.65	37786	23114.5	6.93	-134.1		no	Cloudy,Brown
20/11/2020	MW143	31.4	1.69	86887		7.51	128.7		no	
20/11/2020	MW144	31.2	1.65	40485		7.52	76.8		no	
20/11/2020	MW145	31.1	1.46	97272		7.39	187		no	
21/11/2020	MW146	27.4	4.75	102759	64545	6.94	73		no	Clear
20/11/2020	MW147	29	1.06	109345	65765	7.13	30.7		no	Cloudy,Brown
19/11/2020	MW148D	30.7	0.97	94652	55445	7.27	-129.7		no	Clear
19/11/2020	MW148S	29.3	0.62	53311	32110	6.63	67.2		no	Brown,Cloudy
19/11/2020	MW151	30.1	2.93	16411	9724	6.84	31.4		no	Cloudy,Brown
20/11/2020	MW159	29.1	1.8	31172	13798	6.79	21.1		no	Cloudy,Brown
19/11/2020	MW162	29	2.84	13989	8456.5	7.52	64.5		no	Clear,Cloudy,Brown
19/11/2020	MW163	32.1	2.69	17922	10250.5	7.13	26.6		no	Clear
19/11/2020	MW164	31.6	1.88	9727	5616	7.91	-33.1	QC108, QC208	no	Clear
19/11/2020	MW165	30.2	2.04	2633		8.21	109.1		no	
19/11/2020	MW166	30.7	2.22	3227		7.91	93.3		no	
19/11/2020	MW167	32.7	1.98	6335		7.57	59.3	105 / 205	no	
19/11/2020	MW168	29.6	1.86	13910		7.14	69.7	Qc104 204	no	
19/11/2020	MW170	27.7	5.28	48116	20705	6.7	1.6		no	Brown,Cloudy
19/11/2020	MW172								no	
20/11/2020	MW175	30	2.05	3878	2301	7.55	-107.5		no	Cloudy,Brown
20/11/2020	MW176	30.8	3.13	54030	31590	7.39	15.5		no	Cloudy,Brown
20/11/2020	MW177	29.7	2.24	84902	50700	7.49	-5.7		no	Clear,Cloudy,Brown
20/11/2020	MW178	30.2	1.62	89899		7.55	186.5		no	Clear
20/11/2020	MW179	30	1.64	46304		7.82	178.3		no	
21/11/2020	MW180	27.7	1.09	96847	59865	6.79	78.3		no	Clear
20/11/2020	MW181	28.6	1.21	108667	66235	6.76	3.9		no	Cloudy,Brown
19/11/2020	MW211	30.6	4.47	2698	1586	8.23	27.9		no	Clear,Brown
20/11/2020	OTH103	27.6	1.95	63985	39650	7.83	-22.8		no	Clear,Cloudy
20/11/2020	OTH106	31.2	3.59	66414	33675	8.12	63.5		no	Clear
20/11/2020	OTH107	26.8	4.42	58999	37050	7.59	59.1		no	Clear
20/11/2020	OTH129	28.5	1.27	68418	41730	7.76	-69.9		no	Clear,Cloudy
20/11/2020	OTH132	25.9	1.39	63688	40625	7.87	-64.4		no	Clear
20/11/2020	OTH134	29.1	3.41	69054	41665	7.86	25.8		no	Cloudy,Brown

Date	Location ID	Sample ID	Sample Type	Sampling Method	Sample Depth (m)	WaterBody Depth (m)	Flow Rate	Comments	Temp (oC)	DO (mg/L)	EC (us/Cm)	TDS (mg/L)	pH	Eh (mV)	Colour	Turbidity
19/11/2020	SS123	0960_SS123_201119	Sediment	Direct into Bottle	0.1			QC101, QC201								
19/11/2020	SS279	0960_SS279_201119	Sediment	Direct into Bottle	0.1											
19/11/2020	SS170	0960_SS170_201119	Sediment	Shovel Trowel	0.1											
19/11/2020	SS168	0960_SS168_201119	Sediment	Shovel Trowel	0.1											
19/11/2020	SS166	0960_SS166_201119	Sediment	Shovel Trowel	0.1											
19/11/2020	SS265	0960_SS265_201119	Sediment	Shovel Trowel	0.1											
19/11/2020	SS122	0960_SS122_201119	Sediment	Direct into Bottle	0.1			Qc102 202								
19/11/2020	SS157	0960_SS157_201119	Sediment	Shovel Trowel	0.1											
19/11/2020	SS231	0960_SS231_201119	Sediment	Shovel Trowel	0.1											
19/11/2020	SS114	0960_SS114_201119	Sediment	Direct into Bottle	0.1											
19/11/2020	SS121	0960_SS121_201119	Sediment	Direct into Bottle	0.1											
19/11/2020	SS113	0960_SS113_201119	Sediment	Shovel Trowel	0.1											
19/11/2020	SS243	0960_SS243_201119	Sediment	Shovel Trowel	0.1											
19/11/2020	SS125	0960_SS125_201119	Sediment	Direct into Bottle	0.1											
19/11/2020	SS176	0960_SS176_201119	Sediment	Shovel Trowel	0.1											
19/11/2020	SS124	0960_SS124_201119	Sediment	Direct into Bottle	0.1											
19/11/2020	SS277	0960_SS277_201119	Sediment	Direct into Bottle	0.1			Qc107 207								
19/11/2020	SS278	0960_SS278_201119	Sediment	Direct into Bottle	0.1											
19/11/2020	SS108	0960_SS108_201119	Sediment	Shovel Trowel	0.1											
19/11/2020	SD208	0960_SD208_201119	Sediment	Direct into Bottle	0.1											
20/11/2020	SS190	0960_SS190_201120	Sediment	Direct into Bottle	0.1											
20/11/2020	SS189	0960_SS189_201120	Sediment	Shovel Trowel	0.1											
20/11/2020	SS192	0960_SS192_201120	Sediment	Direct into Bottle	0.1											
20/11/2020	SS227	0960_SS227_201120	Sediment	Direct into Bottle	0.1											
20/11/2020	SS291	0960_SS291_201120	Sediment	Shovel Trowel	0.1											
20/11/2020	SS292	0960_SS292_201120	Sediment	Direct into Bottle	0.1											
20/11/2020	SS293	0960_SS293_201120	Sediment	Shovel Trowel	0.1											
20/11/2020	SS198	0960_SS198_201120	Sediment	Shovel Trowel	0.1											
20/11/2020	SS235	0960_SS235_201120	Sediment	Shovel Trowel	0.1											
20/11/2020	SS234	0960_SS234_201120	Sediment	Shovel Trowel	0.1											
20/11/2020	SD219	0960_SD219_201120	Sediment	Shovel Trowel	0.1											
20/11/2020	SD210	0960_SD210_201120	Sediment	Direct into Bottle	0.1											
20/11/2020	SD302	0960_SD302_201120	Sediment	Direct into Bottle	0.1											
20/11/2020	SD199	0960_SD199_201120	Sediment	Shovel Trowel	0.1											
20/11/2020	SD200	0960_SD200_201120	Sediment	Shovel Trowel	0.1											
20/11/2020	SD209	0960_SD209_201120	Sediment	Direct into Bottle	0.1											
20/11/2020	SS298	0960_SS298_201120	Sediment	Shovel Trowel	0.1											
20/11/2020	SS301	0960_SS301_201120	Sediment	Shovel Trowel	0.1											
20/11/2020	SD205	0960_SD205_201120	Sediment	Shovel Trowel	0.1											
20/11/2020	SS193	0960_SS193_201120	Sediment	Direct into Bottle	0.1											
20/11/2020	SD300	0960_SD300_201120	Sediment	Direct into Bottle	0.1											
20/11/2020	SD207	0960_SD207_201120	Sediment	Direct into Bottle	0.1											
20/11/2020	SD301	0960_SD301_201120	Sediment	Direct into Bottle	0.15											
20/11/2020	SD303	0960_SD303_201120	Sediment	Direct into Bottle	0.2											
20/11/2020	SD304	0960_SD304_201120	Sediment	Direct into Bottle	0.2											
20/11/2020	SD211	0960_SD211_201120	Sediment	Direct into Bottle	0.1											
20/11/2020	SD305	0960_SD305_201120	Sediment	Direct into Bottle	0.3											
21/11/2020	SS288	0960_SS288_201121	Sediment	Direct into Bottle	0.1											
19/11/2020	SW208	0960_SW208_201119	Surface_Water	Direct into Bottle	0.1	0.6	Slow	QC110/210	29.4	3.92	65205	39065	8.21	-25.8	Clear	Low
20/11/2020	SW190		Surface_Water					DRY								
20/11/2020	SW189		Surface_Water					Dry								
20/11/2020	SW219		Surface_Water					Dry								
20/11/2020	SW210	0960_SW210_201120	Surface_Water	Direct into Bottle	0.1				29.1	3.37	69889		7.99	180.1	Brown	Low,Medium
20/11/2020	SW302	0960_SW302_201120	Surface_Water	Direct into Bottle	0.1	0.15	Slow		32.2	3.31	65707		8.16	172.9		Low
20/11/2020	SW199		Surface_Water					Dry								
20/11/2020	SW200		Surface_Water					Dry								
20/11/2020	SW209	0960_SW209_201120	Surface_Water	Direct into Bottle					31.7	3.26	63862		8.24	156		Medium
20/11/2020	SW205	0960_SW205_201120	Surface_Water	Direct into Bottle	0.1	0.1	Slow		33.7	3.41	94981	53040	8.01	61.2	Brown redish	High
20/11/2020	SW193		Surface_Water					DRY								
20/11/2020	SW300	0960_SW300_201120	Surface_Water	Direct into Bottle	0.1	0.1	Slow		37.4	4.74	124945	65715	8.67	35.1	Clear	Medium
20/11/2020	SW301	0960_SW301_201120	Surface_Water	Direct into Bottle	0.1	0.15	Slow		35.5	4.2	89662	48490	8.06	12.3	Clear	Medium
20/11/2020	SW207	0960_SW207_201120	Surface_Water	Direct into Bottle	0.2	0.4	Medium	Qc111/211	32.3	3.42	58687		8.2	155.2		Low
20/11/2020	SW303	0960_SW303_201120	Surface_Water	Direct into Bottle	0.1	0.3	Slow		28.8	3.9	68473	41470	7.97	-5.7		Low
20/11/2020	SW304	0960_SW304_201120	Surface_Water	Direct into Bottle	0.1	0.3	Slow		32.6	4.25	78579	44590	8.09	10.8		Medium
20/11/2020	SW305	0960_SW305_201120	Surface_Water	Direct into Bottle	0.2	0.3	Slow		33.6	3.46	84087	46865	8.27	6.1	Clear	Medium
20/11/2020	SW211	0960_SW211_201120	Surface_Water	Direct into Bottle	0	0.1	Slow		31.4	4.08	91215		8.39	156.6		
21/11/2020	SW288		Surface_Water					DRY								



Calibration Report

Multi-Parameter Water Quality Instrument

Customer: Cardno

Contact: Ashley

Manufacturer: YSI

Instrument: Professional Plus with Quatro cable

Serial #: 19L102399

Cable length: 30m

Item	Test	Pass	Comments
Battery	2 x Alkaline C-cells	✓	Voltage reading above 2.9V
	Battery Saver	✓	Automatically turns off after 30 minutes if not used
Connections	Condition	✓	Good, clean
Cable	Condition	✓	Clean, no tears
Display	Operation	✓	
Firmware	Version	✓	4.0.0
Keypad	Operational	✓	
Display	Screen	✓	
Unit	Condition, seals and O-rings	✓	
Monitor housing	Condition	✓	
pH			
	Condition	✓	Good, clean
	pH millivolts for pH7 calibration range 0 mV ± 50 mV	✓	
	pH 4 mV range + 165 to + 180 from 7 buffer mV value	✓	169.50 mV
	pH slope	✓	55 to 60 mV/pH, ideal 59mV
	Response time < 90 seconds	✓	
	Calibrated and conforms to manufacturer's specifications	✓	
ORP			
	Condition	✓	Good, clean
	Response time < 90 seconds	✓	
	within ± 80mv of reference Zobell Reading	✓	
	Calibrated and conforms to manufacturer's specifications	✓	variance range ± 20mV 2 mV
Conductivity			
	Condition	✓	Good, clean
	Temperature	✓	°C
	Conductivity cell constant 5.0 ± 1.0 in GLP file	✓	
	Clean sensor reads less than 3 uS/cm in dry air	✓	
	Calibrated and conforms to manufacturer's specifications	✓	µS/cm
Dissolved Oxygen			
	Condition	✓	Good, clean
	DO sensor in use	✓	Galvanic
	1.25 mil PE membrane (yellow membrane):	✓	
	DO Sensor Value	✓	(min 4.31 uA - max 8.00 uA) Avg 6.15 uA
	Calibrated and conforms to manufacturer's specifications	✓	ppm

This is to certify that the above instrument has been calibrated to the following specifications:

Instrument Readings								
Parameter	Standards	Reference	Calibration Point	Span	Units	Before	After	Units
Temperature		Room Temp	20	0	°C	NA	20	°C
pH	pH 7.00	356684	7.01	-3.80	mV	6.94	7.01	pH
pH	pH 4.00	355385	4.00	165.70	mV	4.07	4.00	pH
Conductivity	2764 µS/cm at 25°C	20/1007	2764	GLP	5.03	2919	2764	µS/cm
ORP (Reference check only)	Zobell A & B	335411/335412	240	240	mV	238.4	238.5	mV
Zero Dissolved Oxygen	NaSO3 in distilled water	10175	0.0	NA	NA	1.6	0.0	%
100% Dissolved Oxygen	100% Air Saturation	Air	100.0	5.1	uA	111.2	100.0	%

Calibrated by: Gaurav Kanwar

Calibration Date: 12-Nov-20

Next Due: 11-May-21



Equipment Check Report

Water Level/Drawdown Meter

Customer: Cardno

Contact: Ashley

Manufacturer: QED

Instrument: MP30

Serial #: 1672

Cable length: 45m

Item	Test	Pass	Comments
Battery	Voltage (9v battery)	✓	Voltage above 7.9 V
	Capacity	✓	
Probe	Decontaminated	✓	
	Condition	✓	
	Operation	✓	
Connectors	Condition	✓	
Tape Check	Condition	✓	Good, no tears
	Decontaminated	✓	
Instrument Test	Water level mode	✓	
	Drawdown mode	✓	
Speaker	Operation	✓	

Comments

NA

This is to certify that the above instrument has been checked and is in good working order.

Checked by: Gaurav Kanwar

Check Date: 13-Nov-20

Next Due: 12-May-21

EQUIPMENT INFORMATION

Instrument: YSIPP9
 Serial Number: 15K100702 (Display)
 Lot Number: 19F100572 (Sonde)

EQUIPMENT CHECK

Enclosed

Comment

YSI Pro Plus Display	<input checked="" type="checkbox"/>
YSI Quatro Sonde	<input checked="" type="checkbox"/>
Flow Cell	<input checked="" type="checkbox"/>
Probe Guard	<input checked="" type="checkbox"/>
Rubber Storage/Calibration	<input checked="" type="checkbox"/>
Sleeve Calibration Cup + Cap	<input checked="" type="checkbox"/>
YSI Pro Series ProComm II Kit	<input checked="" type="checkbox"/>
Instruction Manual & Field Sheets	<input checked="" type="checkbox"/>
Spare Batteries (x 2)	<input checked="" type="checkbox"/>

SENSOR CALIBRATION DETAILS

	Calibration Undertaken	Accuracy	Pass	Fail
Temperature	Factory Calibrated	$\pm 0.2^{\circ}\text{C}$	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Dissolved Oxygen	<input checked="" type="checkbox"/> 100% Saturation	$\pm 2\%$	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Pressure Compensation	1034 hPa	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Conductivity	<input checked="" type="checkbox"/> 1288mS/cm	$\pm 0.5\%$	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	<input checked="" type="checkbox"/> Check linearity at 1.4mS/cm	$\pm 0.5\%$	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Salinity	Auto Calibrated	$\pm 1\%$	<input checked="" type="checkbox"/>	<input type="checkbox"/>
pH	<input checked="" type="checkbox"/> pH 7.00	± 0.2	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	<input checked="" type="checkbox"/> pH 4.00	± 0.2	<input checked="" type="checkbox"/>	<input type="checkbox"/>
ORP	<input checked="" type="checkbox"/> 240 mV at 20 °C	$\pm 20\text{mV}$	<input checked="" type="checkbox"/>	<input type="checkbox"/>

This is to certify that where possible, this instrument has been calibrated in accordance with the manufacturer's calibration procedure as recommended in the instrument service manual.

ECO Standard Rental Terms & Conditions apply to all equipment calibrations.

Regards,

Paul Goodgame

ECO Environmental Equipment Specialist

Date: 05.10.2020

EQUIPMENT INFORMATION

Instrument: YSIPP13P

Serial Number: 14C102225 (Display)

Lot Number: 17F100380 (Sonde)

EQUIPMENT CHECK

Enclosed

Comment

YSI Pro Plus Display	<input checked="" type="checkbox"/>
YSI Quatro Sonde	<input checked="" type="checkbox"/>
Flow Cell	<input checked="" type="checkbox"/>
Probe Guard	<input checked="" type="checkbox"/>
Rubber Storage/Calibration	<input checked="" type="checkbox"/>
Sleeve Calibration Cup + Cap	<input checked="" type="checkbox"/>
YSI Pro Series ProComm II Kit	<input checked="" type="checkbox"/>
Instruction Manual & Field Sheets	<input checked="" type="checkbox"/>
Spare Batteries (x 2)	<input checked="" type="checkbox"/>

SENSOR CALIBRATION DETAILS

	Calibration Undertaken	Accuracy	Pass	Fail
Temperature	Factory Calibrated	$\pm 0.2^{\circ}\text{C}$	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Dissolved Oxygen	<input checked="" type="checkbox"/> 100% Saturation	$\pm 2\%$	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Pressure Compensation	1019 hPa	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Conductivity	<input checked="" type="checkbox"/> 1288mS/cm	$\pm 0.5\%$	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	<input checked="" type="checkbox"/> Check linearity at 1.4mS/cm	$\pm 0.5\%$	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Salinity	Auto Calibrated	$\pm 1\%$	<input checked="" type="checkbox"/>	<input type="checkbox"/>
pH	<input checked="" type="checkbox"/> pH 7.00	± 0.2	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	<input checked="" type="checkbox"/> pH 4.00	± 0.2	<input checked="" type="checkbox"/>	<input type="checkbox"/>
ORP	<input checked="" type="checkbox"/> 233 mV at 23 $^{\circ}\text{C}$	$\pm 20\text{mV}$	<input checked="" type="checkbox"/>	<input type="checkbox"/>

This is to certify that where possible, this instrument has been calibrated in accordance with the manufacturer's calibration procedure as recommended in the instrument service manual.

ECO Standard Rental Terms & Conditions apply to all equipment calibrations.

Regards,

Paul Goodgame

ECO Environmental Equipment Specialist

Date: 28.10.2020

APPENDIX

E

DATA QUALITY REVIEW

Data Quality Review

PFAS Ongoing Monitoring 2020 post-winter sampling event

This appendix reviews the Quality Assurance (QA) and Quality Control (QC) documentation. Quality assurance encompasses the actions, procedures, checks and decisions undertaken to ensure sample integrity and representativeness, and the reliability and accuracy of analysis results. The QA documentation should also include an indication of the Data Quality Objectives sought in relation to each significant action, test or process involved in the assessment.

QC activities measure the effectiveness of the QA procedures by undertaking testing, and then comparing results to previously established objectives. QC work will include the internal laboratory testing as well as results of QC samples submitted such as trip blanks and duplicates. The quality of the information and/or data is deemed satisfactory when the QC results demonstrate that agreed objectives have been met.

QA/QC Aspects	Evidence & Evaluation
QA Documentation	
Project Quality Plan/Work Plan and Data Quality Objectives	<p>The field investigation was carried out between the 19 and 21 November 2020 and is in accordance with the proposed scope of work, as documented in the SAQP (PFAS OMP SAQP RAAF Base Learmonth, Cardno 2020) issued to the client and in general compliance with the Australian standards AS 4482.1- 2005 "Guide to Sampling and Investigation of Potentially Contaminated Soil, Part 1: Non-volatile and Semi-volatile Compounds", Standards Australia 1998. AS/NZ 5667:1998 <i>Water quality – sampling</i> and NEPM "National Environment Protection (Assessment of Site Contamination) Measure".</p> <p>A quality control program was implemented during the Investigation and the quality assurance procedures used have been reiterated in the report (2020 post-winter Sampling Event Factual Report). In addition, a safety, health and environment work method statement (SHEWMS) was also prepared.</p> <p>The Data Quality Objectives were expressed in terms of the purpose of the assessment and the relevant assessment criteria.</p>
Data Representativeness	
Use of Composites	No Composites were used during the investigation
Holding Times	<p>Chain of custody and laboratory reports provide evidence of holding times. Holding times were generally in compliant with required timeframes. with the exception of the following:</p> <p>Water:</p> <ul style="list-style-type: none"> pH – generally 10 to 12 days overdue <p>Sediment:</p> <ul style="list-style-type: none"> pH – 1-3 days overdue Conductivity – 1-3 days overdue <p>The holding time exceedances for pH and some analytes are due to the Site's remoteness and are not considered to have adversely impacted the reliability of the results obtained, or the conclusions drawn from this assessment.</p>
Verification of field procedures	<p>The methodology conducted during this investigation is documented in the body of the report, and was in general conformance with the SAQP.</p> <p>Non-dedicated equipment was decontaminated between sample locations.</p>

QA/QC Aspects		Evidence & Evaluation	
Data Precision & Accuracy			
QC sample Frequency	QC sample type	SAQP required frequency	Sample Collected
	Blind duplicate	1 in 10 primary water samples (10%) 1 in 20 primary sediment samples (5%)	8 for 64 primary water samples (12.5%) 3 for 49 primary sediment samples (6.1%)
	Split duplicate	1 in 10 primary water samples (10%) 1 in 20 primary sediment samples (5%)	8 for 64 primary water samples (12.5%) 3 for 49 primary sediment samples (6.1%)
	Rinsate	1 per day per YSI	9 for 3 days (100%)
	Field Blank	1 per day per sampler	9 for 3 days (100%)
QC Testing – Blind Replicates (Primary Lab)	▪ RPD Acceptance Criteria:		
	Magnitude of Results		Acceptable RPD range
	< 10 x LOR		No limit
	10 – 20 LOR		0% - 50%
	> 20 x LOR		0% - 20%
	Water		
	▪ Number of Primary Samples Analysed: 64		
	▪ Duplicate Samples Analysed: 8		
	▪ Percentage of RPDs above criteria: 7.2%		
	Sediment		
▪ Number of Primary Samples Analysed: 49			
▪ Duplicate Samples Analysed: 3			
▪ Percentage of RPDs above criteria: 5%			
The level of RPD exceedances is generally minor and probably related to the low analyte concentrations of analyte pairs.			
QC Testing – Field Splits (Secondary Lab)	▪ RPD Acceptance Criteria:		
	Magnitude of Results		Acceptable RPD range
	< 10 x LOR		No limit
	10 – 20 LOR		0% - 50%
	> 20 x LOR		0% - 20%
	Water		
	▪ Number of Primary Samples Analysed: 64		
	▪ Duplicate Samples Analysed: 8		
	▪ Percentage of RPDs above criteria: 9.6%		
	Sediment		
▪ Number of Primary Samples Analysed: 49			
▪ Duplicate Samples Analysed: 3			
▪ Percentage of RPDs above criteria: 10.4%			
The level of RPD is generally minor and probably related to the low analyte concentrations of analyte pairs and/or difference or methodologies between the primary and secondary laboratories.			
Field Blanks	Field Blanks were collected at a rate of one per sampler per fieldwork day. All of the field blank samples tested reported analytes below the laboratory limit of reporting.		
Laboratory Internal QC	Evidence of the laboratories internal QC testing is present and complete in the reports. ALS (Primary) performed internal QC with adequate testing and		

QA/QC Aspects	Evidence & Evaluation
	<p>satisfactory results for method blank, laboratory control samples and laboratory duplicates.</p> <p>All Matrix Spikes generally reported recoveries within the acceptance range of 70% to 130% with the exception of the following:</p> <ul style="list-style-type: none"> • EP2012893, EP2012895, EP2012919 <ul style="list-style-type: none"> ○ PFOS, 6:2 FTS, 8:2 FTS. Client Sample ID: Anonymous. MS recovery not determined, background level greater than or equal to 4x spike level. ○ MeFOSE, EtFOSE. Client Sample ID: Anonymous. MS recovery greater than upper data quality objective. • EP2012897 <ul style="list-style-type: none"> ○ Sulfate as SO4-. Client Sample ID: SW208. MS recovery not determined, background level greater than or equal to 4x spike level. ○ Chloride. Client Sample ID: SW208. MS recovery not determined, background level greater than or equal to 4x spike level. • EP2012917, EP2012943, EP2012947, EP2012956, EP2012957, EP2013114, EP2013120 <ul style="list-style-type: none"> ○ Sulfate as SO4-. Client Sample ID: Anonymous. MS recovery not determined, background level greater than or equal to 4x spike level. ○ Chloride. Client Sample ID: Anonymous. MS recovery not determined, background level greater than or equal to 4x spike level. • EP2012946 <ul style="list-style-type: none"> ○ Sulfate as SO4-. Client Sample ID: OTH132. MS recovery not determined, background level greater than or equal to 4x spike level. ○ Chloride. Client Sample ID: OTH132. MS recovery not determined, background level greater than or equal to 4x spike level. • EP2013115 <ul style="list-style-type: none"> ○ Sulfate as SO4-. Client Sample ID: MW146. MS recovery not determined, background level greater than or equal to 4x spike level. ○ Chloride. Client Sample ID: MW146. MS recovery not determined, background level greater than or equal to 4x spike level. <p>Quality Control sample frequency was generally within the expected rate with the exception of the following:</p> <ul style="list-style-type: none"> • EP2012892, EP2012894, EP2012897, EP2012917, EP2012946, EP2012947, EP2012956, EP2012957, EP2013114, EP2013120 <ul style="list-style-type: none"> ○ PFAS. Duplicate sample frequency Actual rate < Expected rate (10%). ○ PFAS. MS sample frequency Actual rate < Expected rate (5%). <p>No Method Blank value outliers were reported.</p>
Laboratory Method Detection Limit	<p>Laboratory reports indicate the method detection limits were generally lower than the respective assessment criteria.</p> <p>However, the PFAS NEMP Ecological criteria for 99% species protection for PFOS is below the LOR. In accordance with the HEPA (2020) guideline, the LOR was adopted in this instance.</p>
NATA endorsement of laboratory reports	<p>Laboratory reports were stamped with the NATA endorsement stamp and signature.</p> <p>ALS Accreditation No. 825</p>

QA/QC Aspects	Evidence & Evaluation
	Eurofins Accreditation No. 1261
Calibration of Field Equipment	All equipment used during the investigation was calibrated by the supplier prior to use. The equipment calibration certificates are provided in Appendix D.
Decontamination and Equipment Blanks	Rinsate blanks were collected at a rate of one per day from each non dedicated water quality meter (YSI) used. All rinsate samples tested reported analytes concentrations below the laboratory LORs.
Data Comparability	
Standard Procedures	Fieldwork procedures are detailed in the SAQP and reports and are comparable for each phase of Investigation.
Qualified Personnel	Staff involved in managing and reviewing the project and those involved in fieldwork are qualified personnel.
Sample Integrity	Field Chain of Custody/Laboratory request forms can be found in Appendix C.
Data Completeness	
Completeness of test program	The scope of work undertaken was generally consistent with the SAQP.
Validity of Data Set	The data quality review indicates no significant systematic errors in the data collection process and therefore, the data set used as the basis for groundwater investigation is considered valid and complete.

APPENDIX

F

INFORMATION ABOUT ENVIRONMENTAL REPORTS

About Site Environmental Assessment Reports

1. Introduction

This document explains the Environmental Site Assessment (ESA) process and the context that applies to the use of Environmental Reports issued by Cardno.

2. What is an ESA?

Environmental Site Assessments (ESA) are undertaken for a range of purposes, specific to the brief issued by the client in each case. The scope may include one or a combination of any of the following:

- ☐ A factual report of the condition of a portion of the site or one aspect of an entire site.
- ☐ Assessment of the contamination levels in soil to be removed from a site – a waste classification assessment.
- ☐ Validation of the success of remediation of a site or a portion of a site.
- ☐ Provision of a professional opinion about the suitability of a site for one or more uses, in terms of its contamination status.

The scope of any ESA needs to be defined at the outset.

An ESA is not an Environmental Audit. Such audits are undertaken in accordance with the provisions of regulations enacted in various states of Australia, and are referred to as Site Audits in some jurisdictions. Statutory audits provide certification by EPA accredited auditors that a site is suitable for one or more uses. An ESA may provide similar advice but cannot be used in place of an audit if the latter is required by regulation in any instance. However in some circumstances and jurisdictions an ESA is sufficient to provide “environmental sign-off” of a site.

An ESA may be undertaken for due diligence purposes, to establish whether the site has been impacted to the extent that some beneficial uses of the site may be precluded. Due diligence audits in many cases may be completed as non-statutory Audits, although in some jurisdictions they can also be statutory audits, if defined as such at the outset.

3. The ESA Process

The Client generally initiates the ESA process by specifying a brief which identifies the specific objectives of the assessment. If not, it is the consultants’ duty to so specify the ESA

In the case of an ESA to provide an opinion about the suitability of the site for use, it would be conducted in accordance with NEPM (Site Assessment). Such ESA would not commence until a thorough site history assessment (Phase 1 Assessment: to identify the potential for significant contamination at a site) is conducted. However, where the history is unclear, a broad screening of chemical parameters can be used to test environmental media. This normally includes a broad range of organic and inorganic compounds and elements, often referred to as an Environmental Screen.

(In the case of an ESA for a purpose other than to provide an opinion about the suitability of the site for use, it is not always necessary to undertake a Phase 1 assessment.)

The ESA requires sampling of soil at representative locations across the site. A NATA accredited laboratory performs the analysis of soil. It is impractical for all of the soil to be assessed. The ESA is often based on a statistical method of grid or random sampling, augmented by targeted sampling at locations known or suspected to be contaminated. Guidance on sampling strategy and density is provided in Australian Standard AS4482.1–2005. However, some considerable degree of judgement is still required in the application of any sampling and testing strategy. For example the blanket application of the “hot spot” method presented in this standard is often inappropriate given its limitations.

The field program also investigates the likelihood of contamination below the site surface. Field investigations must sample and test fill as well as the natural soils. If contamination is found then it is common for further work to be undertaken to characterise, to the extent practical, its vertical and horizontal extent. However, where fill is encountered and testing shows it to be uncontaminated, it must be realised that the heterogeneous nature of the material might mean that not all pockets of contaminated material can be detected using normal sampling regimes.

EPA guidelines for auditors, that may be relevant for an ESA, indicate the need in all cases to consider the potential for groundwater contamination in any site. This does not mean all sites need to be drilled to sample groundwater, but it is most often the case. Most hydrogeological settings and groundwater conditions are complex and vary in space and time. The condition of groundwater is investigated to identify if any beneficial use or environmental value of groundwater is precluded due to contamination.

As previously stated for soil, all groundwater at the site cannot be tested. The environmental investigations are conducted in accordance with industry standards and guidelines (e.g. EPA Vic Pub 668). This provides a level of confidence that a sufficiently comprehensive assessment of the groundwater at the site is achieved.

Where an investigation shows that groundwater is polluted, consideration should be given to assessing the risks and the need for and practicality of any clean up.

4. Environmental Assessment Report

The ESA Report details the findings of the ESA. It provides summary information on the site definition, the reasons for the assessment and other relevant facts. It reviews the scope and quality of the site investigations, laboratory testing and data analyses undertaken. These reports also present a review of the contamination status of the site, the need for any further clean up, and an opinion on the suitability of the site for a range of beneficial uses and land uses such as “residential – low density”, “commercial” etc, as appropriate.

However, as noted above, some ESA have a narrow scope such as for classification of waste soil for removal from site, and do not make conclusions on suitability of site for use.

The ESA Report generally includes copies of other documents and reports, necessary to support the assessment findings, presented as appendices. These can contain more detailed information than the body of the ESA Report. Care should be taken to also read the appended documents and the ESA report in full.

Cardno generally issues reports in electronic form (e-Report) on CD ROM. ESA Reports are issued in this format as Adobe Acrobat™ PDF files. However, a paper copy of the executive summary of the ESA Report is generally issued to the client, and others as required by the brief or by regulation.

5. Limitations of Environmental Assessment Report

The ESA Report is prepared in a manner that can be easily read by a lay person with a legitimate interest in the contamination status of the site, such as the site owner or occupier, EPA and Local Planning Authority. The ESA report is not intended for use by other parties or for other purposes. Anyone who uses the assessment report for purposes other than specified in the report, does so at their own risk.

The site should only be used for one or more of the beneficial uses and land uses identified in the ESA as suitable.

The conditions and qualifications may apply to the suitability of the site for use, and it is the responsibility of the Client to be cognizant of and accept these in accepting the report. Cardno are only responsible for the issuing of the ESA report but accepts no liability for the costs incurred in the implementation of ESA findings.

The ESA provides a “snapshot” of the site conditions at the time of the site investigation. Consequently, the report may not be valid at a later time if there has been any change to the contamination status of the site in that time. Verification of the status of the site may be required in cases where a significant time has elapsed, or site conditions have changed since the assessment and audit.

The ESA is necessarily limited by constraints such as time, cost and available information; although normal professional practice at the time has been applied with all due care to prepare the report. A necessary requirement of this process is the horizontal and vertical interpolation of data from discrete locations. However, site conditions are generally not homogenous and some discrepancies will occur between the actual and predicted results at locations not directly sampled. There is a risk that contamination may occur at the site and not be identified by a competent investigation and assessment. The approach adopted in sampling (a combination of statistically based grid and judgmental sampling) seeks to reduce, but cannot eliminate, this risk.

Where unexpected occurrences of contamination arise, subsequent to the issue of the ESA Report, Cardno should be permitted to make an interpretation of these facts in relation to the ESA Report findings. Consequently, the Client should inform Cardno and seek their opinion. Cardno accepts no liability for costs incurred due to such

unexpected occurrences, given the inherent uncertainties in the assessment process.

Cardno uses information provided by other parties as the basis for the ESA, and reliance on this information is at the discretion of Cardno. However, however Cardno cannot guarantee any of the facts, findings or conclusions presented by other parties. Cardno will not be liable for the use of information, provided by others that is subsequently found to be intentionally misleading.

The ESA Report is not and does not purport to be anything other than a contaminated land ESA. It is not a geotechnical report and bore logs reproduced are for interpretation of the likely distribution of contamination. They are not intended for geotechnical interpretations and may not be adequate for this purpose.

The ESA Report is not intended to be a comprehensive analysis of the presence and associated risk of asbestos in buildings and services. Where asbestos in buildings and services is known or likely, the report may only caution that an appropriately qualified person be engaged to undertake demolition to avoid contamination of the site.

Cardno

13 August 2015

PFAS OMP First Flush Sampling Event Factual Report

2021 First Flush

RAAF Learmonth

DEF19009



Prepared for
Department of Defence

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Our report is based on information made available by the client. The validity and comprehensiveness of supplied information has not been independently verified and, for the purposes of this report, it is assumed that the information provided to Cardno is both complete and accurate. Whilst, to the best of our knowledge, the information contained in this report is accurate at the date of issue, changes may occur to the site conditions, the site context or the applicable planning framework. This report should not be used after any such changes without consulting the provider of the report or a suitably qualified person.

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Chemical Names

DOC	Dissolved Organic Carbon
DO	Dissolved Oxygen
PFAS	Per- and Poly-fluoroalkyl Substances
PFHxS	Per-fluoro-hexane Sulphonate
PFOA	Per-fluoro-octanoic Acid
PFOS	Per-fluoro-octane Sulfonate
TDS	Total Dissolved Solids (salinity of water)
TSS	Total Suspended Solids

Technical Terms

AFFF	Aqueous Film-Forming Foam
AHD	Australian Height Datum
ANZECC	Australian and New Zealand Environment and Conservation Council
AS	Australian Standard
AST	Above-ground Storage Tank
BGL	Below Ground Level
COC	Chain of Custody
DQI	Data Quality Indicator
DQO	Data Quality Objective
EC	Electrical Conductivity
EPA	Environment Protection Authority
ESA	Environmental Site Assessment
HIL	Health Investigation Level
HSL	Health Screening Level
LOR	Limit of Reporting
N/A	Not Applicable
NATA	National Association of Testing Authorities
NEPC	National Environment Protection Council
NEPM	National Environmental Protection Measure
QA	Quality Assurance
QC	Quality Control
RPD	Relative Percentage Difference
SAQP	Sampling and Analysis Quality Plan
SEPP	State Environment Protection Policy

Units

ha	Hectares
mBGL	Metres Below Ground Level
mbTOC	Metres below Top of Casing
mg/kg	Milligram per Kilogram (approximately equivalent to ppm)
mg/L	Milligram per Litre
µS/cm	Micro Siemens per Centimetre (Electrical Conductivity - Water)

Site Specific

OMP	Ongoing Monitoring Plan
FTG	Fire Training Ground

1 Introduction

1.1 Background

Cardno was engaged by the Australian Department of Defence (“the Client”) to carry out the Per- and Poly-Fluoroalkyl Substances (PFAS) Ongoing Monitoring Plan (OMP) First Flush sampling event at RAAF Base Learmonth (“the site”). The site is located approximately 30km south of Exmouth, WA, and is displayed in Figure 1 of Appendix A.

The OMP was carried out in accordance with the scope and limitations presented in Cardno’s Sampling and Analysis Quality Plan (SAQP):

- > Cardno, June 2020, Reference: DEF19009, ‘PFAS Ongoing Monitoring Plan Sampling and Analysis Quality Plan (SAQP) RAAF Base Learmonth.

The SAQP was reviewed prior to the monitoring event and no changes were required.

For the purposes of this report:

- > “the site” was defined as RAAF Base Learmonth.
- > “the Management Area” was defined as comprising the site, plus the land east of the Base, including the salt pan, drainage channels, Wapet Creek and extends to Exmouth Gulf.

1.2 Purpose & Objectives

The objective of the OMP is to assess the changes in the nature and extent of PFAS within the environment, specifically where there is an identified potentially elevated risk to a receptor or a potential future risk to a receptor associated with Defence’s historical use of legacy Aqueous Film Forming Foam (AFFF).

The purpose of this PFAS OMP factual report is to provide an up-to-date status of the condition of the site as it is currently understood in relation to the most recent sampling event.

The objectives of the report are:

- > To provide a succinct summary of the First Flush 2021 sampling event and provision of analytical results with supporting tables and figures.
- > To provide confirmation of the current understanding of risk.
- > To provide supporting data for the assessment of management actions, where relevant.

1.3 Relevant Guidelines

This assessment has been undertaken in general accordance with applicable industry standards for a site investigation for the purpose, objectives and scope identified in this report. These standards are set out in:

- > National Environment Protection Council (NEPC), 1999, National Environmental Protection (Assessment of Site Contamination) Measure (as amended 2013) (ASC NEPM).
- > Heads of Environmental Protection Authority’s Australia and New Zealand (HEPA), January 2020, PFAS National Environmental Management Plan (NEMP) 2.0.
- > Australian Standard AS 4482-2005 Guide to the investigation and sampling of sites with potentially contaminated soils, Part 1 - Non-volatile and semi-volatile compounds.
- > Standards Australia 1998. AS/NZ 5667:1998 Water quality – sampling.
- > Australian and New Zealand Guidelines, 2018. Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

- > Department of Environment and Regulation (DER), 2014, Assessment and Management of Contaminated Sites¹.
- > Department of Defence, Department of Energy, 2018, Quality System Manual Schedule B15.
- > U.S. Environmental Protection Agency (EPA), 2000, 'Guidance for the Data Quality Objectives Process (EPA QA/G-4)'.
- > USEPA, 2002, 'Guidance on Environmental Data Verification and Data Validation (EPA QA/G-8)'.
- > National Health and Medical Research Council (NHMRC), August 2019, Guidance on Per and Polyfluoroalkyl Substances (PFAS) in Recreational Water.

2 Scope of Work

As per the SAQP requirements, the OMP First Flush monitoring event should be undertaken as close as possible following the first heavy rainfall of the wet season.

A heavy rainfall event, as defined in the Department of Environment and Energy (DoEE, 2017) guidelines, occurred at the site on the 03 March 2021. The Bureau of Meteorology recorded 68.6 mm of rain at the Learmonth Airport weather station (Station No. 5007) that day, which exceeds the heavy rainfall benchmark for March 2021 at this station (50.3 mm). In addition, field observations on the 02 March 2021 (pers comm., Base personnel) indicated flooding around site which triggered the first flush sampling event.

Cardno carried out the tasks detailed in the following sections, between the 03 and 05 March 2021, in order to satisfy the purpose and objectives of this assessment.

2.1 Surface water Monitoring

Sampling of selected surface water monitoring locations was performed in accordance with the SAQP, applying methods set out in Section 3 of this report. The surface water locations monitored as part of the OMP are presented in Table 2-1 and are shown on Figure 2, Appendix A.

Table 2-1 Surface water Monitoring Locations

Monitoring Area	Location ID
Drainage channels (source and pathway)	0960_SW219, 0960_SS234, 0960_SS235, 0960_SS114, 0960_SS113, 0960_SS231, 0960_SS157, 0960_SW265, 0960_SW189, 0960_SS190, 0960_SW288, 0960_SW193, 0960_SS192, 0960_SS198, 0960_SS293, 0960_SS292, 0960_SS291, 0960_SS227, 0960_SS108, 0960_SS170, 0960_SS168, 0960_SS279, 0960_SS166, 0960_SS243, 0960_SS174, 0960_SS121, 0960_SS122, 0960_SS124, 0960_SS277, 0960_SS125, 0960_SS278, 0960_SS176, 0960_SS123, 0960_SW199, 0960_SW200, 0960_SS298
Wapet Creek (Receptor)	0960_SW211, 0960_SW300, 0960_SW210, 0960_SW301, 0960_SW302, 0960_SW303, 0960_SW209, 0960_SW304, 0960_SW305, 0960_SW207, 0960_SW208, 0960_SW205, 0960_SS301

2.2 Sediment Monitoring

Sampling of selected sediment monitoring locations was performed in accordance with the SAQP, applying methods set out in Section 3 of this report. The sediment locations monitored as part of the OMP are presented in Table 2-2 and are shown on Figure 3, Appendix A.

Table 2-2 Sediment Monitoring Locations

Monitoring Area	Location ID
Drainage channels (source and pathway)	0960_SD219, 0960_SS234, 0960_SS235, 0960_SS114, 0960_SS113, 0960_SS231, 0960_SS157, 0960_SS265, 0960_SS189, 0960_SS190, 0960_SS288, 0960_SS193,

¹ It is noted that Site is located on Commonwealth Land and is regulated under the Commonwealth environmental legislation, the State based DWER guidelines are relevant for the sampling of off-Site private properties and waterways.

Monitoring Area	Location ID
	0960_SS192, 0960_SS198, 0960_SS293, 0960_SS292, 0960_SS291, 0960_SS227, 0960_SS108, 0960_SS170, 0960_SS168, 0960_SS279, 0960_SS166, 0960_SS243, 0960_SS174, 0960_SS121, 0960_SS122, 0960_SS124, 0960_SS277, 0960_SS125, 0960_SS278, 0960_SS176, 0960_SS123, 0960_SD199, 0960_SD200, 0960_SS298
Wapet Creek (Receptor)	0960_SD211, 0960_SD300, 0960_SD210, 0960_SD301, 0960_SD302, 0960_SD303, 0960_SD209, 0960_SD304, 0960_SD305, 0960_SD207, 0960_SD208, 0960_SD205, 0960_SS301
Note: 'SS' indicates a shallow soil (dry) location, 'SD' indicates a sediment (wet) location	

2.3 Data Management

All the data included in this factual report has been collected, uploaded to the ESdat database and reviewed according to the data management requirements of the Defence Contamination Management Manual (DCMM) Annex L.

The sample naming convention detailed in the DCMM Annex L was used in the field.

2.3.1 Defence ESdat database

Data collected as part of the First Flush 2021 OMP monitoring event was uploaded to the ESdat database according to the data management requirements of the DCMM Annex L, including:

- > All field data collected was uploaded;
- > Laboratory data was uploaded and approved; and
- > QA/QC data was reconciled.

2.4 Deviations from the OMP SAQP

Deviations from the SAQP for the First Flush 2021 monitoring event are presented in Table 2-3

Table 2-3 Summary of deviations from the OMP SAQP

Location	Deviation	Comments
SS234, SS235, SS114, SS113, SS231, SS157, SS265, SS192, SS198, SS293, SS292, SS291, SS227, SS108, SS170, SS168, SS279, SS166, SS243, SS174, SS121, SS122, SS124, SS277, SS125, SS278, SS176, SS123, SS298, SS301	Not sampled for surface water	These locations were found dry.

3 Methodology

3.1 Surface Water Sampling Methodology

Surface water monitoring procedure is detailed in Table 3-1.

Table 3-1 Surface water Monitoring Method

Activity	Details
Field parameters	<p>The following field parameters were recorded using a water quality meter:</p> <ul style="list-style-type: none"> ▪ pH. ▪ electrical conductivity (EC). ▪ oxidation reduction potential (ORP). ▪ Dissolved oxygen (DO). ▪ Temperature.

Activity	Details
	Field observations such as water flow, odours or sheen presence were also recorded on field sampling sheets.
Sampling Method	<p>Surface water samples were collected directly into sample containers using a 'Grab' (manual) sample method via a long-handled sampling device.</p> <p>Where depth permits, the sample container was positioned at least 10 cm below the surface water level and above the sediment bed and oriented with the capped opening facing downwards to avoid the collection of surface films. Samples were decanted into the laboratory supplied sample containers.</p>
Decontamination procedure	All re-usable sampling equipment was thoroughly washed using PFAS & phosphate-free detergent, then double rinsed with clean water before the sample collection.
Sample identification, preservation transport and holding times	<p>Each sample was labelled with the sample location, date, project identification number and sampler's initials.</p> <p>Samples were collected directly into appropriately preserved laboratory supplied bottles (Teflon-free) and packed in chilled containers for delivery to the laboratory under Chain of custody (CoC) documentation.</p> <p>Sample containers, preservation procedures, sample storage requirements and holding times were undertaken in accordance with those recommended by Standards Australia (AS/NZS 5667.1:1998 and AS 4482.1 as appropriate).</p>
Laboratory Testing	<p>Surface water samples were submitted for the following analysis:</p> <ul style="list-style-type: none"> Full PFAS analytical suite (refer to the SAQP for full list of analytes). Major anions and cations (include calcium, magnesium, sodium, potassium, chloride, sulfate, alkalinity and ionic balance). Dissolved organic carbon (DOC), total suspended solids (TSS), total dissolved solids (TDS) and pH.

3.2 Sediment Sampling Methodology

Sediment sampling methodology is detailed in Table 3-2.

Table 3-2 Sediment Sampling Method

Activity	Details
Sample Collection	<p>Sediment samples were collected at the sediment/water interface using hand tools (e.g. trowel, hand auger, PVC pipe etc.) with samples placed directly into appropriately labelled, laboratory supplied sample containers and packed in chilled containers for delivery to the laboratory under CoC documentation.</p> <p>At each sampling location, the sediment sample was visually assessed and observations (including physical description) recorded on field data sheets.</p>
Field Records	<p>The following information was recorded on the field data sheets:</p> <ul style="list-style-type: none"> Sampling time, date and name of the sampler. Weather conditions. Sample Collection method. Sampling equipment decontamination procedures where non-disposable sampling equipment is utilised.
Decontamination	All re-usable sampling equipment was thoroughly washed using PFAS & phosphate-free detergent, then double rinsed with clean water before the sample collection.
Laboratory Testing	<p>Sediment samples were submitted for the following analysis:</p> <ul style="list-style-type: none"> Full PFAS analytical suite (refer to the SAQP for full list of analytes). Total organic carbon (TOC), electrical conductivity (EC), cation exchange capacity (CEC) and pH.

3.3 Quality Control / Quality Assurance

A critical aspect of site assessments is the demonstration of the quality of the data used as the basis for the assessment. This is achieved through a Data Validation process which includes a review of the following data quality indicators, as described in the SAQP:

- > QA documentation.
- > Bias.
- > Data Representativeness.
- > Data Precision & Accuracy.
- > Laboratory Performance.
- > Data Comparability.
- > Data Set Completeness.

A detailed review of these aspects has been undertaken, the results of which are presented in Appendix E.

The QA/QC review concluded that there are no significant systematic errors in the data collection process and therefore, the dataset used for the assessment is considered valid and complete.

3.4 Assessment Criteria

3.4.1 Surface water

The adopted assessment criteria for surface water are detailed in Table 3-3.

Table 3-3 Criteria for Surface water

Exposure Scenario	Adopted Assessment Criteria		Guidance
	PFHxS / PFOS µg/L	PFOA	
Human Health – Recreational Water	2 ¹	10	NHMRC 2019, HEPA 2020
Ecological – 99% species protection	0.00023 ²	19	HEPA 2020

1. Sum of PFOS and PFHxS.
2. PFOS only; Practical screening guideline of 0.01 µg/L is based on typical current laboratory limit of reporting. Therefore, it should be noted that warning and action levels would not be relevant until the detection limits are reduced or the screening levels are increased (HEPA 2020).

3.4.2 Sediment

It is noted that there are currently no Australian regulatory endorsed assessment levels for risk posed to ecology or human health by PFAS in sediment. As detailed in the SAQP (Cardno, 2020), sediment samples will be assessed with reference to the PFAS NEMP 2.0 (HEPA, 2020) soil criteria for consistency with the DSI (GHD, 2018). The adopted assessment criteria for sediment are detailed in Table 3-4.

Table 3-4 Criteria for Sediment

Exposure Scenario	Adopted Assessment Criteria		Guidance
	PFHxS / PFOS mg/kg	PFOA	
Human Health - Commercial / industrial (on-base activities)	20 ¹	50	HEPA 2020
Ecological – Direct exposure (interim guidelines)	1 ²	10	HEPA 2020
Ecological - indirect exposure (interim guidelines)	0.01 ²	-	HEPA 2020

1. Sum of PFOS and PFHxS.
2. PFOS only

4 Field Observations and Results

4.1 Surface water

4.1.1 Summary of Field Observations

Surface water was observed pooling in the Northern and Southern Drainage channels (Figure 2, Appendix A) and in Wapet creek following the recent heavy rainfall event. The site's drains and central drainage channel were found dry. Cardno understand that the Central and Southern Drainage channels discharge into Wapet Creek; and the Northern Drainage channel and Wapet Creek discharge to Exmouth Gulf (GHD, 2018).

4.1.1.1 Physicochemical parameters

Stabilised physiochemical parameters, water colour and turbidity observations recorded during the surface water sampling program are presented in field sampling records, included in Appendix D. Parameters were generally consistent with the previous monitoring events. Surface water pH was near neutral, water was generally clear and considered moderately saline to hyper-saline. DO readings indicate aerobic surface water conditions. No visual or olfactory evidence of contamination were recorded.

4.1.2 Surface water Laboratory Results

The results of laboratory analysis have been compared against adopted assessment criteria. Analytical data is presented in Table 1, Appendix B. A summary of results exceeding the adopted criteria is presented in Table 4-1. Laboratory results have also been compared to available historical data, Figure 2 in Appendix A presents the surface water monitoring locations where a first time detection of Sum of Per-fluoro-octane Sulfonate (PFOS) and Per-fluoro-hexane Sulphonate (PFHxS) or Per-fluoro-octanoic Acid (PFOA), or a new exceedance of guideline values were reported. The laboratory reports are provided in Appendix C.

Table 4-1 Summary of Surface Water Results Exceeding Adopted Criteria

Analytes	Locations Exceeding Criteria	Lowest Criteria (µg/L)	Max Conc. (µg/L)	No. Analytical Results ¹	No. Results Above Criteria
PFOA	-	10 ²	<0.01	19	0
PFOS	SW189, SW190, SW193, SW209, SW210, SW288, SW300, SW302, SW305	0.01 ³	0.26	19	9
Sum of PFHxS and PFOS	-	2 ²	0.26	19	0

Notes:

1. Non-inclusive of quality control samples
2. Human Health - Recreational Use Guideline (HEPA, 2020)
3. Ecological - 99% species protection level (HEPA, 2020) – LOR (0.01 µg/L) adopted as a practical screening value.

Findings are summarised as follows:

- > Two surface water monitoring locations (SW190 & SW305), reported a first time detect of Sum of PFOS and PFHxS. SW190 was sampled for the first time during the first flush event (previously always dry).
- > No new exceedances of adopted guideline values were reported for any of the surface water samples.
- > All surface water samples reported concentrations of PFOA below the laboratory LOR.
- > Four out of the seven surface water samples taken in the drainage channels reported an exceedance of the Ecological criteria (LOR adopted) for PFOS.
- > Five out of the twelve surface water samples taken within Wapet Creek reported an exceedance of the Ecological criteria (LOR adopted) for PFOS.

> None of the surface water samples exceeded the Recreational Use criteria.

4.2 Sediment

4.2.1 Summary of Field Observations

Field observations recorded at the time of sediment sampling are provided in Table 7, Appendix D.

4.2.2 Laboratory Results

The results of laboratory analysis have been compared against adopted assessment criteria. Sediment analytical results are presented in Table 2, Appendix B. A summary of results exceeding the adopted criteria is presented in Table 4-2. Laboratory results have also been compared to available historical data, Figure 3 in Appendix A presents the sediment monitoring locations where a first-time detection of Sum of PFOS and PFHxS or PFOA; or a new exceedance of guideline values were reported. The laboratory reports are provided in Appendix C.

Table 4-2 Summary of Sediment Results Exceeding Adopted Criteria

Analytes	Locations Exceeding Criteria	Lowest Criteria (mg/kg)	Max Conc. (mg/kg)	No. Analytical Results ¹	No. Results Above Criteria
PFOA	-	10 ²	<0.0002	49	0
PFOS	SS114, SS121, SS123, SS124, SS125, SS174, SS190, SS235, SS243, SS277, SS278	0.01 ³	0.09	49	11
Sum of PFHxS and PFOS	-	20 ⁴	0.09	49	0

Notes:

1. Non-inclusive of quality control samples
2. Ecological – Direct Exposure (HEPA, 2020)
3. Ecological – Indirect exposure (HEPA, 2020)
4. Human Health – Commercial/Industrial (HEPA, 2020)

Findings are summarised as follows:

- > No sediment sample reported a first time detect of PFOA, or Sum of PFOS and PFHxS.
- > No sediment sample reported a new exceedance of guideline values.
- > No exceedances of the Human Health Commercial/Industrial or Ecological criteria were reported during the first flush event.
- > All sediment samples reported concentrations of PFOA below the laboratory LOR.
- > Ten out of twenty-three sediment samples taken in the on-site drainage channels reported an exceedance of the Ecological criteria for PFOS.
- > One out of thirteen sediment samples taken in the off-site drainage channels reported an exceedance of the Ecological criteria for PFOS.

4.3 Changes to the Monitoring Network Condition

No changes to the monitoring network condition were noted during this sampling event.

5 Summary and Conclusions

Cardno undertook the First Flush 2021 surface water and sediment monitoring event at RAAF Base Learmonth as part of the PFAS OMP following the first heavy rainfall of the wet season. Surface water sampling and testing was undertaken at 19 monitoring locations and sediment sampling and testing at 49 locations. 30 surface water monitoring locations were found dry and could not be sampled.

The surface water laboratory results reported the following:

- > Of the 19 samples tested, PFOS (9 samples) was detected above the adopted ecological 99% species protection criteria (LOR adopted).
- > Two surface water monitoring locations reported a first time detect of Sum of PFOS and PFHxS (SW190, sampled for the first time, and SW305).

The sediment laboratory results reported the following:

- > Of the 49 samples that were tested, PFOS (11 samples) was detected above the adopted ecological criteria for indirect exposure (LOR adopted).
- > No sediment sampling location reported a first time detect of PFOA or Sum of PFHxS and PFOS.
- > No sediment sampling location reported a new exceedance of guideline values.

PFAS concentrations were generally within the historical range for all media sampled, with the exceptions reported above.

The next OMP sampling event for RAAF Base Learmonth will be the biannual monitoring event (Post-Summer 2021), scheduled for June 2021. An Annual Interpretive Report will be prepared following this event.

6 References

General References

1. Australian Standard AS 4482-2005 Guide to the investigation and sampling of sites with potentially contaminated soils, Part 1 – Non-volatile and semi-volatile compounds.
2. Australian Standard AS 4482-1999 Guide to the investigation and sampling of sites with potentially contaminated soils, Part 2 – Volatile substances.
3. Australian Water Quality Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ, 2000).
4. Bureau of Meteorology, Climate Data Online (<http://www.bom.gov.au/climate/data/?ref=fr>)
5. *Contaminated Sites Act 2003*, Western Australia.
6. Department of the Environment and Energy (2017) in the National Greenhouse and Energy Reporting Scheme Measurement Technical Guidelines for the Estimation of Emissions by Facilities in Australia.
7. Department of Environment Regulation (DER), 2014, *Assessment and Management of Contaminated Sites*.
8. Department of Water and Environment Regulation (DWER), 2018, Perth Groundwater Atlas, (<https://maps.water.wa.gov.au/#/webmap/gwm>).
9. Environmental Protection Agency (United States EPA), November 2002, Reference: EPA/240/R-02/004, 'Guidance on Environmental Data Verification and Data Validation'.
10. The Heads of EPAs Australia and New Zealand (HEPA; 2020) PFAS National Environmental Management Plan (NEMP) 2.0, January 2020.
11. National Environment Protection Council (NEPC), 1999, National Environmental Protection (Assessment of Site Contamination) Measure (as amended), registered May 2013.
12. National Health and Medical Research Council (NHMRC) (2011, as updated 2018) National Water Quality Management Strategy Australian Drinking Water Guidelines 6, August 2018
13. NHMRC, August 2019, Guidance on Per and Polyfluoroalkyl Substances (PFAS) in Recreational Water.
14. Standards Australia/Standards New Zealand (1998) AS5667.1:1998 'Water Quality – Sampling, Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples'.
15. U.S. Environmental Protection Agency (EPA), 2000, 'Guidance for the Data Quality Objectives Process (EPA QA/G-4)'.
16. USEPA, 2002, 'Guidance on Environmental Data Verification and Data Validation (EPA QA/G-8)'.
17. Department of Environment and Energy, 2017, Defence Contamination Management Manual (DCMM) Annex L, 'OMP Factual Report Writing Guidance'.
- 18.

Site Specific References

19. Cardno, June 2020, PFAS OMP SAQP - RAAF Base Learmonth
20. Cardno, April 2020, PFAS OMP Biannual Monitoring Event Factual Report RAAF Base Learmonth
21. Cardno, May 2020, PFAS OMP First Flush Sampling Event Factual Report RAAF Learmonth
22. Cardno, December 2020, PFAS OMP 2020 post-summer Biannual Monitoring Event RAAF Base Learmonth.
23. Cardno, February 2021, PFAS OMP 2020 post-winter Biannual Monitoring Event RAAF Base Learmonth
24. Department of Defence, May 2019, RAAF Base Learmonth PFAS Management Area Plan.
25. Department of Defence, May 2019, RAAF Base Learmonth PFAS Ongoing Monitoring Plan.
26. GHD, December 2018, RAAF Base Learmonth – PFAS Investigations – Preliminary and Detailed Site Investigation Report.
27. GHD, April 2019, RAAF Base Learmonth – PFAS Investigations – Ecological Risk Assessment Preliminary (ERA).


APPENDIX

A

FIGURES



Legend

 Management Area


 RAAF Learmonth

FIGURE 1
1:60,000 Scale at A3

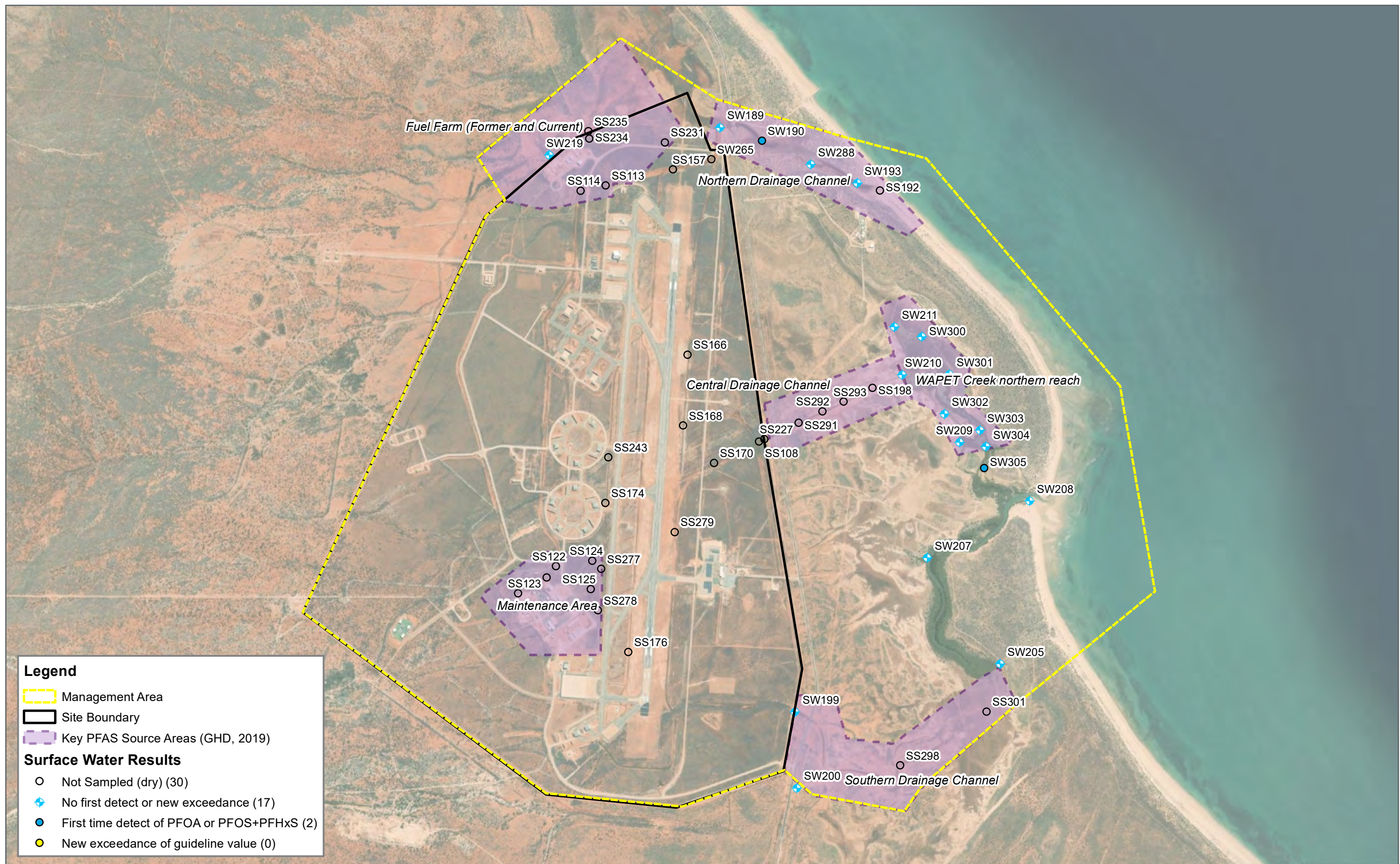


Site Location

FIRST FLUSH SAMPLING EVENT
RAAF BASE LEARMONTH
DEPARTMENT OF DEFENCE



Map Produced by Cardno WA
Date: 2021-06-13 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0960-GS-001_RegionalLocation 02.mxd
Aerial Imagery Supplied by Google Earth



Legend

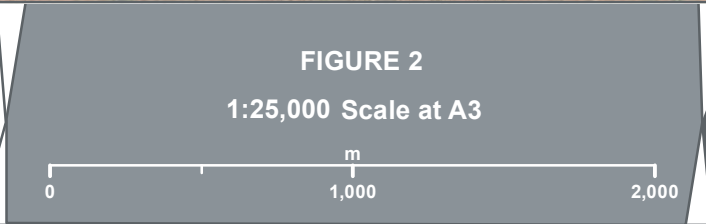
Management Area

Site Boundary

Key PFAS Source Areas (GHD, 2019)

Surface Water Results

- Not Sampled (dry) (30)
- No first detect or new exceedance (17)
- First time detect of PFOA or PFOS+PFHxS (2)
- New exceedance of guideline value (0)



Surface water monitoring locations & Results

FIRST FLUSH SAMPLING EVENT
RAAF BASE LEARMONTH
DEPARTMENT OF DEFENCE

Map Produced by Cardno WA
Date: 2021-06-13 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0960-GS-002_SWMar21 01.mxd

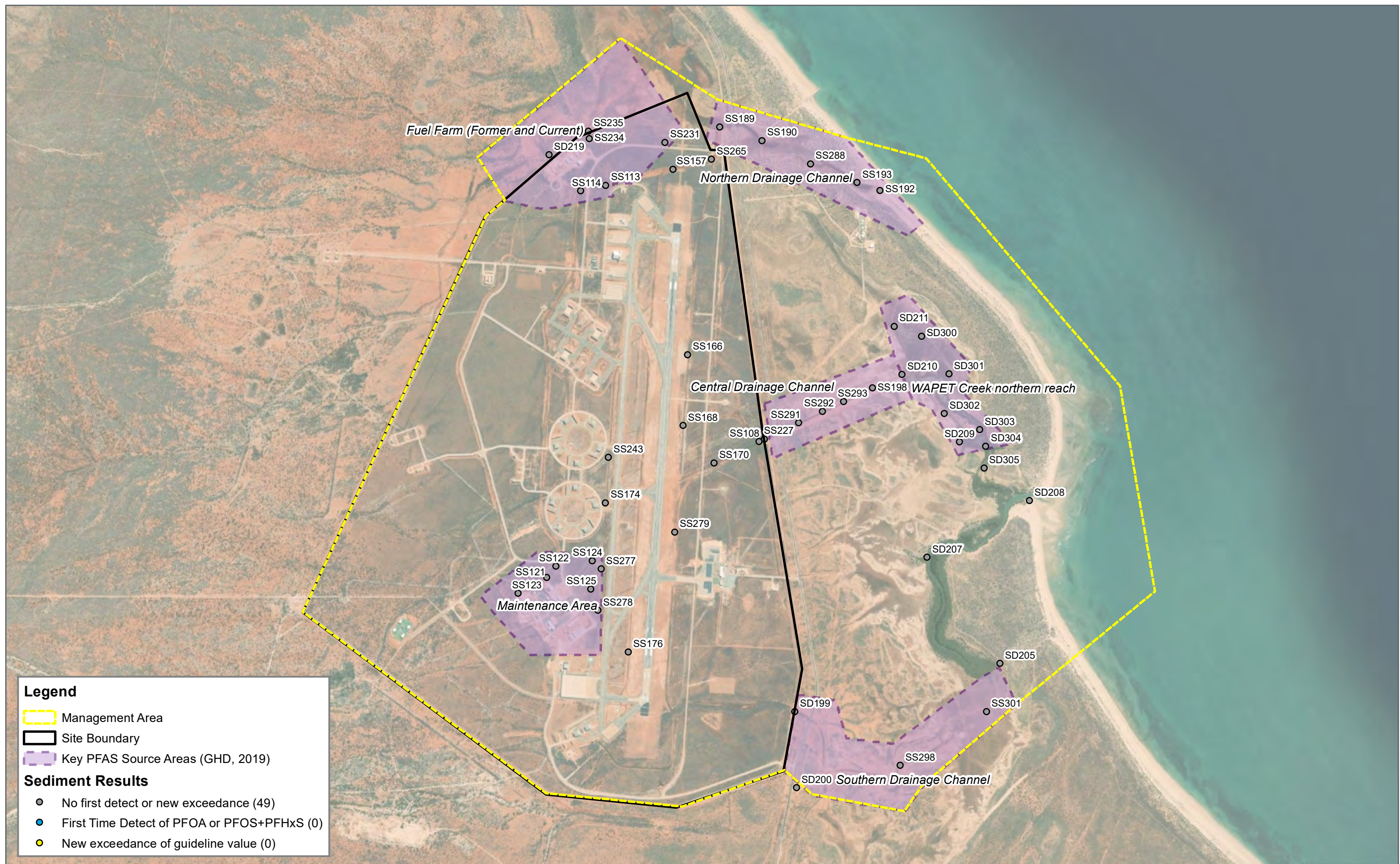
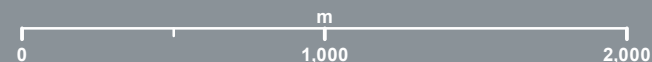


FIGURE 3
1:25,000 Scale at A3



Sediment monitoring locations & Results

FIRST FLUSH SAMPLING EVENT
RAAF BASE LEARMONTH
DEPARTMENT OF DEFENCE



Map Produced by Cardno WA
Date: 2021-06-13 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0960-GS-003_SDMar21 01.mxd

APPENDIX

B

DATA ASSESSMENT TABLES

Table 1: Surface Water Analytical Results

					PFAS - Perfluoroalkyl Sulfonic Acids						PFAS - Perfluoroalkyl Carboxylic Acids											
					Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluorohexanoic acid (PFHxA)	Perfluoropentanoic acid (PFPeA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorononanoic acid (PFNA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTriDA)	Perfluoroundecanoic acid (PFUnDA)	
					µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	
LOR - Limit of Reporting					0.02	0.02	0.02	0.02	0.01	0.02	0.1	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.05	0.02	0.02	
PFAS NEMP (HEPA, 2020) Human Health - Recreational Water											10											
PFAS NEMP (HEPA, 2020) Ecological - 99% Species Protection Level					LOR #1						19											
Area	Lab Report Number	Field ID	Location Code	Date																		
Drainage Channels (source and pathway)	EP2102258	0960_SW189_210304	SW189	4/03/2021	<0.02	<0.02	<0.02	<0.02	0.06	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	
Drainage Channels (source and pathway)	EP2102258	0960_SW190_210304	SW190	4/03/2021	<0.02	<0.02	<0.02	<0.02	0.06	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	
Drainage Channels (source and pathway)	EP2102258	0960_SW193_210304	SW193	4/03/2021	<0.02	<0.02	<0.02	<0.02	0.26	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	
Drainage Channels (source and pathway)	EP2102262	0960_SW199_210304	SW199	4/03/2021	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	
Drainage Channels (source and pathway)	EP2102262	0960_SW200_210304	SW200	4/03/2021	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	
Wapet Creek (receptor)	EP2102258	0960_SW205_210304	SW205	4/03/2021	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	
Wapet Creek (receptor)	EP2102262	0960_SW207_210304	SW207	4/03/2021	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	
Wapet Creek (receptor)	EP2102262	0960_SW208_210304	SW208	4/03/2021	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	
Wapet Creek (receptor)	EP2102262	0960_SW209_210304	SW209	4/03/2021	<0.02	<0.02	<0.02	<0.02	0.12	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	
Wapet Creek (receptor)	EP2102262	0960_SW210_210304	SW210	4/03/2021	<0.02	<0.02	<0.02	<0.02	0.06	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	
Wapet Creek (receptor)	EP2102258	0960_SW211_210304	SW211	4/03/2021	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	
Drainage Channels (source and pathway)	EP2102258	0960_SW219_210304	SW219	4/03/2021	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	
Drainage Channels (source and pathway)	EP2102258	0960_SW288_210304	SW288	4/03/2021	<0.02	<0.02	<0.02	<0.02	0.10	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	
Wapet Creek (receptor)	EP2102258	0960_SW300_210304	SW300	4/03/2021	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	
Wapet Creek (receptor)	EP2102258	0960_SW301_210304	SW301	4/03/2021	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	
Wapet Creek (receptor)	EP2102262	0960_SW302_210304	SW302	4/03/2021	<0.02	<0.02	<0.02	<0.02	0.09	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	
Wapet Creek (receptor)	EP2102258	0960_SW303_210304	SW303	4/03/2021	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	
Wapet Creek (receptor)	EP2102258	0960_SW304_210304	SW304	4/03/2021	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	
Wapet Creek (receptor)	EP2102262	0960_SW305_210304	SW305	4/03/2021	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	

Notes:

LOR - Limit of reporting

First Time detect of PFOA or PFHxS+PFOS

New exceedance of guideline value

1. LOR adopted for PFOS



Table 1: Surface Water Analytical Results

First Flush 2021 OMP Monitoring Event
RAAF Learmonth

					PFAS - Fluorotelomer Sulfonic Acids					PFAS - Perfluoroalkyl Sulfonamides								PFAS		
	Perfluorobutane sulfonic acid (PFBS)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	Sum of PFAS (WA DER List)	Sum of PFHxS and PFOS	Sum of PFAS					
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L					
LOR - Limit of Reporting															0.01	0.01	0.01			
PFAS NEMP (HEPA, 2020) Human Health - Recreational Water															2					
PFAS NEMP (HEPA, 2020) Ecological - 99% Species Protection Level																				
Area	Lab Report Number	Field ID	Location Code	Date																
Drainage Channels (source and pathway)	EP2102258	0960_SW189_210304	SW189	4/03/2021	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	0.06	0.06	0.06			
Drainage Channels (source and pathway)	EP2102258	0960_SW190_210304	SW190	4/03/2021	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	0.06	0.06	0.06			
Drainage Channels (source and pathway)	EP2102258	0960_SW193_210304	SW193	4/03/2021	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	0.26	0.26	0.26			
Drainage Channels (source and pathway)	EP2102262	0960_SW199_210304	SW199	4/03/2021	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.01	<0.01	<0.01			
Drainage Channels (source and pathway)	EP2102262	0960_SW200_210304	SW200	4/03/2021	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.01	<0.01	<0.01			
Wapet Creek (receptor)	EP2102258	0960_SW205_210304	SW205	4/03/2021	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.01	<0.01	<0.01			
Wapet Creek (receptor)	EP2102262	0960_SW207_210304	SW207	4/03/2021	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.01	<0.01	<0.01			
Wapet Creek (receptor)	EP2102262	0960_SW208_210304	SW208	4/03/2021	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.01	<0.01	<0.01			
Wapet Creek (receptor)	EP2102262	0960_SW209_210304	SW209	4/03/2021	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	0.12	0.12	0.12			
Wapet Creek (receptor)	EP2102262	0960_SW210_210304	SW210	4/03/2021	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	0.06	0.06	0.06			
Wapet Creek (receptor)	EP2102258	0960_SW211_210304	SW211	4/03/2021	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.01	<0.01	<0.01			
Drainage Channels (source and pathway)	EP2102258	0960_SW219_210304	SW219	4/03/2021	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.01	<0.01	<0.01			
Drainage Channels (source and pathway)	EP2102258	0960_SW288_210304	SW288	4/03/2021	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	0.10	0.10	0.10			
Wapet Creek (receptor)	EP2102258	0960_SW300_210304	SW300	4/03/2021	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	0.02	0.02	0.02			
Wapet Creek (receptor)	EP2102258	0960_SW301_210304	SW301	4/03/2021	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.01	<0.01	<0.01			
Wapet Creek (receptor)	EP2102262	0960_SW302_210304	SW302	4/03/2021	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	0.09	0.09	0.09			
Wapet Creek (receptor)	EP2102258	0960_SW303_210304	SW303	4/03/2021	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.01	<0.01	<0.01			
Wapet Creek (receptor)	EP2102258	0960_SW304_210304	SW304	4/03/2021	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.01	<0.01	<0.01			
Wapet Creek (receptor)	EP2102262	0960_SW305_210304	SW305	4/03/2021	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	0.02	0.02	0.02			

Notes:

LOR - Limit of reporting

First Time detect of PFOA or PFHxS+PFOS

New exceedance of guideline value

1. LOR adopted for PFOS



Table 1: Surface Water Analytical Results

					Inorganics														Metals			Organic	
					Perfluorobutane sulfonic acid (PFBS)	Carbonate Alkalinity (as CaCO3)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3	Anions Total	Cations Total	Chloride	Ionic Balance	pH (Lab)	Sodium (filtered)	Sulphate as SO4 - Turbidimetric (filtered)	TDS	TOC	Total Suspended Solids	Calcium (filtered)	Magnesium (filtered)	Potassium (filtered)	Dissolved Organic Carbon
					µg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	mg/L	%	pH Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LOR - Limit of Reporting					0.02	1	1	1	1	0.01	0.01	1	0.01	0.01	1	1	10	1	5	1	1	1	1
PFAS NEMP (HEPA, 2020) Human Health - Recreational Water																							
PFAS NEMP (HEPA, 2020) Ecological - 99% Species Protection Level																							
Area	Lab Report Number	Field ID	Location Code	Date																			
Drainage Channels (source and pathway)	EP2102258	0960_SW189_210304	SW189	4/03/2021	<0.02	<1	44	<1	44	1.06	1.19	5	5.88	7.92	7	2	80		31	13	2	3	4
Drainage Channels (source and pathway)	EP2102258	0960_SW190_210304	SW190	4/03/2021	<0.02	<1	62	<1	62	2.32	2.43	23	2.14	7.81	29	21	147		18	18	2	4	6
Drainage Channels (source and pathway)	EP2102258	0960_SW193_210304	SW193	4/03/2021	<0.02	<1	63	<1	63	2.38	2.68	25	5.88	7.79	30	20	148		34	20	3	5	10
Drainage Channels (source and pathway)	EP2102262	0960_SW199_210304	SW199	4/03/2021	<0.02	<1	68	<1	68	1.47	1.66	4	5.91	8.09	5	<1	132		56	24	2	3	5
Drainage Channels (source and pathway)	EP2102262	0960_SW200_210304	SW200	4/03/2021	<0.02	<1	51	<1	51	1.12	1.31	2	8.07	7.93	3	2	68		39	20	1	4	6
Wapet Creek (receptor)	EP2102258	0960_SW205_210304	SW205	4/03/2021	<0.02	<1	106	<1	106	580	680	18,400	7.91	8.00	11,800	2,830	41,200		17	488	1,520	667	3
Wapet Creek (receptor)	EP2102262	0960_SW207_210304	SW207	4/03/2021	<0.02	<1	111	<1	111	623	662	19,900	3.08	8.08	11,500	2,850	41,000		8	475	1,480	655	3
Wapet Creek (receptor)	EP2102262	0960_SW208_210304	SW208	4/03/2021	<0.02	<1	107	<1	107	607	686	19,300	6.04	8.06	11,900	2,920	40,900		22	491	1,530	683	2
Wapet Creek (receptor)	EP2102262	0960_SW209_210304	SW209	4/03/2021	<0.02	<1	116	<1	116	412	422	13,200	1.26	7.74	7,320	1,780	26,300	8	166	328	927	436	
Wapet Creek (receptor)	EP2102262	0960_SW210_210304	SW210	4/03/2021	<0.02	<1	112	<1	112	378	383	12,100	0.71	7.70	6,640	1,640	23,400		84	296	846	387	6
Wapet Creek (receptor)	EP2102258	0960_SW211_210304	SW211	4/03/2021	<0.02	<1	145	<1	145	367	398	11,600	3.96	7.54	6,800	1,790	23,300		344	399	870	406	11
Drainage Channels (source and pathway)	EP2102258	0960_SW219_210304	SW219	4/03/2021	<0.02	<1	67	<1	68	2.14	2.28	19	2.96	8.31	32	12	352	4	476	14	1	4	
Drainage Channels (source and pathway)	EP2102258	0960_SW288_210304	SW288	4/03/2021	<0.02	<1	65	<1	65	2.39	2.78	24	7.45	7.89	30	20	146		50	22	3	5	8
Wapet Creek (receptor)	EP2102258	0960_SW300_210304	SW300	4/03/2021	<0.02	<1	85	<1	85	328	334	10,400	0.96	8.06	5,710	1,580	21,200		5	386	706	337	12
Wapet Creek (receptor)	EP2102258	0960_SW301_210304	SW301	4/03/2021	<0.02	<1	94	<1	94	401	429	12,700	3.36	8.10	7,380	1,950	26,300		7	404	923	450	8
Wapet Creek (receptor)	EP2102262	0960_SW302_210304	SW302	4/03/2021	<0.02	<1	127	<1	127	424	438	13,600	1.63	7.71	7,580	1,840	26,900	10	618	347	970	458	
Wapet Creek (receptor)	EP2102258	0960_SW303_210304	SW303	4/03/2021	<0.02	<1	109	<1	109	578	669	18,400	7.29	8.08	11,600	2,740	41,000		7	485	1,500	665	2
Wapet Creek (receptor)	EP2102258	0960_SW304_210304	SW304	4/03/2021	<0.02	<1	115	<1	115	579	658	18,400	6.35	7.98	11,400	2,770	42,000		17	485	1,470	645	4
Wapet Creek (receptor)	EP2102262	0960_SW305_210304	SW305	4/03/2021	<0.02	<1	104	<1	104	419	442	13,400	2.61	7.94	7,640	1,890	26,600	8	39	364	967	464	

Notes:

LOR - Limit of reporting

First Time detect of PFOA or PFHxS+PFOS

New exceedance of guideline value

1. LOR adopted for PFOS

Notes:

First Time detect of PFOA or PFHxS+PFOS
New exceedance of guideline value
LOR: Limit of Reporting

Notes:

First Time detect of PFOA or PFHxS+PFOS
New exceedance of guideline value
LOR: Limit of Reporting

Table 2: Sediment Analytical Results

					Perfluorobutane sulfonic acid (PFBS)	Exchangeable Sodium Percent	Moisture Content	Exchangeable Calcium	Exchangeable Magnesium	Exchangeable Potassium	Exchangeable Sodium	CEC	Electrical conductivity *(lab)	pH (Lab)	Organic
					mg/kg	%	%	meq/100g	meq/100g	meq/100g	meq/100g	meq/100g	µS/cm	pH Units	%
LOR - Limit of Reporting					0.0002	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1	0.1	0.5
PFAS NEMP (HEPA, 2020) Ecological - Direct exposure (interim guidelines)															
PFAS NEMP (HEPA, 2020) Ecological - Indirect exposure (interim guidelines)															
PFAS NEMP (HEPA, 2020) Human Health- Commercial / industrial (on-base activities)															
Area	Lab Report Number	Field ID	Location Code	Date											
Drainage Channels (source and pathway)	EP2102261	0960_SD199_210304	SD199	4/03/2021	<0.0002	0.2	20.2	20.2	2.0	0.8	<0.1	23.2	74	8.9	1.2
Drainage Channels (source and pathway)	EP2102259	0960_SD200_210304	SD200	4/03/2021	<0.0002	0.4	24.0	23.8	2.6	0.8	0.1	27.3	64	9.1	1.4
Wapet Creek (receptor)	EP2102261	0960_SD205_210304	SD205	4/03/2021	<0.0002	1.7	26.4	12.0	1.2	<0.1	0.2	13.4	3,060	9.3	0.6
Wapet Creek (receptor)	EP2102261	0960_SD207_210304	SD207	4/03/2021	<0.0002	2.4	27.6	8.4	1.2	<0.1	0.2	9.8	3,430	9.2	<0.5
Wapet Creek (receptor)	EP2102261	0960_SD208_210304	SD208	4/03/2021	<0.0002	2.7	22.5	5.0	0.8	<0.1	0.2	6.0	2,830	9.2	1.1
Drainage Channels (source and pathway)	EP2102261	0960_SS288_210304	SS288	4/03/2021	<0.0002	1.2	19.8	8.6	1.4	<0.1	0.1	10.2	104	9.3	<0.5
Wapet Creek (receptor)	EP2102261	0960_SD209_210304	SD209	4/03/2021	<0.0002	1.7	24.1	15.6	7.1	0.8	0.4	23.9	6,240	8.9	0.9
Wapet Creek (receptor)	EP2102261	0960_SD210_210304	SD210	4/03/2021	<0.0002	0.8	25.3	53.4	7.1	0.6	0.5	61.5	3,580	8.7	0.5
Wapet Creek (receptor)	EP2102259	0960_SD211_210304	SD211	4/03/2021	<0.0002	1.5	28.6	28.6	9.2	0.9	0.6	39.3	4,860	8.8	2.6
Drainage Channels (source and pathway)	EP2102259	0960_SD219_210304	SD219	4/03/2021	<0.0002	1.6	26.8	19.4	2.5	0.6	0.4	22.8	126	8.5	1.4
Wapet Creek (receptor)	EP2102261	0960_SD300_210304	SD300	4/03/2021	<0.0002	0.7	18.7	10.1	2.4	0.2	<0.1	12.7	1,510	8.9	<0.5
Wapet Creek (receptor)	EP2102261	0960_SD301_210304	SD301	4/03/2021	<0.0002	0.8	19.3	2.9	1.4	<0.1	<0.1	4.4	3,460	9.1	<0.5
Wapet Creek (receptor)	EP2102261	0960_SD302_210304	SD302	4/03/2021	<0.0002	0.9	20.2	9.4	2.2	0.2	0.1	11.8	3,420	8.6	<0.5
Wapet Creek (receptor)	EP2102261	0960_SD303_210304	SD303	4/03/2021	<0.0002	0.7	22.0	40.3	5.6	0.3	0.3	46.5	5,240	8.8	0.6
Wapet Creek (receptor)	EP2102261	0960_SD304_210304	SD304	4/03/2021	<0.0002	1.4	24.2	25.8	7.1	0.2	0.4	33.6	4,960	8.9	1.6
Wapet Creek (receptor)	EP2102261	0960_SD305_210304	SD305	4/03/2021	<0.0002	0.6	23.1	19.9	3.6	0.2	0.1	23.8	5,010	8.7	<0.5
Drainage Channels (source and pathway)	EP2102261	0960_SS108_210304	SS108	4/03/2021	<0.0002	0.7	19.9	17.8	2.4	0.7	0.1	21.0	82	9.1	<0.5
Drainage Channels (source and pathway)	EP2102261	0960_SS113_210304	SS113	4/03/2021	<0.0002	0.6	23.6	21.8	3.6	0.8	0.2	26.4	110	8.5	<0.5
Drainage Channels (source and pathway)	EP2102259	0960_SS114_210304	SS114	4/03/2021	<0.0002	0.6	26.0	28.8	5.4	1.9	0.2	36.3	121	8.5	1.1
Drainage Channels (source and pathway)	EP2102259	0960_SS121_210304	SS121	4/03/2021	<0.0002	0.8	17.8	21.6	2.0	1.1	0.2	24.8	85	8.8	0.8
Drainage Channels (source and pathway)	EP2102259	0960_SS122_210304	SS122	4/03/2021	<0.0002	2.1	16.4	22.4	2.7	1.0	0.6	26.6	132	8.9	1.5
Drainage Channels (source and pathway)	EP2102259	0960_SS123_210304	SS123	4/03/2021	<0.0002	1.5	13.4	23.2	2.5	0.6	0.4	26.7	96	8.9	1.0
Drainage Channels (source and pathway)	EP2102259	0960_SS124_210304	SS124	4/03/2021	<0.0002	1.3	19.9	22.0	2.8	1.5	0.4	26.6	124	8.5	1.4
Drainage Channels (source and pathway)	EP2102259	0960_SS125_210304	SS125	4/03/2021	<0.0002	0.4	19.2	22.2	1.8	1.4	0.1	25.5	96	8.6	2.3
Drainage Channels (source and pathway)	EP2102261	0960_SS157_210304	SS157	4/03/2021	<0.0002	0.4	23.3	14.0	1.7	0.2	<0.1	16.1	85	8.6	1.6
Drainage Channels (source and pathway)	EP2102261	0960_SS166_210304	SS166	4/03/2021	<0.0002	0.9	23.1	21.6	3.5	1.4	0.2	26.6	118	8.5	<0.5
Drainage Channels (source and pathway)	EP2102261	0960_SS168_210304	SS168	4/03/2021	<0.0002	1.1	30.9	19.6	2.8	1.1	0.2	23.7	132	8.4	2.8
Drainage Channels (source and pathway)	EP2102259	0960_SS170_210304	SS170	4/03/2021	<0.0002	0.3	31.0	23.2	3.6	1.3	<0.1	28.3	177	8.1	2.2
Drainage Channels (source and pathway)	EP2102261	0960_SS174_210304	SS174	4/03/2021	<0.0002	0.5	23.0	24.1	2.8	1.9	0.1	28.9	116	8.6	2.0
Drainage Channels (source and pathway)	EP2102261	0960_SS176_210304	SS176	4/03/2021	<0.0002	1.4	16.2	14.7	1.6	0.7	0.2	17.3	97	8.8	1.0
Drainage Channels (source and pathway)	EP2102259	0960_SS189_210304	SS189	4/03/2021	<0.0002	0.8	10.8	19.3	3.7	0.7	0.2	23.9	91	9.0	2.7
Drainage Channels (source and pathway)	EP2102259	0960_SS190_210304	SS190	4/03/2021	<0.0002	2.1	22.1	20.8	10.2	1.2	0.7	32.9	144	9.5	1.7
Drainage Channels (source and pathway)	EP2102259	0960_SS192_210304	SS192	4/03/2021	<0.0002	6.1	19.2	5.1	0.7	<0.1	0.4	6.2	108	9.6	1.1
Drainage Channels (source and pathway)	EP2102261	0960_SS193_210304	SS193	4/03/2021	<0.0002	1.2	20.2	9.3	1.9	0.1	0.1	11.5	88	9.1	0.7
Drainage Channels (source and pathway)	EP2102259	0960_SS198_210304	SS198	4/03/2021	<0.0002	1.0	22.2	8.6	1.8	0.1	0.1	10.6	56	9.5	0.8
Drainage Channels (source and pathway)	EP2102259	0960_SS227_210304	SS227	4/03/2021	<0.0002	0.8	21.5	14.1	2.2	0.6	0.1	17.0	92	8.5	1.4
Drainage Channels (source and pathway)	EP2102259	0960_SS231_210304	SS231	4/03/2021	<0.0002	7.8	22.8	23.5	5.7	2.1	2.6	33.9	216	9.4	<0.5
Drainage Channels (source and pathway)	EP2102259	0960_SS234_210304	SS234	4/03/2021	<0.0002	3.3	31.4	22.9	4.4	1.4	1.0	29.6	185	8.5	0.9
Drainage Channels (source and pathway)	EP2102259	0960_SS235_210304	SS235	4/03/2021	<0.0002	2.3	23.6	21.7	3.1	0.9	0.6	26.2	89	9.5	1.0
Drainage Channels (source and pathway)	EP2102261	0960_SS243_210304	SS243	4/03/2021	<0.0002	0.4	25.0	20.8	2.2	1.5	<0.1	24.5	170	8.1	2.0
Drainage Channels (source and pathway)	EP2102261	0960_SS265_210304	SS265	4/03/2021	<0.0002	0.4	20.2	19.3	3.3	0.7	<0.1	23.4	108	8.7	<0.5
Drainage Channels (source and pathway)	EP2102261	0960_SS277_210304	SS277	4/03/2021	<0.0002	0.5	19.4	12.1	1.6	1.0	<0.1	14.8	93	8.5	1.6
Drainage Channels (source and pathway)	EP2102261	0960_SS278_210304	SS278	4/03/2021	<0.0002	0.6	25.2	21.0	3.3	1.7	0.1	26.1	182	8.1	1.9
Drainage Channels (source and pathway)	EP2102261	0960_SS279_210304	SS279	4/03/2021	<0.0002	0.4	18.3	10.8	1.6	0.8	<0.1	13.2	69	8.8	<0.5
Drainage Channels (source and pathway)	EP2102259	0960_SS291_210304	SS291	4/03/2021	<0.0002	0.5	20.3	19.4	2.8	0.7	0.1	23.0	98	8.7	1.0
Drainage Channels (source and pathway)	EP2102259	0960_SS292_210304	SS292	4/03/2021	<0.0002	0.9	19.6	13.6	2.1	0.3	0.1	16.1	89	8.6	0.7
Drainage Channels (source and pathway)	EP2102259	0960_SS293_210304	SS293	4/03/2021	<0.0002	1.4	23.8	21.6	5.9	1.4	0.4	29.4	151	8.6	1.7
Drainage Channels (source and pathway)	EP2102259	0960_SS298_210304	SS298	4/03/2021	<0.0002	1.7	12.3	19.1	3.0	0.6	0.4	23.2	119	9.1	2.7
Wapet Creek (receptor)	EP2102261	0960_SS301_210304	SS301	4/03/2021	<0.0002	3.2	23.6	4.6	0.7	<0.1	0.2	5.5	2,990	9.3	1.2

Notes:

First Time detect of PFOA or PFHxS+PFOS

New exceedance of guideline value

LOR: Limit of Reporting



Table 3: Rinsates and Field Blanks

				PFAS - Perfluoroalkyl Sulfonic Acids						PFAS - Perfluoroalkyl Carboxylic Acids										
				Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluorohexanoic acid (PFHxA)	Perfluoropentanoic acid (PFPeA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorononanoic acid (PFNA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnDA)
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR - Limit of Reporting				0.02	0.02	0.02	0.02	0.01	0.02	0.1	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.05	0.02	0.02

Field ID	Sample Type	Lab Report Number	Date	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02
0960_QC301_210304	Rinsate	EP2102258	4/03/2021	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02
0960_QC302_210304	Rinsate	EP2102262	4/03/2021	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02
0960_QC401_210304	Field Blank	EP2102258	4/03/2021	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02
0960_QC402_210304	Field Blank	EP2102262	4/03/2021	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02



Table 3: Rinsates and Field Blanks

				PFA		PFAS - Fluorotelomer Sulfonic Acids				PFAS - Perfluoroalkyl Sulfonamides								PFAS		
				Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	Sum of PFAS (WA DER List)	Sum of PFHxS and PFOS	Sum of PFAS	
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR - Limit of Reporting				0.02	0.02	0.05	0.05	0.05	0.05	0.02	0.05	0.02	0.05	0.05	0.02	0.05	0.01	0.01	0.01	

Field ID	Sample Type	Lab Report Number	Date	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0960_QC301_210304	Rinsate	EP2102258	4/03/2021	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0960_QC302_210304	Rinsate	EP2102262	4/03/2021	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0960_QC401_210304	Field Blank	EP2102258	4/03/2021	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0960_QC402_210304	Field Blank	EP2102262	4/03/2021	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01

Lab Report Number		EP2102258	EP2102258		EP2102258	779426		EP2102262	EP2102262		EP2102262	779426	
Field ID		0960_SW219_210304	0960_QC106_210304		0960_SW219_210304	0960_QC206_210304		0960_SW199_210304	0960_QC104_210304		0960_SW199_210304	0960_QC204_210304	
Date		4/03/2021	4/03/2021		4/03/2021	4/03/2021		4/03/2021	4/03/2021		4/03/2021	4/03/2021	
Matrix Type		Water	Water	RPD	Water	Water	RPD	Water	Water	RPD	Water	Water	RPD
	Unit	EQL											
PFAS - Perfluoroalkyl Sulfonic Acids													
Perfluoropropanesulfonic acid (PFPS)	µg/L	0.01	-	-	-	-	<0.01	-	-	-	-	-	<0.01
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01
Perfluorononanesulfonic acid (PFNS)	µg/L	0.01	-	-	-	-	<0.01	-	-	-	-	-	<0.01
Perfluorodecane sulfonic acid (PFDS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01
PFAS - Perfluoroalkyl Carboxylic Acids													
Perfluorobutanoic acid (PFBA)	µg/L	0.05	<0.1	<0.1	0	<0.1	<0.05	0	<0.1	<0.1	0	<0.1	<0.05
Perfluorohexanoic acid (PFHxA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01
Perfluoropentanoic acid (PFPeA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01
Perfluorooctanoic acid (PFOA)	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01
Perfluorodecanoic acid (PFDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01
Perfluorododecanoic acid (PFDDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01
Perfluorononanoic acid (PFNA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01
Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01
Perfluorotridecanoic acid (PFTrDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01
PFAS - Fluorotelomer Sulfonic Acids													
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01
PFAS - Perfluoroalkyl Sulfonamides													
Perfluorooctane sulfonamide (FOSA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05
N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05
PFAS													
Sum of PFAS (WA DER List)	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.05	0	<0.01	<0.01	0	<0.01	<0.05
Sum of PFHxS and PFOS	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01
Sum of PFAS	µg/L	0.01	<0.01	<0.01	0	<0.01	<0.1	0	<0.01	<0.01	0	<0.01	<0.1
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)	µg/L	0.01	-	-	-	-	<0.01	-	-	-	-	-	<0.01
Sum of PFAS (PFOS + PFOA)	µg/L	0.01	-	-	-	-	<0.01	-	-	-	-	-	<0.01
Inorganics													
Carbonate Alkalinity (as CaCO3)	mg/L	1	<1	<1	0	<1	<10	0	<1	<1	0	<1	<10
Alkalinity (Bicarbonate as CaCO3)	mg/L	1	67	64	5	67	100	40	68	69	1	68	85
Alkalinity (Hydroxide) as CaCO3	mg/L	1	<1	<1	0	<1	<20	0	<1	<1	0	<1	<20
Alkalinity (total) as CaCO3	mg/L	1	68	65	5	68	100	38	68	69	1	68	85
Anions Total	meq/L	0.01	2.14	2.08	3	2.14	-	-	1.47	1.49	1	1.47	-
Cations Total	meq/L	0.01	2.28	2.18	4	2.28	-	-	1.66	1.74	5	1.66	-
Chloride	mg/L	1	19	19	0	19	24	23	4	4	0	4	5.0
Ionic Balance	%	0.01	2.96	2.13	33	2.96	-	-	5.91	7.64	26	5.91	-
pH (Lab)	pH Units	0.01	8.31	8.39	1	8.31	7.7	8	8.09	7.97	1	8.09	7.6
Sodium	mg/L	0.5	-	-	-	-	30	-	-	-	-	-	6.9
Sodium (filtered)	mg/L	0.5	32	32	0	32	-	-	5	4	22	5	-
Sulphate as SO4 - Turbidimetric (filtered)	mg/L	1	12	12	0	12	-	-	<1	<1	0	<1	-
Sulphate	mg/L	5	-	-	-	26	-	-	-	-	-	-	<5
TDS	mg/L	10	352	349	1	352	230	42	132	134	2	132	140
TOC	mg/L	1	4	4	0	4	-	-	-	-	-	-	-
Total Suspended Solids	mg/L	1	476	1,420	100	476	410	15	56	129	79	56	160
Metals													
Calcium	mg/L	0.5	-	-	-	-	15	-	-	-	-	-	23
Calcium (filtered)	mg/L	0.5	14	12	15	14	-	-	24	26	8	24	-
Magnesium	mg/L	0.5	-	-	-	-	2.8	-	-	-	-	-	2.3
Magnesium (filtered)	mg/L	0.5	1	1	0	1	-	-	2	2	0	2	-
Potassium	mg/L	0.5	-	-	-	-	5.4	-	-	-	-	-	3.0
Potassium (filtered)	mg/L	0.5	4	4	0	4	-	-	3	4	29	3	-
Organic													
Dissolved Organic Carbon	mg/L	1	-	-	-	-	-	-	5	4	22	5	-
Dissolved Organic Carbon (filtered)	mg/L	1	-	-	-	-	<5	-	-	-	-	-	<5

*RPDs have only been considered where a concentration is greater than 1 times the estimated quantitation limit (EQL).

**Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: No Limit (1 - 10 x EQL); 50 (10 - 20 x EQL); 20 (> 20 x EQL))

***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory

Lab Report Number			EP2102259	EP2102259		EP2102259	779426		EP2102259	EP2102259	
Field ID			0960_SS123_210304	0960_QC101_210304		0960_SS123_210304	0960_QC201_210304		0960_SS122_210304	0960_QC102_210304	
Date			4/03/2021	4/03/2021		4/03/2021	4/03/2021		4/03/2021	4/03/2021	
Matrix Type			Soil	Soil	RPD	Soil	Soil	RPD	Soil	Soil	RPD
	Unit	EQL									
PFAS - Perfluoroalkyl Sulfonic Acids											
Perfluoropropanesulfonic acid (PFPrS)	mg/kg	0.005	-	-	-	-	<0.005	-	-	-	-
Perfluorobutane sulfonic acid (PFBS)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
Perfluoropentane sulfonic acid (PFPeS)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
Perfluorohexane sulfonic acid (PFHxS)	mg/kg	0.0002	<0.0002	0.0003	40	<0.0002	<0.005	0	<0.0002	<0.0002	0
Perfluoroheptane sulfonic acid (PFHpS)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
Perfluorooctane sulfonic acid (PFOS)	mg/kg	0.0002	0.0900	0.0815	10	0.0900	0.073	21	0.0069	0.0102	39
Perfluorononanesulfonic acid (PFNS)	mg/kg	0.005	-	-	-	-	<0.005	-	-	-	-
Perfluorodecane sulfonic acid (PFDS)	mg/kg	0.0002	0.0011	0.0006	59	0.0011	<0.005	0	<0.0002	0.0017	158
PFAS - Perfluoroalkyl Carboxylic Acids											
Perfluorobutanoic acid (PFBA)	mg/kg	0.001	<0.001	<0.001	0	<0.001	<0.005	0	<0.001	<0.001	0
Perfluorohexanoic acid (PFHxA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
Perfluoropentanoic acid (PFPeA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
Perfluoroheptanoic acid (PFHpA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
Perfluorooctanoic acid (PFOA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
Perfluorodecanoic acid (PFDA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	0.0003	40
Perfluorododecanoic acid (PFDoDA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	0.0003	40
Perfluorononanoic acid (PFNA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
Perfluorotetradecanoic acid (PFTeDA)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0
Perfluorotridecanoic acid (PFTrDA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
Perfluoroundecanoic acid (PFUnDA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	0.0003	40
PFAS - Fluorotelomer Sulfonic Acids											
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.01	0	<0.0005	<0.0005	0
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0
PFAS - Perfluoroalkyl Sulfonamides											
Perfluorooctane sulfonamide (FOSA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
N-Methyl perfluorooctane sulfonamide (MeFOSA)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.01	0	<0.0002	<0.0002	0
N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.01	0	<0.0002	<0.0002	0
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0
PFAS											
Sum of PFAS (WA DER List)	mg/kg	0.0002	0.0900	0.0818	10	0.0900	0.073	21	0.0069	0.0102	39
Sum of PFHxS and PFOS	mg/kg	0.0002	0.0900	0.0818	10	0.0900	0.073	21	0.0069	0.0102	39
Sum of PFAS	mg/kg	0.0002	0.0911	0.0824	10	0.0911	0.073	22	0.0069	0.0128	60
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)	mg/kg	0.005	-	-	-	-	0.073	-	-	-	-
Sum of PFAS (PFOS + PFOA)	mg/kg	0.005	-	-	-	-	0.073	-	-	-	-
Inorganics											
Conductivity (1:5 aqueous extract)	µS/cm	10	-	-	-	-	88	-	-	-	-
Exchangeable Sodium Percent	%	0.1	1.5	1.6	6	1.5	-	-	2.1	2.2	5
pH (1:5 Aqueous extract at 25Å°C as rec.)	pH Units	0.1	-	-	-	-	8.0	-	-	-	-
Moisture Content	%	0.1	13.4	13.2	2	13.4	13	3	16.4	16.4	0
Exchangeable Calcium	meq/100g	0.1	23.2	20.0	15	23.2	-	-	22.4	20.8	7
Exchangeable Magnesium	meq/100g	0.1	2.5	2.5	0	2.5	-	-	2.7	2.3	16
Exchangeable Potassium	meq/100g	0.1	0.6	0.6	0	0.6	-	-	1.0	0.8	22
Exchangeable Sodium	meq/100g	0.1	0.4	0.4	0	0.4	-	-	0.6	0.5	18
CEC	meq/100g	0.05	26.7	23.5	13	26.7	39	37	26.6	24.4	9
Electrical conductivity *(lab)	µS/cm	1	96	101	5	96	-	-	132	121	9
pH (Lab)	pH Units	0.1	8.9	8.9	0	8.9	-	-	8.9	9.0	1
TOC	mg/kg	1.000	-	-	-	-	10,000	-	-	-	-
Organic											
Organic Matter	%	0.5	1.0	<0.5	67	1.0	-	-	1.5	2.0	29

*RPDs have only been considered where a concentration is greater than 1 times the EQL.

**Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each EQL multiplier range are: No Limit (1 - 10 x EQL); 50 (10 - 20 x EQL); 20 (> 20 x EQL))

***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory

		EP2102259	779426		EP2102259	EP2102259		EP2102259	779426		EP2102261	EP2102261	
		0960_SS122_210304	0960_QC202_210304		0960_SS114_210304	0960_QC103_210304		0960_SS114_210304	0960_QC203_210304		0960_SD199_210304	0960_QC105_210304	
		4/03/2021	4/03/2021		4/03/2021	4/03/2021		4/03/2021	4/03/2021		4/03/2021	4/03/2021	
		Soil	Soil	RPD	Soil	Soil	RPD	Soil	Soil	RPD	Soil	Soil	RPD
	Unit												
PFAS - Perfluoroalkyl Sulfonic Acids													
Perfluoropropanesulfonic acid (PFPrS)	mg/kg	-	<0.005	-	-	-	-	-	<0.005	-	-	-	-
Perfluorobutane sulfonic acid (PFBS)	mg/kg	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
Perfluoropentane sulfonic acid (PFPeS)	mg/kg	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
Perfluorohexane sulfonic acid (PFHxS)	mg/kg	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
Perfluoroheptane sulfonic acid (PFHpS)	mg/kg	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
Perfluorooctane sulfonic acid (PFOS)	mg/kg	0.0069	0.0090	26	0.0390	0.0321	19	0.0390	0.029	29	0.0007	0.0006	15
Perfluorononanesulfonic acid (PFNS)	mg/kg	-	<0.005	-	-	-	-	-	<0.005	-	-	-	-
Perfluorodecane sulfonic acid (PFDS)	mg/kg	<0.0002	<0.005	0	0.0007	0.0010	35	0.0007	<0.005	0	<0.0002	<0.0002	0
PFAS - Perfluoroalkyl Carboxylic Acids													
Perfluorobutanoic acid (PFBA)	mg/kg	<0.001	<0.005	0	<0.001	<0.001	0	<0.001	<0.005	0	<0.001	<0.001	0
Perfluorohexanoic acid (PFHxA)	mg/kg	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
Perfluoropentanoic acid (PFPeA)	mg/kg	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
Perfluoroheptanoic acid (PFHpA)	mg/kg	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
Perfluorooctanoic acid (PFOA)	mg/kg	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
Perfluorodecanoic acid (PFDA)	mg/kg	<0.0002	<0.005	0	0.0002	0.0002	0	0.0002	<0.005	0	<0.0002	<0.0002	0
Perfluorododecanoic acid (PFDDoDA)	mg/kg	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
Perfluorononanoic acid (PFNA)	mg/kg	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
Perfluorotetradecanoic acid (PFTeDA)	mg/kg	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0
Perfluorotridecanoic acid (PFTrDA)	mg/kg	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
Perfluoroundecanoic acid (PFUnDA)	mg/kg	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
PFAS - Fluorotelomer Sulfonic Acids													
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	mg/kg	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	mg/kg	<0.0005	<0.01	0	<0.0005	<0.0005	0	<0.0005	<0.01	0	<0.0005	<0.0005	0
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	mg/kg	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	mg/kg	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0
PFAS - Perfluoroalkyl Sulfonamides													
Perfluorooctane sulfonamide (FOSA)	mg/kg	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
N-Methyl perfluorooctane sulfonamide (MeFOSA)	mg/kg	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	mg/kg	<0.0002	<0.01	0	<0.0002	<0.0002	0	<0.0002	<0.01	0	<0.0002	<0.0002	0
N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	mg/kg	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	mg/kg	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	mg/kg	<0.0002	<0.01	0	<0.0002	<0.0002	0	<0.0002	<0.01	0	<0.0002	<0.0002	0
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	mg/kg	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0
PFAS													
Sum of PFAS (WA DER List)	mg/kg	0.0069	<0.01	0	0.0390	0.0321	19	0.0390	0.029	29	0.0007	0.0006	15
Sum of PFHxS and PFOS	mg/kg	0.0069	0.009	26	0.0390	0.0321	19	0.0390	0.029	29	0.0007	0.0006	15
Sum of PFAS	mg/kg	0.0069	<0.05	0	0.0399	0.0333	18	0.0399	<0.05	0	0.0007	0.0006	15
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)	mg/kg	-	0.009	-	-	-	-	-	0.029	-	-	-	-
Sum of PFAS (PFOS + PFOA)	mg/kg	-	0.009	-	-	-	-	-	0.029	-	-	-	-
Inorganics													
Conductivity (1:5 aqueous extract)	µS/cm	-	130	-	-	-	-	-	100	-	-	-	-
Exchangeable Sodium Percent	%	2.1	-	-	0.6	0.6	0	0.6	-	-	0.2	0.2	0
pH (1:5 Aqueous extract at 25A°C as rec.)	pH Units	-	7.8	-	-	-	-	-	7.8	-	-	-	-
Moisture Content	%	16.4	16	2	26.0	26.2	1	26.0	27	4	20.2	17.8	13
Exchangeable Calcium	meq/100g	22.4	-	-	28.8	28.8	0	28.8	-	-	20.2	18.9	7
Exchangeable Magnesium	meq/100g	2.7	-	-	5.4	5.2	4	5.4	-	-	2.0	1.6	22
Exchangeable Potassium	meq/100g	1.0	-	-	1.9	1.8	5	1.9	-	-	0.8	0.6	29
Exchangeable Sodium	meq/100g	0.6	-	-	0.2	0.2	0	0.2	-	-	<0.1	<0.1	0
CEC	meq/100g	26.6	40	40	36.3	36.1	1	36.3	41	12	23.2	21.1	9
Electrical conductivity *(lab)	µS/cm	132	-	-	121	140	15	121	-	-	74	70	6
pH (Lab)	pH Units	8.9	-	-	8.5	8.4	1	8.5	-	-	8.9	8.9	0
TOC	mg/kg	-	23,000	-	-	-	-	-	22,000	-	-	-	-
Organic													
Organic Matter	%	1.5	-	-	1.1	0.8	32	1.1	-	-	1.2	<0.5	82

*RPDs have only been considered where a concentration
**Elevated RPDs are highlighted as per QAQC Profile set
***Interlab Duplicates are matched on a per compound

		EP2102261	779426		EP2102259	EP2102259		EP2102259	779426	
		0960_SD199_210304	0960_QC205_210304		0960_SS291_210304	0960_QC107_210304		0960_SS291_210304	0960_QC207_210304	
		4/03/2021	4/03/2021		4/03/2021	4/03/2021		4/03/2021	4/03/2021	
		Soil	Soil	RPD	Soil	Soil	RPD	Soil	Soil	RPD
	Unit									
PFAS - Perfluoroalkyl Sulfonic Acids										
Perfluoropropanesulfonic acid (PFPrS)	mg/kg	-	<0.005	-	-	-	-	-	<0.005	-
Perfluorobutane sulfonic acid (PFBS)	mg/kg	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluoropentane sulfonic acid (PFPeS)	mg/kg	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorohexane sulfonic acid (PFHxS)	mg/kg	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluoroheptane sulfonic acid (PFHpS)	mg/kg	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorooctane sulfonic acid (PFOS)	mg/kg	0.0007	<0.005	0	0.0014	0.0020	35	0.0014	<0.005	0
Perfluorononanesulfonic acid (PFNS)	mg/kg	-	<0.005	-	-	-	-	-	<0.005	-
Perfluorodecane sulfonic acid (PFDS)	mg/kg	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
PFAS - Perfluoroalkyl Carboxylic Acids										
Perfluorobutanoic acid (PFBA)	mg/kg	<0.001	<0.005	0	<0.001	<0.001	0	<0.001	<0.005	0
Perfluorohexanoic acid (PFHxA)	mg/kg	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluoropentanoic acid (PFPeA)	mg/kg	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluoroheptanoic acid (PFHpA)	mg/kg	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorooctanoic acid (PFOA)	mg/kg	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorodecanoic acid (PFDA)	mg/kg	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorododecanoic acid (PFDoDA)	mg/kg	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorononanoic acid (PFNA)	mg/kg	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorotetradecanoic acid (PFTeDA)	mg/kg	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
Perfluorotridecanoic acid (PFTrDA)	mg/kg	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluoroundecanoic acid (PFUnDA)	mg/kg	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
PFAS - Fluorotelomer Sulfonic Acids										
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	mg/kg	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	mg/kg	<0.0005	<0.01	0	<0.0005	<0.0005	0	<0.0005	<0.01	0
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	mg/kg	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	mg/kg	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
PFAS - Perfluoroalkyl Sulfonamides										
Perfluorooctane sulfonamide (FOSA)	mg/kg	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
N-Methyl perfluorooctane sulfonamide (MeFOSA)	mg/kg	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	mg/kg	<0.0002	<0.01	0	<0.0002	<0.0002	0	<0.0002	<0.01	0
N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	mg/kg	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	mg/kg	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	mg/kg	<0.0002	<0.01	0	<0.0002	<0.0002	0	<0.0002	<0.01	0
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	mg/kg	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
PFAS										
Sum of PFAS (WA DER List)	mg/kg	0.0007	<0.01	0	0.0014	0.0020	35	0.0014	<0.01	0
Sum of PFHxS and PFOS	mg/kg	0.0007	<0.005	0	0.0014	0.0020	35	0.0014	<0.005	0
Sum of PFAS	mg/kg	0.0007	<0.05	0	0.0014	0.0020	35	0.0014	<0.05	0
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)	mg/kg	-	<0.005	-	-	-	-	-	<0.005	-
Sum of PFAS (PFOS + PFOA)	mg/kg	-	<0.005	-	-	-	-	-	<0.005	-
Inorganics										
Conductivity (1:5 aqueous extract)	µS/cm	-	75	-	-	-	-	-	72	-
Exchangeable Sodium Percent	%	0.2	-	-	0.5	0.5	0	0.5	-	-
pH (1:5 Aqueous extract at 25A°C as rec.)	pH Units	-	7.9	-	-	-	-	-	8.0	-
Moisture Content	%	20.2	18	12	20.3	19.2	6	20.3	25	21
Exchangeable Calcium	meq/100g	20.2	-	-	19.4	19.4	0	19.4	-	-
Exchangeable Magnesium	meq/100g	2.0	-	-	2.8	2.8	0	2.8	-	-
Exchangeable Potassium	meq/100g	0.8	-	-	0.7	0.7	0	0.7	-	-
Exchangeable Sodium	meq/100g	<0.1	-	-	0.1	0.1	0	0.1	-	-
CEC	meq/100g	23.2	34	38	23.0	23.0	0	23.0	30	26
Electrical conductivity *(lab)	µS/cm	74	-	-	98	83	17	98	-	-
pH (Lab)	pH Units	8.9	-	-	8.7	8.9	2	8.7	-	-
TOC	mg/kg	-	18,000	-	-	-	-	-	8,000	-
Organic										
Organic Matter	%	1.2	-	-	1.0	0.8	22	1.0	-	-

*RPDs have only been considered where a concentration
**Elevated RPDs are highlighted as per QAQC Profile set
***Interlab Duplicates are matched on a per compound

APPENDIX

C

LABORATORY CERTIFICATES



EMAIL INVOICES TO: claire.armstrong@cardno.com.au

DATE TIME:

/ ES2019CARBSD0002

Other comments:

Telephone : -- 61-8-9406 1301

**CHAIN OF CUSTODY**

COC#: 19851

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: SC DEF19009/Learmonth SW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

°C

Other comments:

SAMPLE DETAILS**ANALYSIS REQUIRED**

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Rinse WATER	Surface Waters Primary WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
010	0960_SW303		04/03/2021 04:49 PM	Water	ALS: 4 Non ALS: 0	No		X		
011	0960_SW301		04/03/2021 04:56 PM	Water	ALS: 4 Non ALS: 0	No		X		
012	0960_SW300		04/03/2021 05:05 PM	Water	ALS: 4 Non ALS: 0	No		X		
013	0960_QC301		04/03/2021 05:06 PM	Water	ALS: 2 Non ALS: 0	No	X			
014	0960_QC401		04/03/2021 05:07 PM	Water	ALS: 2 Non ALS: 0	No	X			



CHAIN OF CUSTODY

COC#: 19851

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: SC DEF19009/Learmonth SW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0960_SW219	HDPE (no PTFE)	20 mL	00350019025564	Grey	No	
001	0960_SW219	HDPE (no PTFE)	20 mL	00350019025532	Grey	No	
001	0960_SW219	Clear Plastic Bottle - Natural	250 mL	00070519143674	Green	No	
001	0960_SW219	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019011672	Purple	No	
002	0960_QC106	HDPE (no PTFE)	20 mL	00350019025642	Grey	No	
002	0960_QC106	HDPE (no PTFE)	20 mL	00350019025671	Grey	No	
002	0960_QC106	Clear Plastic Bottle - Natural	250 mL	00070519143687	Green	No	
002	0960_QC106	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019011680	Purple	No	
003	0960_SW189	Clear Plastic Bottle - Natural	250 mL	00070220154978	Green	No	
003	0960_SW189	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220049213	Purple	No	
003	0960_SW189	HDPE (no PTFE)	20 mL	00350019102662	Grey	No	
003	0960_SW189	HDPE (no PTFE)	20 mL	00350019127002	Grey	No	
004	0960_SW211	HDPE (no PTFE)	20 mL	00350019126754	Grey	No	
004	0960_SW211	HDPE (no PTFE)	20 mL	00350019126985	Grey	No	
004	0960_SW211	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220049270	Purple	No	
004	0960_SW211	Clear Plastic Bottle - Natural	250 mL	00070220155437	Green	No	
005	0960_SW190	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220048870	Purple	No	
005	0960_SW190	Clear Plastic Bottle - Natural	250 mL	00070220154921	Green	No	
005	0960_SW190	HDPE (no PTFE)	20 mL	00350019126752	Grey	No	
005	0960_SW190	HDPE (no PTFE)	20 mL	00350019127036	Grey	No	
006	0960_SW288	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220048961	Purple	No	
006	0960_SW288	Clear Plastic Bottle - Natural	250 mL	00070220154851	Green	No	
006	0960_SW288	HDPE (no PTFE)	20 mL	00350019126787	Grey	No	
006	0960_SW288	HDPE (no PTFE)	20 mL	00350019102618	Grey	No	
006	0960_SW288	HDPE (no PTFE)	20 mL	00350019177497	Grey	No	
006	0960_SW288	HDPE (no PTFE)	20 mL	00350019177330	Grey	No	

**CHAIN OF CUSTODY**

COC#: 19851

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: SC DEF19009/Learmonth SW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

007	0960_SW193	Clear Plastic Bottle - Natural	250 mL	00070220155434	Green	No	
007	0960_SW193	HDPE (no PTFE)	20 mL	00350019042008	Grey	No	
007	0960_SW193	HDPE (no PTFE)	20 mL	00350019042020	Grey	No	
007	0960_SW193	HDPE (no PTFE)	20 mL	00350019127004	Grey	No	
007	0960_SW193	HDPE (no PTFE)	20 mL	00350019126931	Grey	No	
007	0960_SW193	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220049272	Purple	No	
008	0960_SW205	Clear Plastic Bottle - Natural	250 mL	00070519189627	Green	No	
008	0960_SW205	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019016515	Purple	No	
008	0960_SW205	HDPE (no PTFE)	20 mL	00350019041928	Grey	No	
008	0960_SW205	HDPE (no PTFE)	20 mL	00350019042042	Grey	No	
009	0960_SW304	Clear Plastic Bottle - Natural	250 mL	00070519126870	Green	No	
009	0960_SW304	HDPE (no PTFE)	20 mL	00350019177484	Grey	No	
009	0960_SW304	HDPE (no PTFE)	20 mL	00350019177588	Grey	No	
009	0960_SW304	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019016539	Purple	No	
010	0960_SW303	Clear Plastic Bottle - Natural	250 mL	00070220154857	Green	No	
010	0960_SW303	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220022709	Purple	No	
010	0960_SW303	HDPE (no PTFE)	20 mL	00350019102520	Grey	No	
010	0960_SW303	HDPE (no PTFE)	20 mL	00350019102644	Grey	No	
011	0960_SW301	Clear Plastic Bottle - Natural	250 mL	00070519189711	Green	No	
011	0960_SW301	HDPE (no PTFE)	20 mL	00350019035055	Grey	No	
011	0960_SW301	HDPE (no PTFE)	20 mL	00350019026889	Grey	No	
011	0960_SW301	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019016545	Purple	No	
012	0960_SW300	Clear Plastic Bottle - Natural	250 mL	00070519127095	Green	No	
012	0960_SW300	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019016455	Purple	No	
012	0960_SW300	HDPE (no PTFE)	20 mL	00350019177540	Grey	No	
012	0960_SW300	HDPE (no PTFE)	20 mL	00350019177477	Grey	No	
013	0960_QC301	HDPE (no PTFE)	20 mL	00350019177461	Grey	No	



CHAIN OF CUSTODY

COC#: 19851

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFASOMP

SITE: SC DEF19009/Learmonth SW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

013	0960_QC301	HDPE (no PTFE)	20 mL	00350019177359	Grey	No	
014	0960_QC401	HDPE (no PTFE)	20 mL	00350019042077	Grey	No	
014	0960_QC401	HDPE (no PTFE)	20 mL	00350019042116	Grey	No	

Total Bottle Count: ALS: 56, Non ALS: 0

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : EP2102258

<p>Client : CARDNO (WA) PTY LTD</p> <p>Contact : MAELLE BOURDAIS</p> <p>Address : 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006</p> <p>E-mail : maelle.bourdais@cardno.com.au</p> <p>Telephone : ----</p> <p>Facsimile : ----</p> <p>Project : WA_0960_PFASOMP</p> <p>Order number : DEF19009/0960</p> <p>C-O-C number : 19851</p> <p>Site : DEF19009/Learmonth</p> <p>Sampler : MAELLE BOURDAIS, Shaun Chambers</p>	<p>Laboratory : Environmental Division Perth</p> <p>Contact : Nick Courts</p> <p>Address : 26 Rigali Way Wangara WA Australia 6065</p> <p>E-mail : nick.courts@alsglobal.com</p> <p>Telephone : +61-8-9406 1301</p> <p>Facsimile : +61-8-9406 1399</p> <p>Page : 1 of 3</p> <p>Quote number : ES2019CARBSD0002 (SY/139/19)</p> <p>QC Level : NEPM 2013 B3 & ALS QC Standard</p>
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Dates

Date Samples Received : 08-Mar-2021 11:40	Issue Date : 08-Mar-2021
Client Requested Due Date : 18-Mar-2021	Scheduled Reporting Date : 18-Mar-2021

Delivery Details

Mode of Delivery : Carrier	Security Seal : Not Available
No. of coolers/boxes : 6	Temperature : 28.7
Receipt Detail :	No. of samples received / analysed : 14 / 14

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepancies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.



Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G & PFAS - Full Suite (28 analytes)	WATER - EP231X PFAS - Full Suite (28 analytes)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2102258-001	04-Mar-2021 10:29	0960_SW219_210304	✓	✓	✓	✓	✓	✓	✓
EP2102258-002	04-Mar-2021 10:30	0960_QC106_210304	✓	✓	✓	✓	✓	✓	✓
EP2102258-003	04-Mar-2021 11:31	0960_SW189_210304	✓	✓	✓	✓	✓	✓	✓
EP2102258-004	04-Mar-2021 13:21	0960_SW211_210304	✓	✓	✓	✓	✓	✓	✓
EP2102258-005	04-Mar-2021 14:24	0960_SW190_210304	✓	✓	✓	✓	✓	✓	✓
EP2102258-006	04-Mar-2021 14:44	0960_SW288_210304	✓	✓	✓	✓	✓	✓	✓
EP2102258-007	04-Mar-2021 14:53	0960_SW193_210304	✓	✓	✓	✓	✓	✓	✓
EP2102258-008	04-Mar-2021 16:26	0960_SW205_210304	✓	✓	✓	✓	✓	✓	✓
EP2102258-009	04-Mar-2021 16:40	0960_SW304_210304	✓	✓	✓	✓	✓	✓	✓
EP2102258-010	04-Mar-2021 16:49	0960_SW303_210304	✓	✓	✓	✓	✓	✓	✓
EP2102258-011	04-Mar-2021 16:56	0960_SW301_210304	✓	✓	✓	✓	✓	✓	✓
EP2102258-012	04-Mar-2021 17:05	0960_SW300_210304	✓	✓	✓	✓	✓	✓	✓
EP2102258-013	04-Mar-2021 17:06	0960_QC301_210304				✓			
EP2102258-014	04-Mar-2021 17:07	0960_QC401_210304				✓			

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - EP005 Total Organic Carbon (TOC)
EP2102258-001	04-Mar-2021 10:29	0960_SW219_210304		✓
EP2102258-002	04-Mar-2021 10:30	0960_QC106_210304		✓
EP2102258-003	04-Mar-2021 11:31	0960_SW189_210304	✓	
EP2102258-004	04-Mar-2021 13:21	0960_SW211_210304	✓	
EP2102258-005	04-Mar-2021 14:24	0960_SW190_210304	✓	
EP2102258-006	04-Mar-2021 14:44	0960_SW288_210304	✓	
EP2102258-007	04-Mar-2021 14:53	0960_SW193_210304	✓	
EP2102258-008	04-Mar-2021 16:26	0960_SW205_210304	✓	
EP2102258-009	04-Mar-2021 16:40	0960_SW304_210304	✓	
EP2102258-010	04-Mar-2021 16:49	0960_SW303_210304	✓	

Proactive Holding Time Report

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Requested Deliverables

Email claire.armstrong@cardno.com.au

Email derp.labreports@esdat.com.au

[illegible]

CERTIFICATE OF ANALYSIS

Work Order : **EP2102258**
Client : **CARDNO (WA) PTY LTD**
Contact : **MAELLE BOURDAIS**
Address : **11 HARVEST TERRACE PO BOX 155**
WEST PERTH WA, AUSTRALIA 6006
Telephone : **----**
Project : **WA_0960_PFASOMP**
Order number : **DEF19009/0960**
C-O-C number : **19851**
Sampler : **MAELLE BOURDAIS, Shaun Chambers**
Site : **DEF19009/Learmonth**
Quote number : **SY/139/19**
No. of samples received : **14**
No. of samples analysed : **14**

Page : 1 of 12
Laboratory : Environmental Division Perth
Contact : Nick Courts
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 08-Mar-2021 11:40
Date Analysis Commenced : 09-Mar-2021
Issue Date : 12-Mar-2021 17:20



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- EP231X: PFAS results for sample #12 confirmed by re-extraction and re-analysis.
- TDS by method EA-015 may bias high for sample #1 and 2 due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: SURFACE WATER
 (Matrix: WATER)

Sample ID

				0960_SW219_210304	0960_QC106_210304	0960_SW189_210304	0960_SW211_210304	0960_SW190_210304
Sampling date / time				04-Mar-2021 10:29	04-Mar-2021 10:30	04-Mar-2021 11:31	04-Mar-2021 13:21	04-Mar-2021 14:24
Compound	CAS Number	LOR	Unit	EP2102258-001	EP2102258-002	EP2102258-003	EP2102258-004	EP2102258-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	8.31	8.39	7.92	7.54	7.81
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	352	349	80	23300	147
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	476	1420	31	344	18
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L	67	64	44	145	62
Total Alkalinity as CaCO ₃	----	1	mg/L	68	65	44	145	62
ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA								
Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L	12	12	2	1790	21
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	19	19	5	11600	23
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	14	12	13	399	18
Magnesium	7439-95-4	1	mg/L	1	1	2	870	2
Sodium	7440-23-5	1	mg/L	32	32	7	6800	29
Potassium	7440-09-7	1	mg/L	4	4	3	406	4
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	2.14	2.08	1.06	367	2.32
∅ Total Cations	----	0.01	meq/L	2.28	2.18	1.19	398	2.43
∅ Ionic Balance	----	0.01	%	2.96	2.13	5.88	3.96	2.14
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	----	----	4	11	6
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	4	4	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: SURFACE WATER
 (Matrix: WATER)

Sample ID

				0960_SW219_210304	0960_QC106_210304	0960_SW189_210304	0960_SW211_210304	0960_SW190_210304
Sampling date / time				04-Mar-2021 10:29	04-Mar-2021 10:30	04-Mar-2021 11:31	04-Mar-2021 13:21	04-Mar-2021 14:24
Compound	CAS Number	LOR	Unit	EP2102258-001	EP2102258-002	EP2102258-003	EP2102258-004	EP2102258-005
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.06	<0.01	0.06
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)				Sample ID	0960_SW219_210304	0960_QC106_210304	0960_SW189_210304	0960_SW211_210304	0960_SW190_210304
Sampling date / time					04-Mar-2021 10:29	04-Mar-2021 10:30	04-Mar-2021 11:31	04-Mar-2021 13:21	04-Mar-2021 14:24
Compound	CAS Number	LOR	Unit		EP2102258-001	EP2102258-002	EP2102258-003	EP2102258-004	EP2102258-005
				Result	Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	<0.01	0.06	<0.01	0.06
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	<0.01	0.06	<0.01	0.06
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	<0.01	0.06	<0.01	0.06
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		93.0	95.1	96.3	92.2	98.0
13C8-PFOA	----	0.02	%		89.7	90.2	91.1	87.9	94.2



Analytical Results

Sub-Matrix: SURFACE WATER
 (Matrix: WATER)

Sample ID

				0960_SW288_210304	0960_SW193_210304	0960_SW205_210304	0960_SW304_210304	0960_SW303_210304
Sampling date / time				04-Mar-2021 14:44	04-Mar-2021 14:53	04-Mar-2021 16:26	04-Mar-2021 16:40	04-Mar-2021 16:49
Compound	CAS Number	LOR	Unit	EP2102258-006	EP2102258-007	EP2102258-008	EP2102258-009	EP2102258-010
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.89	7.79	8.00	7.98	8.08
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	146	148	41200	42000	41000
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	50	34	17	17	7
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	65	63	106	115	109
Total Alkalinity as CaCO3	----	1	mg/L	65	63	106	115	109
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	20	20	2830	2770	2740
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	24	25	18400	18400	18400
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	22	20	488	485	485
Magnesium	7439-95-4	1	mg/L	3	3	1520	1470	1500
Sodium	7440-23-5	1	mg/L	30	30	11800	11400	11600
Potassium	7440-09-7	1	mg/L	5	5	667	645	665
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	2.39	2.38	580	579	578
∅ Total Cations	----	0.01	meq/L	2.78	2.68	680	658	669
∅ Ionic Balance	----	0.01	%	7.45	5.88	7.91	6.35	7.29
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	8	10	3	4	2
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: SURFACE WATER
 (Matrix: WATER)

Sample ID

				0960_SW288_210304	0960_SW193_210304	0960_SW205_210304	0960_SW304_210304	0960_SW303_210304
Sampling date / time				04-Mar-2021 14:44	04-Mar-2021 14:53	04-Mar-2021 16:26	04-Mar-2021 16:40	04-Mar-2021 16:49
Compound	CAS Number	LOR	Unit	EP2102258-006	EP2102258-007	EP2102258-008	EP2102258-009	EP2102258-010
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.10	0.26	<0.01	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: SURFACE WATER
 (Matrix: WATER)

Sample ID

				0960_SW288_210304	0960_SW193_210304	0960_SW205_210304	0960_SW304_210304	0960_SW303_210304
Sampling date / time				04-Mar-2021 14:44	04-Mar-2021 14:53	04-Mar-2021 16:26	04-Mar-2021 16:40	04-Mar-2021 16:49
Compound	CAS Number	LOR	Unit	EP2102258-006	EP2102258-007	EP2102258-008	EP2102258-009	EP2102258-010
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	0.10	0.26	<0.01	<0.01	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	0.10	0.26	<0.01	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L	0.10	0.26	<0.01	<0.01	<0.01
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	92.3	99.3	89.6	95.5	90.2
13C8-PFOA	----	0.02	%	88.9	91.5	90.3	94.2	93.7



Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)				Sample ID	0960_SW301_210304	0960_SW300_210304	0960_QC301_210304	0960_QC401_210304	----
Sampling date / time					04-Mar-2021 16:56	04-Mar-2021 17:05	04-Mar-2021 17:06	04-Mar-2021 17:07	----
Compound	CAS Number	LOR	Unit		EP2102258-011	EP2102258-012	EP2102258-013	EP2102258-014	-----
					Result	Result	Result	Result	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		8.10	8.06	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		26300	21200	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		7	5	----	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L		<1	<1	----	----	----
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L		<1	<1	----	----	----
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L		94	85	----	----	----
Total Alkalinity as CaCO ₃	----	1	mg/L		94	85	----	----	----
ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA									
Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L		1950	1580	----	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		12700	10400	----	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		404	386	----	----	----
Magnesium	7439-95-4	1	mg/L		923	706	----	----	----
Sodium	7440-23-5	1	mg/L		7380	5710	----	----	----
Potassium	7440-09-7	1	mg/L		450	337	----	----	----
EN055: Ionic Balance									
∅ Total Anions	----	0.01	meq/L		401	328	----	----	----
∅ Total Cations	----	0.01	meq/L		429	334	----	----	----
∅ Ionic Balance	----	0.01	%		3.36	0.96	----	----	----
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		8	12	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----



Analytical Results

Sub-Matrix: SURFACE WATER
 (Matrix: WATER)

Sample ID

				0960_SW301_210304	0960_SW300_210304	0960_QC301_210304	0960_QC401_210304	----
Sampling date / time				04-Mar-2021 16:56	04-Mar-2021 17:05	04-Mar-2021 17:06	04-Mar-2021 17:07	----
Compound	CAS Number	LOR	Unit	EP2102258-011	EP2102258-012	EP2102258-013	EP2102258-014	-----
				Result	Result	Result	Result	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.02	<0.01	<0.01	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----



Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)				Sample ID	0960_SW301_210304	0960_SW300_210304	0960_QC301_210304	0960_QC401_210304	----
Sampling date / time					04-Mar-2021 16:56	04-Mar-2021 17:05	04-Mar-2021 17:06	04-Mar-2021 17:07	----
Compound	CAS Number	LOR	Unit		EP2102258-011	EP2102258-012	EP2102258-013	EP2102258-014	-----
					Result	Result	Result	Result	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	<0.05	<0.05	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	0.02	<0.01	<0.01	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	0.02	<0.01	<0.01	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	0.02	<0.01	<0.01	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		91.2	95.2	88.5	91.2	----
13C8-PFOA	----	0.02	%		89.9	94.6	91.6	91.7	----

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Work Order : EP2102258
Client : CARDNO (WA) PTY LTD
Project : WA_0960_PFASOMP



Surrogate Control Limits

Sub-Matrix: SURFACE WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EP231A: Perfluoroalkyl Sulfonic Acids

(WATER) EP231B: Perfluoroalkyl Carboxylic Acids

(WATER) EP231C: Perfluoroalkyl Sulfonamides

(WATER) EP231D: (n:2) Fluorotelomer Sulfonic Acids

(WATER) EP231P: PFAS Sums

(WATER) EP231S: PFAS Surrogate

QUALITY CONTROL REPORT

Work Order	: EP2102258	Page	: 1 of 9
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 08-Mar-2021
Order number	: DEF19009/0960	Date Analysis Commenced	: 09-Mar-2021
C-O-C number	: 19851	Issue Date	: 12-Mar-2021
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: DEF19009/Learmonth		
Quote number	: SY/139/19		
No. of samples received	: 14		
No. of samples analysed	: 14		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
 CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
 LOR = Limit of reporting
 RPD = Relative Percentage Difference
 # = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA005P: pH by PC Titrator (QC Lot: 3553098)									
EP2102193-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.17	8.15	0.245	0% - 20%
EP2102258-002	0960_QC106_210304	EA005-P: pH Value	----	0.01	pH Unit	8.39	8.40	0.119	0% - 20%
EA005P: pH by PC Titrator (QC Lot: 3553100)									
EP2102258-012	0960_SW300_210304	EA005-P: pH Value	----	0.01	pH Unit	8.06	8.14	0.988	0% - 20%
EP2102352-004	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.06	8.11	0.618	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3554770)									
EP2102258-001	0960_SW219_210304	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	352	363	3.22	0% - 20%
EP2102258-009	0960_SW304_210304	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	42000	42000	0.0714	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3554771)									
EP2102258-001	0960_SW219_210304	EA025H: Suspended Solids (SS)	----	5	mg/L	476	532	11.2	0% - 20%
EP2102258-011	0960_SW301_210304	EA025H: Suspended Solids (SS)	----	5	mg/L	7	7	0.00	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 3553097)									
EP2102193-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	107	102	4.51	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	107	102	4.51	0% - 20%
EP2102258-002	0960_QC106_210304	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	64	63	0.00	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	65	65	0.00	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3553099)									
EP2102258-012	0960_SW300_210304	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	85	86	1.33	0% - 20%

Page : 3 of 9
 Work Order : EP2102258
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFSOMP



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
ED037P: Alkalinity by PC Titrator (QC Lot: 3553099) - continued									
EP2102258-012	0960_SW300_210304	ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	85	86	1.33	0% - 20%
EP2102352-004	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	102	109	7.01	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	102	109	7.01	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3551447)									
EP2102258-001	0960_SW219_210304	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	12	12	0.00	0% - 50%
EP2102258-011	0960_SW301_210304	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1950	1900	3.03	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3551448)									
EP2102258-001	0960_SW219_210304	ED045G: Chloride	16887-00-6	1	mg/L	19	19	0.00	0% - 50%
EP2102258-011	0960_SW301_210304	ED045G: Chloride	16887-00-6	1	mg/L	12700	13100	3.05	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3552543)									
EP2102193-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	737	724	1.83	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	2040	1990	2.52	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	16300	15800	2.91	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	986	953	3.35	0% - 20%
EP2102258-002	0960_QC106_210304	ED093F: Calcium	7440-70-2	1	mg/L	12	11	0.00	0% - 50%
		ED093F: Magnesium	7439-95-4	1	mg/L	1	1	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	32	30	5.81	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	4	4	0.00	No Limit
ED093F: Dissolved Major Cations (QC Lot: 3552544)									
EP2102258-012	0960_SW300_210304	ED093F: Calcium	7440-70-2	1	mg/L	386	397	2.74	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	706	726	2.83	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	5710	5880	2.85	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	337	347	2.85	0% - 20%
EP2102350-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	48	48	0.00	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	6	6	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	76	76	0.00	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	5	5	0.00	No Limit
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3553745)									
EP2102201-001	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	7	7	0.00	No Limit
EP2102258-011	0960_SW301_210304	EP002: Dissolved Organic Carbon	----	1	mg/L	8	9	0.00	No Limit
EP005: Total Organic Carbon (TOC) (QC Lot: 3552890)									
EP2102258-001	0960_SW219_210304	EP005: Total Organic Carbon	----	1	mg/L	4	4	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3553308)									
EP2102242-017	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3553308) - continued									
EP2102242-017	Anonymous	EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP2102258-007	0960_SW193_210304	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.26	0.27	0.00	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3553308)									
EP2102242-017	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP2102258-007	0960_SW193_210304	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP2102258-007	0960_SW193_210304	EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3553308)									
EP2102242-017	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3553308) - continued									
EP2102242-017	Anonymous	EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP2102258-007	0960_SW193_210304	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3553308)									
EP2102242-017	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP2102258-007	0960_SW193_210304	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231P: PFAS Sums (QC Lot: 3553308)									
EP2102242-017	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.00	No Limit
EP2102258-007	0960_SW193_210304	EP231X: Sum of PFAS	----	0.01	µg/L	0.26	0.27	3.77	0% - 20%



Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result		LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 3553098)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	101	98.5	102
				----	7 pH Unit	100	98.5	102
EA005P: pH by PC Titrator (QCLot: 3553100)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	101	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3554770)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	99.4	88.1	114
				<10	1000 mg/L	103	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3554771)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	100	89.1	120
				<5	1000 mg/L	102	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3553097)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	88.1	81.2	126
				<1	200 mg/L	93.5	90.0	110
ED037P: Alkalinity by PC Titrator (QCLot: 3553099)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	100	81.2	126
				<1	200 mg/L	93.9	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3551447)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	99.2	87.7	113
				<1	500 mg/L	108	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3551448)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	97.5	87.9	114
				<1	1000 mg/L	97.7	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3552543)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	102	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	97.1	88.0	110



Sub-Matrix: **WATER**

Method: Compound				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%)	
							Low	High
CAS Number	LOR	Unit	Result					
ED093F: Dissolved Major Cations (QCLot: 3552543) - continued								
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	97.7	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	96.1	89.7	108
ED093F: Dissolved Major Cations (QCLot: 3552544)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	99.5	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	94.8	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	95.4	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	94.6	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3553745)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	110	73.2	116
				<1	100 mg/L	109	73.2	116
EP005: Total Organic Carbon (TOC) (QCLot: 3552890)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	104	87.2	116
				<1	100 mg/L	104	87.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3553308)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	97.8	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	107	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	104	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	108	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	104	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	104	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3553308)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	96.4	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	112	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	115	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	108	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	116	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	113	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	114	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	119	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	112	72.0	134
EP231X: Perfluorotridecanoic acid (PFTriDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	111	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	107	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3553308)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	107	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	105	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	95.7	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	106	66.0	145



Sub-Matrix: **WATER**

Method Blank (MB) Report				Laboratory Control Spike (LCS) Report				
				Spike Concentration	Spike Recovery (%)		Acceptable Limits (%)	
					LCS		Low	High
Method: Compound	CAS Number	LOR	Unit	Result				
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3553308) - continued								
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	106	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	122	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	108	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3553308)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	116	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	110	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	104	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	84.0	71.4	144

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3551447)							
EP2102258-001	0960_SW219_210304	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	106	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3551448)							
EP2102258-001	0960_SW219_210304	ED045G: Chloride	16887-00-6	1000 mg/L	97.0	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3553745)							
EP2102201-002	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	110	70.0	130
EP005: Total Organic Carbon (TOC) (QCLot: 3552890)							
EP2102258-002	0960_QC106_210304	EP005: Total Organic Carbon	----	100 mg/L	105	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3553308)							
EP2102242-017	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	94.2	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	101	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	96.8	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	102	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	120	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	94.8	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3553308)							
EP2102242-017	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	92.0	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	108	72.0	129



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3553308) - continued							
EP2102242-017	Anonymous	EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	110	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	106	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	114	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	111	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	119	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	114	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	112	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	104	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	108	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3553308)							
EP2102242-017	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	107	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	113	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	101	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	102	66.0	145
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	100	57.6	145
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	115	65.0	136
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	106	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3553308)							
EP2102242-017	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	101	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	110	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	109	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	89.4	71.4	144

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2102258	Page	: 1 of 9
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 08-Mar-2021
Site	: DEF19009/Learmonth	Issue Date	: 12-Mar-2021
Sampler	: MAELLE BOURDAIS, Shaun Chambers	No. of samples received	: 14
Order number	: DEF19009/0960	No. of samples analysed	: 14

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- **NO** Matrix Spike outliers occur.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- **NO** Quality Control Sample Frequency Outliers exist.



Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator						
Clear Plastic Bottle - Natural 0960_SW219_210304, 0960_QC106_210304, 0960_SW189_210304, 0960_SW211_210304, 0960_SW190_210304, 0960_SW288_210304, 0960_SW193_210304, 0960_SW205_210304, 0960_SW304_210304, 0960_SW303_210304, 0960_SW301_210304, 0960_SW300_210304	----	----	----	09-Mar-2021	04-Mar-2021	5

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA005P: pH by PC Titrator								
Clear Plastic Bottle - Natural (EA005-P)	04-Mar-2021	----	----	----	09-Mar-2021	04-Mar-2021	✘	
0960_SW219_210304,								0960_QC106_210304,
0960_SW189_210304,								0960_SW211_210304,
0960_SW190_210304,								0960_SW288_210304,
0960_SW193_210304,								0960_SW205_210304,
0960_SW304_210304,								0960_SW303_210304,
0960_SW301_210304,	0960_SW300_210304							
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Clear Plastic Bottle - Natural (EA015H)	04-Mar-2021	----	----	----	10-Mar-2021	11-Mar-2021	✔	
0960_SW219_210304,								0960_QC106_210304,
0960_SW189_210304,								0960_SW211_210304,
0960_SW190_210304,								0960_SW288_210304,
0960_SW193_210304,								0960_SW205_210304,
0960_SW304_210304,								0960_SW303_210304,
0960_SW301_210304,	0960_SW300_210304							



Matrix: **WATER**

Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H) 0960_SW219_210304, 0960_SW189_210304, 0960_SW190_210304, 0960_SW193_210304, 0960_SW304_210304, 0960_SW301_210304,	0960_QC106_210304, 0960_SW211_210304, 0960_SW288_210304, 0960_SW205_210304, 0960_SW303_210304, 0960_SW300_210304	04-Mar-2021	----	----	----	10-Mar-2021 11-Mar-2021	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P) 0960_SW219_210304, 0960_SW189_210304, 0960_SW190_210304, 0960_SW193_210304, 0960_SW304_210304, 0960_SW301_210304,	0960_QC106_210304, 0960_SW211_210304, 0960_SW288_210304, 0960_SW205_210304, 0960_SW303_210304, 0960_SW300_210304	04-Mar-2021	----	----	----	09-Mar-2021 18-Mar-2021	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G) 0960_SW219_210304, 0960_SW189_210304, 0960_SW190_210304, 0960_SW193_210304, 0960_SW304_210304, 0960_SW301_210304,	0960_QC106_210304, 0960_SW211_210304, 0960_SW288_210304, 0960_SW205_210304, 0960_SW303_210304, 0960_SW300_210304	04-Mar-2021	----	----	----	11-Mar-2021 01-Apr-2021	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G) 0960_SW219_210304, 0960_SW189_210304, 0960_SW190_210304, 0960_SW193_210304, 0960_SW304_210304, 0960_SW301_210304,	0960_QC106_210304, 0960_SW211_210304, 0960_SW288_210304, 0960_SW205_210304, 0960_SW303_210304, 0960_SW300_210304	04-Mar-2021	----	----	----	11-Mar-2021 01-Apr-2021	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Natural (ED093F) 0960_SW219_210304, 0960_SW189_210304, 0960_SW190_210304, 0960_SW193_210304, 0960_SW304_210304, 0960_SW301_210304,	0960_QC106_210304, 0960_SW211_210304, 0960_SW288_210304, 0960_SW205_210304, 0960_SW303_210304, 0960_SW300_210304	04-Mar-2021	----	----	----	09-Mar-2021 11-Mar-2021	✓



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002)								
0960_SW189_210304, 0960_SW190_210304, 0960_SW193_210304, 0960_SW304_210304, 0960_SW301_210304,	0960_SW211_210304, 0960_SW288_210304, 0960_SW205_210304, 0960_SW303_210304, 0960_SW300_210304	04-Mar-2021	----	----	----	09-Mar-2021	01-Apr-2021	✓
EP005: Total Organic Carbon (TOC)								
Amber TOC Vial - Sulfuric Acid (EP005)								
0960_SW219_210304,	0960_QC106_210304	04-Mar-2021	----	----	----	09-Mar-2021	01-Apr-2021	✓
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X)								
0960_SW219_210304, 0960_SW189_210304, 0960_SW190_210304, 0960_SW193_210304, 0960_SW304_210304, 0960_SW301_210304, 0960_QC301_210304,	0960_QC106_210304, 0960_SW211_210304, 0960_SW288_210304, 0960_SW205_210304, 0960_SW303_210304, 0960_SW300_210304, 0960_QC401_210304	04-Mar-2021	09-Mar-2021	31-Aug-2021	✓	10-Mar-2021	31-Aug-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X)								
0960_SW219_210304, 0960_SW189_210304, 0960_SW190_210304, 0960_SW193_210304, 0960_SW304_210304, 0960_SW301_210304, 0960_QC301_210304,	0960_QC106_210304, 0960_SW211_210304, 0960_SW288_210304, 0960_SW205_210304, 0960_SW303_210304, 0960_SW300_210304, 0960_QC401_210304	04-Mar-2021	09-Mar-2021	31-Aug-2021	✓	10-Mar-2021	31-Aug-2021	✓
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X)								
0960_SW219_210304, 0960_SW189_210304, 0960_SW190_210304, 0960_SW193_210304, 0960_SW304_210304, 0960_SW301_210304, 0960_QC301_210304,	0960_QC106_210304, 0960_SW211_210304, 0960_SW288_210304, 0960_SW205_210304, 0960_SW303_210304, 0960_SW300_210304, 0960_QC401_210304	04-Mar-2021	09-Mar-2021	31-Aug-2021	✓	10-Mar-2021	31-Aug-2021	✓

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X)		04-Mar-2021	09-Mar-2021	31-Aug-2021	✓	10-Mar-2021	31-Aug-2021	✓
0960_SW219_210304,	0960_QC106_210304,							
0960_SW189_210304,	0960_SW211_210304,							
0960_SW190_210304,	0960_SW288_210304,							
0960_SW193_210304,	0960_SW205_210304,							
0960_SW304_210304,	0960_SW303_210304,							
0960_SW301_210304,	0960_SW300_210304,							
0960_QC301_210304,	0960_QC401_210304							
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X)		04-Mar-2021	09-Mar-2021	31-Aug-2021	✓	10-Mar-2021	31-Aug-2021	✓
0960_SW219_210304,	0960_QC106_210304,							
0960_SW189_210304,	0960_SW211_210304,							
0960_SW190_210304,	0960_SW288_210304,							
0960_SW193_210304,	0960_SW205_210304,							
0960_SW304_210304,	0960_SW303_210304,							
0960_SW301_210304,	0960_SW300_210304,							
0960_QC301_210304,	0960_QC401_210304							



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)		Quality Control Specification	
Analytical Methods	Method	QC	Regular	Actual	Expected		Evaluation
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	4	35	11.43	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	12	16.67	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	12	16.67	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	10	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	35	5.71	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	12	16.67	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	12	16.67	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	10	20.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	35	5.71	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	12	8.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	12	8.33	5.26	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	10	10.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Matrix Spikes (MS) - Continued							
Total Organic Carbon	EP005	1	10	10.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of 'filterable' residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C. This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high temperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.
Total Organic Carbon	EP005	WATER	In house: Referenced to APHA 5310 B, The automated TOC analyzer determines Total and Inorganic Carbon by IR cell. TOC is calculated as the difference. This method is compliant with NEPM Schedule B(3)



Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.



CHAIN OF CUSTODY

COC#: 19853 ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: SC DEF19009/Learmonth SED

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Sediments SEDIMENT	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0960_SS123		04/03/2021 08:36 AM	Soil	ALS: 2 Non ALS: 0	No	X		
002	0960_QC101		04/03/2021 08:37 AM	Soil	ALS: 2 Non ALS: 0	No	X		
003	0960_SS121		04/03/2021 08:50 AM	Soil	ALS: 2 Non ALS: 0	No	X		
004	0960_SS122		04/03/2021 09:06 AM	Soil	ALS: 2 Non ALS: 0	No	X		
005	0960_QC102		04/03/2021 09:06 AM	Soil	ALS: 2 Non ALS: 0	No	X		
006	0960_SS124		04/03/2021 09:21 AM	Soil	ALS: 2 Non ALS: 0	No	X		
007	0960_SS125		04/03/2021 09:29 AM	Soil	ALS: 2 Non ALS: 0	No	X		
008	0960_SS114		04/03/2021 09:42 AM	Soil	ALS: 2 Non ALS: 0	No	X		
009	0960_QC103		04/03/2021 09:43 AM	Soil	ALS: 2 Non ALS: 0	No	X		

Environmental Division
Perth

Work Order Reference
EP2102259



Telephone : -- 61-8-9406 1301



CHAIN OF CUSTODY

COC#: 19853 ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: SC DEF19009/Learmonth SED

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Sediments SEDIMENT	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
010	0960_SS234		04/03/2021 09:59 AM	Soil	ALS: 2 Non ALS: 0	No	X		
011	0960_SS235		04/03/2021 09:59 AM	Soil	ALS: 2 Non ALS: 0	No	X		
012	0960_SD219		04/03/2021 10:28 AM	Soil	ALS: 2 Non ALS: 0	No	X		
013	0960_SS231		04/03/2021 11:03 AM	Soil	ALS: 2 Non ALS: 0	No	X		
014	0960_SS189		04/03/2021 11:30 AM	Soil	ALS: 2 Non ALS: 0	No	X		
015	0960_SS227		04/03/2021 11:41 AM	Soil	ALS: 2 Non ALS: 0	No	X		
016	0960_SD200		04/03/2021 12:30 PM	Soil	ALS: 2 Non ALS: 0	No	X		
017	0960_SS298		04/03/2021 12:31 PM	Soil	ALS: 2 Non ALS: 0	No	X		
018	0960_SD211		04/03/2021 01:20 PM	Soil	ALS: 2 Non ALS: 0	No	X		



CHAIN OF CUSTODY

COC#: 19853

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: SC DEF19009/Learmonth SED

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

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DATE TIME:

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TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Sediments SEDIMENT	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
019	0960_SS198		04/03/2021 01:34 PM	Soil	ALS: 2 Non ALS: 0	No	X		
020	0960_SS293		04/03/2021 01:42 PM	Soil	ALS: 2 Non ALS: 0	No	X		
021	0960_SS292		04/03/2021 01:49 PM	Soil	ALS: 2 Non ALS: 0	No	X		
022	0960_SS291		04/03/2021 02:00 PM	Soil	ALS: 2 Non ALS: 0	No	X		
023	0960_QC107		04/03/2021 02:01 PM	Soil	ALS: 2 Non ALS: 0	No	X		
024	0960_SS190		04/03/2021 02:24 PM	Soil	ALS: 2 Non ALS: 0	No	X		
025	0960_SS192		04/03/2021 03:37 PM	Soil	ALS: 2 Non ALS: 0	No	X		



CHAIN OF CUSTODY

COC#: 19853

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: SC DEF19009/Learmonth SED

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

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RELINQUISHED BY:

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DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0960_SS123	Soil Glass Jar - Unpreserved	150 mL	00260220014927	Orange	No	
001	0960_SS123	HDPE Soil Jar	200 mL	00620719008723	Grey	No	
002	0960_QC101	Soil Glass Jar - Unpreserved	150 mL	00260220014659	Orange	No	
002	0960_QC101	HDPE Soil Jar	200 mL	00620719008693	Grey	No	
003	0960_SS121	Soil Glass Jar - Unpreserved	150 mL	00260520053306	Orange	No	
003	0960_SS121	HDPE Soil Jar	200 mL	00621019018060	Grey	No	
004	0960_SS122	HDPE Soil Jar	200 mL	00621019018163	Grey	No	
004	0960_SS122	Soil Glass Jar - Unpreserved	150 mL	00260520053296	Orange	No	
005	0960_QC102	Soil Glass Jar - Unpreserved	150 mL	00261020093930	Orange	No	
005	0960_QC102	HDPE Soil Jar	200 mL	00620719008701	Grey	No	
006	0960_SS124	Soil Glass Jar - Unpreserved	150 mL	00261219129610	Orange	No	
006	0960_SS124	HDPE Soil Jar	200 mL	00620719026358	Grey	No	
007	0960_SS125	Soil Glass Jar - Unpreserved	150 mL	00261020093895	Orange	No	
007	0960_SS125	HDPE Soil Jar	200 mL	00620219013352	Grey	No	
008	0960_SS114	HDPE Soil Jar	200 mL	00620219039201	Grey	No	
008	0960_SS114	Soil Glass Jar - Unpreserved	150 mL	00261020093906	Orange	No	
009	0960_QC103	Soil Glass Jar - Unpreserved	150 mL	00261020093922	Orange	No	
009	0960_QC103	HDPE Soil Jar	200 mL	00620719042471	Grey	No	
010	0960_SS234	Soil Glass Jar - Unpreserved	150 mL	00261020093917	Orange	No	
010	0960_SS234	HDPE Soil Jar	200 mL	00620219039214	Grey	No	
011	0960_SS235	HDPE Soil Jar	200 mL	00620219039280	Grey	No	
011	0960_SS235	Soil Glass Jar - Unpreserved	150 mL	00261020093897	Orange	No	
012	0960_SD219	Soil Glass Jar - Unpreserved	150 mL	00261020093926	Orange	No	
012	0960_SD219	HDPE Soil Jar	200 mL	00620719038933	Grey	No	
013	0960_SS231	Soil Glass Jar - Unpreserved	150 mL	00261020093901	Orange	No	
013	0960_SS231	HDPE Soil Jar	200 mL	00620219039194	Grey	No	



ALS Laboratory: EP Perth

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

·C

Other comments:

014	0960_SS189	Soil Glass Jar - Unpreserved	150 mL	00261020093908	Orange	No	
014	0960_SS189	HDPE Soil Jar	200 mL	00620719062804	Grey	No	
015	0960_SS227	HDPE Soil Jar	200 mL	00620219039170	Grey	No	
015	0960_SS227	Soil Glass Jar - Unpreserved	150 mL	00261020093920	Orange	No	
016	0960_SD200	HDPE Soil Jar	200 mL	00620719062789	Grey	No	
016	0960_SD200	Soil Glass Jar - Unpreserved	150 mL	00261020093894	Orange	No	
017	0960_SS298	HDPE Soil Jar	200 mL	00620219039248	Grey	No	
017	0960_SS298	Soil Glass Jar - Unpreserved	150 mL	00261020093890	Orange	No	
018	0960_SD211	HDPE Soil Jar	200 mL	00620219039191	Grey	No	
018	0960_SD211	Soil Glass Jar - Unpreserved	150 mL	00261020093887	Orange	No	
019	0960_SS198	HDPE Soil Jar	200 mL	00620719069260	Grey	No	
019	0960_SS198	Soil Glass Jar - Unpreserved	150 mL	00261020093902	Orange	No	
020	0960_SS293	Soil Glass Jar - Unpreserved	150 mL	00261020093888	Orange	No	
020	0960_SS293	HDPE Soil Jar	200 mL	00620719069352	Grey	No	
021	0960_SS292	Soil Glass Jar - Unpreserved	150 mL	00261020093905	Orange	No	
021	0960_SS292	HDPE Soil Jar	200 mL	00620719069312	Grey	No	
022	0960_SS291	HDPE Soil Jar	200 mL	00620719069379	Grey	No	
022	0960_SS291	Soil Glass Jar - Unpreserved	150 mL	00261020093868	Orange	No	
023	0960_QC107	Soil Glass Jar - Unpreserved	150 mL	00261020093898	Orange	No	
023	0960_QC107	HDPE Soil Jar	200 mL	00620719069336	Grey	No	
024	0960_SS190	Soil Glass Jar - Unpreserved	150 mL	00261020093873	Orange	No	
024	0960_SS190	HDPE Soil Jar	200 mL	00620219013407	Grey	No	
025	0960_SS192	HDPE Soil Jar	200 mL	00620719069298	Grey	No	
025	0960_SS192	Soil Glass Jar - Unpreserved	150 mL	00261020110111	Orange	No	

Total Bottle Count: ALS: 50, Non ALS: 0

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : EP2102259

<p>Client : CARDNO (WA) PTY LTD</p> <p>Contact : MAELLE BOURDAIS</p> <p>Address : 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006</p> <p>E-mail : maelle.bourdais@cardno.com.au</p> <p>Telephone : ----</p> <p>Facsimile : ----</p> <p>Project : WA_0960_PFASOMP</p> <p>Order number : DEF19009/0960</p> <p>C-O-C number : 19853</p> <p>Site : DEF19009/Learmonth</p> <p>Sampler : MAELLE BOURDAIS, Shaun Chambers</p>	<p>Laboratory : Environmental Division Perth</p> <p>Contact : Nick Courts</p> <p>Address : 26 Rigali Way Wangara WA Australia 6065</p> <p>E-mail : nick.courts@alsglobal.com</p> <p>Telephone : +61-8-9406 1301</p> <p>Facsimile : +61-8-9406 1399</p> <p>Page : 1 of 3</p> <p>Quote number : ES2019CARBSD0002 (SY/139/19)</p> <p>QC Level : NEPM 2013 B3 & ALS QC Standard</p>
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Dates

Date Samples Received : 08-Mar-2021 11:40	Issue Date : 09-Mar-2021
Client Requested Due Date : 18-Mar-2021	Scheduled Reporting Date : 18-Mar-2021

Delivery Details

Mode of Delivery : Carrier	Security Seal : Not Available
No. of coolers/boxes : 6	Temperature : 28.7
Receipt Detail :	No. of samples received / analysed : 26 / 26

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepancies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.



Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Sampling date / time	Sample ID	SOIL - AG-1 Agricultural Soil Suite 1	SOIL - EA055-103 Moisture Content	SOIL - EP004 Organic Matter in Soil (Walkley Black)	SOIL - EP231X (solids) PFAS - Full Suite (28 analytes)
EP2102259-001	04-Mar-2021 08:36	0960_SS123_210304	✓	✓	✓	✓
EP2102259-002	04-Mar-2021 08:37	0960_QC101_210304	✓	✓	✓	✓
EP2102259-003	04-Mar-2021 08:50	0960_SS121_210304	✓	✓	✓	✓
EP2102259-004	04-Mar-2021 09:06	0960_SS122_210304	✓	✓	✓	✓
EP2102259-005	04-Mar-2021 09:06	0960_QC102_210304	✓	✓	✓	✓
EP2102259-006	04-Mar-2021 09:21	0960_SS124_210304	✓	✓	✓	✓
EP2102259-007	04-Mar-2021 09:29	0960_SS125_210304	✓	✓	✓	✓
EP2102259-008	04-Mar-2021 09:42	0960_SS114_210304	✓	✓	✓	✓
EP2102259-009	04-Mar-2021 09:43	0960_QC103_210304	✓	✓	✓	✓
EP2102259-010	04-Mar-2021 09:59	0960_SS234_210304	✓	✓	✓	✓
EP2102259-011	04-Mar-2021 09:59	0960_SS235_210304	✓	✓	✓	✓
EP2102259-012	04-Mar-2021 10:28	0960_SD219_210304	✓	✓	✓	✓
EP2102259-013	04-Mar-2021 11:03	0960_SS231_210304	✓	✓	✓	✓
EP2102259-014	04-Mar-2021 11:30	0960_SS189_210304	✓	✓	✓	✓
EP2102259-015	04-Mar-2021 11:41	0960_SS227_210304	✓	✓	✓	✓
EP2102259-016	04-Mar-2021 12:30	0960_SD200_210304	✓	✓	✓	✓
EP2102259-017	04-Mar-2021 12:31	0960_SS298_210304	✓	✓	✓	✓
EP2102259-018	04-Mar-2021 13:20	0960_SD211_210304	✓	✓	✓	✓
EP2102259-019	04-Mar-2021 13:34	0960_SS198_210304	✓	✓	✓	✓
EP2102259-020	04-Mar-2021 13:42	0960_SS293_210304	✓	✓	✓	✓
EP2102259-021	04-Mar-2021 13:49	0960_SS292_210304	✓	✓	✓	✓
EP2102259-022	04-Mar-2021 14:00	0960_SS291_210304	✓	✓	✓	✓
EP2102259-023	04-Mar-2021 14:01	0960_QC107_210304	✓	✓	✓	✓
EP2102259-024	04-Mar-2021 14:24	0960_SS190_210304	✓	✓	✓	✓
EP2102259-025	04-Mar-2021 15:37	0960_SS192_210304	✓	✓	✓	✓
EP2102259-026	04-Mar-2021 00:00	0960_SS170_210304	✓	✓	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

ACCOUNTS PAYABLE (WA)

Email claire.armstrong@cardno.com.au

Email derp.labreports@esdat.com.au

Email derp.labreports@esdat.com.au

Email maelle.bourdais@cardno.com.au

Email maelle.bourdais@cardno.com.au

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Email maelle.bourdais@cardno.com.au

Email maelle.bourdais@cardno.com.au

CERTIFICATE OF ANALYSIS

Work Order : **EP2102259**
Client : **CARDNO (WA) PTY LTD**
Contact : **MAELLE BOURDAIS**
Address : **11 HARVEST TERRACE PO BOX 155**
WEST PERTH WA, AUSTRALIA 6006
Telephone : **----**
Project : **WA_0960_PFASOMP**
Order number : **DEF19009/0960**
C-O-C number : **19853**
Sampler : **MAELLE BOURDAIS, Shaun Chambers**
Site : **DEF19009/Learmonth**
Quote number : **SY/139/19**
No. of samples received : **26**
No. of samples analysed : **26**

Page : 1 of 21
Laboratory : Environmental Division Perth
Contact : Nick Courts
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 08-Mar-2021 11:40
Date Analysis Commenced : 09-Mar-2021
Issue Date : 15-Mar-2021 15:38



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H⁺ + Al³⁺).
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SS123_210304	0960_QC101_210304	0960_SS121_210304	0960_SS122_210304	0960_QC102_210304
Sampling date / time					04-Mar-2021 08:36	04-Mar-2021 08:37	04-Mar-2021 08:50	04-Mar-2021 09:06	04-Mar-2021 09:06
Compound	CAS Number	LOR	Unit		EP2102259-001	EP2102259-002	EP2102259-003	EP2102259-004	EP2102259-005
				Result	Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		8.9	8.9	8.8	8.9	9.0
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		96	101	85	132	121
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		13.4	13.2	17.8	16.4	16.4
ED007: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		23.2	20.0	21.6	22.4	20.8
Exchangeable Magnesium	----	0.1	meq/100g		2.5	2.5	2.0	2.7	2.3
Exchangeable Potassium	----	0.1	meq/100g		0.6	0.6	1.1	1.0	0.8
Exchangeable Sodium	----	0.1	meq/100g		0.4	0.4	0.2	0.6	0.5
Cation Exchange Capacity	----	0.1	meq/100g		26.7	23.5	24.8	26.6	24.4
Exchangeable Sodium Percent	----	0.1	%		1.5	1.6	0.8	2.1	2.2
EP004: Organic Matter									
Organic Matter	----	0.5	%		1.0	<0.5	0.8	1.5	2.0
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		<0.0002	0.0003	<0.0002	<0.0002	<0.0002
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		0.0900	0.0815	0.0559	0.0069	0.0102
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		0.0011	0.0006	0.0047	<0.0002	0.0017
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg		<0.001	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		<0.0002	<0.0002	0.0008	<0.0002	0.0003



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				0960_SS123_210304	0960_QC101_210304	0960_SS121_210304	0960_SS122_210304	0960_QC102_210304
Sampling date / time				04-Mar-2021 08:36	04-Mar-2021 08:37	04-Mar-2021 08:50	04-Mar-2021 09:06	04-Mar-2021 09:06
Compound	CAS Number	LOR	Unit	EP2102259-001	EP2102259-002	EP2102259-003	EP2102259-004	EP2102259-005
				Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids - Continued								
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0005	<0.0002	0.0003
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.0002	<0.0002	0.0003
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	0.0911	0.0824	0.0621	0.0069	0.0128



Analytical Results

Sub-Matrix: **SEDIMENT**
 (Matrix: **SOIL**)

Sample ID

				0960_SS123_210304	0960_QC101_210304	0960_SS121_210304	0960_SS122_210304	0960_QC102_210304
Sampling date / time				04-Mar-2021 08:36	04-Mar-2021 08:37	04-Mar-2021 08:50	04-Mar-2021 09:06	04-Mar-2021 09:06
Compound	CAS Number	LOR	Unit	EP2102259-001	EP2102259-002	EP2102259-003	EP2102259-004	EP2102259-005
				Result	Result	Result	Result	Result
EP231P: PFAS Sums - Continued								
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	0.0900	0.0818	0.0559	0.0069	0.0102
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	0.0900	0.0818	0.0559	0.0069	0.0102
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	94.0	103	101	120	98.0
13C8-PFOA	----	0.0002	%	97.0	94.5	95.0	97.5	97.5



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SS124_210304	0960_SS125_210304	0960_SS114_210304	0960_QC103_210304	0960_SS234_210304
Sampling date / time					04-Mar-2021 09:21	04-Mar-2021 09:29	04-Mar-2021 09:42	04-Mar-2021 09:43	04-Mar-2021 09:59
Compound	CAS Number	LOR	Unit		EP2102259-006	EP2102259-007	EP2102259-008	EP2102259-009	EP2102259-010
				Result	Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		8.5	8.6	8.5	8.4	8.5
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		124	96	121	140	185
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		19.9	19.2	26.0	26.2	31.4
ED007: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		22.0	22.2	28.8	28.8	22.9
Exchangeable Magnesium	----	0.1	meq/100g		2.8	1.8	5.4	5.2	4.4
Exchangeable Potassium	----	0.1	meq/100g		1.5	1.4	1.9	1.8	1.4
Exchangeable Sodium	----	0.1	meq/100g		0.4	0.1	0.2	0.2	1.0
Cation Exchange Capacity	----	0.1	meq/100g		26.6	25.5	36.3	36.1	29.6
Exchangeable Sodium Percent	----	0.1	%		1.3	0.4	0.6	0.6	3.3
EP004: Organic Matter									
Organic Matter	----	0.5	%		1.4	2.3	1.1	0.8	0.9
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		0.0384	0.0507	0.0390	0.0321	0.0082
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		0.0016	0.0008	0.0007	0.0010	0.0002
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg		<0.001	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		0.0006	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		0.0017	<0.0002	0.0002	0.0002	0.0002



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				0960_SS124_210304	0960_SS125_210304	0960_SS114_210304	0960_QC103_210304	0960_SS234_210304
Sampling date / time				04-Mar-2021 09:21	04-Mar-2021 09:29	04-Mar-2021 09:42	04-Mar-2021 09:43	04-Mar-2021 09:59
Compound	CAS Number	LOR	Unit	EP2102259-006	EP2102259-007	EP2102259-008	EP2102259-009	EP2102259-010
				Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids - Continued								
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	0.0012	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	0.0012	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	0.0003	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	0.0006
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	0.0012
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	0.0450	0.0515	0.0399	0.0333	0.0104



Analytical Results

Sub-Matrix: **SEDIMENT**
 (Matrix: **SOIL**)

Sample ID

				0960_SS124_210304	0960_SS125_210304	0960_SS114_210304	0960_QC103_210304	0960_SS234_210304
Sampling date / time				04-Mar-2021 09:21	04-Mar-2021 09:29	04-Mar-2021 09:42	04-Mar-2021 09:43	04-Mar-2021 09:59
Compound	CAS Number	LOR	Unit	EP2102259-006	EP2102259-007	EP2102259-008	EP2102259-009	EP2102259-010
				Result	Result	Result	Result	Result
EP231P: PFAS Sums - Continued								
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	0.0384	0.0507	0.0390	0.0321	0.0082
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	0.0384	0.0507	0.0390	0.0321	0.0088
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	87.0	102	100	94.5	101
13C8-PFOA	----	0.0002	%	97.5	92.0	96.5	92.5	94.5



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SS235_210304	0960_SD219_210304	0960_SS231_210304	0960_SS189_210304	0960_SS227_210304
Sampling date / time					04-Mar-2021 09:59	04-Mar-2021 10:28	04-Mar-2021 11:03	04-Mar-2021 11:30	04-Mar-2021 11:41
Compound	CAS Number	LOR	Unit		EP2102259-011	EP2102259-012	EP2102259-013	EP2102259-014	EP2102259-015
				Result	Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		9.5	8.5	9.4	9.0	8.5
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		89	126	216	91	92
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		23.6	26.8	22.8	10.8	21.5
ED007: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		21.7	19.4	23.5	19.3	14.1
Exchangeable Magnesium	----	0.1	meq/100g		3.1	2.5	5.7	3.7	2.2
Exchangeable Potassium	----	0.1	meq/100g		0.9	0.6	2.1	0.7	0.6
Exchangeable Sodium	----	0.1	meq/100g		0.6	0.4	2.6	0.2	0.1
Cation Exchange Capacity	----	0.1	meq/100g		26.2	22.8	33.9	23.9	17.0
Exchangeable Sodium Percent	----	0.1	%		2.3	1.6	7.8	0.8	0.8
EP004: Organic Matter									
Organic Matter	----	0.5	%		1.0	1.4	<0.5	2.7	1.4
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		0.0004	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		0.0219	0.0007	0.0095	0.0051	0.0014
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		<0.0002	<0.0002	0.0008	<0.0002	<0.0002
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg		<0.001	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		<0.0002	<0.0002	0.0004	<0.0002	<0.0002



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				0960_SS235_210304	0960_SD219_210304	0960_SS231_210304	0960_SS189_210304	0960_SS227_210304
Sampling date / time				04-Mar-2021 09:59	04-Mar-2021 10:28	04-Mar-2021 11:03	04-Mar-2021 11:30	04-Mar-2021 11:41
Compound	CAS Number	LOR	Unit	EP2102259-011	EP2102259-012	EP2102259-013	EP2102259-014	EP2102259-015
				Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids - Continued								
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	0.0223	0.0007	0.0107	0.0051	0.0014



Analytical Results

Sub-Matrix: **SEDIMENT**
 (Matrix: **SOIL**)

Sample ID

				0960_SS235_210304	0960_SD219_210304	0960_SS231_210304	0960_SS189_210304	0960_SS227_210304
Sampling date / time				04-Mar-2021 09:59	04-Mar-2021 10:28	04-Mar-2021 11:03	04-Mar-2021 11:30	04-Mar-2021 11:41
Compound	CAS Number	LOR	Unit	EP2102259-011	EP2102259-012	EP2102259-013	EP2102259-014	EP2102259-015
				Result	Result	Result	Result	Result
EP231P: PFAS Sums - Continued								
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	0.0223	0.0007	0.0095	0.0051	0.0014
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	0.0223	0.0007	0.0095	0.0051	0.0014
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	98.5	100	92.5	99.5	114
13C8-PFOA	----	0.0002	%	98.0	97.5	98.0	92.5	88.5



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SD200_210304	0960_SS298_210304	0960_SD211_210304	0960_SS198_210304	0960_SS293_210304
Sampling date / time					04-Mar-2021 12:30	04-Mar-2021 12:31	04-Mar-2021 13:20	04-Mar-2021 13:34	04-Mar-2021 13:42
Compound	CAS Number	LOR	Unit		EP2102259-016	EP2102259-017	EP2102259-018	EP2102259-019	EP2102259-020
				Result	Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		9.1	9.1	8.8	9.5	8.6
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		64	119	4860	56	151
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		24.0	12.3	28.6	22.2	23.8
ED007: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		23.8	19.1	----	8.6	21.6
Exchangeable Magnesium	----	0.1	meq/100g		2.6	3.0	----	1.8	5.9
Exchangeable Potassium	----	0.1	meq/100g		0.8	0.6	----	0.1	1.4
Exchangeable Sodium	----	0.1	meq/100g		0.1	0.4	----	0.1	0.4
Cation Exchange Capacity	----	0.1	meq/100g		27.3	23.2	----	10.6	29.4
Exchangeable Sodium Percent	----	0.1	%		0.4	1.7	----	1.0	1.4
ED008: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		----	----	28.6	----	----
Exchangeable Magnesium	----	0.1	meq/100g		----	----	9.2	----	----
Exchangeable Potassium	----	0.1	meq/100g		----	----	0.9	----	----
Exchangeable Sodium	----	0.1	meq/100g		----	----	0.6	----	----
Cation Exchange Capacity	----	0.1	meq/100g		----	----	39.3	----	----
Exchangeable Sodium Percent	----	0.1	%		----	----	1.5	----	----
EP004: Organic Matter									
Organic Matter	----	0.5	%		1.4	2.7	2.6	0.8	1.7
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		<0.0002	<0.0002	0.0020	<0.0002	0.0075
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				0960_SD200_210304	0960_SS298_210304	0960_SD211_210304	0960_SS198_210304	0960_SS293_210304
Sampling date / time				04-Mar-2021 12:30	04-Mar-2021 12:31	04-Mar-2021 13:20	04-Mar-2021 13:34	04-Mar-2021 13:42
Compound	CAS Number	LOR	Unit	EP2102259-016	EP2102259-017	EP2102259-018	EP2102259-019	EP2102259-020
				Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				0960_SD200_210304	0960_SS298_210304	0960_SD211_210304	0960_SS198_210304	0960_SS293_210304
Sampling date / time				04-Mar-2021 12:30	04-Mar-2021 12:31	04-Mar-2021 13:20	04-Mar-2021 13:34	04-Mar-2021 13:42
Compound	CAS Number	LOR	Unit	EP2102259-016	EP2102259-017	EP2102259-018	EP2102259-019	EP2102259-020
				Result	Result	Result	Result	Result
EP231D: (n:2) Fluorotelomer Sulfonic Acids - Continued								
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	<0.0002	<0.0002	0.0020	<0.0002	0.0075
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.0020	<0.0002	0.0075
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	<0.0002	0.0020	<0.0002	0.0075
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	111	97.5	104	104	93.5
13C8-PFOA	----	0.0002	%	98.0	100	104	98.0	104



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SS292_210304	0960_SS291_210304	0960_QC107_210304	0960_SS190_210304	0960_SS192_210304
Sampling date / time					04-Mar-2021 13:49	04-Mar-2021 14:00	04-Mar-2021 14:01	04-Mar-2021 14:24	04-Mar-2021 15:37
Compound	CAS Number	LOR	Unit		EP2102259-021	EP2102259-022	EP2102259-023	EP2102259-024	EP2102259-025
				Result	Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		8.6	8.7	8.9	9.5	9.6
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		89	98	83	144	108
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		19.6	20.3	19.2	22.1	19.2
ED007: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		13.6	19.4	19.4	20.8	5.1
Exchangeable Magnesium	----	0.1	meq/100g		2.1	2.8	2.8	10.2	0.7
Exchangeable Potassium	----	0.1	meq/100g		0.3	0.7	0.7	1.2	<0.1
Exchangeable Sodium	----	0.1	meq/100g		0.1	0.1	0.1	0.7	0.4
Cation Exchange Capacity	----	0.1	meq/100g		16.1	23.0	23.0	32.9	6.2
Exchangeable Sodium Percent	----	0.1	%		0.9	0.5	0.5	2.1	6.1
EP004: Organic Matter									
Organic Matter	----	0.5	%		0.7	1.0	0.8	1.7	1.1
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		0.0006	0.0014	0.0020	0.0178	<0.0002
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg		<0.001	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	0.0012	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				0960_SS292_210304	0960_SS291_210304	0960_QC107_210304	0960_SS190_210304	0960_SS192_210304
Sampling date / time				04-Mar-2021 13:49	04-Mar-2021 14:00	04-Mar-2021 14:01	04-Mar-2021 14:24	04-Mar-2021 15:37
Compound	CAS Number	LOR	Unit	EP2102259-021	EP2102259-022	EP2102259-023	EP2102259-024	EP2102259-025
				Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids - Continued								
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	0.0006	0.0014	0.0020	0.0190	<0.0002



Analytical Results

Sub-Matrix: **SEDIMENT**
 (Matrix: **SOIL**)

Sample ID

				0960_SS292_210304	0960_SS291_210304	0960_QC107_210304	0960_SS190_210304	0960_SS192_210304
Sampling date / time				04-Mar-2021 13:49	04-Mar-2021 14:00	04-Mar-2021 14:01	04-Mar-2021 14:24	04-Mar-2021 15:37
Compound	CAS Number	LOR	Unit	EP2102259-021	EP2102259-022	EP2102259-023	EP2102259-024	EP2102259-025
				Result	Result	Result	Result	Result
EP231P: PFAS Sums - Continued								
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	0.0006	0.0014	0.0020	0.0178	<0.0002
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	0.0006	0.0014	0.0020	0.0178	<0.0002
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	89.0	91.0	109	106	110
13C8-PFOA	----	0.0002	%	96.0	96.0	99.5	96.0	102



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)		Sample ID		0960_SS170_210304	----	----	----	----
		Sampling date / time		04-Mar-2021 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2102259-026	-----	-----	-----	-----
Result				----	----	----	----	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	8.1	----	----	----	----
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	177	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	31.0	----	----	----	----
ED007: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	23.2	----	----	----	----
Exchangeable Magnesium	----	0.1	meq/100g	3.6	----	----	----	----
Exchangeable Potassium	----	0.1	meq/100g	1.3	----	----	----	----
Exchangeable Sodium	----	0.1	meq/100g	<0.1	----	----	----	----
Cation Exchange Capacity	----	0.1	meq/100g	28.3	----	----	----	----
Exchangeable Sodium Percent	----	0.1	%	0.3	----	----	----	----
EP004: Organic Matter								
Organic Matter	----	0.5	%	2.2	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0036	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	----	----	----	----



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

0960_SS170_210304

Sampling date / time				04-Mar-2021 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2102259-026	-----	-----	-----	-----
Result				----	----	----	----	----

EP231B: Perfluoroalkyl Carboxylic Acids - Continued

Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	----	----	----	----

EP231C: Perfluoroalkyl Sulfonamides

Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	----	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	----	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	----	----	----	----

EP231D: (n:2) Fluorotelomer Sulfonic Acids

4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	----	----	----	----

EP231P: PFAS Sums

Sum of PFAS	----	0.0002	mg/kg	0.0036	----	----	----	----
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Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SS170_210304	----	----	----	----
				Sampling date / time	04-Mar-2021 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2102259-026	-----	-----	-----	-----
				Result		----	----	----	----
EP231P: PFAS Sums - Continued									
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		0.0036	----	----	----	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		0.0036	----	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		107	----	----	----	----
13C8-PFOA	----	0.0002	%		96.5	----	----	----	----

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Work Order : EP2102259
Client : CARDNO (WA) PTY LTD
Project : WA_0960_PFASOMP



Surrogate Control Limits

Sub-Matrix: SEDIMENT		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(SOIL) EP231A: Perfluoroalkyl Sulfonic Acids

(SOIL) EP231D: (n:2) Fluorotelomer Sulfonic Acids

(SOIL) EP231C: Perfluoroalkyl Sulfonamides

(SOIL) EP231B: Perfluoroalkyl Carboxylic Acids

(SOIL) EP231P: PFAS Sums

(SOIL) EP231S: PFAS Surrogate

QUALITY CONTROL REPORT

Work Order	: EP2102259	Page	: 1 of 16
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 08-Mar-2021
Order number	: DEF19009/0960	Date Analysis Commenced	: 09-Mar-2021
C-O-C number	: 19853	Issue Date	: 15-Mar-2021
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: DEF19009/Learmonth		
Quote number	: SY/139/19		
No. of samples received	: 26		
No. of samples analysed	: 26		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
 CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
 LOR = Limit of reporting
 RPD = Relative Percentage Difference
 # = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA002: pH 1:5 (Soils) (QC Lot: 3552751)									
EP2102259-001	0960_SS123_210304	EA002: pH Value	----	0.1	pH Unit	8.9	9.0	1.23	0% - 20%
EP2102259-010	0960_SS234_210304	EA002: pH Value	----	0.1	pH Unit	8.5	8.3	2.26	0% - 20%
EA002: pH 1:5 (Soils) (QC Lot: 3552753)									
EP2102259-021	0960_SS292_210304	EA002: pH Value	----	0.1	pH Unit	8.6	8.5	1.40	0% - 20%
EA010: Conductivity (1:5) (QC Lot: 3552750)									
EP2102259-001	0960_SS123_210304	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	96	90	6.67	0% - 20%
EP2102259-010	0960_SS234_210304	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	185	206	10.9	0% - 20%
EA010: Conductivity (1:5) (QC Lot: 3552752)									
EP2102259-021	0960_SS292_210304	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	89	100	12.0	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3552789)									
EP2102259-001	0960_SS123_210304	EA055: Moisture Content	----	0.1	%	13.4	13.5	0.00	0% - 20%
EP2102259-010	0960_SS234_210304	EA055: Moisture Content	----	0.1	%	31.4	30.7	2.12	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3552790)									
EP2102259-021	0960_SS292_210304	EA055: Moisture Content	----	0.1	%	19.6	18.9	3.84	0% - 20%
ED007: Exchangeable Cations (QC Lot: 3554864)									
EP2102192-001	Anonymous	ED007: Exchangeable Sodium Percent	----	0.1	%	0.7	0.8	0.00	No Limit
		ED007: Exchangeable Calcium	----	0.1	meq/100g	9.0	7.5	17.8	0% - 20%
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	0.9	0.8	0.00	No Limit
		ED007: Exchangeable Potassium	----	0.1	meq/100g	0.5	0.5	0.00	No Limit
		ED007: Exchangeable Sodium	----	0.1	meq/100g	<0.1	<0.1	0.00	No Limit
		ED007: Cation Exchange Capacity	----	0.1	meq/100g	10.4	8.9	16.0	0% - 20%
EP2102259-002	0960_QC101_210304	ED007: Exchangeable Sodium Percent	----	0.1	%	1.6	1.6	0.00	0% - 50%
		ED007: Exchangeable Calcium	----	0.1	meq/100g	20.0	20.1	0.608	0% - 20%
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	2.5	2.4	4.94	0% - 20%



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
ED007: Exchangeable Cations (QC Lot: 3554864) - continued									
EP2102259-002	0960_QC101_210304	ED007: Exchangeable Potassium	----	0.1	meq/100g	0.6	0.6	0.00	No Limit
		ED007: Exchangeable Sodium	----	0.1	meq/100g	0.4	0.4	0.00	No Limit
		ED007: Cation Exchange Capacity	----	0.1	meq/100g	23.5	23.5	0.00	0% - 20%
ED007: Exchangeable Cations (QC Lot: 3554866)									
EP2102259-013	0960_SS231_210304	ED007: Exchangeable Sodium Percent	----	0.1	%	7.8	7.8	0.00	0% - 20%
		ED007: Exchangeable Calcium	----	0.1	meq/100g	23.5	23.6	0.433	0% - 20%
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	5.7	5.8	0.00	0% - 20%
		ED007: Exchangeable Potassium	----	0.1	meq/100g	2.1	2.1	0.00	0% - 20%
		ED007: Exchangeable Sodium	----	0.1	meq/100g	2.6	2.7	0.00	0% - 20%
		ED007: Cation Exchange Capacity	----	0.1	meq/100g	33.9	34.2	0.630	0% - 20%
EP2102259-023	0960_QC107_210304	ED007: Exchangeable Sodium Percent	----	0.1	%	0.5	0.5	0.00	No Limit
		ED007: Exchangeable Calcium	----	0.1	meq/100g	19.4	19.3	0.620	0% - 20%
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	2.8	2.7	0.00	0% - 20%
		ED007: Exchangeable Potassium	----	0.1	meq/100g	0.7	0.7	0.00	No Limit
		ED007: Exchangeable Sodium	----	0.1	meq/100g	0.1	0.1	0.00	No Limit
		ED007: Cation Exchange Capacity	----	0.1	meq/100g	23.0	22.8	0.596	0% - 20%
ED008: Exchangeable Cations (QC Lot: 3553746)									
EP2102259-018	0960_SD211_210304	ED008: Exchangeable Sodium Percent	----	0.1	%	1.5	1.4	0.00	0% - 50%
		ED008: Exchangeable Calcium	----	0.1	meq/100g	28.6	26.8	6.47	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	9.2	10.2	10.7	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	0.9	1.0	0.00	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	0.6	0.6	0.00	No Limit
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	39.3	38.6	1.89	0% - 20%
EP004: Organic Matter (QC Lot: 3552770)									
EP2102259-001	0960_SS123_210304	EP004: Organic Matter	----	0.5	%	1.0	1.0	0.00	No Limit
EP2102259-011	0960_SS235_210304	EP004: Organic Matter	----	0.5	%	1.0	0.9	0.00	No Limit
EP004: Organic Matter (QC Lot: 3552771)									
EP2102259-021	0960_SS292_210304	EP004: Organic Matter	----	0.5	%	0.7	0.7	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3556278)									
EP2102192-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0012	0.0013	10.3	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP2102200-008	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3556278) - continued									
EP2102200-008	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3556287)									
EP2102259-006	0960_SS124_210304	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0384	0.0417	8.24	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	0.0016	0.0019	16.1	No Limit
EP2102259-016	0960_SD200_210304	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3556697)									
EP2102259-026	0960_SS170_210304	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0036	0.0035	0.00	0% - 50%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP2102261-010	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0124	0.0152	20.0	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	0.0004	0.0003	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3556278)									
EP2102192-001	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3556278) - continued									
EP2102200-008	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3556287)									
EP2102259-006	0960_SS124_210304	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	0.0006	0.0006	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	0.0017	0.0016	6.79	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	0.0012	0.0011	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	0.0012	0.0014	12.8	No Limit
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.0002	mg/kg	0.0003	0.0004	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP2102259-016	0960_SD200_210304	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3556697)									
EP2102259-026	0960_SS170_210304	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report							
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)		
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3556697) - continued											
EP2102259-026	0960_SS170_210304	EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit		
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit		
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit		
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit		
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit		
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit		
EP2102261-010	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit		
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit		
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit		
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit		
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit		
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit		
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit		
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit		
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit		
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit		
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit		
		EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3556278)									
		EP2102192-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9			0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit		
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6			0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit		
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8			0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit		
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2			0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit		
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7			0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit		
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2			0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit		
EP2102200-008	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit		
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit		
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit		
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit		
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit		



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3556278) - continued									
EP2102200-008	Anonymous	EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3556287)									
EP2102259-006	0960_SS124_210304	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP2102259-016	0960_SD200_210304	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3556697)									
EP2102259-026	0960_SS170_210304	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3556697) - continued									
EP2102259-026	0960_SS170_210304	EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP2102261-010	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3556278)							
EP2102192-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP2102200-008	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3556287)									
EP2102259-006	0960_SS124_210304	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit

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 Work Order : EP2102259
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3556287) - continued									
EP2102259-006	0960_SS124_210304	EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP2102259-016	0960_SD200_210304	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3556697)									
EP2102259-026	0960_SS170_210304	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP2102261-010	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit



Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

Sub-Matrix: SOIL				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result		LCS	Low	High
EA002: pH 1:5 (Soils) (QCLot: 3552751)								
EA002: pH Value	----	----	pH Unit	----	4 pH Unit	100	70.0	130
				----	7 pH Unit	100	70.0	130
EA002: pH 1:5 (Soils) (QCLot: 3552753)								
EA002: pH Value	----	----	pH Unit	----	4 pH Unit	101	70.0	130
				----	7 pH Unit	100	70.0	130
EA010: Conductivity (1:5) (QCLot: 3552750)								
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	1412 µS/cm	100	93.6	106
EA010: Conductivity (1:5) (QCLot: 3552752)								
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	1412 µS/cm	100	93.6	106
ED007: Exchangeable Cations (QCLot: 3554864)								
ED007: Exchangeable Calcium	----	0.1	meq/100g	<0.1	21.6 meq/100g	93.5	82.9	117
ED007: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.76 meq/100g	95.5	78.4	119
ED007: Exchangeable Potassium	----	0.1	meq/100g	<0.1	1 meq/100g	110	87.9	129
ED007: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.9 meq/100g	112	92.9	132
ED007: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	25.3 meq/100g	94.8	84.7	117
ED007: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
ED007: Exchangeable Cations (QCLot: 3554866)								
ED007: Exchangeable Calcium	----	0.1	meq/100g	<0.1	21.6 meq/100g	91.6	82.9	117
ED007: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.76 meq/100g	93.9	78.4	119
ED007: Exchangeable Potassium	----	0.1	meq/100g	<0.1	1 meq/100g	110	87.9	129
ED007: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.9 meq/100g	111	92.9	132
ED007: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	25.3 meq/100g	93.0	84.7	117
ED007: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
ED008: Exchangeable Cations (QCLot: 3553746)								
ED008: Exchangeable Calcium	----	0.1	meq/100g	<0.1	22.1 meq/100g	88.7	78.7	111
ED008: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.56 meq/100g	85.1	77.6	111
ED008: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.91 meq/100g	99.1	86.9	116
ED008: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.38 meq/100g	98.7	72.3	129
ED008: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
ED008: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	24.95 meq/100g	89.0	79.9	110
EP004: Organic Matter (QCLot: 3552770)								
EP004: Organic Matter	----	0.5	%	<0.5	2.3 %	87.8	70.0	120
				<0.5	85 %	87.8	70.0	120



Sub-Matrix: SOIL				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP004: Organic Matter (QCLot: 3552771)								
EP004: Organic Matter	----	0.5	%	<0.5	2.3 %	105	70.0	120
				<0.5	85 %	90.1	70.0	120
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3556278)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	104	72.0	128
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	122	73.0	123
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	110	67.0	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	126	70.0	132
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	120	68.0	136
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	112	59.0	134
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3556287)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	95.6	72.0	128
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	113	73.0	123
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	104	67.0	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	118	70.0	132
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	104	68.0	136
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	100	59.0	134
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3556697)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	125	72.0	128
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	123	73.0	123
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	107	67.0	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	127	70.0	132
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	115	68.0	136
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	116	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3556278)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	102	71.0	135
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	122	69.0	132
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	124	70.0	132
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	122	71.0	131
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	122	69.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	122	72.0	129
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	132	69.0	133
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	126	64.0	136
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	129	69.0	135
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	120	66.0	139
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	118	69.0	133
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3556287)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	91.8	71.0	135
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	113	69.0	132



Sub-Matrix: **SOIL**

Sub-Matrix: SOIL				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3556287) - continued								
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	117	70.0	132
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	110	71.0	131
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	128	69.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	118	72.0	129
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	121	69.0	133
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	123	64.0	136
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	129	69.0	135
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	124	66.0	139
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	106	69.0	133
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3556697)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	99.4	71.0	135
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	117	69.0	132
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	113	70.0	132
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	115	71.0	131
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	123	69.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	116	72.0	129
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	120	69.0	133
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	112	64.0	136
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	118	69.0	135
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	114	66.0	139
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	114	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3556278)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	118	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	128	71.6	129
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	111	69.8	131
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	124	68.7	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	115	65.1	134
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	136	63.0	144
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	120	61.0	139
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3556287)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	108	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	122	71.6	129
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	116	69.8	131
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	97.8	68.7	130



Sub-Matrix: SOIL				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3556287) - continued								
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	114	65.1	134
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	126	63.0	144
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	104	61.0	139
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3556697)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	119	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	113	71.6	129
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	108	69.8	131
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	110	68.7	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	112	65.1	134
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	116	63.0	144
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	122	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3556278)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	124	62.0	145
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	132	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	107	65.0	137
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	104	69.2	143
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3556287)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	114	62.0	145
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	108	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	116	65.0	137
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	107	69.2	143
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3556697)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	129	62.0	145
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	121	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	115	65.0	137
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	80.4	69.2	143

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.



Sub-Matrix: **SOIL**

Sub-Matrix: SOIL				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3556278)							
EP2102192-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	111	72.0	128
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	118	73.0	123
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	120	67.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	130	70.0	132
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	123	68.0	136
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	115	59.0	134
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3556287)							
EP2102259-006	0960_SS124_210304	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	113	72.0	128
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	122	73.0	123
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	104	67.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	124	70.0	132
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	# Not Determined	68.0	136
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	108	59.0	134
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3556697)							
EP2102259-026	0960_SS170_210304	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	125	72.0	128
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	123	73.0	123
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	109	67.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	125	70.0	132
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	80.8	68.0	136
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	121	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3556278)							
EP2102192-001	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	106	71.0	135
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	128	69.0	132
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	130	70.0	132
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	127	71.0	131
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	122	69.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	123	72.0	129
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	125	69.0	133
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	133	64.0	136
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	133	69.0	135
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.00125 mg/kg	131	66.0	139
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	118	69.0	133
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3556287)							
EP2102259-006	0960_SS124_210304	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	103	71.0	135
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	125	69.0	132
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	122	70.0	132
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	126	71.0	131



Sub-Matrix: SOIL

Sub-Matrix: SOIL				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3556287) - continued							
EP2102259-006	0960_SS124_210304	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	120	69.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	124	72.0	129
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	129	69.0	133
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	122	64.0	136
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	125	69.0	135
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	120	66.0	139
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	114	69.0	133
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3556697)							
EP2102259-026	0960_SS170_210304	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	102	71.0	135
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	118	69.0	132
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	116	70.0	132
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	115	71.0	131
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	120	69.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	111	72.0	129
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	113	69.0	133
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	117	64.0	136
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	124	69.0	135
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	131	66.0	139
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	112	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3556278)							
EP2102192-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	126	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	118	71.6	129
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	121	69.8	131
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	130	68.7	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	124	65.1	134
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	122	63.0	144
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	119	61.0	139
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3556287)							
EP2102259-006	0960_SS124_210304	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	116	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	113	71.6	129
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	105	69.8	131
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	108	68.7	130



Sub-Matrix: **SOIL**

Sub-Matrix: SOIL				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3556287) - continued							
EP2102259-006	0960_SS124_210304	EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	110	65.1	134
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	120	63.0	144
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	125	61.0	139
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3556697)							
EP2102259-026	0960_SS170_210304	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	114	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	110	71.6	129
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	107	69.8	131
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	114	68.7	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	120	65.1	134
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	128	63.0	144
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	115	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3556278)							
EP2102192-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	122	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	121	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	101	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	136	69.2	143
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3556287)							
EP2102259-006	0960_SS124_210304	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	124	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	126	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	122	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	122	69.2	143
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3556697)							
EP2102259-026	0960_SS170_210304	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	118	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	118	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	108	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	79.2	69.2	143

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2102259	Page	: 1 of 9
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 08-Mar-2021
Site	: DEF19009/Learmonth	Issue Date	: 15-Mar-2021
Sampler	: MAELLE BOURDAIS, Shaun Chambers	No. of samples received	: 26
Order number	: DEF19009/0960	No. of samples analysed	: 26

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- Matrix Spike outliers exist - please see following pages for full details.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- **NO** Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- **NO** Quality Control Sample Frequency Outliers exist.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EP231A: Perfluoroalkyl Sulfonic Acids	EP2102259--006	0960_SS124_210304	Perfluorooctane sulfonic acid (PFOS)	1763-23-1	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA002: pH 1:5 (Soils)								
Soil Glass Jar - Unpreserved (EA002)		04-Mar-2021	09-Mar-2021	11-Mar-2021	✓	09-Mar-2021	09-Mar-2021	✓
0960_SS123_210304,	0960_QC101_210304,							
0960_SS121_210304,	0960_SS122_210304,							
0960_QC102_210304,	0960_SS124_210304,							
0960_SS125_210304,	0960_SS114_210304,							
0960_QC103_210304,	0960_SS234_210304,							
0960_SS235_210304,	0960_SD219_210304,							
0960_SS231_210304,	0960_SS189_210304,							
0960_SS227_210304,	0960_SD200_210304,							
0960_SS298_210304,	0960_SD211_210304,							
0960_SS198_210304,	0960_SS293_210304,							
0960_SS292_210304,	0960_SS291_210304,							
0960_QC107_210304,	0960_SS190_210304,							
0960_SS192_210304,	0960_SS170_210304,							



Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA010: Conductivity (1:5)								
Soil Glass Jar - Unpreserved (EA010)	04-Mar-2021	09-Mar-2021	11-Mar-2021	✔	09-Mar-2021	06-Apr-2021	✔	
0960_SS123_210304,								0960_QC101_210304,
0960_SS121_210304,								0960_SS122_210304,
0960_QC102_210304,								0960_SS124_210304,
0960_SS125_210304,								0960_SS114_210304,
0960_QC103_210304,								0960_SS234_210304,
0960_SS235_210304,								0960_SD219_210304,
0960_SS231_210304,								0960_SS189_210304,
0960_SS227_210304,								0960_SD200_210304,
0960_SS298_210304,								0960_SD211_210304,
0960_SS198_210304,								0960_SS293_210304,
0960_SS292_210304,								0960_SS291_210304,
0960_QC107_210304,								0960_SS190_210304,
0960_SS192_210304,								0960_SS170_210304
EA055: Moisture Content (Dried @ 105-110°C)								
Soil Glass Jar - Unpreserved (EA055)	04-Mar-2021	----	----	----	09-Mar-2021	18-Mar-2021	✔	
0960_SS123_210304,								0960_QC101_210304,
0960_SS121_210304,								0960_SS122_210304,
0960_QC102_210304,								0960_SS124_210304,
0960_SS125_210304,								0960_SS114_210304,
0960_QC103_210304,								0960_SS234_210304,
0960_SS235_210304,								0960_SD219_210304,
0960_SS231_210304,								0960_SS189_210304,
0960_SS227_210304,								0960_SD200_210304,
0960_SS298_210304,								0960_SD211_210304,
0960_SS198_210304,								0960_SS293_210304,
0960_SS292_210304,								0960_SS291_210304,
0960_QC107_210304,								0960_SS190_210304,
0960_SS192_210304,								0960_SS170_210304

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED007: Exchangeable Cations								
Soil Glass Jar - Unpreserved (ED007)		04-Mar-2021	11-Mar-2021	01-Apr-2021	✓	11-Mar-2021	01-Apr-2021	✓
0960_SS123_210304,	0960_QC101_210304,							
0960_SS121_210304,	0960_SS122_210304,							
0960_QC102_210304,	0960_SS124_210304,							
0960_SS125_210304,	0960_SS114_210304,							
0960_QC103_210304,	0960_SS234_210304,							
0960_SS235_210304,	0960_SD219_210304,							
0960_SS231_210304,	0960_SS189_210304,							
0960_SS227_210304,	0960_SD200_210304,							
0960_SS298_210304,	0960_SS198_210304,							
0960_SS293_210304,	0960_SS292_210304,							
0960_SS291_210304,	0960_QC107_210304,							
0960_SS190_210304,	0960_SS192_210304,							
0960_SS170_210304								
ED008: Exchangeable Cations								
Soil Glass Jar - Unpreserved (ED008)		04-Mar-2021	11-Mar-2021	01-Apr-2021	✓	11-Mar-2021	01-Apr-2021	✓
0960_SD211_210304								
EP004: Organic Matter								
Soil Glass Jar - Unpreserved (EP004)		04-Mar-2021	10-Mar-2021	01-Apr-2021	✓	10-Mar-2021	01-Apr-2021	✓
0960_SS123_210304,	0960_QC101_210304,							
0960_SS121_210304,	0960_SS122_210304,							
0960_QC102_210304,	0960_SS124_210304,							
0960_SS125_210304,	0960_SS114_210304,							
0960_QC103_210304,	0960_SS234_210304,							
0960_SS235_210304,	0960_SD219_210304,							
0960_SS231_210304,	0960_SS189_210304,							
0960_SS227_210304,	0960_SD200_210304,							
0960_SS298_210304,	0960_SD211_210304,							
0960_SS198_210304,	0960_SS293_210304,							
0960_SS292_210304,	0960_SS291_210304,							
0960_QC107_210304,	0960_SS190_210304,							
0960_SS192_210304,	0960_SS170_210304							



Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE Soil Jar (EP231X) 0960_SS123_210304, 0960_SS121_210304, 0960_QC102_210304	0960_QC101_210304, 0960_SS122_210304,	04-Mar-2021	10-Mar-2021	31-Aug-2021	✔	11-Mar-2021	19-Apr-2021	✔
HDPE Soil Jar (EP231X) 0960_SS124_210304, 0960_SS114_210304, 0960_SS234_210304, 0960_SD219_210304, 0960_SS189_210304, 0960_SD200_210304, 0960_SD211_210304, 0960_SS293_210304, 0960_SS291_210304, 0960_SS190_210304, 0960_SS170_210304	0960_SS125_210304, 0960_QC103_210304, 0960_SS235_210304, 0960_SS231_210304, 0960_SS227_210304, 0960_SS298_210304, 0960_SS198_210304, 0960_SS292_210304, 0960_QC107_210304, 0960_SS192_210304,	04-Mar-2021	11-Mar-2021	31-Aug-2021	✔	11-Mar-2021	20-Apr-2021	✔
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE Soil Jar (EP231X) 0960_SS123_210304, 0960_SS121_210304, 0960_QC102_210304	0960_QC101_210304, 0960_SS122_210304,	04-Mar-2021	10-Mar-2021	31-Aug-2021	✔	11-Mar-2021	19-Apr-2021	✔
HDPE Soil Jar (EP231X) 0960_SS124_210304, 0960_SS114_210304, 0960_SS234_210304, 0960_SD219_210304, 0960_SS189_210304, 0960_SD200_210304, 0960_SD211_210304, 0960_SS293_210304, 0960_SS291_210304, 0960_SS190_210304, 0960_SS170_210304	0960_SS125_210304, 0960_QC103_210304, 0960_SS235_210304, 0960_SS231_210304, 0960_SS227_210304, 0960_SS298_210304, 0960_SS198_210304, 0960_SS292_210304, 0960_QC107_210304, 0960_SS192_210304,	04-Mar-2021	11-Mar-2021	31-Aug-2021	✔	11-Mar-2021	20-Apr-2021	✔



Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EP231C: Perfluoroalkyl Sulfonamides								
HDPE Soil Jar (EP231X) 0960_SS123_210304, 0960_SS121_210304, 0960_QC102_210304	0960_QC101_210304, 0960_SS122_210304,	04-Mar-2021	10-Mar-2021	31-Aug-2021	✔	11-Mar-2021	19-Apr-2021	✔
HDPE Soil Jar (EP231X) 0960_SS124_210304, 0960_SS114_210304, 0960_SS234_210304, 0960_SD219_210304, 0960_SS189_210304, 0960_SD200_210304, 0960_SD211_210304, 0960_SS293_210304, 0960_SS291_210304, 0960_SS190_210304, 0960_SS170_210304	0960_SS125_210304, 0960_QC103_210304, 0960_SS235_210304, 0960_SS231_210304, 0960_SS227_210304, 0960_SS298_210304, 0960_SS198_210304, 0960_SS292_210304, 0960_QC107_210304, 0960_SS192_210304,	04-Mar-2021	11-Mar-2021	31-Aug-2021	✔	11-Mar-2021	20-Apr-2021	✔
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE Soil Jar (EP231X) 0960_SS123_210304, 0960_SS121_210304, 0960_QC102_210304	0960_QC101_210304, 0960_SS122_210304,	04-Mar-2021	10-Mar-2021	31-Aug-2021	✔	11-Mar-2021	19-Apr-2021	✔
HDPE Soil Jar (EP231X) 0960_SS124_210304, 0960_SS114_210304, 0960_SS234_210304, 0960_SD219_210304, 0960_SS189_210304, 0960_SD200_210304, 0960_SD211_210304, 0960_SS293_210304, 0960_SS291_210304, 0960_SS190_210304, 0960_SS170_210304	0960_SS125_210304, 0960_QC103_210304, 0960_SS235_210304, 0960_SS231_210304, 0960_SS227_210304, 0960_SS298_210304, 0960_SS198_210304, 0960_SS292_210304, 0960_QC107_210304, 0960_SS192_210304,	04-Mar-2021	11-Mar-2021	31-Aug-2021	✔	11-Mar-2021	20-Apr-2021	✔



Matrix: SOIL

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EP231P: PFAS Sums								
HDPE Soil Jar (EP231X) 0960_SS123_210304, 0960_SS121_210304, 0960_QC102_210304	0960_QC101_210304, 0960_SS122_210304,	04-Mar-2021	10-Mar-2021	31-Aug-2021	✔	11-Mar-2021	19-Apr-2021	✔
HDPE Soil Jar (EP231X) 0960_SS124_210304, 0960_SS114_210304, 0960_SS234_210304, 0960_SD219_210304, 0960_SS189_210304, 0960_SD200_210304, 0960_SD211_210304, 0960_SS293_210304, 0960_SS291_210304, 0960_SS190_210304, 0960_SS170_210304	0960_SS125_210304, 0960_QC103_210304, 0960_SS235_210304, 0960_SS231_210304, 0960_SS227_210304, 0960_SS298_210304, 0960_SS198_210304, 0960_SS292_210304, 0960_QC107_210304, 0960_SS192_210304,	04-Mar-2021	11-Mar-2021	31-Aug-2021	✔	11-Mar-2021	20-Apr-2021	✔



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)		Quality Control Specification	
Analytical Methods	Method	QC	Regular	Actual	Expected		Evaluation
Laboratory Duplicates (DUP)							
Electrical Conductivity (1:5)	EA010	3	26	11.54	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	4	34	11.76	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	1	100.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	3	26	11.54	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	3	26	11.54	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	6	60	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	3	26	11.54	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Electrical Conductivity (1:5)	EA010	2	26	7.69	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	2	34	5.88	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	1	100.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	4	26	15.38	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	3	60	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	4	26	15.38	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Electrical Conductivity (1:5)	EA010	2	26	7.69	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	2	34	5.88	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	1	100.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	26	7.69	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	3	60	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	3	60	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	In house: Referenced to Rayment and Lyons 4A1 and APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Electrical Conductivity (1:5)	EA010	SOIL	In house: Referenced to Rayment and Lyons 3A1 and APHA 2510. Conductivity is determined on soil samples using a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Exchangeable Cations	ED007	SOIL	In house: Referenced to Rayment & Lyons Method 15A1. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM Schedule B(3).
Exchangeable Cations with pre-treatment	ED008	SOIL	In house: Referenced to Rayment & Lyons Method 15A2. Soluble salts are removed from the sample prior to analysis. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM Schedule B(3).
Organic Matter	EP004	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3)
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	SOIL	In-house: Analysis of soils by solvent extraction followed by LC-Electrospray-MS-MS, Negative Mode using MRM using internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Exchangeable Cations Preparation Method	ED007PR	SOIL	In house: Referenced to Rayment & Lyons method 15A1. A 1M NH4Cl extraction by end over end tumbling at a ratio of 1:20. There is no pretreatment for soluble salts. Extracts can be run by ICP for cations.
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
Organic Matter	EP004-PR	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3).
QuEChERS Extraction of Solids	ORG71	SOIL	In house: Sequential extractions with Acetonitrile/Methanol by shaking. Extraction efficiency aided by the addition of salts under acidic conditions. Where relevant, interferences from co-extracted organics are removed with dispersive clean-up media (dSPE). The extract is either diluted or concentrated and exchanged into the analytical solvent.



CHAIN OF CUSTODY

COC#: 19804

ALS Laboratory: EP Perth

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: AB DEF19009/Learmonth SED

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

TURNAROUND REQUIREMENTS: 5 Days

Biohazard info:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

°C

Other comments:

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Sediments SEDIMENT	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0960_SS176		04/03/2021 08:27 AM	Soil	ALS: 2 Non ALS: 0	No	X		
002	0960_SS279		04/03/2021 08:35 AM	Soil	ALS: 2 Non ALS: 0	No	X		
003	0960_SS168		04/03/2021 08:47 AM	Soil	ALS: 2 Non ALS: 0	No	X		
004	0960_SS166		04/03/2021 08:51 AM	Soil	ALS: 2 Non ALS: 0	No	X		
005	0960_SS265		04/03/2021 09:00 AM	Soil	ALS: 2 Non ALS: 0	No	X		
006	0960_SS113		04/03/2021 09:11 AM	Soil	ALS: 2 Non ALS: 0	No	X		
007	0960_SS157		04/03/2021 09:28 AM	Soil	ALS: 2 Non ALS: 0	No	X		
008	0960_SS243		04/03/2021 09:31 AM	Soil	ALS: 2 Non ALS: 0	No	X		
009	0960_SS174		04/03/2021 09:32 AM	Soil	ALS: 2 Non ALS: 0	No	X		

Environmental Division
Perth

Work Order Reference

EP2102261



Telephone: --61-8-9406 1301



CHAIN OF CUSTODY

COC#: 19804 ALS Laboratory: EP Perth

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOM

SITE: AB DEF19009/Learmonth SED

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Sediments SEDIMENT	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
010	0960_SS277		04/03/2021 09:46 AM	Soil	ALS: 2 Non ALS: 0	No	X		
011	0960_SS278		04/03/2021 09:53 AM	Soil	ALS: 1 Non ALS: 1	No	X		
012	0960_SD199		04/03/2021 10:35 AM	Soil	ALS: 2 Non ALS: 0	No	X		
013	0960_QC105		04/03/2021 10:44 AM	Soil	ALS: 2 Non ALS: 0	No	X		
014	0960_SS108		04/03/2021 11:41 AM	Soil	ALS: 2 Non ALS: 0	No	X		
015	0960_SD210		04/03/2021 01:10 PM	Soil	ALS: 2 Non ALS: 0	No	X		
016	0960_SD302		04/03/2021 01:15 PM	Soil	ALS: 2 Non ALS: 0	No	X		
017	0960_SD209		04/03/2021 01:16 PM	Soil	ALS: 2 Non ALS: 0	No	X		
018	0960_SD305		04/03/2021 02:09 PM	Soil	ALS: 2 Non ALS: 0	No	X		



CHAIN OF CUSTODY

COC#: 19804

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: AB DEF19009/Learmonth SED

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

°C

Other comments:

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Sediments SEDIMENT	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
019	0960_SS208		04/03/2021 03:20 PM	Soil	ALS: 2 Non ALS: 0	No	X		
020	0960_SS193		04/03/2021 03:21 PM	Soil	ALS: 2 Non ALS: 0	No	X		
021	0960_SD208		04/03/2021 04:16 PM	Soil	ALS: 2 Non ALS: 0	No	X		
022	0960_SD207		04/03/2021 04:19 PM	Soil	ALS: 2 Non ALS: 0	No	X		
023	0960_SD205		04/03/2021 04:21 PM	Soil	ALS: 2 Non ALS: 0	No	X		
024	0960_SS301		04/03/2021 04:23 PM	Soil	ALS: 2 Non ALS: 0	No	X		
025	0960_SD304		04/03/2021 04:38 PM	Soil	ALS: 2 Non ALS: 0	No	X		
026	0960_SD303		04/03/2021 04:41 PM	Soil	ALS: 2 Non ALS: 0	No	X		
027	0970_SD301		04/03/2021 04:50 PM	Soil	ALS: 2 Non ALS: 0	No	X		

**CHAIN OF CUSTODY**

COC#: 19804

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFASOMP

SITE: AB DEF19009/Learmonth SED

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

°C

Other comments:

SAMPLE DETAILS**ANALYSIS REQUIRED**

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Sediments SEDIMENT	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
028	0960_SD300		04/03/2021 05:03 PM	Soil	ALS: 2 Non ALS: 0	No	X		

**CHAIN OF CUSTODY**

COC#: 19804

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: AB DEF19009/Learmonth SED

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

°C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0960_SS176	HDPE Soil Jar	200 mL	00620719069267	Grey	No	
001	0960_SS176	Soil Glass Jar - Unpreserved	150 mL	00261020093962	Orange	No	
002	0960_SS279	Soil Glass Jar - Unpreserved	150 mL	00261020093444	Orange	No	
002	0960_SS279	HDPE Soil Jar	200 mL	00620719069380	Grey	No	
003	0960_SS168	HDPE Soil Jar	200 mL	00620719069344	Grey	No	
003	0960_SS168	Soil Glass Jar - Unpreserved	150 mL	00261020093438	Orange	No	
004	0960_SS166	HDPE Soil Jar	200 mL	00620719069353	Grey	No	
004	0960_SS166	Soil Glass Jar - Unpreserved	150 mL	00261020093432	Orange	No	
005	0960_SS265	Soil Glass Jar - Unpreserved	150 mL	00261020093421	Orange	No	
005	0960_SS265	HDPE Soil Jar	200 mL	00620719069324	Grey	No	
006	0960_SS113	Soil Glass Jar - Unpreserved	150 mL	00261020093442	Orange	No	
006	0960_SS113	HDPE Soil Jar	200 mL	00620719069350	Grey	No	
007	0960_SS157	HDPE Soil Jar	200 mL	00620719069355	Grey	No	
007	0960_SS157	Soil Glass Jar - Unpreserved	150 mL	00261020093944	Orange	No	
008	0960_SS243	HDPE Soil Jar	200 mL	00620719069335	Grey	No	
008	0960_SS243	Soil Glass Jar - Unpreserved	150 mL	00261020093977	Orange	No	
009	0960_SS174	HDPE Soil Jar	200 mL	00620719069358	Grey	No	
009	0960_SS174	Soil Glass Jar - Unpreserved	150 mL	00261020093958	Orange	No	
010	0960_SS277	Soil Glass Jar - Unpreserved	150 mL	00261020093984	Orange	No	
010	0960_SS277	HDPE Soil Jar	200 mL	00620719069394	Grey	No	
011	0960_SS278	HDPE Soil Jar	200 mL	00620719069305	Grey	No	
012	0960_SD199	Soil Glass Jar - Unpreserved	150 mL	00261020093959	Orange	No	
012	0960_SD199	HDPE Soil Jar	200 mL	00620719069264	Grey	No	
013	0960_QC105	Soil Glass Jar - Unpreserved	150 mL	00261020093963	Orange	No	
013	0960_QC105	HDPE Soil Jar	200 mL	00620719069389	Grey	No	
014	0960_SS108	HDPE Soil Jar	200 mL	00620719069317	Grey	No	



CHAIN OF CUSTODY

COC#: 19804

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: AB DEF19009/Learmonth SED

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

°C

Other comments:

014	0960_SS108	Soil Glass Jar - Unpreserved	150 mL	00261020093970	Orange	No	
015	0960_SD210	HDPE Soil Jar	200 mL	00620719069398	Grey	No	
015	0960_SD210	Soil Glass Jar - Unpreserved	150 mL	00261020093419	Orange	No	
016	0960_SD302	HDPE Soil Jar	200 mL	00620719069367	Grey	No	
016	0960_SD302	Soil Glass Jar - Unpreserved	150 mL	00261020109859	Orange	No	
017	0960_SD209	HDPE Soil Jar	200 mL	00620719069346	Grey	No	
017	0960_SD209	Soil Glass Jar - Unpreserved	150 mL	00261020109910	Orange	No	
018	0960_SD305	HDPE Soil Jar	200 mL	00620719069373	Grey	No	
018	0960_SD305	Soil Glass Jar - Unpreserved	150 mL	00261020110050	Orange	No	
019	0960_SS208	Soil Glass Jar - Unpreserved	150 mL	00261020110085	Orange	No	
019	0960_SS208	HDPE Soil Jar	200 mL	00620719069365	Grey	No	
020	0960_SS193	Soil Glass Jar - Unpreserved	150 mL	00261020109868	Orange	No	
020	0960_SS193	HDPE Soil Jar	200 mL	00620719069374	Grey	No	
021	0960_SD208	Soil Glass Jar - Unpreserved	150 mL	00261020110123	Orange	No	
021	0960_SD208	HDPE Soil Jar	200 mL	00620719069388	Grey	No	
022	0960_SD207	Soil Glass Jar - Unpreserved	150 mL	00261020110121	Orange	No	
022	0960_SD207	HDPE Soil Jar	200 mL	00620719069386	Grey	No	
023	0960_SD205	HDPE Soil Jar	200 mL	00620719069375	Grey	No	
023	0960_SD205	Soil Glass Jar - Unpreserved	150 mL	00261020110082	Orange	No	
024	0960_SS301	HDPE Soil Jar	200 mL	00620719069302	Grey	No	
024	0960_SS301	Soil Glass Jar - Unpreserved	150 mL	00261219121024	Orange	No	
025	0960_SD304	HDPE Soil Jar	200 mL	00620719069359	Grey	No	
025	0960_SD304	Soil Glass Jar - Unpreserved	150 mL	00261020110105	Orange	No	
026	0960_SD303	Soil Glass Jar - Unpreserved	150 mL	00261020110113	Orange	No	
026	0960_SD303	HDPE Soil Jar	200 mL	00620719069341	Grey	No	
027	0970_SD301	HDPE Soil Jar	200 mL	00620719069329	Grey	No	
027	0970_SD301	Soil Glass Jar - Unpreserved	150 mL	00261020110080	Orange	No	



CHAIN OF CUSTODY

COC#: 19804 ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFASOMP

SITE: AB DEF19009/Learmonth SED

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

028	0960_SD300	Soil Glass Jar - Unpreserved	150 mL	00261219121034	Orange	No	
028	0960_SD300	HDPE Soil Jar	200 mL	00620719069326	Grey	No	

Total Bottle Count: ALS: 55, Non ALS: 1

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : EP2102261

<p>Client : CARDNO (WA) PTY LTD</p> <p>Contact : MAELLE BOURDAIS</p> <p>Address : 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006</p> <p>E-mail : maelle.bourdais@cardno.com.au</p> <p>Telephone : ----</p> <p>Facsimile : ----</p> <p>Project : WA_0960_PFASOMP</p> <p>Order number : DEF19009/0960</p> <p>C-O-C number : 19804</p> <p>Site : DEF19009/Learmonth</p> <p>Sampler : ASHLEY BROWN, MAELLE BOURDAIS</p>	<p>Laboratory : Environmental Division Perth</p> <p>Contact : Nick Courts</p> <p>Address : 26 Rigali Way Wangara WA Australia 6065</p> <p>E-mail : nick.courts@alsglobal.com</p> <p>Telephone : +61-8-9406 1301</p> <p>Facsimile : +61-8-9406 1399</p> <p>Page : 1 of 3</p> <p>Quote number : ES2019CARBSD0002 (SY/139/19)</p> <p>QC Level : NEPM 2013 B3 & ALS QC Standard</p>
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Dates

Date Samples Received : 08-Mar-2021 11:40	Issue Date : 08-Mar-2021
Client Requested Due : 18-Mar-2021	Scheduled Reporting Date : 18-Mar-2021
Date	

Delivery Details

Mode of Delivery : Carrier	Security Seal : Not Available
No. of coolers/boxes : 6	Temperature : 28.7
Receipt Detail :	No. of samples received / analysed : 28 / 28

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepancies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.



Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	Sampling date / time	Sample ID	SOIL - AG-1 Agricultural Soil Suite 1	SOIL - EA055-103 Moisture Content	SOIL - EP004 Organic Matter in Soil (Walkley Black)	SOIL - EP231X (solids) PFAS - Full Suite (28 analytes)
EP2102261-001	04-Mar-2021 08:27	0960_SS176_210304	✓	✓	✓	✓
EP2102261-002	04-Mar-2021 08:35	0960_SS279_210304	✓	✓	✓	✓
EP2102261-003	04-Mar-2021 08:47	0960_SS168_210304	✓	✓	✓	✓
EP2102261-004	04-Mar-2021 08:51	0960_SS166_210304	✓	✓	✓	✓
EP2102261-005	04-Mar-2021 09:00	0960_SS265_210304	✓	✓	✓	✓
EP2102261-006	04-Mar-2021 09:11	0960_SS113_210304	✓	✓	✓	✓
EP2102261-007	04-Mar-2021 09:28	0960_SS157_210304	✓	✓	✓	✓
EP2102261-008	04-Mar-2021 09:31	0960_SS243_210304	✓	✓	✓	✓
EP2102261-009	04-Mar-2021 09:32	0960_SS174_210304	✓	✓	✓	✓
EP2102261-010	04-Mar-2021 09:46	0960_SS277_210304	✓	✓	✓	✓
EP2102261-011	04-Mar-2021 09:53	0960_SS278_210304	✓	✓	✓	✓
EP2102261-012	04-Mar-2021 10:35	0960_SD199_210304	✓	✓	✓	✓
EP2102261-013	04-Mar-2021 10:44	0960_QC105_210304	✓	✓	✓	✓
EP2102261-014	04-Mar-2021 11:41	0960_SS108_210304	✓	✓	✓	✓
EP2102261-015	04-Mar-2021 13:10	0960_SD210_210304	✓	✓	✓	✓
EP2102261-016	04-Mar-2021 13:15	0960_SD302_210304	✓	✓	✓	✓
EP2102261-017	04-Mar-2021 13:16	0960_SD209_210304	✓	✓	✓	✓
EP2102261-018	04-Mar-2021 14:09	0960_SD305_210304	✓	✓	✓	✓
EP2102261-019	04-Mar-2021 15:20	0960_SS208_210304	✓	✓	✓	✓
EP2102261-020	04-Mar-2021 15:21	0960_SS193_210304	✓	✓	✓	✓
EP2102261-021	04-Mar-2021 16:16	0960_SD208_210304	✓	✓	✓	✓
EP2102261-022	04-Mar-2021 16:19	0960_SD207_210304	✓	✓	✓	✓
EP2102261-023	04-Mar-2021 16:21	0960_SD205_210304	✓	✓	✓	✓
EP2102261-024	04-Mar-2021 16:23	0960_SS301_210304	✓	✓	✓	✓
EP2102261-025	04-Mar-2021 16:38	0960_SD304_210304	✓	✓	✓	✓
EP2102261-026	04-Mar-2021 16:41	0960_SD303_210304	✓	✓	✓	✓
EP2102261-027	04-Mar-2021 16:50	0970_SD301	✓	✓	✓	✓
EP2102261-028	04-Mar-2021 17:03	0960_SD300	✓	✓	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

ACCOUNTS PAYABLE (WA)

Email claire.armstrong@cardno.com.au

Email derp.labreports@esdat.com.au

Email derp.labreports@esdat.com.au

Email maelle.bourdais@cardno.com.au

Email maelle.bourdais@cardno.com.au

Email maelle.bourdais@cardno.com.au

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Email maelle.bourdais@cardno.com.au

Email maelle.bourdais@cardno.com.au

Email maelle.bourdais@cardno.com.au

CERTIFICATE OF ANALYSIS

Work Order : **EP2102261**
Client : **CARDNO (WA) PTY LTD**
Contact : **MAELLE BOURDAIS**
Address : **11 HARVEST TERRACE PO BOX 155**
WEST PERTH WA, AUSTRALIA 6006
Telephone : **----**
Project : **WA_0960_PFASOMP**
Order number : **DEF19009/0960**
C-O-C number : **19804**
Sampler : **ASHLEY BROWN, MAELLE BOURDAIS**
Site : **DEF19009/Learmonth**
Quote number : **SY/139/19**
No. of samples received : **28**
No. of samples analysed : **28**

Page : 1 of 21
Laboratory : Environmental Division Perth
Contact : Nick Courts
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 08-Mar-2021 11:40
Date Analysis Commenced : 09-Mar-2021
Issue Date : 17-Mar-2021 19:37



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- ED008: Poor duplicate precision was obtained for Cation Exchange Capacity and Exchangeable Calcium on sample EP2102261-015 due to possible sample heterogeneity. Results have been confirmed by re-extraction and re-analysis.
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H⁺ + Al³⁺).
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SS176_210304	0960_SS279_210304	0960_SS168_210304	0960_SS166_210304	0960_SS265_210304
Sampling date / time					04-Mar-2021 08:27	04-Mar-2021 08:35	04-Mar-2021 08:47	04-Mar-2021 08:51	04-Mar-2021 09:00
Compound	CAS Number	LOR	Unit		EP2102261-001	EP2102261-002	EP2102261-003	EP2102261-004	EP2102261-005
				Result	Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		8.8	8.8	8.4	8.5	8.7
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		97	69	132	118	108
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		16.2	18.3	30.9	23.1	20.2
ED007: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		14.7	10.8	19.6	21.6	19.3
Exchangeable Magnesium	----	0.1	meq/100g		1.6	1.6	2.8	3.5	3.3
Exchangeable Potassium	----	0.1	meq/100g		0.7	0.8	1.1	1.4	0.7
Exchangeable Sodium	----	0.1	meq/100g		0.2	<0.1	0.2	0.2	<0.1
Cation Exchange Capacity	----	0.1	meq/100g		17.3	13.2	23.7	26.6	23.4
Exchangeable Sodium Percent	----	0.1	%		1.4	0.4	1.1	0.9	0.4
EP004: Organic Matter									
Organic Matter	----	0.5	%		1.0	<0.5	2.8	<0.5	<0.5
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		0.0018	0.0028	0.0010	0.0018	0.0012
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg		<0.001	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				0960_SS176_210304	0960_SS279_210304	0960_SS168_210304	0960_SS166_210304	0960_SS265_210304
Sampling date / time				04-Mar-2021 08:27	04-Mar-2021 08:35	04-Mar-2021 08:47	04-Mar-2021 08:51	04-Mar-2021 09:00
Compound	CAS Number	LOR	Unit	EP2102261-001	EP2102261-002	EP2102261-003	EP2102261-004	EP2102261-005
				Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids - Continued								
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	0.0018	0.0028	0.0010	0.0018	0.0012



Analytical Results

Sub-Matrix: **SEDIMENT**
 (Matrix: **SOIL**)

Sample ID

				0960_SS176_210304	0960_SS279_210304	0960_SS168_210304	0960_SS166_210304	0960_SS265_210304
Sampling date / time				04-Mar-2021 08:27	04-Mar-2021 08:35	04-Mar-2021 08:47	04-Mar-2021 08:51	04-Mar-2021 09:00
Compound	CAS Number	LOR	Unit	EP2102261-001	EP2102261-002	EP2102261-003	EP2102261-004	EP2102261-005
				Result	Result	Result	Result	Result
EP231P: PFAS Sums - Continued								
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	0.0018	0.0028	0.0010	0.0018	0.0012
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	0.0018	0.0028	0.0010	0.0018	0.0012
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	101	97.5	100	104	102
13C8-PFOA	----	0.0002	%	98.0	98.0	100	98.0	98.5



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SS113_210304	0960_SS157_210304	0960_SS243_210304	0960_SS174_210304	0960_SS277_210304
Sampling date / time					04-Mar-2021 09:11	04-Mar-2021 09:28	04-Mar-2021 09:31	04-Mar-2021 09:32	04-Mar-2021 09:46
Compound	CAS Number	LOR	Unit		EP2102261-006	EP2102261-007	EP2102261-008	EP2102261-009	EP2102261-010
				Result	Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		8.5	8.6	8.1	8.6	8.5
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		110	85	170	116	93
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		23.6	23.3	25.0	23.0	19.4
ED007: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		21.8	14.0	20.8	24.1	12.1
Exchangeable Magnesium	----	0.1	meq/100g		3.6	1.7	2.2	2.8	1.6
Exchangeable Potassium	----	0.1	meq/100g		0.8	0.2	1.5	1.9	1.0
Exchangeable Sodium	----	0.1	meq/100g		0.2	<0.1	<0.1	0.1	<0.1
Cation Exchange Capacity	----	0.1	meq/100g		26.4	16.1	24.5	28.9	14.8
Exchangeable Sodium Percent	----	0.1	%		0.6	0.4	0.4	0.5	0.5
EP004: Organic Matter									
Organic Matter	----	0.5	%		<0.5	1.6	2.0	2.0	1.6
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		0.0045	0.0010	0.0760	0.0514	0.0124
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		0.0002	<0.0002	0.0021	0.0072	0.0004
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg		<0.001	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		<0.0002	<0.0002	0.0002	0.0004	<0.0002



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				0960_SS113_210304	0960_SS157_210304	0960_SS243_210304	0960_SS174_210304	0960_SS277_210304
Sampling date / time				04-Mar-2021 09:11	04-Mar-2021 09:28	04-Mar-2021 09:31	04-Mar-2021 09:32	04-Mar-2021 09:46
Compound	CAS Number	LOR	Unit	EP2102261-006	EP2102261-007	EP2102261-008	EP2102261-009	EP2102261-010
				Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids - Continued								
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	0.0005	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	0.0005	<0.0002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	0.0047	0.0010	0.0783	0.0600	0.0128



Analytical Results

Sub-Matrix: **SEDIMENT**
 (Matrix: **SOIL**)

Sample ID

				0960_SS113_210304	0960_SS157_210304	0960_SS243_210304	0960_SS174_210304	0960_SS277_210304
Sampling date / time				04-Mar-2021 09:11	04-Mar-2021 09:28	04-Mar-2021 09:31	04-Mar-2021 09:32	04-Mar-2021 09:46
Compound	CAS Number	LOR	Unit	EP2102261-006	EP2102261-007	EP2102261-008	EP2102261-009	EP2102261-010
				Result	Result	Result	Result	Result
EP231P: PFAS Sums - Continued								
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	0.0045	0.0010	0.0760	0.0514	0.0124
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	0.0045	0.0010	0.0760	0.0514	0.0124
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	104	106	98.0	97.0	107
13C8-PFOA	----	0.0002	%	96.5	96.5	94.0	93.0	97.0



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SS278_210304	0960_SD199_210304	0960_QC105_210304	0960_SS108_210304	0960_SD210_210304
Sampling date / time					04-Mar-2021 09:53	04-Mar-2021 10:35	04-Mar-2021 10:44	04-Mar-2021 11:41	04-Mar-2021 13:10
Compound	CAS Number	LOR	Unit		EP2102261-011	EP2102261-012	EP2102261-013	EP2102261-014	EP2102261-015
				Result	Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		8.1	8.9	8.9	9.1	8.7
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		182	74	70	82	3580
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		25.2	20.2	17.8	19.9	25.3
ED007: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		21.0	20.2	18.9	17.8	----
Exchangeable Magnesium	----	0.1	meq/100g		3.3	2.0	1.6	2.4	----
Exchangeable Potassium	----	0.1	meq/100g		1.7	0.8	0.6	0.7	----
Exchangeable Sodium	----	0.1	meq/100g		0.1	<0.1	<0.1	0.1	----
Cation Exchange Capacity	----	0.1	meq/100g		26.1	23.2	21.1	21.0	----
Exchangeable Sodium Percent	----	0.1	%		0.6	0.2	0.2	0.7	----
ED008: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		----	----	----	----	53.4
Exchangeable Magnesium	----	0.1	meq/100g		----	----	----	----	7.1
Exchangeable Potassium	----	0.1	meq/100g		----	----	----	----	0.6
Exchangeable Sodium	----	0.1	meq/100g		----	----	----	----	0.5
Cation Exchange Capacity	----	0.1	meq/100g		----	----	----	----	61.5
Exchangeable Sodium Percent	----	0.1	%		----	----	----	----	0.8
EP004: Organic Matter									
Organic Matter	----	0.5	%		1.9	1.2	<0.5	<0.5	0.5
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	0.0003
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		0.0137	0.0007	0.0006	0.0034	0.0013
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		0.0005	<0.0002	<0.0002	<0.0002	<0.0002



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				0960_SS278_210304	0960_SD199_210304	0960_QC105_210304	0960_SS108_210304	0960_SD210_210304
Sampling date / time				04-Mar-2021 09:53	04-Mar-2021 10:35	04-Mar-2021 10:44	04-Mar-2021 11:41	04-Mar-2021 13:10
Compound	CAS Number	LOR	Unit	EP2102261-011	EP2102261-012	EP2102261-013	EP2102261-014	EP2102261-015
				Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				0960_SS278_210304	0960_SD199_210304	0960_QC105_210304	0960_SS108_210304	0960_SD210_210304
Sampling date / time				04-Mar-2021 09:53	04-Mar-2021 10:35	04-Mar-2021 10:44	04-Mar-2021 11:41	04-Mar-2021 13:10
Compound	CAS Number	LOR	Unit	EP2102261-011	EP2102261-012	EP2102261-013	EP2102261-014	EP2102261-015
				Result	Result	Result	Result	Result
EP231D: (n:2) Fluorotelomer Sulfonic Acids - Continued								
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	0.0142	0.0007	0.0006	0.0034	0.0016
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	0.0137	0.0007	0.0006	0.0034	0.0016
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	0.0137	0.0007	0.0006	0.0034	0.0016
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	95.5	108	102	100	106
13C8-PFOA	----	0.0002	%	93.0	94.5	92.5	95.5	97.0



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SD302_210304	0960_SD209_210304	0960_SD305_210304	0960_SS208_210304	0960_SS193_210304
Sampling date / time					04-Mar-2021 13:15	04-Mar-2021 13:16	04-Mar-2021 14:09	04-Mar-2021 15:20	04-Mar-2021 15:21
Compound	CAS Number	LOR	Unit		EP2102261-016	EP2102261-017	EP2102261-018	EP2102261-019	EP2102261-020
				Result	Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		8.6	8.9	8.7	9.3	9.1
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		3420	6240	5010	104	88
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		20.2	24.1	23.1	19.8	20.2
ED007: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		----	----	----	8.6	9.3
Exchangeable Magnesium	----	0.1	meq/100g		----	----	----	1.4	1.9
Exchangeable Potassium	----	0.1	meq/100g		----	----	----	<0.1	0.1
Exchangeable Sodium	----	0.1	meq/100g		----	----	----	0.1	0.1
Cation Exchange Capacity	----	0.1	meq/100g		----	----	----	10.2	11.5
Exchangeable Sodium Percent	----	0.1	%		----	----	----	1.2	1.2
ED008: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		9.4	15.6	19.9	----	----
Exchangeable Magnesium	----	0.1	meq/100g		2.2	7.1	3.6	----	----
Exchangeable Potassium	----	0.1	meq/100g		0.2	0.8	0.2	----	----
Exchangeable Sodium	----	0.1	meq/100g		0.1	0.4	0.1	----	----
Cation Exchange Capacity	----	0.1	meq/100g		11.8	23.9	23.8	----	----
Exchangeable Sodium Percent	----	0.1	%		0.9	1.7	0.6	----	----
EP004: Organic Matter									
Organic Matter	----	0.5	%		<0.5	0.9	<0.5	<0.5	0.7
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		0.0013	0.0016	<0.0002	0.0016	0.0007
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				0960_SD302_210304	0960_SD209_210304	0960_SD305_210304	0960_SS208_210304	0960_SS193_210304
Sampling date / time				04-Mar-2021 13:15	04-Mar-2021 13:16	04-Mar-2021 14:09	04-Mar-2021 15:20	04-Mar-2021 15:21
Compound	CAS Number	LOR	Unit	EP2102261-016	EP2102261-017	EP2102261-018	EP2102261-019	EP2102261-020
				Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				0960_SD302_210304	0960_SD209_210304	0960_SD305_210304	0960_SS208_210304	0960_SS193_210304
Sampling date / time				04-Mar-2021 13:15	04-Mar-2021 13:16	04-Mar-2021 14:09	04-Mar-2021 15:20	04-Mar-2021 15:21
Compound	CAS Number	LOR	Unit	EP2102261-016	EP2102261-017	EP2102261-018	EP2102261-019	EP2102261-020
				Result	Result	Result	Result	Result
EP231D: (n:2) Fluorotelomer Sulfonic Acids - Continued								
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	0.0013	0.0016	<0.0002	0.0016	0.0007
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	0.0013	0.0016	<0.0002	0.0016	0.0007
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	0.0013	0.0016	<0.0002	0.0016	0.0007
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	102	100	100	106	99.5
13C8-PFOA	----	0.0002	%	94.5	93.0	96.5	97.0	97.0



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SD208_210304	0960_SD207_210304	0960_SD205_210304	0960_SS301_210304	0960_SD304_210304
Sampling date / time					04-Mar-2021 16:16	04-Mar-2021 16:19	04-Mar-2021 16:21	04-Mar-2021 16:23	04-Mar-2021 16:38
Compound	CAS Number	LOR	Unit		EP2102261-021	EP2102261-022	EP2102261-023	EP2102261-024	EP2102261-025
				Result	Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		9.2	9.2	9.3	9.3	8.9
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		2830	3430	3060	2990	4960
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		22.5	27.6	26.4	23.6	24.2
ED008: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		5.0	8.4	12.0	4.6	25.8
Exchangeable Magnesium	----	0.1	meq/100g		0.8	1.2	1.2	0.7	7.1
Exchangeable Potassium	----	0.1	meq/100g		<0.1	<0.1	<0.1	<0.1	0.2
Exchangeable Sodium	----	0.1	meq/100g		0.2	0.2	0.2	0.2	0.4
Cation Exchange Capacity	----	0.1	meq/100g		6.0	9.8	13.4	5.5	33.6
Exchangeable Sodium Percent	----	0.1	%		2.7	2.4	1.7	3.2	1.4
EP004: Organic Matter									
Organic Matter	----	0.5	%		1.1	<0.5	0.6	1.2	1.6
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg		<0.001	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				0960_SD208_210304	0960_SD207_210304	0960_SD205_210304	0960_SS301_210304	0960_SD304_210304
Sampling date / time				04-Mar-2021 16:16	04-Mar-2021 16:19	04-Mar-2021 16:21	04-Mar-2021 16:23	04-Mar-2021 16:38
Compound	CAS Number	LOR	Unit	EP2102261-021	EP2102261-022	EP2102261-023	EP2102261-024	EP2102261-025
				Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids - Continued								
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002



Analytical Results

Sub-Matrix: **SEDIMENT**
 (Matrix: **SOIL**)

Sample ID

				0960_SD208_210304	0960_SD207_210304	0960_SD205_210304	0960_SS301_210304	0960_SD304_210304
Sampling date / time				04-Mar-2021 16:16	04-Mar-2021 16:19	04-Mar-2021 16:21	04-Mar-2021 16:23	04-Mar-2021 16:38
Compound	CAS Number	LOR	Unit	EP2102261-021	EP2102261-022	EP2102261-023	EP2102261-024	EP2102261-025
				Result	Result	Result	Result	Result
EP231P: PFAS Sums - Continued								
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	104	104	116	98.0	105
13C8-PFOA	----	0.0002	%	99.5	98.0	100	102	93.5



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SD303_210304	0970_SD301	0960_SD300	----	----
Sampling date / time					04-Mar-2021 16:41	04-Mar-2021 16:50	04-Mar-2021 17:03	----	----
Compound	CAS Number	LOR	Unit		EP2102261-026	EP2102261-027	EP2102261-028	-----	-----
				Result	Result	Result	Result	----	----
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		8.8	9.1	8.9	----	----
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		5240	3460	1510	----	----
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		22.0	19.3	18.7	----	----
ED008: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		40.3	2.9	10.1	----	----
Exchangeable Magnesium	----	0.1	meq/100g		5.6	1.4	2.4	----	----
Exchangeable Potassium	----	0.1	meq/100g		0.3	<0.1	0.2	----	----
Exchangeable Sodium	----	0.1	meq/100g		0.3	<0.1	<0.1	----	----
Cation Exchange Capacity	----	0.1	meq/100g		46.5	4.4	12.7	----	----
Exchangeable Sodium Percent	----	0.1	%		0.7	0.8	0.7	----	----
EP004: Organic Matter									
Organic Matter	----	0.5	%		0.6	<0.5	<0.5	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg		<0.001	<0.001	<0.001	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	----	----



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				0960_SD303_210304	0970_SD301	0960_SD300	----	----
Sampling date / time				04-Mar-2021 16:41	04-Mar-2021 16:50	04-Mar-2021 17:03	----	----
Compound	CAS Number	LOR	Unit	EP2102261-026	EP2102261-027	EP2102261-028	-----	-----
				Result	Result	Result	----	----
EP231B: Perfluoroalkyl Carboxylic Acids - Continued								
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----



Analytical Results

Sub-Matrix: **SEDIMENT**
 (Matrix: **SOIL**)

Sample ID

				0960_SD303_210304	0970_SD301	0960_SD300	----	----
Sampling date / time				04-Mar-2021 16:41	04-Mar-2021 16:50	04-Mar-2021 17:03	----	----
Compound	CAS Number	LOR	Unit	EP2102261-026	EP2102261-027	EP2102261-028	-----	-----
				Result	Result	Result	----	----
EP231P: PFAS Sums - Continued								
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	103	102	97.5	----	----
13C8-PFOA	----	0.0002	%	102	98.0	94.5	----	----

Page : 21 of 21
Work Order : EP2102261
Client : CARDNO (WA) PTY LTD
Project : WA_0960_PFASOMP



Surrogate Control Limits

Sub-Matrix: SEDIMENT		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(SOIL) EP231B: Perfluoroalkyl Carboxylic Acids

(SOIL) EP231D: (n:2) Fluorotelomer Sulfonic Acids

(SOIL) EP231C: Perfluoroalkyl Sulfonamides

(SOIL) EP231A: Perfluoroalkyl Sulfonic Acids

(SOIL) EP231P: PFAS Sums

(SOIL) EP231S: PFAS Surrogate

QUALITY CONTROL REPORT

Work Order	: EP2102261	Page	: 1 of 12
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 08-Mar-2021
Order number	: DEF19009/0960	Date Analysis Commenced	: 09-Mar-2021
C-O-C number	: 19804	Issue Date	: 17-Mar-2021
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		
Site	: DEF19009/Learmonth		
Quote number	: SY/139/19		
No. of samples received	: 28		
No. of samples analysed	: 28		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
 CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
 LOR = Limit of reporting
 RPD = Relative Percentage Difference
 # = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA002: pH 1:5 (Soils) (QC Lot: 3552755)									
EP2102261-001	0960_SS176_210304	EA002: pH Value	----	0.1	pH Unit	8.8	8.9	0.00	0% - 20%
EP2102261-010	0960_SS277_210304	EA002: pH Value	----	0.1	pH Unit	8.5	8.6	0.00	0% - 20%
EA002: pH 1:5 (Soils) (QC Lot: 3552757)									
EP2102261-021	0960_SD208_210304	EA002: pH Value	----	0.1	pH Unit	9.2	9.2	0.00	0% - 20%
EA010: Conductivity (1:5) (QC Lot: 3552754)									
EP2102261-001	0960_SS176_210304	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	97	98	0.00	0% - 20%
EP2102261-010	0960_SS277_210304	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	93	93	0.00	0% - 20%
EA010: Conductivity (1:5) (QC Lot: 3552756)									
EP2102261-021	0960_SD208_210304	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	2830	2830	0.00	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3552797)									
EP2102261-001	0960_SS176_210304	EA055: Moisture Content	----	0.1	%	16.2	16.0	1.18	0% - 20%
EP2102261-010	0960_SS277_210304	EA055: Moisture Content	----	0.1	%	19.4	19.1	1.65	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3552798)									
EP2102261-021	0960_SD208_210304	EA055: Moisture Content	----	0.1	%	22.5	20.5	9.43	0% - 20%
ED007: Exchangeable Cations (QC Lot: 3556020)									
EP2102261-001	0960_SS176_210304	ED007: Exchangeable Sodium Percent	----	0.1	%	1.4	1.3	0.00	0% - 50%
		ED007: Exchangeable Calcium	----	0.1	meq/100g	14.7	15.3	3.76	0% - 20%
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	1.6	1.7	0.00	0% - 50%
		ED007: Exchangeable Potassium	----	0.1	meq/100g	0.7	0.8	0.00	No Limit
		ED007: Exchangeable Sodium	----	0.1	meq/100g	0.2	0.2	0.00	No Limit
		ED007: Cation Exchange Capacity	----	0.1	meq/100g	17.3	18.0	4.18	0% - 20%
EP2102261-010	0960_SS277_210304	ED007: Exchangeable Sodium Percent	----	0.1	%	0.5	0.5	0.00	No Limit
		ED007: Exchangeable Calcium	----	0.1	meq/100g	12.1	12.2	0.00	0% - 20%
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	1.6	1.6	0.00	0% - 50%



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
ED007: Exchangeable Cations (QC Lot: 3556020) - continued									
EP2102261-010	0960_SS277_210304	ED007: Exchangeable Potassium	----	0.1	meq/100g	1.0	1.0	0.00	0% - 50%
		ED007: Exchangeable Sodium	----	0.1	meq/100g	<0.1	<0.1	0.00	No Limit
		ED007: Cation Exchange Capacity	----	0.1	meq/100g	14.8	14.8	0.00	0% - 20%
ED008: Exchangeable Cations (QC Lot: 3555881)									
EP2102261-015	0960_SD210_210304	ED008: Exchangeable Sodium Percent	----	0.1	%	0.8	0.9	20.2	No Limit
		ED008: Exchangeable Calcium	----	0.1	meq/100g	53.4	# 42.6	22.5	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	7.1	6.1	14.1	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	0.6	0.7	0.00	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	0.5	0.5	0.00	No Limit
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	61.5	# 49.8	21.0	0% - 20%
EP2102261-026	0960_SD303_210304	ED008: Exchangeable Sodium Percent	----	0.1	%	0.7	0.7	0.00	No Limit
		ED008: Exchangeable Calcium	----	0.1	meq/100g	40.3	43.1	6.81	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	5.6	5.3	5.14	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	0.3	0.3	0.00	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	0.3	0.3	0.00	No Limit
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	46.5	49.0	5.34	0% - 20%
EP004: Organic Matter (QC Lot: 3552772)									
EP2102261-001	0960_SS176_210304	EP004: Organic Matter	----	0.5	%	1.0	0.9	0.00	No Limit
EP2102261-011	0960_SS278_210304	EP004: Organic Matter	----	0.5	%	1.9	1.8	0.00	No Limit
EP004: Organic Matter (QC Lot: 3552773)									
EP2102261-021	0960_SD208_210304	EP004: Organic Matter	----	0.5	%	1.1	<0.5	77.1	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3556697)									
EP2102259-026	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0036	0.0035	0.00	0% - 50%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP2102261-010	0960_SS277_210304	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0124	0.0152	20.0	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	0.0004	0.0003	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3556700)									
EP2102261-020	0960_SS193_210304	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3556700) - continued									
EP2102261-020	0960_SS193_210304	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0007	0.0006	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP2102349-002	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0003	0.0002	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3556697)							
EP2102259-026	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
		EP2102261-010	0960_SS277_210304	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4			0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9			0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1			0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP231X: Perfluorononanoic acid (PFNA)	375-95-1			0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2			0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8			0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1			0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8			0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7			0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4			0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3556700)									
EP2102261-020	0960_SS193_210304	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3556700) - continued									
EP2102261-020	0960_SS193_210304	EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP2102349-002	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3556697)									
EP2102259-026	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP2102261-010	0960_SS277_210304	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3556700)									
EP2102261-020	0960_SS193_210304	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP2102349-002	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3556697)									
EP2102259-026	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP2102261-010	0960_SS277_210304	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit

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 Work Order : EP2102261
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3556697) - continued									
EP2102261-010	0960_SS277_210304	EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3556700)									
EP2102261-020	0960_SS193_210304	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
EP2102349-002	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.00	No Limit



Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

Sub-Matrix: SOIL				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EA002: pH 1:5 (Soils) (QCLot: 3552755)								
EA002: pH Value	----	----	pH Unit	----	4 pH Unit	101	70.0	130
				----	7 pH Unit	100	70.0	130
EA002: pH 1:5 (Soils) (QCLot: 3552757)								
EA002: pH Value	----	----	pH Unit	----	4 pH Unit	101	70.0	130
				----	7 pH Unit	100	70.0	130
EA010: Conductivity (1:5) (QCLot: 3552754)								
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	1412 µS/cm	100	93.6	106
EA010: Conductivity (1:5) (QCLot: 3552756)								
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	12810 µS/cm	100	93.6	106
ED007: Exchangeable Cations (QCLot: 3556020)								
ED007: Exchangeable Calcium	----	0.1	meq/100g	<0.1	21.6 meq/100g	94.5	82.9	117
ED007: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.76 meq/100g	99.0	78.4	119
ED007: Exchangeable Potassium	----	0.1	meq/100g	<0.1	1 meq/100g	112	87.9	129
ED007: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.9 meq/100g	111	92.9	132
ED007: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	25.3 meq/100g	95.9	84.7	117
ED007: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
ED008: Exchangeable Cations (QCLot: 3555881)								
ED008: Exchangeable Calcium	----	0.1	meq/100g	<0.1	22.1 meq/100g	94.3	78.7	111
ED008: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.56 meq/100g	90.9	77.6	111
ED008: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.91 meq/100g	111	86.9	116
ED008: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.38 meq/100g	113	72.3	129
ED008: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
ED008: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	24.95 meq/100g	95.0	79.9	110
EP004: Organic Matter (QCLot: 3552772)								
EP004: Organic Matter	----	0.5	%	<0.5	2.3 %	90.9	70.0	120
				<0.5	85 %	77.6	70.0	120
EP004: Organic Matter (QCLot: 3552773)								
EP004: Organic Matter	----	0.5	%	<0.5	2.3 %	70.4	70.0	120
				<0.5	85 %	84.0	70.0	120
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3556697)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	125	72.0	128
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	123	73.0	123
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	107	67.0	130



Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result			Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3556697) - continued								
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	127	70.0	132
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	115	68.0	136
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	116	59.0	134
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3556700)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	122	72.0	128
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	120	73.0	123
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	117	67.0	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	117	70.0	132
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	121	68.0	136
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	117	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3556697)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	99.4	71.0	135
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	117	69.0	132
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	113	70.0	132
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	115	71.0	131
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	123	69.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	116	72.0	129
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	120	69.0	133
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	112	64.0	136
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	118	69.0	135
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	114	66.0	139
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	114	69.0	133
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3556700)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	107	71.0	135
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	118	69.0	132
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	118	70.0	132
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	121	71.0	131
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	120	69.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	121	72.0	129
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	125	69.0	133
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	115	64.0	136
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	120	69.0	135
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	116	66.0	139
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	126	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3556697)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	119	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	113	71.6	129
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	108	69.8	131

Method Blank (MB) Report

Spike

Spike Recovery (%)

Acceptable Limits (%)

CAS Number

LOR

Unit

Result

Concentration

LCS

Low

High

EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	110	68.7	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	112	65.1	134
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	116	63.0	144
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	122	61.0	139

EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	116	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	108	71.6	129
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	116	69.8	131
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	113	68.7	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	120	65.1	134
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	112	63.0	144
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	112	61.0	139

EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	129	62.0	145
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	121	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	115	65.0	137
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	80.4	69.2	143

EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	124	62.0	145
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	116	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	113	65.0	137
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	102	69.2	143

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Matrix Spike (MS) Report

Spike

SpikeRecovery(%)

Acceptable Limits (%)

Laboratory sample ID

Sample ID

Method: Compound

CAS Number

Concentration

MS

Low

High

EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3556697)

Matrix Spike (MS) Report

				Spike	SpikeRecovery(%)	Acceptable Limits (%)			
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High		
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3556697) - continued									
EP2102259-026	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	125	72.0	128		
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	123	73.0	123		
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	109	67.0	130		
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	125	70.0	132		
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	80.8	68.0	136		
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	121	59.0	134		
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3556700)									
EP2102261-020	0960_SS193_210304	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	123	72.0	128		
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	122	73.0	123		
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	121	67.0	130		
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	92.8	70.0	132		
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	121	68.0	136		
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	111	59.0	134		
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3556697)									
EP2102259-026	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	102	71.0	135		
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	118	69.0	132		
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	116	70.0	132		
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	115	71.0	131		
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	120	69.0	133		
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	111	72.0	129		
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	113	69.0	133		
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	117	64.0	136		
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	124	69.0	135		
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.00125 mg/kg	131	66.0	139		
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	112	69.0	133		
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3556700)									
EP2102261-020	0960_SS193_210304	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	117	71.0	135		
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	119	69.0	132		
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	116	70.0	132		
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	116	71.0	131		
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	119	69.0	133		
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	119	72.0	129		
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	117	69.0	133		
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	116	64.0	136		
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	118	69.0	135		
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.00125 mg/kg	124	66.0	139		
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	123	69.0	133		
		EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3556697)							



Sub-Matrix: SOIL

Sub-Matrix: SOIL				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3556697) - continued							
EP2102259-026	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	114	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	110	71.6	129
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	107	69.8	131
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	114	68.7	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	120	65.1	134
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	128	63.0	144
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	115	61.0	139
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3556700)							
EP2102261-020	0960_SS193_210304	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	117	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	117	71.6	129
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	120	69.8	131
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	124	68.7	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	112	65.1	134
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	118	63.0	144
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	116	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3556697)							
EP2102259-026	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	118	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	118	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	108	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	79.2	69.2	143
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3556700)							
EP2102261-020	0960_SS193_210304	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	120	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	113	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	123	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	124	69.2	143

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2102261	Page	: 1 of 8
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 08-Mar-2021
Site	: DEF19009/Learmonth	Issue Date	: 17-Mar-2021
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS	No. of samples received	: 28
Order number	: DEF19009/0960	No. of samples analysed	: 28

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Laboratory Control outliers occur.
- **NO** Matrix Spike outliers occur.
- Duplicate outliers exist - please see following pages for full details.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- **NO** Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

- **NO** Quality Control Sample Frequency Outliers exist.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Duplicate (DUP) RPDs							
ED008: Exchangeable Cations	EP2102261--015	0960_SD210_210304	Exchangeable Calcium	----	22.5 %	0% - 20%	RPD exceeds LOR based limits
ED008: Exchangeable Cations	EP2102261--015	0960_SD210_210304	Cation Exchange Capacity	----	21.0 %	0% - 20%	RPD exceeds LOR based limits

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA002: pH 1:5 (Soils)								
Soil Glass Jar - Unpreserved (EA002)								
0960_SS176_210304,	0960_SS279_210304,	04-Mar-2021	10-Mar-2021	11-Mar-2021	✓	10-Mar-2021	10-Mar-2021	✓
0960_SS168_210304,	0960_SS166_210304,							
0960_SS265_210304,	0960_SS113_210304,							
0960_SS157_210304,	0960_SS243_210304,							
0960_SS174_210304,	0960_SS277_210304,							
0960_SS278_210304,	0960_SD199_210304,							
0960_QC105_210304,	0960_SS108_210304,							
0960_SD210_210304,	0960_SD302_210304,							
0960_SD209_210304,	0960_SD305_210304,							
0960_SS208_210304,	0960_SS193_210304,							
0960_SD208_210304,	0960_SD207_210304,							
0960_SD205_210304,	0960_SS301_210304,							
0960_SD304_210304,	0960_SD303_210304,							
0970_SD301,	0960_SD300							



Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA010: Conductivity (1:5)								
Soil Glass Jar - Unpreserved (EA010)								
0960_SS176_210304, 0960_SS168_210304, 0960_SS265_210304, 0960_SS157_210304, 0960_SS174_210304, 0960_SS278_210304, 0960_QC105_210304, 0960_SD210_210304, 0960_SD209_210304, 0960_SS208_210304, 0960_SD208_210304, 0960_SD205_210304, 0960_SD304_210304, 0970_SD301,	0960_SS279_210304, 0960_SS166_210304, 0960_SS113_210304, 0960_SS243_210304, 0960_SS277_210304, 0960_SD199_210304, 0960_SS108_210304, 0960_SD302_210304, 0960_SD305_210304, 0960_SS193_210304, 0960_SD207_210304, 0960_SS301_210304, 0960_SD303_210304, 0960_SD300	04-Mar-2021	10-Mar-2021	11-Mar-2021	✔	10-Mar-2021	07-Apr-2021	✔
EA055: Moisture Content (Dried @ 105-110°C)								
Soil Glass Jar - Unpreserved (EA055)								
0960_SS176_210304, 0960_SS168_210304, 0960_SS265_210304, 0960_SS157_210304, 0960_SS174_210304, 0960_SS278_210304, 0960_QC105_210304, 0960_SD210_210304, 0960_SD209_210304, 0960_SS208_210304, 0960_SD208_210304, 0960_SD205_210304, 0960_SD304_210304, 0970_SD301,	0960_SS279_210304, 0960_SS166_210304, 0960_SS113_210304, 0960_SS243_210304, 0960_SS277_210304, 0960_SD199_210304, 0960_SS108_210304, 0960_SD302_210304, 0960_SD305_210304, 0960_SS193_210304, 0960_SD207_210304, 0960_SS301_210304, 0960_SD303_210304, 0960_SD300	04-Mar-2021	----	----	----	09-Mar-2021	18-Mar-2021	✔
ED007: Exchangeable Cations								
Soil Glass Jar - Unpreserved (ED007)								
0960_SS176_210304, 0960_SS168_210304, 0960_SS265_210304, 0960_SS157_210304, 0960_SS174_210304, 0960_SS278_210304, 0960_QC105_210304, 0960_SS208_210304,	0960_SS279_210304, 0960_SS166_210304, 0960_SS113_210304, 0960_SS243_210304, 0960_SS277_210304, 0960_SD199_210304, 0960_SS108_210304, 0960_SS193_210304,	04-Mar-2021	15-Mar-2021	01-Apr-2021	✔	15-Mar-2021	01-Apr-2021	✔



Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED008: Exchangeable Cations								
Soil Glass Jar - Unpreserved (ED008)								
0960_SD210_210304,	0960_SD302_210304,	04-Mar-2021	15-Mar-2021	01-Apr-2021	✔	15-Mar-2021	01-Apr-2021	✔
0960_SD209_210304,	0960_SD305_210304,							
0960_SD208_210304,	0960_SD207_210304,							
0960_SD205_210304,	0960_SS301_210304,							
0960_SD304_210304,	0960_SD303_210304,							
0970_SD301,	0960_SD300							
EP004: Organic Matter								
Soil Glass Jar - Unpreserved (EP004)								
0960_SS176_210304,	0960_SS279_210304,	04-Mar-2021	17-Mar-2021	01-Apr-2021	✔	17-Mar-2021	01-Apr-2021	✔
0960_SS168_210304,	0960_SS166_210304,							
0960_SS265_210304,	0960_SS113_210304,							
0960_SS157_210304,	0960_SS243_210304,							
0960_SS174_210304,	0960_SS277_210304,							
0960_SS278_210304,	0960_SD199_210304,							
0960_QC105_210304,	0960_SS108_210304,							
0960_SD210_210304,	0960_SD302_210304,							
0960_SD209_210304,	0960_SD305_210304,							
0960_SS208_210304,	0960_SS193_210304,							
0960_SD208_210304,	0960_SD207_210304,							
0960_SD205_210304,	0960_SS301_210304,							
0960_SD304_210304,	0960_SD303_210304,							
0970_SD301,	0960_SD300							
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE Soil Jar (EP231X)								
0960_SS176_210304,	0960_SS279_210304,	04-Mar-2021	11-Mar-2021	31-Aug-2021	✔	11-Mar-2021	20-Apr-2021	✔
0960_SS168_210304,	0960_SS166_210304,							
0960_SS265_210304,	0960_SS113_210304,							
0960_SS157_210304,	0960_SS243_210304,							
0960_SS174_210304,	0960_SS277_210304,							
0960_SS278_210304,	0960_SD199_210304,							
0960_QC105_210304,	0960_SS108_210304,							
0960_SD210_210304,	0960_SD302_210304,							
0960_SD209_210304,	0960_SD305_210304,							
0960_SS208_210304,	0960_SS193_210304,							
0960_SD208_210304,	0960_SD207_210304,							
0960_SD205_210304,	0960_SS301_210304,							
0960_SD304_210304,	0960_SD303_210304,							
0970_SD301,	0960_SD300							

Page : 5 of 8
 Work Order : EP2102261
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE Soil Jar (EP231X)								
0960_SS176_210304, 0960_SS168_210304, 0960_SS265_210304, 0960_SS157_210304, 0960_SS174_210304, 0960_SS278_210304, 0960_QC105_210304, 0960_SD210_210304, 0960_SD209_210304, 0960_SS208_210304, 0960_SD208_210304, 0960_SD205_210304, 0960_SD304_210304, 0970_SD301,	0960_SS279_210304, 0960_SS166_210304, 0960_SS113_210304, 0960_SS243_210304, 0960_SS277_210304, 0960_SD199_210304, 0960_SS108_210304, 0960_SD302_210304, 0960_SD305_210304, 0960_SS193_210304, 0960_SD207_210304, 0960_SS301_210304, 0960_SD303_210304, 0960_SD300	04-Mar-2021	11-Mar-2021	31-Aug-2021	✔	11-Mar-2021	20-Apr-2021	✔
EP231C: Perfluoroalkyl Sulfonamides								
HDPE Soil Jar (EP231X)								
0960_SS176_210304, 0960_SS168_210304, 0960_SS265_210304, 0960_SS157_210304, 0960_SS174_210304, 0960_SS278_210304, 0960_QC105_210304, 0960_SD210_210304, 0960_SD209_210304, 0960_SS208_210304, 0960_SD208_210304, 0960_SD205_210304, 0960_SD304_210304, 0970_SD301,	0960_SS279_210304, 0960_SS166_210304, 0960_SS113_210304, 0960_SS243_210304, 0960_SS277_210304, 0960_SD199_210304, 0960_SS108_210304, 0960_SD302_210304, 0960_SD305_210304, 0960_SS193_210304, 0960_SD207_210304, 0960_SS301_210304, 0960_SD303_210304, 0960_SD300	04-Mar-2021	11-Mar-2021	31-Aug-2021	✔	11-Mar-2021	20-Apr-2021	✔



Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE Soil Jar (EP231X)		04-Mar-2021	11-Mar-2021	31-Aug-2021	✔	11-Mar-2021	20-Apr-2021	✔
0960_SS176_210304,	0960_SS279_210304,							
0960_SS168_210304,	0960_SS166_210304,							
0960_SS265_210304,	0960_SS113_210304,							
0960_SS157_210304,	0960_SS243_210304,							
0960_SS174_210304,	0960_SS277_210304,							
0960_SS278_210304,	0960_SD199_210304,							
0960_QC105_210304,	0960_SS108_210304,							
0960_SD210_210304,	0960_SD302_210304,							
0960_SD209_210304,	0960_SD305_210304,							
0960_SS208_210304,	0960_SS193_210304,							
0960_SD208_210304,	0960_SD207_210304,							
0960_SD205_210304,	0960_SS301_210304,							
0960_SD304_210304,	0960_SD303_210304,							
0970_SD301,	0960_SD300							
EP231P: PFAS Sums								
HDPE Soil Jar (EP231X)		04-Mar-2021	11-Mar-2021	31-Aug-2021	✔	11-Mar-2021	20-Apr-2021	✔
0960_SS176_210304,	0960_SS279_210304,							
0960_SS168_210304,	0960_SS166_210304,							
0960_SS265_210304,	0960_SS113_210304,							
0960_SS157_210304,	0960_SS243_210304,							
0960_SS174_210304,	0960_SS277_210304,							
0960_SS278_210304,	0960_SD199_210304,							
0960_QC105_210304,	0960_SS108_210304,							
0960_SD210_210304,	0960_SD302_210304,							
0960_SD209_210304,	0960_SD305_210304,							
0960_SS208_210304,	0960_SS193_210304,							
0960_SD208_210304,	0960_SD207_210304,							
0960_SD205_210304,	0960_SS301_210304,							
0960_SD304_210304,	0960_SD303_210304,							
0970_SD301,	0960_SD300							



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)		Quality Control Specification	
Analytical Methods	Method	QC	Regular	Actual	Expected		Evaluation
Laboratory Duplicates (DUP)							
Electrical Conductivity (1:5)	EA010	3	28	10.71	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	2	16	12.50	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	2	12	16.67	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	3	28	10.71	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	3	28	10.71	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	4	33	12.12	10.00	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	3	28	10.71	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Electrical Conductivity (1:5)	EA010	2	28	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	16	6.25	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	12	8.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	4	28	14.29	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	33	6.06	5.00	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	4	28	14.29	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Electrical Conductivity (1:5)	EA010	2	28	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	16	6.25	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	12	8.33	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	28	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	33	6.06	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	33	6.06	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	In house: Referenced to Rayment and Lyons 4A1 and APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Electrical Conductivity (1:5)	EA010	SOIL	In house: Referenced to Rayment and Lyons 3A1 and APHA 2510. Conductivity is determined on soil samples using a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Exchangeable Cations	ED007	SOIL	In house: Referenced to Rayment & Lyons Method 15A1. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM Schedule B(3).
Exchangeable Cations with pre-treatment	ED008	SOIL	In house: Referenced to Rayment & Lyons Method 15A2. Soluble salts are removed from the sample prior to analysis. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM Schedule B(3).
Organic Matter	EP004	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3)
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	SOIL	In-house: Analysis of soils by solvent extraction followed by LC-Electrospray-MS-MS, Negative Mode using MRM using internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Exchangeable Cations Preparation Method	ED007PR	SOIL	In house: Referenced to Rayment & Lyons method 15A1. A 1M NH ₄ Cl extraction by end over end tumbling at a ratio of 1:20. There is no pretreatment for soluble salts. Extracts can be run by ICP for cations.
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
Organic Matter	EP004-PR	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3).
QuEChERS Extraction of Solids	ORG71	SOIL	In house: Sequential extractions with Acetonitrile/Methanol by shaking. Extraction efficiency aided by the addition of salts under acidic conditions. Where relevant, interferences from co-extracted organics are removed with dispersive clean-up media (dSPE). The extract is either diluted or concentrated and exchanged into the analytical solvent.

**CHAIN OF CUSTODY**

ALS COC#: 19849

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: AB DEF19009/Learmonth SW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH:

SAMPLER MOBILE:

QUOTE NO: SY/139/19

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

°C

Other comments:

SAMPLE DETAILS**ANALYSIS REQUIRED**

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Rinsate WATER	Surface Waters Primary WATER	TOC additional WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0960_SW199		04/03/2021 10:51 AM	Water	ALS: 4 Non ALS: 0	No		X			
002	0960_QC104		04/03/2021 10:52 AM	Water	ALS: 3 Non ALS: 1	No		X			
003	0960_SW200		04/03/2021 12:28 PM	Water	ALS: 4 Non ALS: 0	No		X			
004	0960_SW210		04/03/2021 12:59 PM	Water	ALS: 4 Non ALS: 0	No		X			
005	0960_SW302	Unfiltered	04/03/2021 01:17 PM	Water	ALS: 4 Non ALS: 0	No		X	X		
006	0960_SW209	unfiltered	04/03/2021 01:18 PM	Water	ALS: 4 Non ALS: 0	No		Partial 7/8	X		
007	0960_SW305		04/03/2021 02:06 PM	Water	ALS: 4 Non ALS: 0	No		Partial 7/8	X		
008	0960_SW208		04/03/2021 04:25 PM	Water	ALS: 4 Non ALS: 0	No		X			
009	0960_SW207		04/03/2021 04:28 PM	Water	ALS: 4 Non ALS: 0	No		X			

Environmental Division
Perth

Work Order Reference

EP2102262

Telephone : - 61-8-9406 1301



CHAIN OF CUSTODY

COC#: 19849 ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: AB DEF19009/Learmonth SW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	PARTIAL ANALYSIS GROUP NAME	MATRIX	SELECTED ANALYSIS NAME
006	0960_SW209	Surface Waters Primary WATER	Water	- EA005P pH (PCT) - NT-02 Major Anions (Chloride, Sulphate, Alkalinity) - NT-01 Major Cations (Ca, Mg, Na, K) - EA025H Suspended Solids - Standard Level - EA015H Total Dissolved Solids - Standard Level - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G & ED093F - EP231X PFAS - Full Suite (28 analytes)
007	0960_SW305	Surface Waters Primary WATER	Water	- EA005P pH (PCT) - NT-02 Major Anions (Chloride, Sulphate, Alkalinity) - NT-01 Major Cations (Ca, Mg, Na, K) - EA025H Suspended Solids - Standard Level - EA015H Total Dissolved Solids - Standard Level - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G & ED093F - EP231X PFAS - Full Suite (28 analytes)



RECEIVED BY:

DATE TIME:

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact?	Yes	No	N/A
----------------------	-----	----	-----

Free ice / frozen ice bricks present upon receipt?	Yes	No	N/A
--	-----	----	-----

Random Sample Temperature on Receipt: _____ °C

Other comments:

Thursday, March 4, 2021 9:26:38 AM



CHAIN OF CUSTODY

COC#: 19849

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: AB DEF19009/Learmonth SW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

007	0960_SW305	Amber TOC Vial - Sulfuric Acid	40 mL	00180220049327	Purple	No	
008	0960_SW208	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019016460	Purple	No	
008	0960_SW208	HDPE (no PTFE)	20 mL	00350019102409	Grey	No	
008	0960_SW208	HDPE (no PTFE)	20 mL	00350019041245	Grey	No	
008	0960_SW208	Clear Plastic Bottle - Natural	250 mL	00070519189714	Green	No	
009	0960_SW207	Clear Plastic Bottle - Natural	250 mL	00070519189637	Green	No	
009	0960_SW207	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019016575	Purple	No	
009	0960_SW207	HDPE (no PTFE)	20 mL	00350019126834	Grey	No	
009	0960_SW207	HDPE (no PTFE)	20 mL	00350019177541	Grey	No	
010	0960_QC302	HDPE (no PTFE)	20 mL	00350019026838	Grey	No	
010	0960_QC302	HDPE (no PTFE)	20 mL	00350019035158	Grey	No	
011	0960_QC402	HDPE (no PTFE)	20 mL	00350019177439	Grey	No	
011	0960_QC402	HDPE (no PTFE)	20 mL	00350019177363	Grey	No	

Total Bottle Count: ALS: 39, Non ALS: 1

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : EP2102262

<p>Client : CARDNO (WA) PTY LTD</p> <p>Contact : MAELLE BOURDAIS</p> <p>Address : 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006</p> <p>E-mail : maelle.bourdais@cardno.com.au</p> <p>Telephone : ----</p> <p>Facsimile : ----</p> <p>Project : WA_0960_PFASOMP</p> <p>Order number : DEF19009/0960</p> <p>C-O-C number : 19849</p> <p>Site : DEF19009/Learmonth</p> <p>Sampler : ASHLEY BROWN, MAELLE BOURDAIS</p>	<p>Laboratory : Environmental Division Perth</p> <p>Contact : Nick Courts</p> <p>Address : 26 Rigali Way Wangara WA Australia 6065</p> <p>E-mail : nick.courts@alsglobal.com</p> <p>Telephone : +61-8-9406 1301</p> <p>Facsimile : +61-8-9406 1399</p> <p>Page : 1 of 3</p> <p>Quote number : ES2019CARBSD0002 (SY/139/19)</p> <p>QC Level : NEPM 2013 B3 & ALS QC Standard</p>
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Dates

Date Samples Received : 08-Mar-2021 11:40	Issue Date : 08-Mar-2021
Client Requested Due : 18-Mar-2021	Scheduled Reporting Date : 18-Mar-2021
Date	

Delivery Details

Mode of Delivery : Carrier	Security Seal : Not Available
No. of coolers/boxes : 6	Temperature : 28.7
Receipt Detail :	No. of samples received / analysed : 11 / 11

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepancies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.



Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2102262-001	04-Mar-2021 10:51	0960_SW199_210304	✓	✓	✓	✓	✓	✓	✓
EP2102262-002	04-Mar-2021 10:52	0960_QC104_210304	✓	✓	✓	✓	✓	✓	✓
EP2102262-003	04-Mar-2021 12:28	0960_SW200_210304	✓	✓	✓	✓	✓	✓	✓
EP2102262-004	04-Mar-2021 12:59	0960_SW210_210304	✓	✓	✓	✓	✓	✓	✓
EP2102262-005	04-Mar-2021 13:17	0960_SW302_210304	✓	✓	✓	✓	✓	✓	✓
EP2102262-006	04-Mar-2021 13:18	0960_SW209_210304	✓	✓	✓	✓	✓	✓	✓
EP2102262-007	04-Mar-2021 14:06	0960_SW305_210304	✓	✓	✓	✓	✓	✓	✓
EP2102262-008	04-Mar-2021 16:25	0960_SW208_210304	✓	✓	✓	✓	✓	✓	✓
EP2102262-009	04-Mar-2021 16:28	0960_SW207_210304	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP005 Total Organic Carbon (TOC)	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2102262-001	04-Mar-2021 10:51	0960_SW199_210304		✓
EP2102262-002	04-Mar-2021 10:52	0960_QC104_210304		✓
EP2102262-003	04-Mar-2021 12:28	0960_SW200_210304		✓
EP2102262-004	04-Mar-2021 12:59	0960_SW210_210304		✓
EP2102262-005	04-Mar-2021 13:17	0960_SW302_210304	✓	✓
EP2102262-006	04-Mar-2021 13:18	0960_SW209_210304	✓	✓
EP2102262-007	04-Mar-2021 14:06	0960_SW305_210304	✓	✓
EP2102262-008	04-Mar-2021 16:25	0960_SW208_210304		✓
EP2102262-009	04-Mar-2021 16:28	0960_SW207_210304		✓
EP2102262-010	04-Mar-2021 17:06	0960_QC302_210304		✓
EP2102262-011	04-Mar-2021 17:07	0960_QC402_210304		✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.



Evaluation: ✖ = Holding time breach : ✔ = Within holding time.

Requested Deliverables

- A4 - AU Tax Invoice (INV)

- A4 - AU Tax Invoice (INV)

Email claire.armstrong@cardno.com.au

- EDI Format - ESDAT (ESDAT)

- EDI Format - ESDAT (ESDAT)

Email derp.labreports@esdat.com.au

- *AU Certificate of Analysis - NATA (COA)

Email maelle.bourdais@cardno.com.au

- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)

Email maelle.bourdais@cardno.com.au

- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)

Email maelle.bourdais@cardno.com.au

- A4 - AU Sample Receipt Notification - Environmental HT (SRN)

Email maelle.bourdais@cardno.com.au

- Chain of Custody (CoC) (COC)

Email maelle.bourdais@cardno.com.au

- EDI Format - ESDAT (ESDAT)

Email maele.bourdais@cardno.com.au

- EDI Format - XTab (XTAB)

Email maelle.bourdais@cardno.com.au

CERTIFICATE OF ANALYSIS

Work Order : **EP2102262**
Client : **CARDNO (WA) PTY LTD**
Contact : **MAELLE BOURDAIS**
Address : **11 HARVEST TERRACE PO BOX 155**
WEST PERTH WA, AUSTRALIA 6006
Telephone : **----**
Project : **WA_0960_PFASOMP**
Order number : **DEF19009/0960**
C-O-C number : **19849**
Sampler : **ASHLEY BROWN, MAELLE BOURDAIS**
Site : **DEF19009/Learmonth**
Quote number : **SY/139/19**
No. of samples received : **11**
No. of samples analysed : **11**

Page : 1 of 14
Laboratory : Environmental Division Perth
Contact : Nick Courts
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 08-Mar-2021 11:40
Date Analysis Commenced : 09-Mar-2021
Issue Date : 18-Mar-2021 16:49



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

Ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- EP231X-LL: Positive result for analyte Perfluorooctane sulfonic acid (PFOS) on sample EP2102262_004 has been confirmed by re-extraction and re-analysis.
- EA025H (Total Suspended Solids): It is recognised sample #2 is a duplicate of sample #1 however, there is insufficient sample volume for result confirmation. Please scrutinize results accordingly.
- TDS by method EA-015 may bias high for sample #1 and #2 due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0960_QC104_210304	0960_SW200_210304	0960_SW302_210304	0960_QC302_210304	----
Sampling date / time					04-Mar-2021 10:52	04-Mar-2021 12:28	04-Mar-2021 13:17	04-Mar-2021 17:06	----
Compound	CAS Number	LOR	Unit		EP2102262-002	EP2102262-003	EP2102262-005	EP2102262-010	-----
					Result	Result	Result	Result	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		7.97	7.93	7.71	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		134	68	26900	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		129	39	618	----	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L		<1	<1	<1	----	----
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L		<1	<1	<1	----	----
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L		69	51	127	----	----
Total Alkalinity as CaCO ₃	----	1	mg/L		69	51	127	----	----
ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA									
Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L		<1	2	1840	----	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		4	2	13600	----	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		26	20	347	----	----
Magnesium	7439-95-4	1	mg/L		2	1	970	----	----
Sodium	7440-23-5	1	mg/L		4	3	7580	----	----
Potassium	7440-09-7	1	mg/L		4	4	458	----	----
EN055: Ionic Balance									
∅ Total Anions	----	0.01	meq/L		1.49	1.12	424	----	----
∅ Total Cations	----	0.01	meq/L		1.74	1.31	438	----	----
∅ Ionic Balance	----	0.01	%		7.64	8.07	1.63	----	----
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		4	6	----	----	----
EP005: Total Organic Carbon (TOC)									
Total Organic Carbon	----	1	mg/L		----	----	10	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_QC104_210304	0960_SW200_210304	0960_SW302_210304	0960_QC302_210304	----
Sampling date / time				04-Mar-2021 10:52	04-Mar-2021 12:28	04-Mar-2021 13:17	04-Mar-2021 17:06	----
Compound	CAS Number	LOR	Unit	EP2102262-002	EP2102262-003	EP2102262-005	EP2102262-010	-----
				Result	Result	Result	Result	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.09	<0.01	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_QC104_210304	0960_SW200_210304	0960_SW302_210304	0960_QC302_210304	----
Sampling date / time				04-Mar-2021 10:52	04-Mar-2021 12:28	04-Mar-2021 13:17	04-Mar-2021 17:06	----
Compound	CAS Number	LOR	Unit	EP2102262-002	EP2102262-003	EP2102262-005	EP2102262-010	-----
				Result	Result	Result	Result	----
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.09	<0.01	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	0.09	<0.01	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	<0.01	0.09	<0.01	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	79.6	88.6	94.9	92.4	----
13C8-PFOA	----	0.02	%	113	112	95.8	94.9	----



Analytical Results

Sub-Matrix: SURFACE WATER
 (Matrix: WATER)

Sample ID

				0960_SW199_210304	0960_SW209_210304	0960_SW305_210304	0960_SW208_210304	0960_SW207_210304
Sampling date / time				04-Mar-2021 10:51	04-Mar-2021 13:18	04-Mar-2021 14:06	04-Mar-2021 16:25	04-Mar-2021 16:28
Compound	CAS Number	LOR	Unit	EP2102262-001	EP2102262-006	EP2102262-007	EP2102262-008	EP2102262-009
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	8.09	7.74	7.94	8.06	8.08
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	132	26300	26600	40900	41000
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	56	166	39	22	8
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L	68	116	104	107	111
Total Alkalinity as CaCO ₃	----	1	mg/L	68	116	104	107	111
ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA								
Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L	<1	1780	1890	2920	2850
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	4	13200	13400	19300	19900
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	24	328	364	491	475
Magnesium	7439-95-4	1	mg/L	2	927	967	1530	1480
Sodium	7440-23-5	1	mg/L	5	7320	7640	11900	11500
Potassium	7440-09-7	1	mg/L	3	436	464	683	655
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	1.47	412	419	607	623
∅ Total Cations	----	0.01	meq/L	1.66	422	442	686	662
∅ Ionic Balance	----	0.01	%	5.91	1.26	2.61	6.04	3.08
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	5	----	----	2	3
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	----	8	8	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: SURFACE WATER
 (Matrix: WATER)

Sample ID

				0960_SW199_210304	0960_SW209_210304	0960_SW305_210304	0960_SW208_210304	0960_SW207_210304
Sampling date / time				04-Mar-2021 10:51	04-Mar-2021 13:18	04-Mar-2021 14:06	04-Mar-2021 16:25	04-Mar-2021 16:28
Compound	CAS Number	LOR	Unit	EP2102262-001	EP2102262-006	EP2102262-007	EP2102262-008	EP2102262-009
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.12	0.02	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: SURFACE WATER
 (Matrix: WATER)

Sample ID

				0960_SW199_210304	0960_SW209_210304	0960_SW305_210304	0960_SW208_210304	0960_SW207_210304
Sampling date / time				04-Mar-2021 10:51	04-Mar-2021 13:18	04-Mar-2021 14:06	04-Mar-2021 16:25	04-Mar-2021 16:28
Compound	CAS Number	LOR	Unit	EP2102262-001	EP2102262-006	EP2102262-007	EP2102262-008	EP2102262-009
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	0.12	0.02	<0.01	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	0.12	0.02	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	0.12	0.02	<0.01	<0.01
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	92.6	91.3	97.6	95.6	86.0
13C8-PFOA	----	0.02	%	104	92.4	92.6	95.0	92.6



Analytical Results

Sub-Matrix: SURFACE WATER
 (Matrix: WATER)

Sample ID

0960_QC402_210304

Sampling date / time				04-Mar-2021 17:07	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2102262-011	-----	-----	-----	-----
Result				----	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	----	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	----	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	----	----	----	----



Analytical Results

Sub-Matrix: SURFACE WATER
 (Matrix: WATER)

Sample ID

0960_QC402_210304

Sampling date / time				04-Mar-2021 17:07	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2102262-011	-----	-----	-----	-----
Result				----	----	----	----	----

EP231C: Perfluoroalkyl Sulfonamides - Continued

N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	----	----	----	----

EP231D: (n:2) Fluorotelomer Sulfonic Acids

4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	----	----	----	----

EP231P: PFAS Sums

Sum of PFAS	----	0.01	µg/L	<0.01	----	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	----	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	----	----	----	----

EP231S: PFAS Surrogate

13C4-PFOS	----	0.02	%	93.0	----	----	----	----
13C8-PFOA	----	0.02	%	92.7	----	----	----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	0960_SW210_210304	----	----	----	----
Sampling date / time				04-Mar-2021 12:59	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2102262-004	-----	-----	-----	-----
Result				----	----	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.70	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	23400	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	84	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	112	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	112	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1640	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	12100	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	296	----	----	----	----
Magnesium	7439-95-4	1	mg/L	846	----	----	----	----
Sodium	7440-23-5	1	mg/L	6640	----	----	----	----
Potassium	7440-09-7	1	mg/L	387	----	----	----	----
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	378	----	----	----	----
∅ Total Cations	----	0.01	meq/L	383	----	----	----	----
∅ Ionic Balance	----	0.01	%	0.71	----	----	----	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	6	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	----	----	----	----



Analytical Results

Sub-Matrix: **WATER**
 (Matrix: **WATER**)

Sample ID

0960_SW210_210304

Sampling date / time

04-Mar-2021 12:59

Compound

CAS Number

LOR

Unit

EP2102262-004

Result

EP231A: Perfluoroalkyl Sulfonic Acids - Continued

Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.06	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	----	----	----	----

EP231B: Perfluoroalkyl Carboxylic Acids

Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	----	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	----	----	----	----
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	----	----	----	----

EP231C: Perfluoroalkyl Sulfonamides

Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	----	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	----	----	----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	0960_SW210_210304	----	----	----	----
				Sampling date / time	04-Mar-2021 12:59	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2102262-004	-----	-----	-----	-----
				Result		----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	----	----	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		0.06	----	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		0.06	----	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		0.06	----	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		96.8	----	----	----	----
13C8-PFOA	----	0.02	%		107	----	----	----	----



Surrogate Control Limits

Sub-Matrix: GROUNDWATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Sub-Matrix: SURFACE WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EP231A: Perfluoroalkyl Sulfonic Acids

(WATER) EP231B: Perfluoroalkyl Carboxylic Acids

(WATER) EP231C: Perfluoroalkyl Sulfonamides

(WATER) EP231D: (n:2) Fluorotelomer Sulfonic Acids

(WATER) EP231P: PFAS Sums

(WATER) EP231S: PFAS Surrogate

QUALITY CONTROL REPORT

Work Order	: EP2102262	Page	: 1 of 10
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 08-Mar-2021
Order number	: DEF19009/0960	Date Analysis Commenced	: 09-Mar-2021
C-O-C number	: 19849	Issue Date	: 18-Mar-2021
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		
Site	: DEF19009/Learmonth		
Quote number	: SY/139/19		
No. of samples received	: 11		
No. of samples analysed	: 11		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key :
 Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
 CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
 LOR = Limit of reporting
 RPD = Relative Percentage Difference
 # = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA005P: pH by PC Titrator (QC Lot: 3553100)									
EP2102258-012	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.06	8.14	0.988	0% - 20%
EP2102352-004	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.06	8.11	0.618	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3554786)									
EP2102262-001	0960_SW199_210304	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	132	138	4.44	0% - 50%
EP2102262-009	0960_SW207_210304	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	41000	40400	1.38	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3554787)									
EP2102262-001	0960_SW199_210304	EA025H: Suspended Solids (SS)	----	5	mg/L	56	59	6.11	0% - 50%
ED037P: Alkalinity by PC Titrator (QC Lot: 3553099)									
EP2102258-012	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	85	86	1.33	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	85	86	1.33	0% - 20%
EP2102352-004	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.00	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	102	109	7.01	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	102	109	7.01	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3551442)									
EP2102193-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	3930	3930	0.0290	0% - 20%
EP2102262-002	0960_QC104_210304	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	<1	0.00	No Limit
ED045G: Chloride by Discrete Analyser (QC Lot: 3551443)									
EP2102193-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	25000	25200	1.02	0% - 20%
EP2102262-002	0960_QC104_210304	ED045G: Chloride	16887-00-6	1	mg/L	4	4	0.00	No Limit
ED093F: Dissolved Major Cations (QC Lot: 3552544)									
EP2102258-012	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	386	397	2.74	0% - 20%

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
ED093F: Dissolved Major Cations (QC Lot: 3552544) - continued									
EP2102258-012	Anonymous	ED093F: Magnesium	7439-95-4	1	mg/L	706	726	2.83	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	5710	5880	2.85	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	337	347	2.85	0% - 20%
EP2102350-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	48	48	0.00	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	6	6	0.00	No Limit
		ED093F: Sodium	7440-23-5	1	mg/L	76	76	0.00	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	5	5	0.00	No Limit
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3553745)									
EP2102201-001	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	7	7	0.00	No Limit
EP2102258-011	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	8	9	0.00	No Limit
EP005: Total Organic Carbon (TOC) (QC Lot: 3552890)									
EP2102258-001	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	4	4	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3556017)									
EP2102262-001	0960_SW199_210304	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3556555)									
EP2102350-001	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.21	0.23	6.00	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.14	0.13	8.41	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3556017)									
EP2102262-001	0960_SW199_210304	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.00	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit
		EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3556555)							

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3556555) - continued									
EP2102350-001	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.12	0.11	0.00	0% - 50%
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.95	0.92	3.29	0% - 20%
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.54	0.51	4.88	0% - 20%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.35	0.34	0.00	0% - 50%
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	0.05	0.05	0.00	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.00	No Limit		
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3556017)									
EP2102262-001	0960_SW199_210304	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3556555)									
EP2102350-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3556017)									

Page : 5 of 10
 Work Order : EP2102262
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3556017) - continued									
EP2102262-001	0960_SW199_210304	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3556555)									
EP2102350-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.00	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	1.98	1.79	10.5	0% - 20%
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	0.43	0.44	3.67	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.00	No Limit
EP231P: PFAS Sums (QC Lot: 3556017)									
EP2102262-001	0960_SW199_210304	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.00	No Limit
EP231P: PFAS Sums (QC Lot: 3556555)									
EP2102350-001	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	4.77	4.52	5.38	0% - 20%



Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EA005P: pH by PC Titrator (QCLot: 3553100)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	101	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3554786)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	2000 mg/L	100	88.1	114
				<10	1000 mg/L	98.2	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3554787)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	113	89.1	120
				<5	1000 mg/L	102	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3553099)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	100	81.2	126
				<1	200 mg/L	93.9	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3551442)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	101	87.7	113
				<1	500 mg/L	106	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3551443)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	105	87.9	114
				<1	1000 mg/L	105	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3552544)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	99.5	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	94.8	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	95.4	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	94.6	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3553745)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	110	73.2	116
				<1	100 mg/L	109	73.2	116
EP005: Total Organic Carbon (TOC) (QCLot: 3552890)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	104	87.2	116
				<1	100 mg/L	104	87.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3556017)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	81.8	72.0	130



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3556017) - continued								
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	97.0	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	94.0	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	104	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	87.2	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	92.8	53.0	142
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3556555)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	111	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	117	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	112	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	120	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	106	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	118	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3556017)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	93.6	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	104	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	102	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	77.2	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	96.2	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	97.8	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	82.8	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	124	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	124	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	117	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	88.7	71.0	132
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3556555)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	98.0	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	112	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	116	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	113	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	128	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	118	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	121	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	120	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	122	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	127	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	116	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3556017)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	117	67.0	137



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3556017) - continued								
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	83.4	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	92.9	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	110	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	74.8	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	123	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	111	61.0	135
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3556555)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	109	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	129	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	101	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	118	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	109	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	98.0	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	116	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3556017)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	100	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	106	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	118	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	107	71.4	144
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3556555)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	120	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	124	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	125	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	120	71.4	144

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Matrix Spike (MS) Report		
Spike	Spike Recovery(%)	Acceptable Limits (%)



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3551442)							
EP2102193-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3551443)							
EP2102193-001	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	# Not Determined	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3553745)							
EP2102201-002	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	110	70.0	130
EP005: Total Organic Carbon (TOC) (QCLot: 3552890)							
EP2102258-002	Anonymous	EP005: Total Organic Carbon	----	100 mg/L	105	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3556017)							
EP2102262-004	0960_SW210_210304	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	79.8	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	107	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	97.2	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	109	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	82.8	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	83.2	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3556017)							
EP2102262-004	0960_SW210_210304	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	88.8	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	110	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	103	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	72.4	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	97.2	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	104	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	92.2	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	125	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	114	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	101	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	85.4	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3556017)							
EP2102262-004	0960_SW210_210304	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	121	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	88.1	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	92.7	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	111	66.0	145
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	73.8	57.6	145

Page : 10 of 10
 Work Order : EP2102262
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3556017) - continued							
EP2102262-004	0960_SW210_210304	EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	129	65.0	136
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	108	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3556017)							
EP2102262-004	0960_SW210_210304	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	103	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	102	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	100	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	83.8	71.4	144

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2102262	Page	: 1 of 9
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 08-Mar-2021
Site	: DEF19009/Learmonth	Issue Date	: 18-Mar-2021
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS	No. of samples received	: 11
Order number	: DEF19009/0960	No. of samples analysed	: 11

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- Matrix Spike outliers exist - please see following pages for full details.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- Quality Control Sample Frequency Outliers exist - please see following pages for full details.



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO ₄ 2- by DA	EP2102193--001	Anonymous	Sulfate as SO₄ - Turbidimetric	14808-79-8	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
ED045G: Chloride by Discrete Analyser	EP2102193--001	Anonymous	Chloride	16887-00-6	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method		<i>Extraction / Preparation</i>			<i>Analysis</i>		
Container / Client Sample ID(s)		<i>Date extracted</i>	<i>Due for extraction</i>	<i>Days overdue</i>	<i>Date analysed</i>	<i>Due for analysis</i>	<i>Days overdue</i>
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural							
0960_SW199_210304,	0960_QC104_210304,	----	----	----	09-Mar-2021	04-Mar-2021	5
0960_SW200_210304,	0960_SW210_210304,						
0960_SW302_210304,	0960_SW209_210304,						
0960_SW305_210304,	0960_SW208_210304,						
0960_SW207_210304							

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	2	35	5.71	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	1	35	2.86	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for **VOC in soils** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural (EA005-P) 0960_SW199_210304, 0960_QC104_210304, 0960_SW200_210304, 0960_SW210_210304, 0960_SW302_210304, 0960_SW209_210304, 0960_SW305_210304, 0960_SW208_210304, 0960_SW207_210304	04-Mar-2021	----	----	----	09-Mar-2021	04-Mar-2021	✗
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H) 0960_SW199_210304, 0960_QC104_210304, 0960_SW200_210304, 0960_SW210_210304, 0960_SW302_210304, 0960_SW209_210304, 0960_SW305_210304, 0960_SW208_210304, 0960_SW207_210304	04-Mar-2021	----	----	----	10-Mar-2021	11-Mar-2021	✓
EA025: Total Suspended Solids dried at 104 ± 2 °C							
Clear Plastic Bottle - Natural (EA025H) 0960_SW199_210304, 0960_QC104_210304, 0960_SW200_210304, 0960_SW210_210304, 0960_SW302_210304, 0960_SW209_210304, 0960_SW305_210304, 0960_SW208_210304, 0960_SW207_210304	04-Mar-2021	----	----	----	10-Mar-2021	11-Mar-2021	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P) 0960_SW199_210304, 0960_QC104_210304, 0960_SW200_210304, 0960_SW210_210304, 0960_SW302_210304, 0960_SW209_210304, 0960_SW305_210304, 0960_SW208_210304, 0960_SW207_210304	04-Mar-2021	----	----	----	09-Mar-2021	18-Mar-2021	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G) 0960_SW199_210304, 0960_QC104_210304, 0960_SW200_210304, 0960_SW210_210304, 0960_SW302_210304, 0960_SW209_210304, 0960_SW305_210304, 0960_SW208_210304, 0960_SW207_210304	04-Mar-2021	----	----	----	11-Mar-2021	01-Apr-2021	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G) 0960_SW199_210304, 0960_QC104_210304, 0960_SW200_210304, 0960_SW210_210304, 0960_SW302_210304, 0960_SW209_210304, 0960_SW305_210304, 0960_SW208_210304, 0960_SW207_210304	04-Mar-2021	----	----	----	11-Mar-2021	01-Apr-2021	✓



Matrix: **WATER**

Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F)								
0960_SW199_210304, 0960_SW200_210304, 0960_SW302_210304, 0960_SW305_210304, 0960_SW207_210304	0960_QC104_210304, 0960_SW210_210304, 0960_SW209_210304, 0960_SW208_210304,	04-Mar-2021	----	----	----	09-Mar-2021	11-Mar-2021	✓
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002)								
0960_SW199_210304, 0960_SW200_210304, 0960_SW208_210304,	0960_QC104_210304, 0960_SW210_210304, 0960_SW207_210304	04-Mar-2021	----	----	----	09-Mar-2021	01-Apr-2021	✓
EP005: Total Organic Carbon (TOC)								
Amber TOC Vial - Sulfuric Acid (EP005)								
0960_SW302_210304, 0960_SW305_210304	0960_SW209_210304,	04-Mar-2021	----	----	----	09-Mar-2021	01-Apr-2021	✓
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X)								
0960_SW302_210304, 0960_SW305_210304, 0960_SW207_210304, 0960_QC402_210304	0960_SW209_210304, 0960_SW208_210304, 0960_QC302_210304,	04-Mar-2021	11-Mar-2021	31-Aug-2021	✓	11-Mar-2021	31-Aug-2021	✓
HDPE (no PTFE) (EP231X)								
0960_SW199_210304, 0960_SW200_210304,	0960_QC104_210304, 0960_SW210_210304	04-Mar-2021	11-Mar-2021	31-Aug-2021	✓	12-Mar-2021	31-Aug-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X)								
0960_SW302_210304, 0960_SW305_210304, 0960_SW207_210304, 0960_QC402_210304	0960_SW209_210304, 0960_SW208_210304, 0960_QC302_210304,	04-Mar-2021	11-Mar-2021	31-Aug-2021	✓	11-Mar-2021	31-Aug-2021	✓
HDPE (no PTFE) (EP231X)								
0960_SW199_210304, 0960_SW200_210304,	0960_QC104_210304, 0960_SW210_210304	04-Mar-2021	11-Mar-2021	31-Aug-2021	✓	12-Mar-2021	31-Aug-2021	✓
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X)								
0960_SW302_210304, 0960_SW305_210304, 0960_SW207_210304, 0960_QC402_210304	0960_SW209_210304, 0960_SW208_210304, 0960_QC302_210304,	04-Mar-2021	11-Mar-2021	31-Aug-2021	✓	11-Mar-2021	31-Aug-2021	✓
HDPE (no PTFE) (EP231X)								
0960_SW199_210304, 0960_SW200_210304,	0960_QC104_210304, 0960_SW210_210304	04-Mar-2021	11-Mar-2021	31-Aug-2021	✓	12-Mar-2021	31-Aug-2021	✓



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X) 0960_SW302_210304, 0960_SW305_210304, 0960_SW207_210304, 0960_QC402_210304	0960_SW209_210304, 0960_SW208_210304, 0960_QC302_210304,	04-Mar-2021	11-Mar-2021	31-Aug-2021	✔	11-Mar-2021	31-Aug-2021	✔
HDPE (no PTFE) (EP231X) 0960_SW199_210304, 0960_SW200_210304,	0960_QC104_210304, 0960_SW210_210304	04-Mar-2021	11-Mar-2021	31-Aug-2021	✔	12-Mar-2021	31-Aug-2021	✔
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X) 0960_SW302_210304, 0960_SW305_210304, 0960_SW207_210304, 0960_QC402_210304	0960_SW209_210304, 0960_SW208_210304, 0960_QC302_210304,	04-Mar-2021	11-Mar-2021	31-Aug-2021	✔	11-Mar-2021	31-Aug-2021	✔
HDPE (no PTFE) (EP231X) 0960_SW199_210304, 0960_SW200_210304,	0960_QC104_210304, 0960_SW210_210304	04-Mar-2021	11-Mar-2021	31-Aug-2021	✔	12-Mar-2021	31-Aug-2021	✔



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	15	13.33	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	35	5.71	10.00	✗	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	10	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	10	20.00	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	10	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	15	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	35	5.71	5.00	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	10	20.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	10	20.00	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	10	20.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	15	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	35	5.71	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	10	10.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	10	10.00	5.26	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	10	10.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	35	2.86	5.00	✗	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Matrix: WATER				Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.			
Quality Control Sample Type		Count		Rate (%)		Quality Control Specification	
<i>Analytical Methods</i>	<i>Method</i>	<i>QC</i>	<i>Regular</i>	<i>Actual</i>	<i>Expected</i>	<i>Evaluation</i>	
Matrix Spikes (MS) - Continued							
Total Organic Carbon	EP005	1	10	10.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard



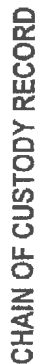
Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of 'filterable' residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high temperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.
Total Organic Carbon	EP005	WATER	In house: Referenced to APHA 5310 B, The automated TOC analyzer determines Total and Inorganic Carbon by IR cell. TOC is calculated as the difference. This method is compliant with NEPM Schedule B(3)



Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.



CHAIN OF CUSTODY RECORD

Sydney Laboratory
Unit 11, Plot 11, Bank Road, New Cross, West M14 9 7JH
Tel: 02080 840000 Fax: 02080 840001 Email: info@sydney.co.uk

Brisbane Laboratory
Unit 1, 27 Beaulieu Road, Moorooka, QLD 4122
07 3805 9916 Postgraduate@brisbanelab.com.au

Perth Laboratory
1111 151st Avenue Highway 104 West 01266
08 9371 1000 Fax 08 9371 1001

Melbourne Laboratory

Melbourne Laboratory
5 Macaulay Road Dandenong South VIC 3176
Tel: 03 9594 4400 Fax: 03 9594 4401 Email: mel@melb.vic.gov.au

Company	CARDNO	Project No	WA_0960_PFSOMP	Project Manager	David James	Sampler(s)	Ashley Brown
Address	11 harvest Tce WEST PERTH	Project Name	Learmonth	EDD Format ES&A Equat inc	ES&A	Handed over by	ALS
Contact Name	Maele Bourdais					Email for Invoice	claire.armstrong@cardno.com.au
Phone No	0448 308 372					Email for Results	maelle.bourdais@cardno.com.au derp.labreports@es&a.com.au
						Containers	Required third party analysis (N/A) Container type & quantity

Special Directions	Client Sample ID	Sampled Date/Time	Matrix
derp.labreports@esdat.com.au with the project No in the header file.			Soils (S)
Purchase Order		Lab/Analytical	Water (W)
Quote ID No			
DEF19009/430			

When results are requested, the SUITE code must be used.

Any

Full PFAS suite

(water) Major anions & cation

(water) DOC, TSS, TDS, pH

(sediment) TOC, CEC, pH

500mL Plastic

250mL Plastic

125mL Plastic

200mL Amber Glass

40mL VOA vial

500mL PFAS Bottle

Jar (Glass or HDPE)

Other (Asbestos AS1984, WA Guidelines)

☐ Same day*

☐ 1 day*

☐ 2 days*

☒ 5 days (Standard)

☐ Other

Overnight (reporting by Sample)

*Guarantee not given

Sample Comments / Dangerous Goods Hazard Warning

0960_QC201-210304	4/3/21	S	X	X	779272-Na18445
0960-QC202-210304		S	X	X	-Na18446
0960-QC203-210304		S	X	X	-Na18447
0960-QC204-210304		3	X	X	-Na18448
0960-QC205-210304		S	X	X	-Na18449
0960-QC206-210304		3	X	X	-Na18450
0960-QC207-210304		S	X	X	-Na18451

[illegible]

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NATA # 1261 Site # 18217

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Company Name: Cardno (WA)
Address: 11 Harvest Terrace
West Perth
WA 6005

Project Name: LEARMONTH
Project ID: WA_0960_PFASOMP

Order No.: DEF19009/415/240
Report #: 779426
Phone: 08 9273 3888
Fax: 08 9388 3831

Received: Mar 8, 2021 11:30 AM
Due: Mar 17, 2021
Priority: 5 Day
Contact Name: Maelle Bourdais

Eurofins Analytical Services Manager : Rhys Thomas

Sample Detail						Dissolved Organic Carbon	pH (1:5 Aqueous extract at 25°C as rec.)	pH (at 25 °C)	Total Organic Carbon	Total Suspended Solids Dried at 103–105°C	Moisture Set	Cation Exchange Capacity	Per- and Polyfluoroalkyl Substances (PFASs)	Total Dissolved Solids Dried at 180°C ± 2°C
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	X	X	X		X
Sydney Laboratory - NATA Site # 18217														
Brisbane Laboratory - NATA Site # 20794													X	
Perth Laboratory - NATA Site # 23736														
Mayfield Laboratory														
External Laboratory														
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID									
1	0960_QC201_210304	Mar 04, 2021		Soil	M21-Ma18445		X		X		X	X	X	
2	0960_QC202_210304	Mar 04, 2021		Soil	M21-Ma18446		X		X		X	X	X	
3	0960_QC203_210304	Mar 04, 2021		Soil	M21-Ma18447		X		X		X	X	X	
4	0960_QC204_210304	Mar 04, 2021		Water	M21-Ma18448	X		X		X			X	X
5	0960_QC205_210304	Mar 04, 2021		Soil	M21-Ma18449		X		X		X	X	X	
6	0960_QC206_	Mar 04, 2021		Water	M21-Ma18450	X		X		X			X	X

Australia

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Site # 1254 & 14271

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NATA # 1261 Site # 18217

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Company Name: Cardno (WA)
Address: 11 Harvest Terrace
West Perth
WA 6005

Project Name: LEARMONTH
Project ID: WA_0960_PFASOMP

Order No.: DEF19009/415/240
Report #: 779426
Phone: 08 9273 3888
Fax: 08 9388 3831

Received: Mar 8, 2021 11:30 AM
Due: Mar 17, 2021
Priority: 5 Day
Contact Name: Maelle Bourdais

Eurofins Analytical Services Manager : Rhys Thomas

Sample Detail						Disolved Organic Carbon	pH (1:5 Aqueous extract at 25°C as rec.)	pH (at 25 °C)	Total Organic Carbon	Total Suspended Solids Dried at 103–105°C	Moisture Set	Cation Exchange Capacity	Per- and Polyfluoroalkyl Substances (PFASs)	Total Dissolved Solids Dried at 180°C ± 2°C
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	X	X	X		X
Sydney Laboratory - NATA Site # 18217														
Brisbane Laboratory - NATA Site # 20794													X	
Perth Laboratory - NATA Site # 23736														
Mayfield Laboratory														
External Laboratory														
	210304													
7	0960_QC207_210304	Mar 04, 2021		Soil	M21-Ma18451		X		X		X	X	X	
Test Counts						2	5	2	5	2	5	5	7	2

Cardno Consulting WA
11 Harvest Terrace
West Perth
WA 6005



NATA Accredited
Accreditation Number 1261
Site Number 1254

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition
Arrangement for the mutual recognition of the
equivalence of testing, medical testing, calibration,
inspection and proficiency testing scheme providers
reports.

Attention: **Maelle Bourdais**

Report **779426-S**
Project name **LEARMONTH**
Project ID **WA_0960_PFASOMP**
Received Date **Mar 08, 2021**

Client Sample ID			0960_QC201_2 10304	0960_QC202_2 10304	0960_QC203_2 10304	0960_QC205_2 10304
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			M21-Ma18445	M21-Ma18446	M21-Ma18447	M21-Ma18449
Date Sampled			Mar 04, 2021	Mar 04, 2021	Mar 04, 2021	Mar 04, 2021
Test/Reference	LOR	Unit				
Conductivity (1:5 aqueous extract at 25°C as rec.)	10	uS/cm	88	130	100	75
pH (1:5 Aqueous extract at 25°C as rec.)	0.1	pH Units	8.0	7.8	7.8	7.9
Total Organic Carbon	0.1	%	1.0	2.3	2.2	1.8
% Moisture	1	%	13	16	27	18
Cation Exchange Capacity						
Cation Exchange Capacity	0.05	meq/100g	39	40	41	34
Perfluoroalkyl carboxylic acids (PFCAs)						
Perfluorobutanoic acid (PFBA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoropentanoic acid (PFPeA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorohexanoic acid (PFHxA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoroheptanoic acid (PFHpA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorooctanoic acid (PFOA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorononanoic acid (PFNA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorodecanoic acid (PFDA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoroundecanoic acid (PFUnDA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorododecanoic acid (PFDoDA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotridecanoic acid (PFTeDA) ^{N15}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotetradecanoic acid (PFTeDA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
13C4-PFBA (surr.)	1	%	128	122	115	95
13C5-PFPeA (surr.)	1	%	143	141	133	142
13C5-PFHxA (surr.)	1	%	150	152	137	146
13C4-PFHpA (surr.)	1	%	75	73	69	68
13C8-PFOA (surr.)	1	%	84	82	82	77
13C5-PFNA (surr.)	1	%	80	79	70	72
13C6-PFDA (surr.)	1	%	86	84	81	82
13C2-PFUnDA (surr.)	1	%	94	89	86	93
13C2-PFDoDA (surr.)	1	%	93	89	81	81
13C2-PFTeDA (surr.)	1	%	92	96	88	89
Perfluoroalkyl sulfonamido substances						
Perfluorooctane sulfonamide (FOSA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5

Client Sample ID			0960_QC201_2 10304	0960_QC202_2 10304	0960_QC203_2 10304	0960_QC205_2 10304
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			M21-Ma18445	M21-Ma18446	M21-Ma18447	M21-Ma18449
Date Sampled			Mar 04, 2021	Mar 04, 2021	Mar 04, 2021	Mar 04, 2021
Test/Reference	LOR	Unit				
Perfluoroalkyl sulfonamido substances						
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA) ^{N11}	10	ug/kg	< 10	< 10	< 10	< 10
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA) ^{N11}	10	ug/kg	< 10	< 10	< 10	< 10
13C8-FOSA (surr.)	1	%	125	131	121	118
D3-N-MeFOSA (surr.)	1	%	105	93	87	88
D5-N-EtFOSA (surr.)	1	%	124	127	129	122
D7-N-MeFOSE (surr.)	1	%	109	108	103	83
D9-N-EtFOSE (surr.)	1	%	120	80	104	84
D5-N-EtFOSAA (surr.)	1	%	89	87	80	76
D3-N-MeFOSAA (surr.)	1	%	83	85	81	79
Perfluoroalkyl sulfonic acids (PFSA's)						
Perfluorobutanesulfonic acid (PFBS) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorononanesulfonic acid (PFNS) ^{N15}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoropropanesulfonic acid (PFPrS) ^{N15}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoropentanesulfonic acid (PFPeS) ^{N15}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorohexanesulfonic acid (PFHxS) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoroheptanesulfonic acid (PFHpS) ^{N15}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorooctanesulfonic acid (PFOS) ^{N11}	5	ug/kg	^{N09} 73	^{N09} 9.0	29	< 5
Perfluorodecanesulfonic acid (PFDS) ^{N15}	5	ug/kg	< 5	< 5	< 5	< 5
13C3-PFBS (surr.)	1	%	101	90	81	99
18O2-PFHxS (surr.)	1	%	103	89	85	91
13C8-PFOS (surr.)	1	%	97	123	110	115
n:2 Fluorotelomer sulfonic acids (n:2 FTSA's)						
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA) ^{N11}	10	ug/kg	< 10	< 10	< 10	< 10
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
13C2-4:2 FTS (surr.)	1	%	62	69	80	101
13C2-6:2 FTSA (surr.)	1	%	97	113	101	164
13C2-8:2 FTSA (surr.)	1	%	91	91	82	112
13C2-10:2 FTSA (surr.)	1	%	90	92	85	94
PFASs Summations						
Sum (PFHxS + PFOS)*	5	ug/kg	73	9	29	< 5
Sum of US EPA PFAS (PFOS + PFOA)*	5	ug/kg	73	9	29	< 5
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	5	ug/kg	73	9	29	< 5
Sum of WA DWER PFAS (n=10)*	10	ug/kg	73	< 10	29	< 10
Sum of PFASs (n=30)*	50	ug/kg	73	< 50	< 50	< 50

Client Sample ID			0960_QC207_2 10304
Sample Matrix			Soil
Eurofins Sample No.			M21-Ma18451
Date Sampled			Mar 04, 2021
Test/Reference	LOR	Unit	
Conductivity (1:5 aqueous extract at 25°C as rec.)	10	uS/cm	72
pH (1:5 Aqueous extract at 25°C as rec.)	0.1	pH Units	8.0
Total Organic Carbon	0.1	%	0.8
% Moisture	1	%	25
Cation Exchange Capacity			
Cation Exchange Capacity	0.05	meq/100g	30
Perfluoroalkyl carboxylic acids (PFCAs)			
Perfluorobutanoic acid (PFBA) ^{N11}	5	ug/kg	< 5
Perfluoropentanoic acid (PFPeA) ^{N11}	5	ug/kg	< 5
Perfluorohexanoic acid (PFHxA) ^{N11}	5	ug/kg	< 5
Perfluoroheptanoic acid (PFHpA) ^{N11}	5	ug/kg	< 5
Perfluorooctanoic acid (PFOA) ^{N11}	5	ug/kg	< 5
Perfluorononanoic acid (PFNA) ^{N11}	5	ug/kg	< 5
Perfluorodecanoic acid (PFDA) ^{N11}	5	ug/kg	< 5
Perfluoroundecanoic acid (PFUnDA) ^{N11}	5	ug/kg	< 5
Perfluorododecanoic acid (PFDoDA) ^{N11}	5	ug/kg	< 5
Perfluorotridecanoic acid (PFTeDA) ^{N15}	5	ug/kg	< 5
Perfluorotetradecanoic acid (PFTeDA) ^{N11}	5	ug/kg	< 5
13C4-PFBA (surr.)	1	%	108
13C5-PFPeA (surr.)	1	%	150
13C5-PFHxA (surr.)	1	%	133
13C4-PFHpA (surr.)	1	%	80
13C8-PFOA (surr.)	1	%	86
13C5-PFNA (surr.)	1	%	79
13C6-PFDA (surr.)	1	%	86
13C2-PFUnDA (surr.)	1	%	94
13C2-PFDoDA (surr.)	1	%	84
13C2-PFTeDA (surr.)	1	%	99
Perfluoroalkyl sulfonamido substances			
Perfluorooctane sulfonamide (FOSA) ^{N11}	5	ug/kg	< 5
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA) ^{N11}	5	ug/kg	< 5
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA) ^{N11}	5	ug/kg	< 5
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE) ^{N11}	5	ug/kg	< 5
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE) ^{N11}	5	ug/kg	< 5
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA) ^{N11}	10	ug/kg	< 10
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA) ^{N11}	10	ug/kg	< 10
13C8-FOSA (surr.)	1	%	113
D3-N-MeFOSA (surr.)	1	%	91
D5-N-EtFOSA (surr.)	1	%	133
D7-N-MeFOSE (surr.)	1	%	97
D9-N-EtFOSE (surr.)	1	%	109
D5-N-EtFOSAA (surr.)	1	%	91
D3-N-MeFOSAA (surr.)	1	%	83

Client Sample ID			0960_QC207_2 10304
Sample Matrix			Soil
Eurofins Sample No.			M21-Ma18451
Date Sampled			Mar 04, 2021
Test/Reference	LOR	Unit	
Perfluoroalkyl sulfonic acids (PFASs)			
Perfluorobutanesulfonic acid (PFBS) ^{N11}	5	ug/kg	< 5
Perfluorononanesulfonic acid (PFNS) ^{N15}	5	ug/kg	< 5
Perfluoropropanesulfonic acid (PFPrS) ^{N15}	5	ug/kg	< 5
Perfluoropentanesulfonic acid (PFPeS) ^{N15}	5	ug/kg	< 5
Perfluorohexanesulfonic acid (PFHxS) ^{N11}	5	ug/kg	< 5
Perfluoroheptanesulfonic acid (PFHpS) ^{N15}	5	ug/kg	< 5
Perfluorooctanesulfonic acid (PFOS) ^{N11}	5	ug/kg	< 5
Perfluorodecanesulfonic acid (PFDS) ^{N15}	5	ug/kg	< 5
13C3-PFBS (surr.)	1	%	94
18O2-PFHxS (surr.)	1	%	91
13C8-PFOS (surr.)	1	%	114
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA) ^{N11}	5	ug/kg	< 5
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA) ^{N11}	10	ug/kg	< 10
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA) ^{N11}	5	ug/kg	< 5
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA) ^{N11}	5	ug/kg	< 5
13C2-4:2 FTS (surr.)	1	%	96
13C2-6:2 FTSA (surr.)	1	%	123
13C2-8:2 FTSA (surr.)	1	%	126
13C2-10:2 FTSA (surr.)	1	%	101
PFASs Summations			
Sum (PFHxS + PFOS)*	5	ug/kg	< 5
Sum of US EPA PFAS (PFOS + PFOA)*	5	ug/kg	< 5
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	5	ug/kg	< 5
Sum of WA DWER PFAS (n=10)*	10	ug/kg	< 10
Sum of PFASs (n=30)*	50	ug/kg	< 50

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Conductivity (1:5 aqueous extract at 25°C as rec.) - Method: LTM-INO-4030 Conductivity	Melbourne	Mar 12, 2021	7 Days
Cation Exchange Capacity - Method: LTM-MET-3060 Cation Exchange Capacity by bases & Exchangeable Sodium Percentage	Melbourne	Mar 15, 2021	180 Days
pH (1:5 Aqueous extract at 25°C as rec.) - Method: LTM-GEN-7090 pH in soil by ISE	Melbourne	Mar 12, 2021	7 Days
Total Organic Carbon - Method: LTM-INO-4060 Total Organic Carbon in water and soil	Melbourne	Mar 15, 2021	28 Days
% Moisture - Method: LTM-GEN-7080 Moisture	Melbourne	Mar 10, 2021	14 Days
Per- and Polyfluoroalkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs) - Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)	Brisbane	Mar 10, 2021	14 Days
Perfluoroalkyl sulfonamido substances - Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)	Brisbane	Mar 10, 2021	14 Days
Perfluoroalkyl sulfonic acids (PFSAAs) - Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)	Brisbane	Mar 17, 2021	14 Days
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs) - Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)	Brisbane	Mar 17, 2021	180 Days

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Site # 1254 & 14271

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NATA # 1261 Site # 18217

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NATA # 1261 Site # 20794

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Kewdale WA 6105
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Site # 23736

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Company Name: Cardno (WA)
Address: 11 Harvest Terrace
West Perth
WA 6005

Project Name: LEARMONTH
Project ID: WA_0960_PFASOMP

Order No.: DEF19009/415/240
Report #: 779426
Phone: 08 9273 3888
Fax: 08 9388 3831

Received: Mar 8, 2021 11:30 AM
Due: Mar 17, 2021
Priority: 5 Day
Contact Name: Maelle Bourdais

Eurofins Analytical Services Manager : Rhys Thomas

Sample Detail						Dissolved Organic Carbon	pH (1:5 Aqueous extract at 25°C as rec.)	pH (at 25 °C)	Total Organic Carbon	Total Suspended Solids Dried at 103–105°C	Moisture Set	Cation Exchange Capacity	Eurofins Suite B11E: Cl/SO4/Alkalinity	Per- and Polyfluoroalkyl Substances (PFASs)	Eurofins Suite B11C: Na/K/Ca/Mg	Total Dissolved Solids Dried at 180°C ± 2°C
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	X	X	X	X		X	X
Sydney Laboratory - NATA Site # 18217																
Brisbane Laboratory - NATA Site # 20794														X		
Perth Laboratory - NATA Site # 23736																
Mayfield Laboratory																
External Laboratory																
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID											
1	0960_QC201_210304	Mar 04, 2021		Soil	M21-Ma18445		X		X		X	X		X		
2	0960_QC202_210304	Mar 04, 2021		Soil	M21-Ma18446		X		X		X	X		X		
3	0960_QC203_210304	Mar 04, 2021		Soil	M21-Ma18447		X		X		X	X		X		
4	0960_QC204_210304	Mar 04, 2021		Water	M21-Ma18448	X		X		X			X	X	X	X
5	0960_QC205_210304	Mar 04, 2021		Soil	M21-Ma18449		X		X		X	X		X		
6	0960_QC206_	Mar 04, 2021		Water	M21-Ma18450	X		X		X			X	X	X	X

Australia

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Company Name: Cardno (WA)
Address: 11 Harvest Terrace
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WA 6005

Project Name: LEARMONTH
Project ID: WA_0960_PFASOMP

Order No.: DEF19009/415/240
Report #: 779426
Phone: 08 9273 3888
Fax: 08 9388 3831

Received: Mar 8, 2021 11:30 AM
Due: Mar 17, 2021
Priority: 5 Day
Contact Name: Maelle Bourdais

Eurofins Analytical Services Manager : Rhys Thomas

Sample Detail						Dissolved Organic Carbon	pH (1:5 Aqueous extract at 25°C as rec.)	pH (at 25 °C)	Total Organic Carbon	Total Suspended Solids Dried at 103–105°C	Moisture Set	Cation Exchange Capacity	Eurofins Suite B11E: Cl/SO ₄ /Alkalinity	Per- and Polyfluoroalkyl Substances (PFASs)	Eurofins Suite B11C: Na/K/Ca/Mg	Total Dissolved Solids Dried at 180°C ± 2°C
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	X	X	X	X		X	X
Sydney Laboratory - NATA Site # 18217																
Brisbane Laboratory - NATA Site # 20794														X		
Perth Laboratory - NATA Site # 23736																
Mayfield Laboratory																
External Laboratory																
	210304															
7	0960_QC207_210304	Mar 04, 2021		Soil	M21-Ma18451		X		X		X	X		X		
Test Counts						2	5	2	5	2	5	5	2	7	2	2

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram

mg/L: milligrams per litre

ug/L: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100mL: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NC	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 20-130% Phenols & 50-150% PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " - " in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Organic Carbon	%	< 0.1			0.1	Pass	
Method Blank							
Cation Exchange Capacity							
Cation Exchange Capacity	meq/100g	< 0.05			0.05	Pass	
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	ug/kg	< 5			5	Pass	
Perfluoropentanoic acid (PFPeA)	ug/kg	< 5			5	Pass	
Perfluorohexanoic acid (PFHxA)	ug/kg	< 5			5	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/kg	< 5			5	Pass	
Perfluorooctanoic acid (PFOA)	ug/kg	< 5			5	Pass	
Perfluorononanoic acid (PFNA)	ug/kg	< 5			5	Pass	
Perfluorodecanoic acid (PFDA)	ug/kg	< 5			5	Pass	
Perfluoroundecanoic acid (PFUnDA)	ug/kg	< 5			5	Pass	
Perfluorododecanoic acid (PFDoDA)	ug/kg	< 5			5	Pass	
Perfluorotridecanoic acid (PFTTrDA)	ug/kg	< 5			5	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/kg	< 5			5	Pass	
Method Blank							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	ug/kg	< 5			5	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/kg	< 5			5	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/kg	< 5			5	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	ug/kg	< 5			5	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	ug/kg	< 5			5	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/kg	< 10			10	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/kg	< 10			10	Pass	
Method Blank							
Perfluoroalkyl sulfonic acids (PFSA's)							
Perfluorobutanesulfonic acid (PFBS)	ug/kg	< 5			5	Pass	
Perfluorononanesulfonic acid (PFNS)	ug/kg	< 5			5	Pass	
Perfluoropropanesulfonic acid (PFPrS)	ug/kg	< 5			5	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/kg	< 5			5	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/kg	< 5			5	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/kg	< 5			5	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/kg	< 5			5	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/kg	< 5			5	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids (n:2 FTSA's)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	ug/kg	< 5			5	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	ug/kg	< 10			10	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	ug/kg	< 5			5	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	ug/kg	< 5			5	Pass	
LCS - % Recovery							
Total Organic Carbon	%	100			70-130	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	96			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	108			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	110			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	97			50-150	Pass	

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Perfluorooctanoic acid (PFOA)			%	107			50-150	Pass	
Perfluorononanoic acid (PFNA)			%	109			50-150	Pass	
Perfluorodecanoic acid (PFDA)			%	95			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)			%	106			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)			%	121			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)			%	121			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)			%	104			50-150	Pass	
LCS - % Recovery									
Perfluoroalkyl sulfonamido substances									
Perfluorooctane sulfonamide (FOSA)			%	97			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)			%	118			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)			%	97			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)			%	98			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)			%	116			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)			%	124			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)			%	105			50-150	Pass	
LCS - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)									
Perfluorobutanesulfonic acid (PFBS)			%	88			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)			%	120			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)			%	96			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)			%	79			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)			%	106			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)			%	94			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)			%	109			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)			%	115			50-150	Pass	
LCS - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSA's)									
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)			%	74			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)			%	73			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)			%	111			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)			%	73			50-150	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1					
Perfluorobutanoic acid (PFBA)	M21-Ma18446	CP	%	85			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	M21-Ma18446	CP	%	106			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	M21-Ma18446	CP	%	107			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	M21-Ma18446	CP	%	103			50-150	Pass	
Perfluorooctanoic acid (PFOA)	M21-Ma18446	CP	%	108			50-150	Pass	
Perfluorononanoic acid (PFNA)	M21-Ma18446	CP	%	122			50-150	Pass	
Perfluorodecanoic acid (PFDA)	M21-Ma18446	CP	%	94			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	M21-Ma18446	CP	%	111			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	M21-Ma18446	CP	%	111			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	M21-Ma18446	CP	%	115			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M21-Ma18446	CP	%	108			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances				Result 1					
Perfluorooctane sulfonamide (FOSA)	M21-Ma18446	CP	%	107			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M21-Ma18446	CP	%	97			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M21-Ma18446	CP	%	101			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	M21-Ma18446	CP	%	88			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	M21-Ma18446	CP	%	93			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M21-Ma18446	CP	%	119			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M21-Ma18446	CP	%	112			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSA's)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	M21-Ma18446	CP	%	91			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	M21-Ma18446	CP	%	106			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	M21-Ma18446	CP	%	110			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	M21-Ma18446	CP	%	92			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	M21-Ma18446	CP	%	103			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	M21-Ma18446	CP	%	96			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	M21-Ma18446	CP	%	128			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	M21-Ma18446	CP	%	98			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSA's)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	M21-Ma18446	CP	%	82			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	M21-Ma18446	CP	%	115			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M21-Ma18446	CP	%	112			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M21-Ma18446	CP	%	75			50-150	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
				Result 1	Result 2	RPD			
Conductivity (1:5 aqueous extract at 25°C as rec.)	M21-Ma18134	NCP	uS/cm	280	290	3.8	30%	Pass	
pH (1:5 Aqueous extract at 25°C as rec.)	M21-Ma18134	NCP	pH Units	7.1	7.1	pass	30%	Pass	
Total Organic Carbon	N21-Ma31364	NCP	%	< 0.1	< 0.1	<1	30%	Pass	
% Moisture	M21-Ma18132	NCP	%	4.3	4.7	8.0	30%	Pass	
Duplicate									
Perfluoroalkyl carboxylic acids (PFCA's)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	M21-Ma18445	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	M21-Ma18445	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	M21-Ma18445	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	M21-Ma18445	CP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	M21-Ma18445	CP	ug/kg	< 5	< 5	<1	30%	Pass	

Duplicate								
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD		
Perfluorononanoic acid (PFNA)	M21-Ma18445	CP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorodecanoic acid (PFDA)	M21-Ma18445	CP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluoroundecanoic acid (PFUnDA)	M21-Ma18445	CP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorododecanoic acid (PFDoDA)	M21-Ma18445	CP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorotridecanoic acid (PFTrDA)	M21-Ma18445	CP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorotetradecanoic acid (PFTeDA)	M21-Ma18445	CP	ug/kg	< 5	< 5	<1	30%	Pass
Duplicate								
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD		
Perfluorooctane sulfonamide (FOSA)	M21-Ma18445	CP	ug/kg	< 5	< 5	<1	30%	Pass
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M21-Ma18445	CP	ug/kg	< 5	< 5	<1	30%	Pass
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M21-Ma18445	CP	ug/kg	< 5	< 5	<1	30%	Pass
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	M21-Ma18445	CP	ug/kg	< 5	< 5	<1	30%	Pass
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	M21-Ma18445	CP	ug/kg	< 5	< 5	<1	30%	Pass
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M21-Ma18445	CP	ug/kg	< 10	< 10	<1	30%	Pass
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M21-Ma18445	CP	ug/kg	< 10	< 10	<1	30%	Pass
Duplicate								
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD		
Perfluorobutanesulfonic acid (PFBS)	M21-Ma18445	CP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorononanesulfonic acid (PFNS)	M21-Ma18445	CP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluoropropanesulfonic acid (PFPrS)	M21-Ma18445	CP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluoropentanesulfonic acid (PFPeS)	M21-Ma18445	CP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorohexanesulfonic acid (PFHxS)	M21-Ma18445	CP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluoroheptanesulfonic acid (PFHpS)	M21-Ma18445	CP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorooctanesulfonic acid (PFOS)	M21-Ma18445	CP	ug/kg	73	71	2.0	30%	Pass
Perfluorodecanesulfonic acid (PFDS)	M21-Ma18445	CP	ug/kg	< 5	< 5	<1	30%	Pass
Duplicate								
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)				Result 1	Result 2	RPD		
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	M21-Ma18445	CP	ug/kg	< 5	< 5	<1	30%	Pass
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	M21-Ma18445	CP	ug/kg	< 10	< 10	<1	30%	Pass
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M21-Ma18445	CP	ug/kg	< 5	< 5	<1	30%	Pass
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M21-Ma18445	CP	ug/kg	< 5	< 5	<1	30%	Pass

Comments
Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N09	Quantification of linear and branched isomers has been conducted as a single total response using the relative response factor for the corresponding linear/branched standard.
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.
N15	Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).

Authorised by:

Rhys Thomas	Analytical Services Manager
Emily Rosenberg	Senior Analyst-Metal (VIC)
Sarah McCallion	Senior Analyst-PFAS (QLD)
Scott Beddoes	Senior Analyst-Inorganic (VIC)



Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please [click here](#).

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NATA Accredited
Accreditation Number 1261
Site Number 1254

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 NATA is a signatory to the ILAC Mutual Recognition
 Arrangement for the mutual recognition of the
 equivalence of testing, medical testing, calibration,
 inspection and proficiency testing scheme providers
 reports.

Attention: **Maelle Bourdais**

Report **779426-W**
 Project name **LEARMONTH**
 Project ID **WA_0960_PFASOMP**
 Received Date **Mar 08, 2021**

Client Sample ID			0960_QC204_2 10304	0960_QC206_2 10304
Sample Matrix			Water	Water
Eurofins Sample No.			M21-Ma18448	M21-Ma18450
Date Sampled			Mar 04, 2021	Mar 04, 2021
Test/Reference	LOR	Unit		
Chloride	1	mg/L	5.0	24
Dissolved Organic Carbon	5	mg/L	< 5	< 5
pH (at 25 °C)	0.1	pH Units	7.6	7.7
Sulphate (as SO ₄)	5	mg/L	< 5	26
Total Dissolved Solids Dried at 180°C ± 2°C	10	mg/L	140	230
Total Suspended Solids Dried at 103–105°C	1	mg/L	160	410
Alkalinity (speciated)				
Bicarbonate Alkalinity (as CaCO ₃)	20	mg/L	85	100
Carbonate Alkalinity (as CaCO ₃)	10	mg/L	< 10	< 10
Hydroxide Alkalinity (as CaCO ₃)	20	mg/L	< 20	< 20
Total Alkalinity (as CaCO ₃)	20	mg/L	85	100
Alkali Metals				
Calcium	0.5	mg/L	23	15
Magnesium	0.5	mg/L	2.3	2.8
Potassium	0.5	mg/L	3.0	5.4
Sodium	0.5	mg/L	6.9	30
Perfluoroalkyl carboxylic acids (PFCA)				
Perfluorobutanoic acid (PFBA) ^{N11}	0.05	ug/L	< 0.05	< 0.05
Perfluoropentanoic acid (PFPeA) ^{N11}	0.01	ug/L	< 0.01	< 0.01
Perfluorohexanoic acid (PFHxA) ^{N11}	0.01	ug/L	< 0.01	< 0.01
Perfluoroheptanoic acid (PFHpA) ^{N11}	0.01	ug/L	< 0.01	< 0.01
Perfluorooctanoic acid (PFOA) ^{N11}	0.01	ug/L	< 0.01	< 0.01
Perfluorononanoic acid (PFNA) ^{N11}	0.01	ug/L	< 0.01	< 0.01
Perfluorodecanoic acid (PFDA) ^{N11}	0.01	ug/L	< 0.01	< 0.01
Perfluoroundecanoic acid (PFUnDA) ^{N11}	0.01	ug/L	< 0.01	< 0.01
Perfluorododecanoic acid (PFDoDA) ^{N11}	0.01	ug/L	< 0.01	< 0.01
Perfluorotridecanoic acid (PFTeDA) ^{N15}	0.01	ug/L	< 0.01	< 0.01
Perfluorotetradecanoic acid (PFTeDA) ^{N11}	0.01	ug/L	< 0.01	< 0.01
13C4-PFBA (surr.)	1	%	139	148
13C5-PFPeA (surr.)	1	%	140	145
13C5-PFHxA (surr.)	1	%	119	124
13C4-PFHpA (surr.)	1	%	131	138
13C8-PFOA (surr.)	1	%	131	136
13C5-PFNA (surr.)	1	%	116	126
13C6-PFDA (surr.)	1	%	116	113

Client Sample ID			0960_QC204_2 10304	0960_QC206_2 10304
Sample Matrix			Water	Water
Eurofins Sample No.			M21-Ma18448	M21-Ma18450
Date Sampled			Mar 04, 2021	Mar 04, 2021
Test/Reference	LOR	Unit		
Perfluoroalkyl carboxylic acids (PFCAs)				
13C2-PFUnDA (surr.)	1	%	125	131
13C2-PFDoDA (surr.)	1	%	123	128
13C2-PFTeDA (surr.)	1	%	87	77
Perfluoroalkyl sulfonamido substances				
Perfluorooctane sulfonamide (FOSA) ^{N11}	0.05	ug/L	< 0.05	< 0.05
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA) ^{N11}	0.05	ug/L	< 0.05	< 0.05
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA) ^{N11}	0.05	ug/L	< 0.05	< 0.05
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE) ^{N11}	0.05	ug/L	< 0.05	< 0.05
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE) ^{N11}	0.05	ug/L	< 0.05	< 0.05
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA) ^{N11}	0.05	ug/L	< 0.05	< 0.05
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA) ^{N11}	0.05	ug/L	< 0.05	< 0.05
13C8-FOSA (surr.)	1	%	133	141
D3-N-MeFOSA (surr.)	1	%	118	132
D5-N-EtFOSA (surr.)	1	%	120	130
D7-N-MeFOSE (surr.)	1	%	126	140
D9-N-EtFOSE (surr.)	1	%	110	123
D5-N-EtFOSAA (surr.)	1	%	90	34
D3-N-MeFOSAA (surr.)	1	%	69	32
Perfluoroalkyl sulfonic acids (PFSA)s				
Perfluorobutanesulfonic acid (PFBS) ^{N11}	0.01	ug/L	< 0.01	< 0.01
Perfluorononanesulfonic acid (PFNS) ^{N15}	0.01	ug/L	< 0.01	< 0.01
Perfluoropropanesulfonic acid (PFPrS) ^{N15}	0.01	ug/L	< 0.01	< 0.01
Perfluoropentanesulfonic acid (PFPeS) ^{N15}	0.01	ug/L	< 0.01	< 0.01
Perfluorohexanesulfonic acid (PFHxS) ^{N11}	0.01	ug/L	< 0.01	< 0.01
Perfluoroheptanesulfonic acid (PFHpS) ^{N15}	0.01	ug/L	< 0.01	< 0.01
Perfluorooctanesulfonic acid (PFOS) ^{N11}	0.01	ug/L	< 0.01	< 0.01
Perfluorodecanesulfonic acid (PFDS) ^{N15}	0.01	ug/L	< 0.01	< 0.01
13C3-PFBS (surr.)	1	%	54	54
18O2-PFHxS (surr.)	1	%	126	119
13C8-PFOS (surr.)	1	%	114	117
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)s				
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA) ^{N11}	0.01	ug/L	< 0.01	< 0.01
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA) ^{N11}	0.05	ug/L	< 0.05	< 0.05
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA) ^{N11}	0.01	ug/L	< 0.01	< 0.01
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA) ^{N11}	0.01	ug/L	< 0.01	< 0.01
13C2-4:2 FTS (surr.)	1	%	73	77
13C2-6:2 FTSA (surr.)	1	%	84	89
13C2-8:2 FTSA (surr.)	1	%	62	66
13C2-10:2 FTSA (surr.)	1	%	60	64

Client Sample ID			0960_QC204_2 10304	0960_QC206_2 10304
Sample Matrix			Water	Water
Eurofins Sample No.			M21-Ma18448	M21-Ma18450
Date Sampled			Mar 04, 2021	Mar 04, 2021
Test/Reference	LOR	Unit		
PFASs Summations				
Sum (PFHxS + PFOS)*	0.01	ug/L	< 0.01	< 0.01
Sum of US EPA PFAS (PFOS + PFOA)*	0.01	ug/L	< 0.01	< 0.01
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	0.01	ug/L	< 0.01	< 0.01
Sum of WA DWER PFAS (n=10)*	0.05	ug/L	< 0.05	< 0.05
Sum of PFASs (n=30)*	0.1	ug/L	< 0.1	< 0.1

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Eurofins Suite B11E: Cl/SO₄/Alkalinity			
Chloride	Melbourne	Mar 12, 2021	28 Days
- Method: LTM-INO-4090 Chloride by Discrete Analyser			
Sulphate (as SO ₄)	Melbourne	Mar 12, 2021	28 Days
- Method: LTM-INO-4110 Sulfate by Discrete Analyser			
Alkalinity (speciated)	Melbourne	Mar 12, 2021	14 Days
- Method: LTM-INO-4250 Alkalinity by Electrometric Titration			
Dissolved Organic Carbon	Melbourne	Mar 12, 2021	28 Days
- Method: APHA 5310B Dissolved Organic Carbon			
pH (at 25 °C)	Melbourne	Mar 12, 2021	0 Hours
- Method: LTM-GEN-7090 pH in water by ISE			
Total Suspended Solids Dried at 103–105°C	Melbourne	Mar 12, 2021	7 Days
- Method: LTM-INO-4070 Analysis of Suspended Solids in Water by Gravimetry			
Eurofins Suite B11C: Na/K/Ca/Mg	Melbourne	Mar 12, 2021	180 Days
- Method: LTM-MET-3010 Alkali Metals by ICP-AES			
Total Dissolved Solids Dried at 180°C ± 2°C	Melbourne	Mar 12, 2021	7 Days
- Method: LTM-INO-4170 Total Dissolved Solids in Water			
Per- and Polyfluoroalkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs)	Brisbane	Mar 16, 2021	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonamido substances	Brisbane	Mar 16, 2021	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonic acids (PFSAAs)	Brisbane	Mar 16, 2021	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)	Brisbane	Mar 16, 2021	14 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			

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Company Name: Cardno (WA)
Address: 11 Harvest Terrace
West Perth
WA 6005
Project Name: LEARMONTH
Project ID: WA_0960_PFASOMP

Order No.: DEF19009/415/240
Report #: 779426
Phone: 08 9273 3888
Fax: 08 9388 3831

Received: Mar 8, 2021 11:30 AM
Due: Mar 17, 2021
Priority: 5 Day
Contact Name: Maelle Bourdais

Eurofins Analytical Services Manager : Rhys Thomas

Sample Detail						Dissolved Organic Carbon	pH (1:5 Aqueous extract at 25°C as rec.)	pH (at 25 °C)	Total Organic Carbon	Total Suspended Solids Dried at 103–105°C	Moisture Set	Cation Exchange Capacity	Eurofins Suite B11E: Cl/SO4/Alkalinity	Per- and Polyfluoroalkyl Substances (PFASs)	Eurofins Suite B11C: Na/K/Ca/Mg	Total Dissolved Solids Dried at 180°C ± 2°C
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	X	X	X	X		X	X
Sydney Laboratory - NATA Site # 18217																
Brisbane Laboratory - NATA Site # 20794														X		
Perth Laboratory - NATA Site # 23736																
Mayfield Laboratory																
External Laboratory																
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID											
1	0960_QC201_210304	Mar 04, 2021		Soil	M21-Ma18445		X		X		X	X		X		
2	0960_QC202_210304	Mar 04, 2021		Soil	M21-Ma18446		X		X		X	X		X		
3	0960_QC203_210304	Mar 04, 2021		Soil	M21-Ma18447		X		X		X	X		X		
4	0960_QC204_210304	Mar 04, 2021		Water	M21-Ma18448	X		X		X			X	X	X	X
5	0960_QC205_210304	Mar 04, 2021		Soil	M21-Ma18449		X		X		X	X		X		
6	0960_QC206_	Mar 04, 2021		Water	M21-Ma18450	X		X		X			X	X	X	X

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Company Name: Cardno (WA)
Address: 11 Harvest Terrace
West Perth
WA 6005

Project Name: LEARMONTH
Project ID: WA_0960_PFASOMP

Order No.: DEF19009/415/240
Report #: 779426
Phone: 08 9273 3888
Fax: 08 9388 3831

Received: Mar 8, 2021 11:30 AM
Due: Mar 17, 2021
Priority: 5 Day
Contact Name: Maelle Bourdais

Eurofins Analytical Services Manager : Rhys Thomas

Sample Detail						Dissolved Organic Carbon	pH (1:5 Aqueous extract at 25°C as rec.)	pH (at 25 °C)	Total Organic Carbon	Total Suspended Solids Dried at 103–105°C	Moisture Set	Cation Exchange Capacity	Eurofins Suite B11E: Cl/SO4/Alkalinity	Per- and Polyfluoroalkyl Substances (PFASs)	Eurofins Suite B11C: Na/K/Ca/Mg	Total Dissolved Solids Dried at 180°C ± 2°C
Melbourne Laboratory - NATA Site # 1254 & 14271						X	X	X	X	X	X	X	X		X	X
Sydney Laboratory - NATA Site # 18217																
Brisbane Laboratory - NATA Site # 20794														X		
Perth Laboratory - NATA Site # 23736																
Mayfield Laboratory																
External Laboratory																
	210304															
7	0960_QC207_210304	Mar 04, 2021		Soil	M21-Ma18451		X		X		X	X		X		
Test Counts						2	5	2	5	2	5	5	2	7	2	2

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram	mg/L: milligrams per litre	ug/L: micrograms per litre
ppm: Parts per million	ppb: Parts per billion	%: Percentage
org/100mL: Organisms per 100 millilitres	NTU: Nephelometric Turbidity Units	MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NC	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 20-130% Phenols & 50-150% PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " - " in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Chloride	mg/L	< 1			1	Pass	
Sulphate (as SO ₄)	mg/L	< 5			5	Pass	
Total Dissolved Solids Dried at 180°C ± 2°C	mg/L	< 10			10	Pass	
Total Suspended Solids Dried at 103–105°C	mg/L	< 1			1	Pass	
Method Blank							
Alkalinity (speciated)							
Bicarbonate Alkalinity (as CaCO ₃)	mg/L	< 20			20	Pass	
Carbonate Alkalinity (as CaCO ₃)	mg/L	< 10			10	Pass	
Hydroxide Alkalinity (as CaCO ₃)	mg/L	< 20			20	Pass	
Total Alkalinity (as CaCO ₃)	mg/L	< 20			20	Pass	
Method Blank							
Alkali Metals							
Calcium	mg/L	< 0.5			0.5	Pass	
Magnesium	mg/L	< 0.5			0.5	Pass	
Potassium	mg/L	< 0.5			0.5	Pass	
Sodium	mg/L	< 0.5			0.5	Pass	
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	ug/L	< 0.05			0.05	Pass	
Perfluoropentanoic acid (PFPeA)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanoic acid (PFHxA)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanoic acid (PFOA)	ug/L	< 0.01			0.01	Pass	
Perfluorononanoic acid (PFNA)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanoic acid (PFDA)	ug/L	< 0.01			0.01	Pass	
Perfluoroundecanoic acid (PFUnDA)	ug/L	< 0.01			0.01	Pass	
Perfluorododecanoic acid (PFDoDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotridecanoic acid (PFTeDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/L	< 0.01			0.01	Pass	
Method Blank							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	ug/L	< 0.05			0.05	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/L	< 0.05			0.05	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/L	< 0.05			0.05	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	ug/L	< 0.05			0.05	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	ug/L	< 0.05			0.05	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/L	< 0.05			0.05	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/L	< 0.05			0.05	Pass	
Method Blank							
Perfluoroalkyl sulfonic acids (PFSA's)							
Perfluorobutanesulfonic acid (PFBS)	ug/L	< 0.01			0.01	Pass	
Perfluorononanesulfonic acid (PFNS)	ug/L	< 0.01			0.01	Pass	
Perfluoropropanesulfonic acid (PFPrS)	ug/L	< 0.01			0.01	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/L	< 0.01			0.01	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	ug/L	< 0.05			0.05	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	ug/L	< 0.01			0.01	Pass	
LCS - % Recovery							
Chloride	%	108			70-130	Pass	
Sulphate (as SO ₄)	%	99			70-130	Pass	
Total Dissolved Solids Dried at 180°C ± 2°C	%	107			70-130	Pass	
Total Suspended Solids Dried at 103–105°C	%	112			70-130	Pass	
LCS - % Recovery							
Alkalinity (speciated)							
Carbonate Alkalinity (as CaCO ₃)	%	93			70-130	Pass	
Total Alkalinity (as CaCO ₃)	%	99			70-130	Pass	
LCS - % Recovery							
Alkali Metals							
Calcium	%	95			80-120	Pass	
Magnesium	%	98			80-120	Pass	
Potassium	%	94			80-120	Pass	
Sodium	%	105			80-120	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	137			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	100			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	103			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	108			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	101			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	98			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	109			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	%	108			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	%	120			50-150	Pass	
Perfluorotridecanoic acid (PFTriDA)	%	97			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	120			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	%	100			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	%	107			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	%	110			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	%	116			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	%	104			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	%	108			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	%	110			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	%	95			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	%	74			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	%	86			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	%	110			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	%	103			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	%	87			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	%	111			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	%	62			50-150	Pass	
LCS - % Recovery							
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	%	108			50-150	Pass	

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)			%	94			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)			%	98			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)			%	103			50-150	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
				Result 1					
Total Suspended Solids Dried at 103–105°C	M21-Ma25010	NCP	%	109			70-130	Pass	
Spike - % Recovery									
Alkali Metals				Result 1					
Calcium	M21-Ma22980	NCP	%	98			75-125	Pass	
Magnesium	M21-Ma26343	NCP	%	103			75-125	Pass	
Potassium	M21-Ma26460	NCP	%	105			75-125	Pass	
Sodium	M21-Ma22980	NCP	%	104			75-125	Pass	
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1					
Perfluorobutanoic acid (PFBA)	B21-Ma29233	NCP	%	101			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	B21-Ma29233	NCP	%	94			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	B21-Ma29233	NCP	%	91			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	B21-Ma29233	NCP	%	94			50-150	Pass	
Perfluorooctanoic acid (PFOA)	B21-Ma29233	NCP	%	99			50-150	Pass	
Perfluorononanoic acid (PFNA)	B21-Ma29233	NCP	%	90			50-150	Pass	
Perfluorodecanoic acid (PFDA)	B21-Ma29233	NCP	%	95			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	B21-Ma29233	NCP	%	88			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	B21-Ma29233	NCP	%	98			50-150	Pass	
Perfluorotridecanoic acid (PFTTrDA)	B21-Ma29233	NCP	%	102			50-150	Pass	
Perfluorotetradecanoic acid (PFTTeDA)	B21-Ma29233	NCP	%	106			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances				Result 1					
Perfluorooctane sulfonamide (FOSA)	B21-Ma29233	NCP	%	91			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	B21-Ma29233	NCP	%	92			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	B21-Ma29233	NCP	%	103			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	B21-Ma29233	NCP	%	97			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	B21-Ma29233	NCP	%	92			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	B21-Ma29233	NCP	%	103			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	B21-Ma29233	NCP	%	99			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	B21-Ma29233	NCP	%	86			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	B21-Ma29233	NCP	%	74			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	B21-Ma29233	NCP	%	77			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	B21-Ma29233	NCP	%	99			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Perfluorohexanesulfonic acid (PFHxS)	B21-Ma29233	NCP	%	98			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	B21-Ma29233	NCP	%	81			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	B21-Ma29233	NCP	%	122			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	B21-Ma29233	NCP	%	62			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	B21-Ma29233	NCP	%	102			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	B21-Ma29233	NCP	%	94			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	B21-Ma29233	NCP	%	75			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	B21-Ma29233	NCP	%	90			50-150	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
				Result 1	Result 2	RPD			
Chloride	M21-Ma20373	NCP	mg/L	230	220	5.0	30%	Pass	
pH (at 25 °C)	M21-Ma19034	NCP	pH Units	8.0	7.9	pass	30%	Pass	
Sulphate (as SO ₄)	B21-Ma22510	NCP	mg/L	1900	1800	3.0	30%	Pass	
Total Dissolved Solids Dried at 180°C ± 2°C	M21-Ma20371	NCP	mg/L	560	470	17	30%	Pass	
Total Suspended Solids Dried at 103–105°C	M21-Ma25010	NCP	mg/L	9.6	12	19	30%	Pass	
Duplicate									
Alkalinity (speciated)				Result 1	Result 2	RPD			
Bicarbonate Alkalinity (as CaCO ₃)	M21-Ma19034	NCP	mg/L	400	410	1.0	30%	Pass	
Carbonate Alkalinity (as CaCO ₃)	M21-Ma19034	NCP	mg/L	< 10	< 10	<1	30%	Pass	
Hydroxide Alkalinity (as CaCO ₃)	M21-Ma19034	NCP	mg/L	< 20	< 20	<1	30%	Pass	
Total Alkalinity (as CaCO ₃)	M21-Ma19034	NCP	mg/L	400	410	1.0	30%	Pass	
Duplicate									
Alkali Metals				Result 1	Result 2	RPD			
Calcium	M21-Ma22980	NCP	mg/L	77	79	3.0	30%	Pass	
Magnesium	M21-Ma26343	NCP	mg/L	8.1	7.5	17	30%	Pass	
Potassium	M21-Ma26460	NCP	mg/L	43	40	7.0	30%	Pass	
Sodium	M21-Ma22980	NCP	mg/L	180	180	2.0	30%	Pass	
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	B21-Ma29232	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	B21-Ma29232	NCP	ug/L	0.01	0.01	5.0	30%	Pass	
Perfluorohexanoic acid (PFHxA)	B21-Ma29232	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	B21-Ma29232	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	B21-Ma29232	NCP	ug/L	0.05	0.05	3.0	30%	Pass	
Perfluorononanoic acid (PFNA)	B21-Ma29232	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	B21-Ma29232	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	B21-Ma29232	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorododecanoic acid (PFDoDA)	B21-Ma29232	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotridecanoic acid (PFTeDA)	B21-Ma29232	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTEDA)	B21-Ma29232	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	

Duplicate								
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD		
Perfluorooctane sulfonamide (FOSA)	B21-Ma29232	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	B21-Ma29232	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	B21-Ma29232	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	B21-Ma29232	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	B21-Ma29232	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	B21-Ma29232	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	B21-Ma29232	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
Duplicate								
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD		
Perfluorobutanesulfonic acid (PFBS)	B21-Ma29232	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorononanesulfonic acid (PFNS)	B21-Ma29232	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluoropropanesulfonic acid (PFPrS)	B21-Ma29232	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluoropentanesulfonic acid (PFPeS)	B21-Ma29232	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorohexanesulfonic acid (PFHxS)	B21-Ma29232	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluoroheptanesulfonic acid (PFHpS)	B21-Ma29232	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorooctanesulfonic acid (PFOS)	B21-Ma29232	NCP	ug/L	0.15	0.15	2.0	30%	Pass
Perfluorodecanesulfonic acid (PFDS)	B21-Ma29232	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Duplicate								
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)				Result 1	Result 2	RPD		
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	B21-Ma29232	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	B21-Ma29232	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	B21-Ma29232	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	B21-Ma29232	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass

Comments
Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.
N15	Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).

Authorised by:

Rhys Thomas	Analytical Services Manager
Emily Rosenberg	Senior Analyst-Metal (VIC)
Sarah McCallion	Senior Analyst-PFAS (QLD)
Scott Beddoes	Senior Analyst-Inorganic (VIC)



Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please [click here](#).

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APPENDIX

D

FIELD RECORDS & CALIBRATION CERTIFICATES



Table 6 Surface Water Field Records

First Flush 2021 OMP Monitoring Event
RAAF Learmonth

Site	Monitoring Site ID	Date	Sample ID	Sampling Method	Sample Depth (m)	WaterBody Depth (m)	Location	Flow Rate	SW Site Comments ?	Temperature C	DO (mg/L)	EC (us/Cm)	TDS	pH +/- 0.1	Eh (mV)+-10mV	Water Colour	Turbidity
RAAF Learmonth	SW219_	4/03/2021	0960_SW219_210304	Direct_into_Bottle	2		2 Onsite	Slow	QC106, QC206	305	384	4214	27560	867	808	Brown	Medium
RAAF Learmonth	SW199_	4/03/2021	0960_SW199_210304	Water_Scoop	0.1		0.3 Offsite	Slow	Qc104/204	30.3	1.82	727		8.01	90	Brown	Medium
RAAF Learmonth	SW189_	4/03/2021	0960_SW189_210304	Direct_into_Bottle	1		3 Offsite	Slow		268	203	1216	7930	843	922	Brown	Medium
RAAF Learmonth	SW200_	4/03/2021	0960_SW200_210304	Direct_into_Bottle	0.1		0.4 Offsite	Slow		30	3.26	138.2		8.15	115.6	Brown	Medium
RAAF Learmonth	SW210_	4/03/2021	0960_SW210_210304	Direct_into_Bottle	0.1		0.2 Offsite	Slow		31.9	3.17	32976		7.71	111.5	Brown	Medium
RAAF Learmonth	SW210_	4/03/2021	0960_SW210_210304														
RAAF Learmonth	SW211_	4/03/2021	0960_SW211_210304	Direct_into_Bottle	1		15 Offsite	Slow		350	264	32426	2108600	807	1064	Clear	Medium
RAAF Learmonth	SW302_	4/03/2021	0960_SW302_210304	Direct_into_Bottle	0.1		0.2 Offsite	Slow		35.2	3.42	38984		8.12	71.9		High
RAAF Learmonth	SW209_	4/03/2021	0960_SW209_210304	Direct_into_Bottle	0.1		0.15 Offsite	Slow		34.7	4.1	25507		8.08	75.9	Brown	High
RAAF Learmonth	SW190_	4/03/2021	0960_SW190_210304	Direct_into_Bottle	1		2 Offsite	Slow		320	126	758	49400	829	654	Clear/brown	Low
RAAF Learmonth	SW288_	4/03/2021	0960_SW288_210304	Direct_into_Bottle	1		2 Offsite	Slow	2 extra pfas bottles	329	137	2708	17615	825	797		Low
RAAF Learmonth	SW193_	4/03/2021	0960_SW193_210304	Direct_into_Bottle	1		1 Offsite	Slow		340	188	2587	16835	816	8966		Low
RAAF Learmonth	SW208_	4/03/2021	0960_SW208_210304	Direct_into_Bottle	0.2		0.5 Offsite	Medium		29.7	3.07	54507		80	833	Clear	Low
RAAF Learmonth	SW207_	4/03/2021	0960_SW207_210304	Direct_into_Bottle	0.3		0.3 Offsite	Medium		320	3.75	54484		7.99	84.1	Clear	Low
RAAF Learmonth	SW205_	4/03/2021	0960_SW205_210304	Direct_into_Bottle	0.1		0.15 Offsite	Slow		31.2	3.56	54728		8	86.5		Low
RAAF Learmonth	SW304_	4/03/2021	0960_SW304_210304	Direct_into_Bottle	0.1		0.15 Offsite	Slow		29.3	3.08	54547		7.99	94.3		Low
RAAF Learmonth	SW303_	4/03/2021	0960_SW303_210304	Direct_into_Bottle	0.15		0.35 Offsite	Slow		29.2	3.54	54377		8.02	85.7	Clear	
RAAF Learmonth	SW301_	4/03/2021	0960_SW301_210304	Direct_into_Bottle	0.1		0.2 Offsite	Slow		33.6	4.4	37379		8.26	84.3	Colourless	Low
RAAF Learmonth	SW300_	4/03/2021	0960_SW300_210304	Direct_into_Bottle	0.1		0.2 Offsite	Slow		32.3	4.21	30632		8.48	87	Colourless	Low

Site	Monitoring Site ID	Date	Sample ID	Depth of Sediment Sampling (m)	Sampling Method	Sample Condition	Sample Description	Other SS Site Comments
RAAF Learmonth	SS176_	4/03/2021 4:00	0960_SS176_210304	0	Shovel_Trowel	Dry	Clay orange	
RAAF Learmonth	SS279_	4/03/2021 4:00	0960_SS279_210304	0	Direct_into_Bottle	Wet	Orange clay	
RAAF Learmonth	SS123_	4/03/2021 4:00	0960_SS123_210304	1	Direct_into_Bottle	Dry	Red, none, moist clay	QC101, QC201
RAAF Learmonth	SS170_	4/03/2021 4:00	0960_SS170_210304	0	Shovel_Trowel	Wet	Orange clay	
RAAF Learmonth	SS168_	4/03/2021 4:00	0960_SS168_210304	0	Direct_into_Bottle	Wet	Orangw clay	
RAAF Learmonth	SS121_	4/03/2021 4:00	0960_SS121_210304	1	Shovel_Trowel	Dry	Red, wet clay	
RAAF Learmonth	SS166_	4/03/2021 4:00	0960_SS166_210304		Direct_into_Bottle	Wet	Ckay	
RAAF Learmonth	SS265_	4/03/2021 4:00	0960_SS265_210304	0.2	Direct_into_Bottle	Wet	Orange clay	
RAAF Learmonth	SS113_	4/03/2021 4:00	0960_SS113_210304	0.2	Shovel_Trowel	Wet	Orange clay	
RAAF Learmonth	SS122_	4/03/2021 4:00	0960_SS122_210304	1	Direct_into_Bottle	Dry	Red, none, sandy clay	QC102, QC202
RAAF Learmonth	SS157_	4/03/2021 4:00	0960_SS157_210304	0.2	Shovel_Trowel	Wet	Orange clay	
RAAF Learmonth	SS124_	4/03/2021 4:00	0960_SS124_210304	1	Direct_into_Bottle	Dry	Red, moist clay	
RAAF Learmonth	SS157_	4/03/2021 4:00	0960_SS157_210304	0	Direct_into_Bottle	Wet	Orange clay	
RAAF Learmonth	SS125_	4/03/2021 4:00	0960_SS125_210304	1	Direct_into_Bottle	Dry	Red, moist clay	
RAAF Learmonth	SS243_	4/03/2021 4:00	0960_SS243_210304	0	Direct_into_Bottle	Dry	Orange clay moist	
RAAF Learmonth	SS174_	4/03/2021 4:00	0960_SS174_210304	0	Direct_into_Bottle	Dry	Orange clay moist	
RAAF Learmonth	SS277_	4/03/2021 4:00	0960_SS277_210304		Direct_into_Bottle	Dry	Orange clay moist	
RAAF Learmonth	SS114_	4/03/2021 4:00	0960_SS114_210304	1	Direct_into_Bottle	Dry	Red, organic, moist clay	QC103/203
RAAF Learmonth	SS278_	4/03/2021 4:00	0960_SS278_210304	0	Direct_into_Bottle	Dry	Orange clay moist	
RAAF Learmonth	SS234_	4/03/2021 4:00	0960_SS234_210304	1	Direct_into_Bottle	Wet	Red, wet clay	
RAAF Learmonth	SS235_	4/03/2021 4:00	0960_SS235_210304	1	Direct_into_Bottle	Wet	Red, wet clay	Sampled inside fence due to inundated roads
RAAF Learmonth	SD199_	4/03/2021 4:00	0960_SD199_210304	0.3	Shovel_Trowel	Wet	Orange clay	Qc105/205
RAAF Learmonth	SD219_	4/03/2021 4:00	0960_SD219_210304	2	Direct_into_Bottle	Wet	Red, wet clay	
RAAF Learmonth	SS231_	4/03/2021 4:00	0960_SS231_210304	1	Direct_into_Bottle	Dry	Red wet clay	
RAAF Learmonth	SS189_	4/03/2021 4:00	0960_SS189_210304	1	Direct_into_Bottle	Wet	Red, rocky clay	
RAAF Learmonth	SS227_	4/03/2021 4:00	0960_SS227_210304	1	Direct_into_Bottle	Dry	Red, moist clay	
RAAF Learmonth	SD210_	4/03/2021 4:00	0960_SD210_210304		Shovel_Trowel	Wet	Orange clay	
RAAF Learmonth	SD211_	4/03/2021 4:00	0960_SD211_210304	1	Direct_into_Bottle	Wet	Grey wet clay	
RAAF Learmonth	SS298_	4/03/2021 4:00	0960_SS298_210304	1	Direct_into_Bottle	Dry	Red clay	
RAAF Learmonth	SD200_	4/03/2021 4:00	0960_SD200_210304	1	Direct_into_Bottle	Wet	Red clay	
RAAF Learmonth	SS198_	4/03/2021 4:00	0960_SS198_210304	1	Direct_into_Bottle	Dry	Red moist sand	
RAAF Learmonth	SD302_	4/03/2021 4:00	0960_SD302_210304		Direct_into_Bottle	Wet	Orange clay	
RAAF Learmonth	SD209_	4/03/2021 4:00	0960_SD209_210304	0	Direct_into_Bottle		Orange clay	
RAAF Learmonth	SS293_	4/03/2021 4:00	0960_SS293_210304	1	Direct_into_Bottle	Wet	Red wet clay	
RAAF Learmonth	SS292_	4/03/2021 4:00	0960_SS292_210304	1	Direct_into_Bottle	Wet	Red moist clay/sand	
RAAF Learmonth	SS291_	4/03/2021 4:00	0960_SS291_210304	1	Direct_into_Bottle	Wet	Red wet sandy clay	QC107, QC207
RAAF Learmonth	SS190_	4/03/2021 4:00	0960_SS190_210304	2	Direct_into_Bottle	Wet	Red wet clay	
RAAF Learmonth	SS288_	4/03/2021 4:00	0960_SS288_210304	0	Direct_into_Bottle	Wet	Orange clay	
RAAF Learmonth	SS193_	4/03/2021 4:00	0960_SS193_210304	0	Shovel_Trowel	Wet	Orange sandy clay	
RAAF Learmonth	SD208_	4/03/2021 4:00	0960_SD208_210304	0	Direct_into_Bottle	Wet	Brown sand	
RAAF Learmonth	SS192_	4/03/2021 4:00	0960_SS192_210304	1	Direct_into_Bottle	Wet	Yellow grey med grain sand	
RAAF Learmonth	SD207_	4/03/2021 4:00	0960_SD207_210304	0	Direct_into_Bottle	Wet	Brown sand	
RAAF Learmonth	SD205_	4/03/2021 4:00	0960_SD205_210304	0	Direct_into_Bottle	Wet	Brown sand	
RAAF Learmonth	SS301_	4/03/2021 4:00	0960_SS301_210304	0	Direct_into_Bottle	Wet	Brown sand	
RAAF Learmonth	SD304_	4/03/2021 4:00	0960_SD304_210304	0	Direct_into_Bottle	Wet	Brown sandy clay	
RAAF Learmonth	SD303_	4/03/2021 4:00	0960_SD303_210304	0	Direct_into_Bottle	Wet	Brown sandy clay	
RAAF Learmonth	SD301_	4/03/2021 4:00	0960_SD301_210304	0	Direct_into_Bottle	Wet	Brown sandy clay	
RAAF Learmonth	SD300_	4/03/2021 4:00	0960_SD300_210304	0	Direct_into_Bottle	Wet	Brown sand	
RAAF Learmonth	SS123_	5/03/2021 4:00	0960_SS123_210305	1	Direct_into_Bottle	Dry	Brown sand, no odour, black organic matter	



Calibration Report

Multi-Parameter Water Quality Instrument

Customer:

Contact:

Manufacturer: YSI

Instrument: Professional Plus with Quatro cable

Serial #: 20D101039

Cable length: 1m

Item	Test	Pass	Comments
Battery	2 x Alkaline C-cells	✓	Voltage reading above 2.9V
	Battery Saver	✓	Automatically turns off after 30 minutes if not used
Connections	Condition	✓	Good, clean
Cable	Condition	✓	Clean, no tears
Display	Operation	✓	
Firmware	Version	✓	4.0.0
Keypad	Operational	✓	
Display	Screen	✓	
Unit	Condition, seals and O-rings	✓	
Monitor housing	Condition	✓	
pH			
Condition		✓	Good, clean
pH millivolts for pH7 calibration range	0 mV ± 50 mV	✓	
pH 4 mV range + 165 to + 180 from 7 buffer mV value		✓	173.40 mV
pH slope		✓	55 to 60 mV/pH, ideal 59mV 57.86
Response time < 90 seconds		✓	
Calibrated and conforms to manufacturer's specifications		✓	
ORP			
Condition		✓	Good, clean
Response time < 90 seconds		✓	
within ± 80mv of reference Zobell Reading		✓	
Calibrated and conforms to manufacturer's specifications		✓	variance range ± 20mV -3 mV
Conductivity			
Condition		✓	Good, clean
Temperature		✓	°C
Conductivity cell constant	5.0 ± 1.0 in GLP file	✓	
Clean sensor reads less than 3 uS/cm in dry air		✓	
Calibrated and conforms to manufacturer's specifications		✓	µS/cm
Dissolved Oxygen			
Condition		✓	Good, clean
DO sensor in use		✓	Galvanic
1.25 mil PE membrane (yellow membrane):		✓	
DO Sensor Value		✓	(min 4.31 uA - max 8.00 uA) Avg 6.15 uA
Calibrated and conforms to manufacturer's specifications		✓	ppm

This is to certify that the above instrument has been calibrated to the following specifications:

Parameter	Standards	Reference	Calibration Point	Span	Units	Instrument Readings		
						Before	After	Units
Temperature		Room Temp	24.6	0	°C	NA	24.6	°C
pH	pH 7.00	356684	7.01	-30.20	mV	7.04	7.01	pH
pH	pH 4.00	355385	4.00	143.20	mV	4.07	4.00	pH
Conductivity	2764 µS/cm at 25°C	20/1007	2764	GLP	5.01	2757	2764	µS/cm
ORP (Reference check only)	Zobell A & B	20/0506	230	230	mV	237.4	232.5	mV
Zero Dissolved Oxygen	NaSO3 in distilled water	10175	0.0	NA	NA	0.8	0.0	%
100% Dissolved Oxygen	100% Air Saturation	Air	100.0	6.58	uA	108.7	100.0	%

Calibrated by: Gaurav Kanwar

Calibration Date: 28-Feb-21

Next Due: 27-Aug-21



Calibration Report

Multi-Parameter Water Quality Instrument

Customer:

Contact:

Manufacturer: YSI

Instrument: Professional Plus with Quatro cable

Serial #: 19L102399

Cable length: 1m

Item	Test	Pass	Comments
Battery	2 x Alkaline C-cells	✓	Voltage reading above 2.9V
	Battery Saver	✓	Automatically turns off after 30 minutes if not used
Connections	Condition	✓	Good, clean
Cable	Condition	✓	Clean, no tears
Display	Operation	✓	
Firmware	Version	✓	4.0.0
Keypad	Operational	✓	
Display	Screen	✓	
Unit	Condition, seals and O-rings	✓	
Monitor housing	Condition	✓	
pH			
Condition		✓	Good, clean
pH millivolts for pH7 calibration range 0 mV ± 50 mV		✓	
pH 4 mV range + 165 to + 180 from 7 buffer mV value		✓	172.80 mV
pH slope		✓	55 to 60 mV/pH, ideal 59mV 57.65
Response time < 90 seconds		✓	
Calibrated and conforms to manufacturer's specifications		✓	
ORP			
Condition		✓	Good, clean
Response time < 90 seconds		✓	
within ± 80mv of reference Zobell Reading		✓	
Calibrated and conforms to manufacturer's specifications		✓	variance range ± 20mV -3 mV
Conductivity			
Condition		✓	Good, clean
Temperature		✓	°C
Conductivity cell constant 5.0 ± 1.0 in GLP file		✓	
Clean sensor reads less than 3 uS/cm in dry air		✓	
Calibrated and conforms to manufacturer's specifications		✓	µs/cm
Dissolved Oxygen			
Condition		✓	Good, clean
DO sensor in use		✓	Galvanic
1.25 mil PE membrane (yellow membrane):		✓	
DO Sensor Value		✓	(min 4.31 uA - max 8.00 uA) Avg 6.15 uA
Calibrated and conforms to manufacturer's specifications		✓	ppm

This is to certify that the above instrument has been calibrated to the following specifications:

Parameter	Standards	Reference	Calibration Point	Span	Units	Instrument Readings		
						Before	After	Units
Temperature		Room Temp	24.6	0	°C	NA	24.6	°C
pH	pH 7.00	356684	7.01	-28.80	mV	7.08	7.01	pH
pH	pH 4.00	355385	4.00	144.00	mV	4.09	4.00	pH
Conductivity	2764 µs/cm at 25°C	20/1007	2764	GLP	5.06	2777	2764	µs/cm
ORP (Reference check only)	Zobell A & B	20/0506	230	230	mV	235.5	232.5	mV
Zero Dissolved Oxygen	NaSO3 in distilled water	10175	0.0	NA	NA	0.4	0.0	%
100% Dissolved Oxygen	100% Air Saturation	Air	100.0	6.51	uA	99	100.0	%

Calibrated by: Gaurav Kanwar

Calibration Date: 28-Feb-21

Next Due: 27-Aug-21

APPENDIX

E

DATA QUALITY REVIEW

Data Quality Review

PFAS Ongoing Monitoring Plan First Flush 2021 Factual Report

This appendix reviews the Quality Assurance (QA) and Quality Control (QC) documentation. Quality assurance encompasses the actions, procedures, checks and decisions undertaken to ensure sample integrity and representativeness, and the reliability and accuracy of analysis results. The QA documentation should also include an indication of the Data Quality Objectives sought in relation to each significant action, test or process involved in the assessment.

QC activities measure the effectiveness of the QA procedures by undertaking testing, and then comparing results to previously established objectives. QC work will include the internal laboratory testing as well as results of QC samples submitted such as trip blanks and duplicates. The quality of the information and/or data is deemed satisfactory when the QC results demonstrate that agreed objectives have been met.

QA/QC Aspects	Evidence & Evaluation
QA Documentation	
Project Quality Plan/Work Plan and Data Quality Objectives	<p>The field investigation was carried out on the 04 March 2021 and is in accordance with the proposed scope of work, as documented in the SAQP (PFAS OMP SAQP RAAF Base Learmonth, Cardno 2020) issued to the client and in general compliance with the Australian standards AS 4482.1- 2005 “<i>Guide to Sampling and Investigation of Potentially Contaminated Soil, Part 1: Non-volatile and Semi-volatile Compounds</i>”; Standards Australia 1998. AS/NZ 5667:1998 <i>Water quality – sampling</i> and NEPM “<i>National Environment Protection (Assessment of Site Contamination) Measure</i>”.</p> <p>A quality control program was implemented during the Investigation and the quality assurance procedures used have been reiterated in the report (First Flush 2021 Sampling Event Factual Report). In addition, a safety, health and environment work method statement (SHEWMS) was also prepared.</p> <p>The Data Quality Objectives were expressed in terms of the purpose of the assessment and the relevant assessment criteria.</p>
Data Representativeness	
Use of Composites	No Composites were used during the investigation
Holding Times	<p>Chain of custody and laboratory reports provide evidence of holding times. Holding times were generally in compliant with required timeframes. with the exception of the following:</p> <p>Surface water:</p> <ul style="list-style-type: none"> pH – generally 5 days overdue <p>Sediment:</p> <ul style="list-style-type: none"> No holding time outliers exist <p>The holding time exceedances for pH are due to the Site’s remoteness and are not considered to have adversely impacted the reliability of the results obtained, or the conclusions drawn from this assessment.</p>
Verification of field procedures	<p>The methodology conducted during this investigation is documented in the body of the report, and was in general conformance with the SAQP.</p> <p>Non-disposable equipment was decontaminated between sample locations.</p>

QA/QC Aspects	Evidence & Evaluation															
Data Precision & Accuracy																
QC sample Frequency	<table><tr><th>QC sample type</th><th>SAQP required frequency</th><th>Sample Collected</th></tr><tr><td>Blind duplicate</td><td>1 in 10 primary samples (10%)</td><td>2 for 19 primary water samples (10.5%) 5 for 49 primary sediment samples (10.2%)</td></tr><tr><td>Split duplicate</td><td>1 in 10 primary samples (10%)</td><td>2 for 19 primary water samples (10.5%) 5 for 49 primary sediment samples (10.2%)</td></tr><tr><td>Rinsate</td><td>1 per day per YSI</td><td>2 for 1 days (100%)</td></tr><tr><td>Field Blank</td><td>1 per day per sampler</td><td>2 for 1 days (100%)</td></tr></table>	QC sample type	SAQP required frequency	Sample Collected	Blind duplicate	1 in 10 primary samples (10%)	2 for 19 primary water samples (10.5%) 5 for 49 primary sediment samples (10.2%)	Split duplicate	1 in 10 primary samples (10%)	2 for 19 primary water samples (10.5%) 5 for 49 primary sediment samples (10.2%)	Rinsate	1 per day per YSI	2 for 1 days (100%)	Field Blank	1 per day per sampler	2 for 1 days (100%)
	QC sample type	SAQP required frequency	Sample Collected													
	Blind duplicate	1 in 10 primary samples (10%)	2 for 19 primary water samples (10.5%) 5 for 49 primary sediment samples (10.2%)													
	Split duplicate	1 in 10 primary samples (10%)	2 for 19 primary water samples (10.5%) 5 for 49 primary sediment samples (10.2%)													
	Rinsate	1 per day per YSI	2 for 1 days (100%)													
Field Blank	1 per day per sampler	2 for 1 days (100%)														
QC Testing – Blind Replicates (Primary Lab)	<div>RPD Acceptance Criteria:</div> <table><tr><th>Magnitude of Results</th><th>Acceptable RPD range</th></tr><tr><td>< 10 x LOR</td><td>No limits</td></tr><tr><td>10 – 20 LOR</td><td>0% - 50%</td></tr><tr><td>> 20 x LOR</td><td>0% - 20%</td></tr></table> <div>Surface water</div> <div><div>Number of Samples Analysed: 19</div><div>Duplicate Samples Analysed: 2</div><div>Percentage of RPDs Exceeding Criteria: 3.4%</div></div> <div>Sediment</div> <div><div>Number of Samples Analysed: 49</div><div>Duplicate Samples Analysed: 5</div><div>Percentage of RPDs Exceeding Criteria: 1.7%</div></div> <div>The level of RPD is generally minor and probably related to the low analyte concentrations of analyte pairs.</div>	Magnitude of Results	Acceptable RPD range	< 10 x LOR	No limits	10 – 20 LOR	0% - 50%	> 20 x LOR	0% - 20%							
	Magnitude of Results	Acceptable RPD range														
	< 10 x LOR	No limits														
	10 – 20 LOR	0% - 50%														
	> 20 x LOR	0% - 20%														
QC Testing – Field Splits (Secondary Lab)	<div>RPD Acceptance Criteria:</div> <table><tr><th>Magnitude of Results</th><th>Acceptable RPD range</th></tr><tr><td>< 10 x LOR</td><td>No limits</td></tr><tr><td>10 – 20 LOR</td><td>0% - 50%</td></tr><tr><td>> 20 x LOR</td><td>0% - 20%</td></tr></table> <div>Surface water</div> <div><div>Number of Samples Analysed: 19</div><div>Duplicate Samples Analysed: 2</div><div>Percentage of RPDs Exceeding Criteria: 6.0%</div></div> <div>Sediment</div> <div><div>Number of Samples Analysed: 49</div><div>Duplicate Samples Analysed: 5</div><div>Percentage of RPDs Exceeding Criteria: 5.8%</div></div> <div>The level of RPD is insignificant. The level of RPD is generally minor and probably related to the low analyte concentrations of analyte pairs and/or difference or methodologies between the primary and secondary laboratories.</div>	Magnitude of Results	Acceptable RPD range	< 10 x LOR	No limits	10 – 20 LOR	0% - 50%	> 20 x LOR	0% - 20%							
	Magnitude of Results	Acceptable RPD range														
	< 10 x LOR	No limits														
	10 – 20 LOR	0% - 50%														
	> 20 x LOR	0% - 20%														
Field Blanks	Field Blanks were collected at a rate of one per sampler per fieldwork day. All field blank samples tested reported analytes below the laboratory limit of reporting.															
Laboratory Internal QC	Evidence of the laboratories internal QC testing is present and complete in the reports. ALS (Primary) performed internal QC with adequate testing and															

QA/QC Aspects	Evidence & Evaluation
	<p>satisfactory results for method blank, laboratory control samples and surrogate recovery outliers.</p> <p>All Duplicates generally reported RPDs within the acceptance range of 0% to 20% with the exception of the following:</p> <ul style="list-style-type: none"> • EP2102261 <ul style="list-style-type: none"> ○ Exchangeable Calcium (22.5%) and Cation Exchange Capacity (21.0%). Client Sample ID: SD210. RPD exceeded LOR based limits <p>All Matrix Spikes generally reported recoveries within the acceptance range of 70% to 130% with the exception of the following:</p> <ul style="list-style-type: none"> • EP2102259 <ul style="list-style-type: none"> ○ PFOS. Client Sample ID: SS124. MS recovery not determined, background level greater than or equal to 4x spike level. • EP2102262 <ul style="list-style-type: none"> ○ Sulfate as SO₄, Chloride. Client Sample ID: Anonymous. MS recovery not determined, background level greater than or equal to 4x spike level. <p>Quality Control sample frequency was generally within the accepted rate with the exception of the following:</p> <ul style="list-style-type: none"> • EP2102262 <ul style="list-style-type: none"> ○ PFAS. Duplicate sample frequency Actual Rate (5.71%) < Expected rate (10%) ○ PFAS. MS sample frequency Actual rate (2.86%) < Expected Rate (5%)
Laboratory Method Detection Limit	<p>Laboratory reports indicate the method detection limits were generally lower than the respective assessment criteria.</p> <p>However, the PFAS NEMP Ecological criteria for 99% species protection for PFOS is below the LOR. In accordance with the HEPA (2020) guideline, the LOR was adopted in this instance.</p>
NATA endorsement of laboratory reports	<p>Laboratory reports were stamped with the NATA endorsement stamp and signature.</p> <p>ALS Accreditation No. 825</p> <p>Eurofins Accreditation No. 1261</p>
Calibration of Field Equipment	<p>All equipment used during the investigation was calibrated by the supplier prior to use.</p> <p>The equipment calibration certificates are provided in Appendix D.</p>
Decontamination and Equipment Blanks	<p>Rinsate blanks were collected at a rate of one per day each non dedicated water quality meter (YSI) used. All rinsate samples tested reported analytes concentrations below the laboratory LORs.</p>
Data Comparability	
Standard Procedures	<p>Fieldwork procedures are detailed in the SAQP and reports and are comparable for each phase of Investigation.</p>
Qualified Personnel	<p>Staff involved in managing and reviewing the project and those involved in fieldwork are qualified personnel.</p>
Sample Integrity	<p>Field Chain of Custody/Laboratory request forms can be found in Appendix C.</p>
Data Completeness	
Completeness of test program	<p>The scope of work undertaken was generally consistent with the SAQP.</p>
Validity of Data Set	<p>The data quality review indicates no significant systematic errors in the data collection process and therefore, the data set used as the basis for groundwater investigation is considered valid and complete.</p>

APPENDIX

F

INFORMATION ABOUT ENVIRONMENTAL REPORTS

About Site Environmental Assessment Reports

1. Introduction

This document explains the Environmental Site Assessment (ESA) process and the context that applies to the use of Environmental Reports issued by Cardno.

2. What is an ESA?

Environmental Site Assessments (ESA) are undertaken for a range of purposes, specific to the brief issued by the client in each case. The scope may include one or a combination of any of the following:

- ☐ A factual report of the condition of a portion of the site or one aspect of an entire site.
- ☐ Assessment of the contamination levels in soil to be removed from a site – a waste classification assessment.
- ☐ Validation of the success of remediation of a site or a portion of a site.
- ☐ Provision of a professional opinion about the suitability of a site for one or more uses, in terms of its contamination status.

The scope of any ESA needs to be defined at the outset.

An ESA is not an Environmental Audit. Such audits are undertaken in accordance with the provisions of regulations enacted in various states of Australia, and are referred to as Site Audits in some jurisdictions. Statutory audits provide certification by EPA accredited auditors that a site is suitable for one or more uses. An ESA may provide similar advice but cannot be used in place of an audit if the latter is required by regulation in any instance. However in some circumstances and jurisdictions an ESA is sufficient to provide “environmental sign-off” of a site.

An ESA may be undertaken for due diligence purposes, to establish whether the site has been impacted to the extent that some beneficial uses of the site may be precluded. Due diligence audits in many cases may be completed as non-statutory Audits, although in some jurisdictions they can also be statutory audits, if defined as such at the outset.

3. The ESA Process

The Client generally initiates the ESA process by specifying a brief which identifies the specific objectives of the assessment. If not, it is the consultants’ duty to so specify the ESA

In the case of an ESA to provide an opinion about the suitability of the site for use, it would be conducted in accordance with NEPM (Site Assessment). Such ESA would not commence until a thorough site history assessment (Phase 1 Assessment: to identify the potential for significant contamination at a site) is conducted. However, where the history is unclear, a broad screening of chemical parameters can be used to test environmental media. This normally includes a broad range of organic and inorganic compounds and elements, often referred to as an Environmental Screen.

(In the case of an ESA for a purpose other than to provide an opinion about the suitability of the site for use, it is not always necessary to undertake a Phase 1 assessment.)

The ESA requires sampling of soil at representative locations across the site. A NATA accredited laboratory performs the analysis of soil. It is impractical for all of the soil to be assessed. The ESA is often based on a statistical method of grid or random sampling, augmented by targeted sampling at locations known or suspected to be contaminated. Guidance on sampling strategy and density is provided in Australian Standard AS4482.1–2005. However, some considerable degree of judgement is still required in the application of any sampling and testing strategy. For example the blanket application of the “hot spot” method presented in this standard is often inappropriate given its limitations.

The field program also investigates the likelihood of contamination below the site surface. Field investigations must sample and test fill as well as the natural soils. If contamination is found then it is common for further work to be undertaken to characterise, to the extent practical, its vertical and horizontal extent. However, where fill is encountered and testing shows it to be uncontaminated, it must be realised that the heterogeneous nature of the material might mean that not all pockets of contaminated material can be detected using normal sampling regimes.

EPA guidelines for auditors, that may be relevant for an ESA, indicate the need in all cases to consider the potential for groundwater contamination in any site. This does not mean all sites need to be drilled to sample groundwater, but it is most often the case. Most hydrogeological settings and groundwater conditions are complex and vary in space and time. The condition of groundwater is investigated to identify if any beneficial use or environmental value of groundwater is precluded due to contamination.

As previously stated for soil, all groundwater at the site cannot be tested. The environmental investigations are conducted in accordance with industry standards and guidelines (e.g. EPA Vic Pub 668). This provides a level of confidence that a sufficiently comprehensive assessment of the groundwater at the site is achieved.

Where an investigation shows that groundwater is polluted, consideration should be given to assessing the risks and the need for and practicality of any clean up.

4. Environmental Assessment Report

The ESA Report details the findings of the ESA. It provides summary information on the site definition, the reasons for the assessment and other relevant facts. It reviews the scope and quality of the site investigations, laboratory testing and data analyses undertaken. These reports also present a review of the contamination status of the site, the need for any further clean up, and an opinion on the suitability of the site for a range of beneficial uses and land uses such as “residential – low density”, “commercial” etc, as appropriate.

However, as noted above, some ESA have a narrow scope such as for classification of waste soil for removal from site, and do not make conclusions on suitability of site for use.

The ESA Report generally includes copies of other documents and reports, necessary to support the assessment findings, presented as appendices. These can contain more detailed information than the body of the ESA Report. Care should be taken to also read the appended documents and the ESA report in full.

Cardno generally issues reports in electronic form (e-Report) on CD ROM. ESA Reports are issued in this format as Adobe Acrobat™ PDF files. However, a paper copy of the executive summary of the ESA Report is generally issued to the client, and others as required by the brief or by regulation.

5. Limitations of Environmental Assessment Report

The ESA Report is prepared in a manner that can be easily read by a lay person with a legitimate interest in the contamination status of the site, such as the site owner or occupier, EPA and Local Planning Authority. The ESA report is not intended for use by other parties or for other purposes. Anyone who uses the assessment report for purposes other than specified in the report, does so at their own risk.

The site should only be used for one or more of the beneficial uses and land uses identified in the ESA as suitable.

The conditions and qualifications may apply to the suitability of the site for use, and it is the responsibility of the Client to be cognizant of and accept these in accepting the report. Cardno are only responsible for the issuing of the ESA report but accepts no liability for the costs incurred in the implementation of ESA findings.

The ESA provides a “snapshot” of the site conditions at the time of the site investigation. Consequently, the report may not be valid at a later time if there has been any change to the contamination status of the site in that time. Verification of the status of the site may be required in cases where a significant time has elapsed, or site conditions have changed since the assessment and audit.

The ESA is necessarily limited by constraints such as time, cost and available information; although normal professional practice at the time has been applied with all due care to prepare the report. A necessary requirement of this process is the horizontal and vertical interpolation of data from discrete locations. However, site conditions are generally not homogenous and some discrepancies will occur between the actual and predicted results at locations not directly sampled. There is a risk that contamination may occur at the site and not be identified by a competent investigation and assessment. The approach adopted in sampling (a combination of statistically based grid and judgmental sampling) seeks to reduce, but cannot eliminate, this risk.

Where unexpected occurrences of contamination arise, subsequent to the issue of the ESA Report, Cardno should be permitted to make an interpretation of these facts in relation to the ESA Report findings. Consequently, the Client should inform Cardno and seek their opinion. Cardno accepts no liability for costs incurred due to such

unexpected occurrences, given the inherent uncertainties in the assessment process.

Cardno uses information provided by other parties as the basis for the ESA, and reliance on this information is at the discretion of Cardno. However, however Cardno cannot guarantee any of the facts, findings or conclusions presented by other parties. Cardno will not be liable for the use of information, provided by others that is subsequently found to be intentionally misleading.

The ESA Report is not and does not purport to be anything other than a contaminated land ESA. It is not a geotechnical report and bore logs reproduced are for interpretation of the likely distribution of contamination. They are not intended for geotechnical interpretations and may not be adequate for this purpose.

The ESA Report is not intended to be a comprehensive analysis of the presence and associated risk of asbestos in buildings and services. Where asbestos in buildings and services is known or likely, the report may only caution that an appropriately qualified person be engaged to undertake demolition to avoid contamination of the site.

Cardno

13 August 2015

PFAS OMP Biannual Monitoring Event Factual Report

June 2021

RAAF Learmonth

DEF19009



Prepared for
Department of Defence

9 August 2021

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This document is produced by Cardno solely for the benefit and use by the client in accordance with the terms of the engagement. Cardno does not and shall not assume any responsibility or liability whatsoever to any third party arising out of any use or reliance by any third party on the content of this document.

Our report is based on information made available by the client. The validity and comprehensiveness of supplied information has not been independently verified and, for the purposes of this report, it is assumed that the information provided to Cardno is both complete and accurate. Whilst, to the best of our knowledge, the information contained in this report is accurate at the date of issue, changes may occur to the site conditions, the site context or the applicable planning framework. This report should not be used after any such changes without consulting the provider of the report or a suitably qualified person.

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Chemical Names

DOC	Dissolved Organic Carbon
DO	Dissolved Oxygen
PFAS	Per- and Poly-fluoroalkyl Substances
PFHxS	Per-fluoro-hexane Sulphonate
PFOA	Per-fluoro-octanoic Acid
PFOS	Per-fluoro-octane Sulfonate
TDS	Total Dissolved Solids (salinity of water)
TOC	Total Organic Carbon
TSS	Total Suspended Solids

Technical Terms

AFFF	Aqueous Film-Forming Foam
AHD	Australian Height Datum
ANZECC	Australian and New Zealand Environment and Conservation Council
AS	Australian Standard
BGL	Below Ground Level
COC	Chain of Custody
DQI	Data Quality Indicator
DQO	Data Quality Objective
EC	Electrical Conductivity
EPA	Environment Protection Authority
ESA	Environmental Site Assessment
HIL	Health Investigation Level
HSL	Health Screening Level
LOR	Limit of Reporting
N/A	Not Applicable
NATA	National Association of Testing Authorities
NEPC	National Environment Protection Council
NEPM	National Environmental Protection Measure
QA	Quality Assurance
QC	Quality Control
RPD	Relative Percentage Difference
SAQP	Sampling and Analysis Quality Plan

Units

ha	Hectares
mBGL	Metres Below Ground Level
mbTOC	Metres below Top of Casing
mg/kg	Milligram per Kilogram (approximately equivalent to ppm)
mg/L	Milligram per Litre
µS/cm	Micro Siemens per Centimetre (Electrical Conductivity - Water)

Site Specific

OMP	Ongoing Monitoring Plan
FTG	Fire Training Ground
RAAF	Royal Australian Airforce

1 Introduction

1.1 Background

Cardno was engaged by the Australian Department of Defence (“the Client”) to carry out the Per- and Poly-Fluoroalkyl Substances (PFAS) Ongoing Monitoring Plan (OMP) biannual sampling event at the Royal Australian Airforce (RAAF) Learmonth (“the Site”). The Site is located approximately 30 km south of Exmouth, WA (Figure 1, Appendix A).

The OMP was carried out in accordance with the scope and limitations presented in Cardno’s Sampling and Analysis Quality Plan (SAQP):

- > Cardno, 14 June 2021, Reference: DEF19009, ‘PFAS Ongoing Monitoring Plan Sampling and Analysis Quality Plan (SAQP) RAAF Base Learmonth’.

The SAQP was reviewed and updated prior to the monitoring event.

For the purposes of this report:

- > “the Site” was defined as RAAF Base Learmonth.
- > “the Management Area” was defined as comprising the site, plus the land east of the Base, including the salt pan, drainage channels, Wapet Creek and extends to Exmouth Gulf (Figure 2, Appendix A).

1.2 Purpose & Objectives

The objective of the OMP is to assess the changes in the nature and extent of PFAS within the environment, specifically where there is an identified potentially elevated risk to a receptor or a potential future risk to a receptor associated with Defence’s historical use of legacy Aqueous Film Forming Foam (AFFF).

The purpose of this PFAS OMP factual report is to provide an up-to-date status of the condition of the site as it is currently understood in relation to the most recent sampling event.

The objectives of the report are:

- > To provide a succinct summary of the June 2021 sampling event and provision of analytical results with supporting tables and figures.
- > To provide confirmation of the current understanding of risk.
- > To provide supporting data for the assessment of management actions, where relevant.

1.3 Relevant Guidelines

This assessment has been undertaken in general accordance with applicable industry standards for a site investigation for the purpose, objectives and scope identified in this report. These standards are set out in:

- > National Environment Protection Council (NEPC), 1999, National Environmental Protection (Assessment of Site Contamination) Measure (as amended 2013) (ASC NEPM).
- > Heads of Environmental Protection Authority’s Australia and New Zealand (HEPA), January 2020, PFAS National Environmental Management Plan (NEMP) 2.0.
- > Australian Standard AS 4482-2005 Guide to the investigation and sampling of sites with potentially contaminated soils, Part 1 - Non-volatile and semi-volatile compounds.
- > Standards Australia 1998. AS/NZ 5667:1998 Water quality – sampling.
- > Australian and New Zealand Guidelines, 2018. Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

- > Department of Environment and Regulation (DER), 2014, Assessment and Management of Contaminated Sites¹.
- > Department of Defence, Department of Energy, 2018, Quality System Manual Schedule B15.
- > U.S. Environmental Protection Agency (EPA), 2000, 'Guidance for the Data Quality Objectives Process (EPA QA/G-4)'.
- > USEPA, 2002, 'Guidance on Environmental Data Verification and Data Validation (EPA QA/G-8)'.
- > National Health and Medical Research Council (NHMRC), August 2019, Guidance on Per and Polyfluoroalkyl Substances (PFAS) in Recreational Water.

2 Scope of Work

Cardno carried out the tasks detailed in the following sections in order to satisfy the purpose and objectives of this assessment.

2.1 Groundwater Monitoring

Sampling of selected groundwater bores was performed in accordance with the SAQP, applying methods set out in Section 3 of this report. The groundwater bores monitored as part of the OMP are presented in Table 2-1, and are shown on Figure 4, Appendix A.

Table 2-1 Groundwater Monitoring Locations

Monitoring Area	Location ID
Source Area 1 – Maintenance Area	0960_MW114, 0960_MW021, 0960_MW113, 0960_MW211, 0960_MW162, 0960_MW163, 0960_MW018, 0960_MW164, 0960_MW165, 0960_MW166, 0960_MW167, 0960_MW168, 0960_MW112, 0960_MW115., 0960_MW233
Source Area 2 – Fuel Farm	0960_MW016, 0960_MW105, 0960_MW148D, 0960_MW148S, 0960_MW151, 0960_MW159.
Pathway	0960_MW122, 0960_MW146, 0960_MW147, 0960_MW180, 0960_MW181, 0960_MW172, 0960_MW170, 0960_MW127, 0960_MW126, 0960_MW139, 0960_MW140, 0960_MW102, 0960_MW138, 0960_MW145, 0960_MW103, 0960_MW104, 0960_MW134, 0960_MW135, 0960_MW175, 0960_MW124, 0960_MW144, 0960_MW143.
Receptor	0960_MW137, 0960_MW176, 0960_MW177, 0960_MW178, 0960_MW179, 0960_MW141.

2.2 Seepage Water Monitoring

Sampling of selected seepage water monitoring locations was performed in accordance with the SAQP, applying methods set out in section 3 of this report. The seepage water locations monitored as part of the OMP are presented in Table 2-2 and are shown on Figure 4, Appendix A.

Table 2-2 Seepage Water Monitoring Locations

Monitoring Area	Location ID
Seepage	0960_OTH132, 0960_OTH134, 0960_OTH129, 0960_OTH103, 0960_OTH106, 0960_OTH107.

¹ It is noted that Site is located on Commonwealth Land and is regulated under the Commonwealth environmental legislation, the State based DWER guidelines are relevant for the sampling of off-Site private properties and waterways.

2.3 Surface water Monitoring

Sampling of selected surface water monitoring locations was performed in accordance with the SAQP, applying methods set out in Section 3 of this report. The surface water locations monitored as part of the OMP are presented in Table 2-3 and are shown on Figure 5, Appendix A.

Table 2-3 Surface water Monitoring Locations

Monitoring Area	Location ID
Drainage channels	SW219, SS234, SS235, SW114, SS113, SS231, SS157, SW265, SW189, SS190, SW288, SW193, SS192, SS198, SW293, SS292, SW291, SS227, SS108, SS170, SS168, SS279, SS166, SS243, SS174, SW121, SW122, SS124, SS277, SS125, SS278, SS176, SW123, SW199, SW200, SW298.
WAPET Creek	SW211, SW300, SW210, SW001, SW302, SW303, SW209, SW304, SW305, SW207, SW208, SW205, SW301.

2.4 Sediment Monitoring

Sampling of selected sediment (or shallow soil if dry) monitoring locations was performed in accordance with the SAQP, applying methods set out in Section 3 of this report. The sediment locations monitored as part of the OMP are presented in Table 2-4 and are shown on Figure 6, Appendix A.

Table 2-4 Sediment Monitoring Locations

Monitoring Area	Location ID
Drainage channels	SD219, SS234, SS235, SS114, SS113, SS231, SS157, SS265, SS189, SS190, SS288, SS193, SS192, SS198, SS293, SS292, SS291, SS227, SS108, SS170, SS168, SS279, SS166, SS243, SS174, SS121, SS122, SS124, SS277, SS125, SS278, SS176, SS123, SD199, SD200, SS298.
WAPET Creek	SD211, SD300, SD210, SD301, SD302, SD303, SD209, SD304, SD305, SD207, SD208, SD205, SS301.

Note: 'SS' prefix indicates a shallow soil (dry) location, 'SD' prefix a sediment (wet) location

2.5 Data Management

All the data included in the Report has been collected, uploaded to the ESdat database and reviewed according to the data management requirements of the Defence Contamination Management Manual (DCMM) Annex L.

The sample naming convention detailed in the DCMM Annex L was used in the field.

2.5.1 Defence ESdat database

Data collected as part of the June 2021 OMP monitoring event was uploaded to the ESdat database according to the data management requirements of the DCMM Annex L, including:

- > All field data collected was uploaded;
- > Laboratory data was uploaded and approved; and
- > QA/QC data was reconciled.

2.6 Deviations from the OMP SAQP

Deviations from the SAQP (Cardno, 2021) for the June 2021 monitoring event are presented in Table 2-5.

Table 2-5 Summary of deviations from the OMP SAQP

Location	Deviation	Comments
SW199, SW219, SS108, SS113, SW114, SW121, SW122, SW123, SS124, SS125, SS157, SS166, SS168, SS170, SS174, SS176, SW192, SS198, SW199, SS231, SS234, SS235, SS243, SS277, SS278, SS279, SW291, SS292, SW293, SS227.	Not sampled	These surface water monitoring locations were found dry

Location	Deviation	Comments
SW/SS301	Sampled ~300m to the west of monitoring location	Area not accessible due to flooding. Contingency location is still located within the Southern drainage channel pathway.

3 Methodology

3.1 Groundwater Sampling Methodology

Groundwater monitoring was undertaken applying the methods detailed in Table 3-1.

Table 3-1 Groundwater Sampling Method

Activity	Details
Well Gauging	Standing Water Level (SWL) were gauged using an interface probe. All wells were measured against a specified mark at the top of the well casing.
Groundwater Field Parameters	<p>Groundwater field parameters were recorded via a down-hole water quality meter (positioned within the mid screen interval) prior to deployment of HydraSleeves® or pre-sample collection. The following field parameters were recorded using a water quality meter:</p> <ul style="list-style-type: none"> pH. electrical conductivity (EC). oxidation reduction potential (ORP). Dissolved oxygen (DO). Temperature. <p>Once field parameters have stabilised (as indicated by at least three consecutive measurements falling within +/- 10% of each other) measurement were recorded on field data records.</p> <p>All field instruments (e.g. water quality meter) were calibrated by the equipment supplier and reading of reference solutions (bump tests) undertaken daily in the field to optimise the accuracy of the measurements taken. Calibration certificates and bump tests records are provided in Appendix D.</p>
Deployment and Retrieval of HydraSleeves (single level well sample collection)	<p>HydraSleeve were deployed with top weight sample collection to begin at the lowest point. HydraSleeve sampling devices were left in wells for a minimum of 12 hours to allow restabilisation of the well following the slight disturbance caused by sampler deployment.</p> <p>Samples were collected via continuous pull method at a rate allowing the water to pass through the check valve into the sample sleeve.</p> <p>Samples were discharged immediately (minimise changes in chemistry) via discharge tube.</p> <p>Following sampling, hydrasleeves were deployed in preparation for the next OMP monitoring event using the same string for consistency between event (same depth of sampling i.e. within screen).</p>
Peristaltic pump (multi-level wells sample collection)	<p>The shallowest (non-dry) wells were sampled at each multi-level well location, using Teflon-free dedicated and disposable high-density polyethylene (HDPE) tubing coupled to a peristaltic pump system. The groundwater was purged at a low flow rate of 0.2 mL/min.</p> <p>SWL and field parameters were measured during purging and post sample collection to ensure limited drawdown effects. The groundwater was sampled when the field parameters had stabilised.</p>
Decontamination procedure	<p>Dedicated HydraSleeves/tubing were used at each groundwater bore thus removing the need for decontamination.</p> <p>All re-usable sampling equipment was thoroughly washed using PFAS & phosphate-free detergent, then double rinsed with clean water before the sample collection.</p>

Activity	Details
Sample identification, preservation transport and holding times	<p>Each sample was labelled with the sample location, date, project identification number and sampler's initials.</p> <p>Samples were collected directly into appropriately preserved laboratory supplied bottles (Teflon-free) and packed in chilled containers for delivery to the laboratory under Chain of Custody (CoC) documentation.</p> <p>Sample containers, preservation procedures, sample storage requirements and holding times were undertaken in accordance with those recommended by Standards Australia (AS/NZS 5667.1:1998 and AS 4482.1 as appropriate).</p>
Laboratory Testing	<p>Groundwater samples were submitted for the following analysis:</p> <ul style="list-style-type: none"> Full PFAS analytical suite (refer to the SAQP for full list of analytes). Major anions and cations (include calcium, magnesium, sodium, potassium, chloride, sulfate, alkalinity and ionic balance). Dissolved organic carbon (DOC), total suspended solids (TSS), total dissolved solids (TDS) and pH. <p>The primary laboratory was ALS Global Laboratories (Perth), and the secondary laboratory (quality control) was Eurofins (Perth). Both laboratories are NATA-accredited for the parameters tested. Copies of the NATA stamped laboratory reports and Chain of Custody documentation are included in Appendix D.</p>
Laboratory Testing – Quality Control	<p>Groundwater QC samples were collected at the following frequencies as detailed in the SAQP (Cardno, 2021):</p> <ul style="list-style-type: none"> Field duplicate (intra-laboratory) samples at 1 per 10 water samples or 1 per batch if the batch is less than 10 samples. Field triplicate (inter-laboratory) samples at 1 per 10 water samples and sent to a secondary laboratory. Rinsate blank sample at 1 per day [collected off re-used sampling equipment (e.g. interface probe)]. Field blank samples at 1 per day.

3.2 Seepage Water Sampling Methodology

Seepage water monitoring procedure is detailed in Table 3-2.

Table 3-2 Seepage water Sampling method

Activity	Details
Field parameters	<p>The following field parameters were recorded using a water quality meter:</p> <ul style="list-style-type: none"> pH. electrical conductivity (EC). oxidation reduction potential (ORP). Dissolved oxygen (DO). Temperature. <p>Field observations such as water flow, odours or sheen presence were also recorded on field sampling sheets.</p>
Sampling Method	<p>Sampling was carried out in a two-hour period; one hour each side of the low tide. Sampling protocol involved a shallow excavation in the beach sand; just above where inundation by wave action is occurring.</p> <p>Sampling containers were be lowered into the exposed seepage water and filled.</p>
Decontamination procedure	<p>All re-usable sampling equipment was thoroughly washed using PFAS & phosphate-free detergent, then double rinsed with clean water before the sample collection.</p>
Sample identification, preservation transport and holding times	<p>Each sample was labelled with the sample location, date, project identification number and sampler's initials.</p> <p>Samples were collected directly into appropriately preserved laboratory supplied bottles (Teflon-free) and packed in chilled containers for delivery to the laboratory under CoC documentation.</p>

Activity	Details
	Sample containers, preservation procedures, sample storage requirements and holding times were undertaken in accordance with those recommended by Standards Australia (AS/NZS 5667.1:1998 and AS 4482.1 as appropriate).
Laboratory Testing	<p>Seepage water samples were submitted for the following analysis:</p> <ul style="list-style-type: none"> Full PFAS analytical suite (refer to the SAQP for full list of analytes). Major anions and cations (include calcium, magnesium, sodium, potassium, chloride, sulfate, alkalinity and ionic balance). DOC, TSS, TDS and pH.
Laboratory Testing – Quality Control	<p>Seepage water QC samples were collected at the following frequencies as detailed in the SAQP (Cardno, 2021):</p> <ul style="list-style-type: none"> Field duplicate (intra-laboratory) samples at 1 per 10 water samples or 1 per batch if the batch is less than 10 samples. Field triplicate (inter-laboratory) samples at 1 per 10 water samples and sent to a secondary laboratory.

3.3 Surface Water Sampling Methodology

Surface water monitoring procedure is detailed in Table 3-3.

Table 3-3 Surface water Sampling Method

Activity	Details
Field parameters	<p>The following field parameters were recorded using a water quality meter:</p> <ul style="list-style-type: none"> pH. electrical conductivity (EC). oxidation reduction potential (ORP). Dissolved oxygen (DO). Temperature. <p>Field observations such as water flow, odours or sheen presence were also recorded on field sampling sheets.</p>
Sampling Method	<p>Surface water samples were collected directly into sample containers using a 'Grab' (manual) sample method via a long handled sampling device.</p> <p>Where depth permits, the sample container was positioned at least 10 cm below the surface water level and above the sediment bed and oriented with the capped opening facing downwards to avoid the collection of surface films.</p>
Decontamination procedure	<p>All re-usable sampling equipment was thoroughly washed using PFAS & phosphate-free detergent, then double rinsed with clean water before the sample collection.</p>
Sample identification, preservation transport and holding times	<p>Each sample was labelled with the sample location, date, project identification number and sampler's initials.</p> <p>Samples were collected directly into appropriately preserved laboratory supplied bottles (Teflon-free) and packed in chilled containers for delivery to the laboratory under CoC documentation.</p> <p>Sample containers, preservation procedures, sample storage requirements and holding times were undertaken in accordance with those recommended by Standards Australia (AS/NZS 5667.1:1998 and AS 4482.1 as appropriate).</p>
Laboratory Testing	<p>Surface water samples were submitted for the following analysis:</p> <ul style="list-style-type: none"> Full PFAS analytical suite (refer to the SAQP for full list of analytes). Major anions and cations (include calcium, magnesium, sodium, potassium, chloride, sulfate, alkalinity and ionic balance). DOC, TSS, TDS and pH.
Laboratory Testing – Quality Control	<p>Surface water QC samples were collected at the following frequencies as detailed in the SAQP (Cardno, 2021):</p> <ul style="list-style-type: none"> Field duplicate (intra-laboratory) samples at 1 per 10 water samples or 1 per batch if the batch is less than 10 samples.

Activity	Details
	<ul style="list-style-type: none"> Field triplicate (inter-laboratory) samples at 1 per 10 water samples and sent to a secondary laboratory.

3.4 Sediment Sampling Methodology

Sediment sampling methodology is detailed in Table 3-4.

Table 3-4 Sediment Sampling Method

Activity	Details
Sample Collection	<p>Sediment samples were collected at the sediment/water interface using hand tools (e.g. trowel, hand auger, PVC pipe etc.) with samples placed directly into appropriately labelled, laboratory supplied sample containers and packed in chilled containers for delivery to the laboratory under CoC documentation.</p> <p>At each sampling location, the sediment sample was visually assessed and observations (including physical description) recorded on field data sheets.</p>
Field Records	<p>The following information was recorded on the field data sheets:</p> <ul style="list-style-type: none"> Sampling time, date and name of the sampler. Weather conditions. Sample Collection method. Sampling equipment decontamination procedures where non-disposable sampling equipment is utilised.
Decontamination	<p>All re-usable sampling equipment was thoroughly washed using PFAS & phosphate-free detergent, then double rinsed with clean water before the sample collection.</p>
Laboratory Testing	<p>Sediment samples were submitted for the following analysis:</p> <ul style="list-style-type: none"> Full PFAS analytical suite (refer to the SAQP for full list of analytes). Total organic content (TOC), EC, cation exchange capacity (CEC) and pH
Laboratory Testing – Quality Control	<p>Sediment QC samples were collected at the following frequencies as detailed in the SAQP (Cardno, 2021):</p> <ul style="list-style-type: none"> Field duplicate (intra-laboratory) samples greater than 1 per 20 sediment samples or 1 per batch if the batch is less than 20 samples. Field triplicate (inter-laboratory) samples greater than 1 per 20 sediment samples and sent to a secondary laboratory.

3.5 Quality Control / Quality Assurance

A critical aspect of site assessments is the demonstration of the quality of the data used as the basis for the assessment. This is achieved through a Data Validation process which includes a review of the following data quality indicators, as described in the SAQP:

- > QA documentation.
- > Bias.
- > Data Representativeness.
- > Data Precision & Accuracy.
- > Laboratory Performance.
- > Data Comparability.
- > Data Set Completeness.

A detailed review of these aspects has been undertaken, the results of which are presented in Appendix E.

The QA/QC review concluded that there are no significant systematic errors in the data collection process and therefore, the dataset used for the assessment is considered valid and complete.

3.6 Assessment Criteria

3.6.1 Groundwater, Seepage water and surface water

The adopted assessment criteria for groundwater are detailed in Table 3-5.

Table 3-5 Criteria for groundwater, seepage water and surface water

Exposure Scenario	Adopted Assessment Criteria		Guidance
	PFHxS / PFOS µg/L	PFOA	
Human Health – Recreational Water	2 ¹	10	NHMRC 2019, HEPA 2020
Ecological – 99% species protection	0.00023 ²	19	HEPA 2020
<ol style="list-style-type: none"> Sum of PFOS and PFHxS. PFOS only; Practical screening guideline of 0.01 µg/L is based on typical current laboratory limit of reporting. Therefore, it should be noted that warning and action levels would not be relevant until the detection limits are reduced or the screening levels are increased (HEPA 2020). 			

3.6.2 Sediment

The adopted assessment criteria for sediment are detailed in Table 3-6.

Table 3-6 Criteria for Sediment

Exposure Scenario	Adopted Assessment Criteria		Guidance
	PFHxS / PFOS mg/kg	PFOA	
Human Health - Commercial / industrial (on-base activities)	20 ¹	50	HEPA 2020
Ecological – Direct exposure (interim guidelines)	1 ²	10	HEPA 2020
Ecological - indirect exposure (interim guidelines)	0.01 ²	-	HEPA 2020
<ol style="list-style-type: none"> Sum of PFOS and PFHxS. PFOS only 			

4 Field Observations and Results

4.1 General Site Observations

A significant rainfall event occurred in Exmouth on the 10th June with 173.4mm of rain recorded at the Exmouth Town BoM station (No. 5051). Even though only 28.4 mm were recorded at the Learmonth Airport BoM station (No. 5007) on that day, surface water was observed pooling in Wapet Creek and in the off-Site northern and southern drainage channels which resulted in more surface water samples collected than during the June 2020 monitoring event. None of the groundwater monitoring wells was found dry during the June 2021 monitoring event, conducted on 23-24 June 2021.

4.2 Groundwater

4.2.1 Summary of Field Observations

4.2.1.1 Physicochemical parameters

Stabilised physicochemical parameters, water colour and turbidity observations recorded during the groundwater sampling program are presented in field sampling records, included in Appendix D. Groundwater was fresh to hyper saline (TDS ranging from 808 mg/L to 66,950 mg/L), acidic to near neutral

(pH ranging 5.8 to 8.3). Groundwater temperature was on average 25°C, DO readings mostly indicate aerobic groundwater condition (DO ranging from 0.45 mg/L to 16.2 mg/L). Field parameters were generally consistent with the previous monitoring event.

4.2.1.2 Groundwater Elevation and Migration

Well gauging was undertaken over two days and several tide cycles which has been considered when interpreting inferred groundwater contours and flow direction.

Groundwater elevation ranged from -0.2 mAHD (MW179) to 1.7 mAHD (MW143). Depth to groundwater was observed to range approximately between 1 meter below ground level (mbgl) and 5 mbgl.

Groundwater flow beneath the Base was interpreted to be generally easterly, towards the Exmouth Gulf, consistent with the previous monitoring events. Groundwater is inferred to flow towards an area of groundwater depression that lies between the Base and the coast. Groundwater elevation in wells closer to the shore might be influenced by tidal effects.

Groundwater elevation contours and flow direction are shown in Figure 3, Appendix A. Gauging records are presented in Appendix D.

4.2.2 Groundwater Laboratory Results

The results of laboratory analysis have been compared against adopted assessment criteria. Tabulated analytical results including non-PFAS analytes are provided within Appendix B. A summary of results exceeding the adopted criteria is presented in Table 4-1. Laboratory results have also been compared to available historical data in order to identify monitoring wells where a first-time detection of Sum of PFOS and PFHxS or PFOA; or a new exceedance of guideline values were reported. Figure 4 in Appendix A presents the groundwater monitoring locations. The laboratory reports are provided in Appendix C.

Table 4-1 Summary of Groundwater Results Exceeding Adopted Criteria

Analytes	Locations Exceeding Criteria	Lowest Criteria (µg/L)	Max Conc. (µg/L)	No. Analytical Results ¹	No. Results Above Criteria
PFOA	-	10 ²	2.30 (MW016)	49	0
PFOS	MW016, MW018, MW021, MW105, MW112, MW115, MW138, MW139, MW148D, MW148S, MW151, MW162, MW163, MW164, MW165, MW166, MW167, MW168, MW172, MW175, MW211, MW233	0.01 ³	25.3 (MW016)	49	22
Sum of PFHxS and PFOS	MW016, MW148D, MW148S, MW151, MW162, MW163, MW164, MW172, MW211, MW233	2 ²	82.2 (MW016)	49	10

Notes:

1. Non-inclusive of quality control samples
2. HEPA 2020 guideline value for human health – Recreational Use
3. HEPA 2020 guideline value for ecological 99% species protection (LOR adopted)

Findings are summarised as follows:

- > There was no first time detection of PFOA or the sum of PFOS and PFHxS for any of the groundwater monitoring locations.
- > No new exceedance of a guideline value was reported for any of the groundwater monitoring locations.

4.3 Seepage Water

4.3.1 Summary of Field Observations

Stabilised physiochemical parameters, water colour and turbidity observations recorded during the groundwater sampling program are presented in field sampling record sheets, included in Appendix D. Seepage water temperature was on average 17°C, DO readings indicate aerobic conditions, pH was near

neutral and TDS indicates saline water. Field parameters were generally consistent with the previous monitoring event.

4.3.2 Laboratory Results

The results of laboratory analysis have been compared against adopted assessment criteria. Tabulated analytical results including non-PFAS analytes are provided within Appendix B. A summary of results is presented in Table 4-2. Laboratory results have also been compared to available historical data in order to identify monitoring wells where a first-time detection of Sum of PFOS and PFHxS or PFOA; or a new exceedance of guideline values were reported. Figure 4 in Appendix A presents the seepage water monitoring locations. The laboratory reports are provided in Appendix C.

Table 4-2 Summary of Seepage water Results Exceeding Adopted Criteria

Analytes	Locations Exceeding Criteria	Lowest Criteria (µg/L)	Max Conc. (µg/L)	No. Analytical Results ¹	No. Results Above Criteria
PFOA	-	10 ²	<0.01	6	0
PFOS	-	0.01 ³	<0.01	6	0
Sum of PFHxS and PFOS	-	2 ²	<0.01	6	0

Notes:

1. Non-inclusive of quality control samples
2. HEPA 2020 guideline value for human health – Recreational Use
3. HEPA 2020 guideline value for ecological 99% species protection (LOR adopted)

Findings are summarised as follows:

- > All seepage water samples analysed reported PFAS concentrations below the laboratory LOR.
- > There was no first time detect of PFOA or Sum of PFOS and PFHxS or new exceedance of guideline values at the seepage water monitoring locations during the June 2021 monitoring event.

4.4 Surface water

4.4.1 Summary of Field Observations

Stabilised physiochemical parameters, water colour and turbidity observations recorded during the groundwater sampling program are presented in field sampling record sheets, included in Appendix D. Field parameters were generally consistent with the previous monitoring events. pH was near neutral, water condition was aerobic and fresh to hyper saline (TDS ranging from 879 to 43,940 mg/L).

4.4.2 Laboratory Results

The results of laboratory analysis have been compared against adopted assessment criteria. Tabulated analytical results including non-PFAS analytes are provided within Appendix B. A summary of results exceeding the adopted criteria is presented in Table 4-3. Laboratory results have also been compared to available historical data in order to identify monitoring wells where a first-time detection of Sum of PFOS and PFHxS or PFOA; or a new exceedance of guideline values were reported. Figure 5 in Appendix A presents the surface water monitoring locations. The laboratory reports are provided in Appendix C.

Table 4-3 Summary of Surface water Results Exceeding Adopted Criteria

Analytes	Locations Exceeding Criteria	Lowest Criteria (µg/L)	Max Conc. (µg/L)	No. Analytical Results ¹	No. Results Above Criteria
PFOA	-	10 ²	<0.01	19	0
PFOS	SW189, SW190, SW210, SW300, SW265	0.01 ³	0.45 (SW189)	19	5
Sum of PFHxS and PFOS	-	2 ²	0.45 (SW189)	19	0

Notes:

1. Non-inclusive of quality control samples
2. HEPA 2020 guideline value for human health – Recreational Use
3. HEPA 2020 guideline value for ecological 99% species protection (LOR adopted)

Findings are summarised as follows:

- > 14 out of 19 surface water samples reported PFAS concentrations below the laboratory LOR.
- > No first time detect of PFOA or Sum of PFOS and PFHxS or new exceedance of a guideline value were reported for the surface water monitoring locations during the June 2021 monitoring event.

4.5 Sediment

4.5.1 Summary of Field Observations

Observations recorded during the sediment sampling program are provided in the field sampling record sheets within Appendix D.

4.5.2 Laboratory Results

The results of laboratory analysis have been compared against adopted assessment criteria. Tabulated analytical results including non-PFAS analytes are provided within Appendix B. Soil criteria are adopted in the absence of criteria for sediment for consistency with the SAQP (Cardno, June 2021), DSI (GHD, 2018) and ERA (GHD, 2019). A summary of results exceeding the adopted criteria is presented in Table 4-4. Laboratory results have also been compared to available historical data in order to identify monitoring wells where a first-time detection of Sum of PFOS and PFHxS or PFOA; or a new exceedance of guideline values were reported. Figure 6 in Appendix A presents the sediment monitoring locations.

Table 4-4 Summary of Sediment Results Exceeding Adopted Criteria

Analytes	Locations Exceeding Criteria	Lowest Criteria (mg/kg)	Max Conc. (mg/kg)	No. Analytical Results ¹	No. Results Above Criteria
PFOA	-	10 ²	0.0003 (SS122)	49	0
PFOS	SS121, SS123, SS124, SS125, SS174, SS227, SS231, SS234, SS235, SS279, SS293.	0.01 ³	0.0766 (SS124)	49	11
Sum of PFHxS and PFOS	-	20 ⁴	0.0766 (SS124)	49	0

Notes:

1. Non-inclusive of quality control samples
2. Ecosystems – all land uses – Direct exposure (HEPA, 2020)
3. Ecosystems – all land uses – Indirect exposure (HEPA, 2020)
4. Human health – Commercial/Industrial (HEPA, 2020)

Findings are summarised as follows:

- > SS279 (Site drainage channels, northeast of maintenance area) and SS293 (off-Site, central drainage channel) reported a new exceedance of the HEPA (2020) ecological criteria for indirect exposure for

PFOS (0.01 mg/kg). These monitoring locations had previously reported detectable concentrations of PFOS.

- > No first time detection of PFOA or the sum of PFOS and PFHxS were reported at any of the sediment monitoring locations during June 2021.

4.6 Changes to the Monitoring Network Condition

Groundwater monitoring bore MW021 gatic lid cover was concealed by dirt and rocks. It is noted that this bore wasn't found during the November 2020 monitoring event (noted 'covered by recent earthworks'). No other changes to the monitoring network condition were noted during this sampling event.

5 Summary and Conclusions

Cardno undertook the June 2021 groundwater, seepage water, surface water and sediment monitoring event at RAAF Base Learmonth as part of the PFAS OMP. Groundwater sampling and testing was undertaken at 49 monitoring bores, 19 surface water locations, six (6) seepage water locations and 49 sediment monitoring locations. 30 surface water monitoring locations could not be sampled as these were found dry.

Groundwater levels were gauged in all wells before sampling. Groundwater is inferred to flow towards an area of groundwater depression that lies between the Base and the coast.

The groundwater laboratory results reported the following:

- > Of the 49 samples that were tested, PFOS (22 samples) and Sum of PFHxS and PFOS (10 samples) reported concentrations that exceeded the HEPA (2020) ecological guideline value for 99% protection species and HEPA (2020) guideline value for recreational use respectively.
- > There was no first time detection of PFOA or the sum of PFOS and PFHxS for any of the groundwater monitoring locations.
- > No new exceedance of a guideline value was reported for any of the groundwater monitoring locations.

The seepage water laboratory results reported the following:

- > All seepage water samples analysed reported PFAS concentrations below the laboratory LOR.
- > There was no first time detect of PFOA or Sum of PFOS and PFHxS or new exceedance of guideline values at the seepage water monitoring locations during the June 2021 monitoring event.

The surface water laboratory results reported the following:

- > Of the 19 surface water samples that were tested, PFOS (5 samples) reported concentrations that exceeded the HEPA (2020) ecological guideline value for 99% protection species.
- > 14 out of 19 surface water samples reported PFAS concentrations below the laboratory LOR.
- > No first time detect of PFOA or Sum of PFOS and PFHxS or new exceedance of a guideline value were reported for the surface water monitoring locations during the June 2021 monitoring event.

The sediment laboratory results reported the following:

- > Of the 49 sediment samples that were tested, PFOS (11 samples) reported concentrations that exceeded the HEPA (2020) ecological indirect exposure criteria.
- > SS279 (Site drainage channels, northeast of maintenance area) and SS293 (off-Site, central drainage channel) reported a new exceedance of the HEPA (2020) ecological criteria for indirect exposure for PFOS (0.01 mg/kg). These monitoring locations had previously reported detectable concentrations of PFOS.
- > No first time detection of PFOA or the sum of PFOS and PFHxS were reported at any of the sediment monitoring locations during June 2021.

PFAS concentrations were generally within the historical range for all media sampled, with the exceptions reported above.

It is recommended that a cone or peg is placed near monitoring bore MW021 to prevent losing/blocking this bore in the future.

The next OMP sampling event for RAAF Base Learmonth will be the November 2021 monitoring event.

6 References

General References

1. Australian Standard AS 4482-2005 Guide to the investigation and sampling of sites with potentially contaminated soils, Part 1 – Non-volatile and semi-volatile compounds.
2. Australian Standard AS 4482-1999 Guide to the investigation and sampling of sites with potentially contaminated soils, Part 2 – Volatile substances.
3. Australian Water Quality Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ, 2000).
4. *Contaminated Sites Act 2003*, Western Australia.
5. Department of Defence, May 2021, PFAS OMP Factual Report Guidance Version 0.2.
6. Department of Defence, July 2018 amended August 2019, *Contamination Management Manual*, Annex L *Guidance on Data Management*.
7. Department of the Environment and Energy (2017) in the National Greenhouse and Energy Reporting Scheme Measurement Technical Guidelines for the Estimation of Emissions by Facilities in Australia.
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APPENDIX

A

FIGURES



Legend

 Management Area


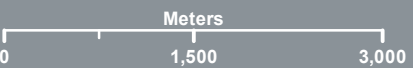
 RAAF Learmonth

FIGURE 1
1:60,000 Scale at A3



Site Location

BIANNUAL SAMPLING EVENT
RAAF BASE LEARMONTH
DEPARTMENT OF DEFENCE



Map Produced by Cardno WA
Date: 2021-07-12 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0960-GS-001_RegionalLocation 02.mxd
Aerial Imagery Supplied by Google Earth

1a	Maintenance Area (Source Area)
1b	Pathway (site drains and groundwater)
1c	Pathway (groundwater)
1d	Southern Drainage Channel (Pathway)
1e	Central Drainage Channel (Pathway)
1f	Southern reach of WAPET Creek (Receptor)
1g	Northern reach of WAPET Creek (Receptor)
2a	Fuel Farm (Source Area)
2b	Fuel Farm (Pathway)
2c	Northern Drainage Channel (Pathway)
3a	Pathway (groundwater)
3b	Site drains (Pathway)

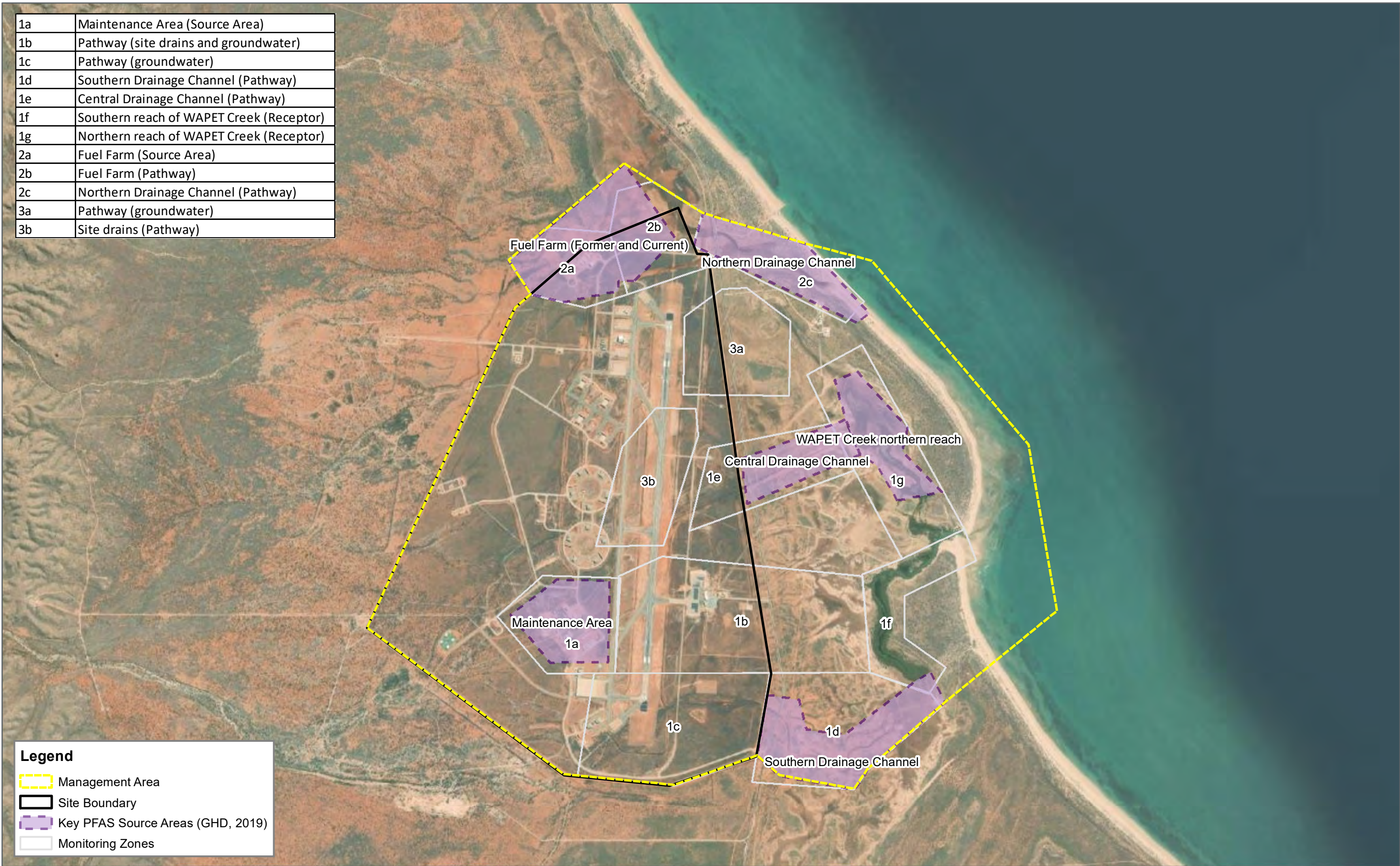
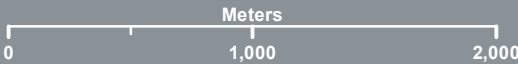


FIGURE 2
1:31,000 Scale at A3



Management Area

BIANNUAL SAMPLING EVENT
RAAF BASE LEARMONTH
DEPARTMENT OF DEFENCE



Map Produced by Cardno WA
Date: 2021-08-09 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0960-GS-002_ManagementAreas 02.mxd
Aerial Imagery Supplied by Google Earth

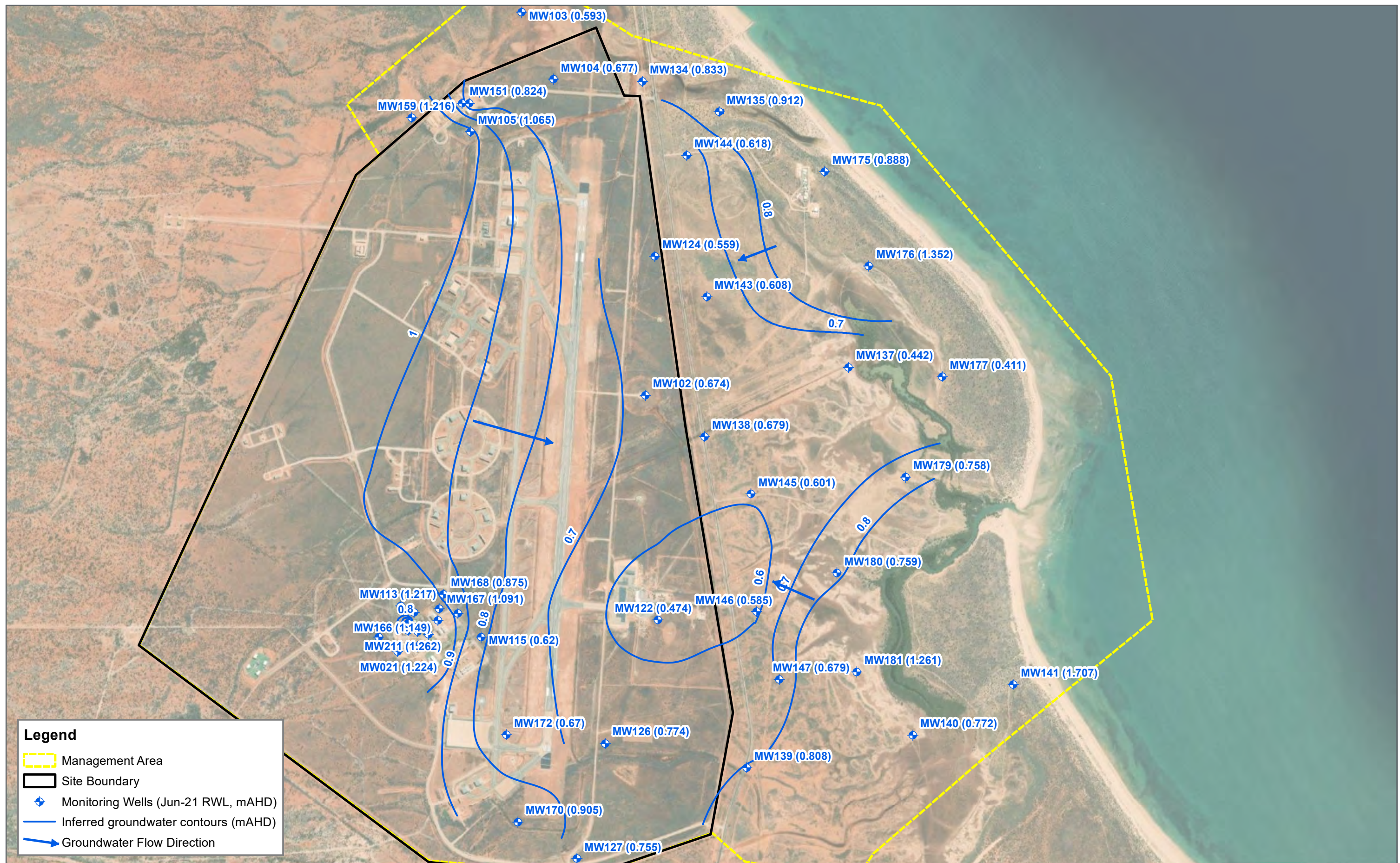


FIGURE 3
1:21,000 Scale at A3

0 500 1,000
m

Inferred Groundwater Contours

BIANNUAL SAMPLING EVENT
RAAF BASE LEARMONTH
DEPARTMENT OF DEFENCE



Cardno

Map Produced by Cardno WA
Date: 2021-07-12 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0960-GS-003_Jun21GWContours 01.mxd
Aerial Imagery Supplied by Google Earth

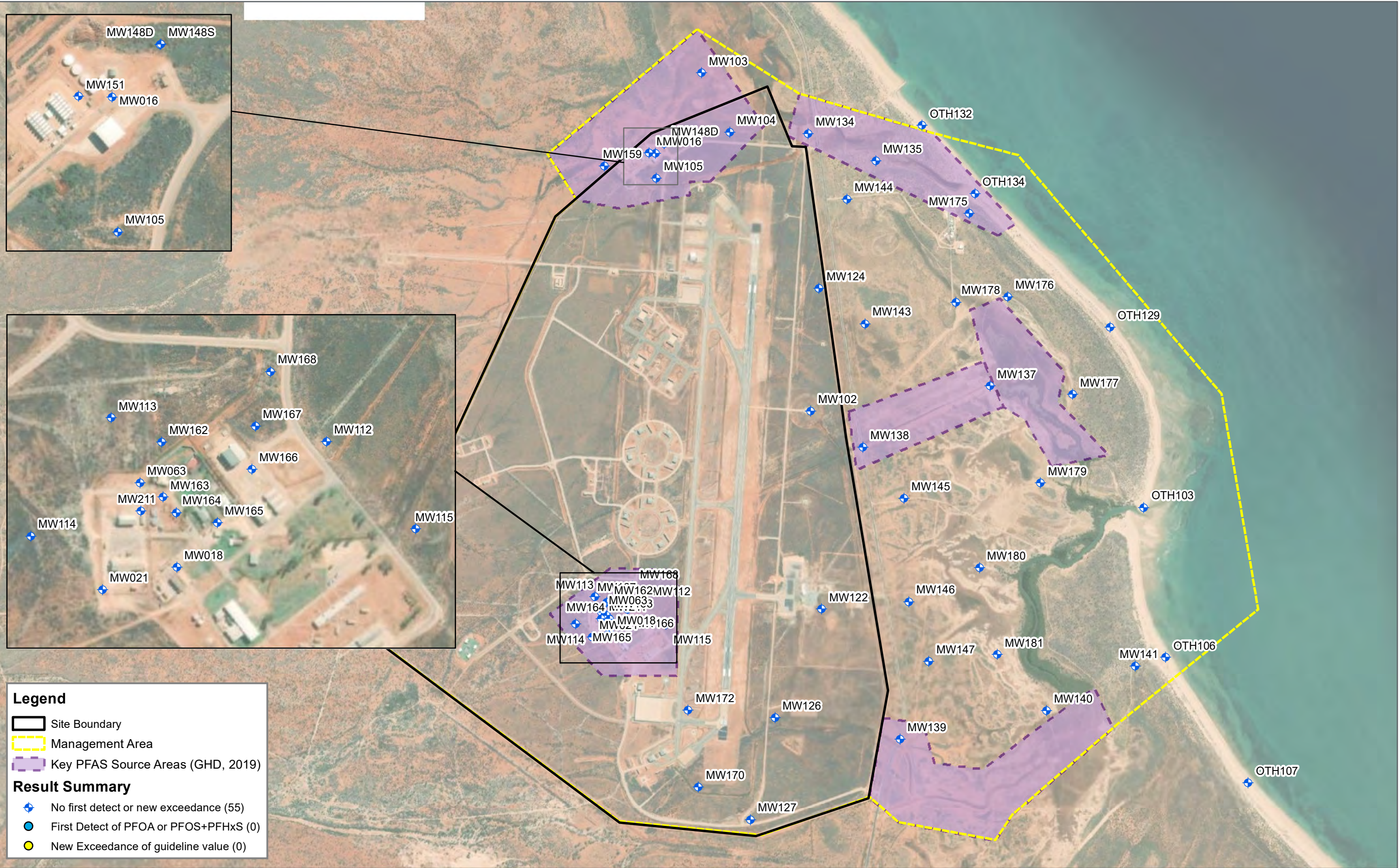
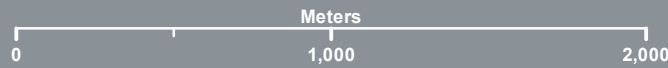


FIGURE 4
1:24,000 Scale at A3



Groundwater & Seepage water Monitoring Locations and Results

BIANNUAL SAMPLING EVENT
RAAF BASE LEARMONTH
DEPARTMENT OF DEFENCE

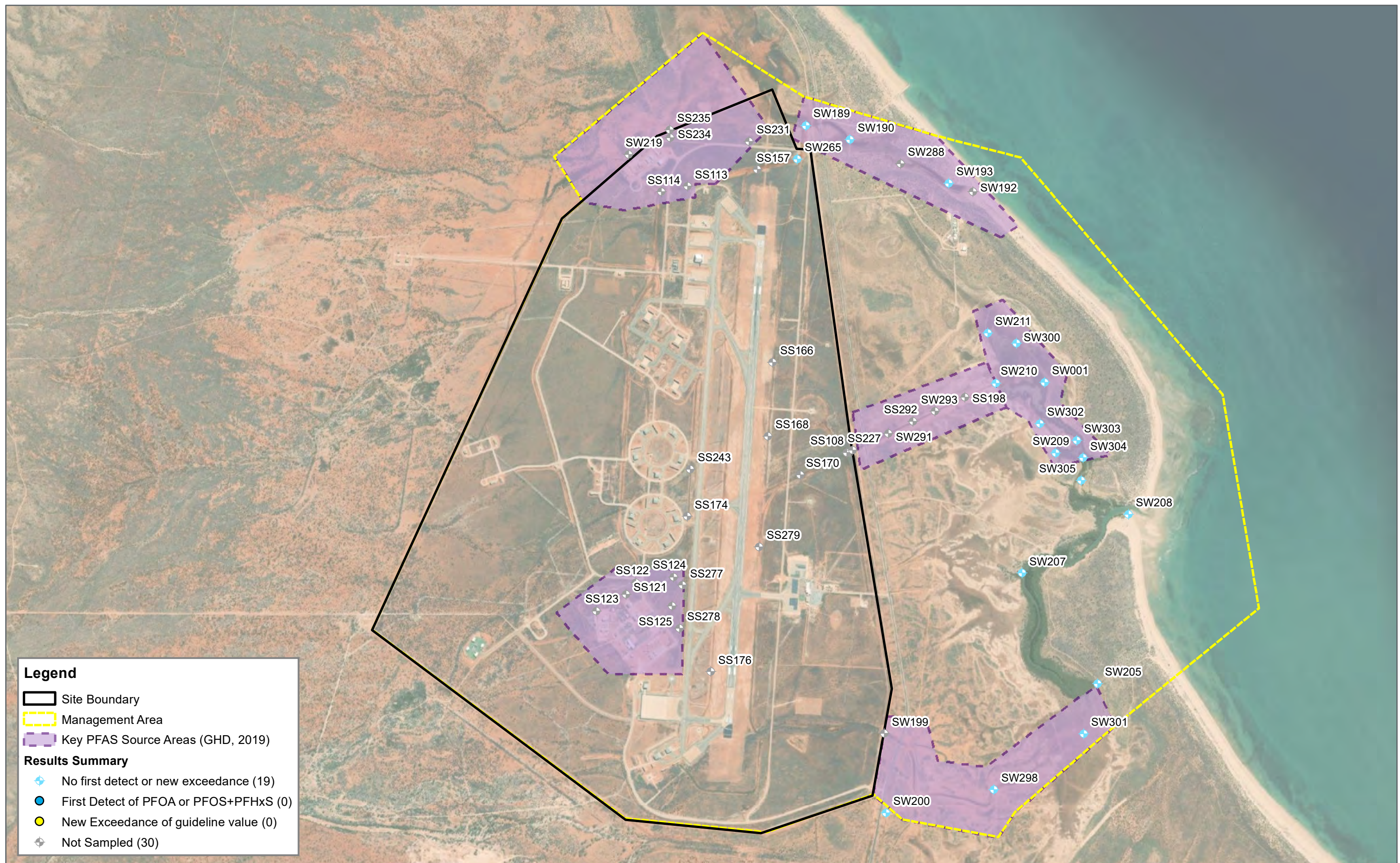


FIGURE 5
1:24,000 Scale at A3

Meters
0 1,000 2,000

Surface Water Monitoring Locations & Results

BIANNUAL SAMPLING EVENT
RAAF BASE LEARMONTH
DEPARTMENT OF DEFENCE



Cardno

Map Produced by Cardno WA
Date: 2021-07-12 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0960-GS-004_SWResults_Jun21 01.mxd
Aerial Imagery Supplied by Google Earth

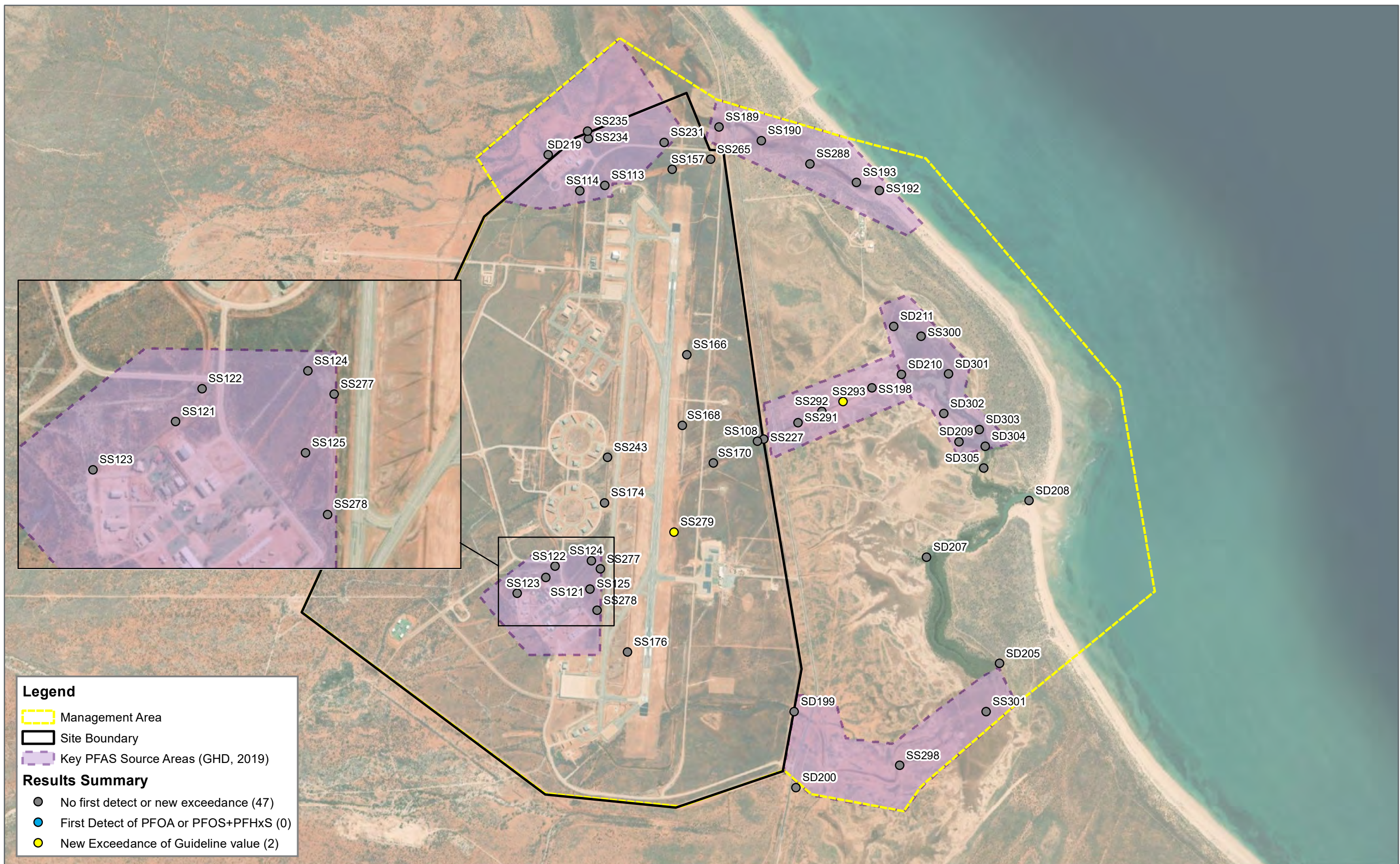
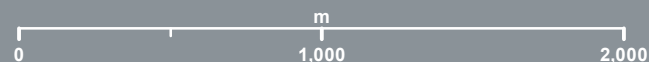


FIGURE 6
1:25,000 Scale at A3



Sediment monitoring locations & Results

BIANNUAL SAMPLING EVENT
RAAF BASE LEARMONTH
DEPARTMENT OF DEFENCE



Map Produced by Cardno WA
Date: 2021-07-12 | Project: DEF19009
Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
Map: DEF19009_WA_0960-GS-006_SDResults_Jun21 01.mxd

APPENDIX

B

DATA ASSESSMENT TABLES

LOR - Limit of Reporting	PFAS - Perfluoroalkyl Sulfonic Acids						PFAS - Perfluoroalkyl Carboxylic Acids										PFAS - Fluorotelomer Sulfonic Acids				PFAS - Perfluoroalkyl Sulfonamides								PFAS		
	Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluorooheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluorohexanoic acid (PFHxA)	Perfluorooctanoic acid (PFPA)	Perfluorooheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoA)	Perfluorotridecanoic acid (PFTrA)	Perfluorotetradecanoic acid (PFTeA)	Perfluoropentadecanoic acid (PFPeA)	Perfluorooctadecanoic acid (PFODa)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-methyl perfluorooctane sulfonamide (MeFOSA)	N-ethyl perfluorooctane sulfonamide (EFOA)	N-ethyl perfluorooctane sulfonamide (EFOA)	N-ethyl perfluorooctane sulfonamide (EFOA)	Sum of PFAS (WA DER list)	Sum of PFHxS and PFOS	Sum of PFAS
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
PFAS NEMP 2020 Interim Marine 99%	0.02	0.02	0.02	0.02	0.01	0.02	0.1	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.05	0.02	0.02	0.05	0.05	0.05	0.05	0.02	0.05	0.02	0.05	0.05	0.02	0.05	0.01	0.01	0.01
PFAS NEMP 2020 Recreational Water					0.00023*						19																		2		

Field ID	Location Code	Date	Lab Report Number	0.06	0.10	1.02	0.03	0.33	<0.02	<0.1	0.29	0.12	0.06	0.06	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	1.94	1.35	2.07
0960_MW018_210623	MW018	23/06/2021	EP2107193	0.08	0.08	0.47	<0.02	0.21	<0.02	<0.1	0.09	0.02	<0.02	0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.88	0.68	0.96
0960_MW021_210623	MW021	23/06/2021	EP2107193	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0960_MW102_210623	MW102	23/06/2021	EP2107189	0.13	0.04	0.13	<0.02	<0.01	<0.02	<0.1	0.03	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.29	0.13	0.33
0960_MW103_210623	MW103	23/06/2021	EP2107189	0.07	<0.02	0.05	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.12	0.05	0.12
0960_MW104_210623	MW104	23/06/2021	EP2107189	0.12	0.16	0.73	<0.02	0.03	<0.02	<0.1	0.13	0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	1.03	0.76	1.19
0960_MW105_210623	MW105	23/06/2021	EP2107193	9.12	10.5	56.9	3.80	25.3	<0.02	2.4	30.4	6.06	1.76	2.30	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	134	82.2	148
0960_MW016_210623	MW016	23/06/2021	EP2107189	0.02	0.03	0.40	<0.02	0.56	<0.02	<0.1	0.07	<0.02	<0.02	0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	1.06	0.96	1.09
0960_MW112_210624	MW112	24/06/2021	EP2107276	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0960_MW113_210624	MW113	23/06/2021	EP2107193	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0960_MW114_210623	MW114	23/06/2021	EP2107193	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0960_MW115_210624	MW115	24/06/2021	EP2107276	0.10	0.13	0.91	<0.02	0.12	<0.02	<0.1	0.20	0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	1.39	1.03	1.52
0960_MW122_210624	MW122	24/06/2021	EP2107276	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0960_MW124_210623	MW124	23/06/2021	EP2107189	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0960_MW126_210623	MW126	23/06/2021	EP2107189	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0960_MW127_210623	MW127	23/06/2021	EP2107189	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0960_MW134_210624	MW134	24/06/2021	EP2107273	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0960_MW135_210624	MW135	24/06/2021	EP2107273	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0960_MW137_210624	MW137	24/06/2021	EP2107276	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0960_MW138_210624	MW138	24/06/2021	EP2107276	<0.02	<0.02	0.03	<0.02	0.09	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.12	0.12	0.12
0960_MW139_210624	MW139	24/06/2021	EP2107276	<0.02	<0.02	0.03	<0.02	0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	0.04	0.04	0.04
0960_MW140_6.0-6.5_210624	MW140	24/06/2021	EP2107277	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0960_MW141_7.0-7.5_210624	MW141	24/06/2021	EP2107277	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0960_MW143_210624	MW143	24/06/2021	EP2107273	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0960_MW144_210624	MW144	24/06/2021	EP2107273	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0960_MW145_210624	MW145	24/06/2021	EP2107273	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0960_MW146_210624	MW146	24/06/2021	EP2107276	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0960_MW147_4.0-4.5_210624	MW147	24/06/2021	EP2107277	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01</

	Inorganics														Metals			Organic
	Carbonate Alkalinity (as CaCO3)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3	Anions Total	Cations Total	Chloride	% Ionic Balance	pH (Lab)	Sodium (filtered)	Sulphate as SO4 - Turbidimetric (filtered)	TDS	TOC	Total Suspended Solids	Calcium (filtered)	Magnesium (filtered)	Potassium (filtered)	Dissolved Organic Carbon
	mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	mg/L	%	pH Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LOR - Limit of Reporting	1	1	1	1	0.01	0.01	1	0.01	0.01	1	1	10	1	5	1	1	1	1
PFAS NEMP 2020 Interim Marine 99%																		
PFAS NEMP 2020 Recreational Water																		

Field ID	Location Code	Date	Lab Report Number																			
0960_MW018_210623	MW018	23/06/2021	EP2107193		24	933	<1	956	31.4	29.3	307	3.49	8.38	636	174	2,070	3	4,530	6	9	22	
0960_MW021_210623	MW021	23/06/2021	EP2107193	<1		702	<1	702	82.0	73.8	2,180	5.25	7.98	1,400	312	4,660		514	82	91	53	4
0960_MW102_210623	MW102	23/06/2021	EP2107189	<1		137	<1	137	1,070	1,240	35,000	7.32	7.34	21,800	3,820	78,700	<1	691	1,450	2,410	765	
0960_MW103_210623	MW103	23/06/2021	EP2107189	<1		154	<1	154	856	1,000	28,300	7.97	7.40	16,800	2,640	66,800	3	11,400	1,400	2,220	832	
0960_MW104_210623	MW104	23/06/2021	EP2107189	<1		233	<1	233	930	1,110	29,900	8.87	7.50	19,400	3,920	69,300		161	816	2,450	956	5
0960_MW105_210623	MW105	23/06/2021	EP2107193	<1		363	<1	363	479	526	15,600	4.71	7.73	9,000	1,520	33,500		527	556	1,150	486	3
0960_MW016_210623	MW016	23/06/2021	EP2107189	<1		1,160	<1	1,160	78.4	72.8	1,540	3.66	7.92	1,500	565	4,820	4	1,990	25	52	81	
0960_MW112_210624	MW112	24/06/2021	EP2107276	<1		726	<1	726	131	141	3,360	3.64	7.87	2,730	1,050	7,890		54	111	169	112	<1
0960_MW113_210623	MW113	23/06/2021	EP2107193	<1		379	<1	379	104	105	3,240	0.57	7.68	1,820	254	6,930		1,470	197	176	77	2
0960_MW114_210623	MW114	23/06/2021	EP2107193	<1		456	<1	456	89.3	87.8	2,650	0.81	7.89	1,640	260	5,070		73	116	111	62	3
0960_MW115_210624	MW115	24/06/2021	EP2107276	<1		328	<1	328	397	429	12,900	3.88	7.65	7,250	1,260	25,800		146	623	903	310	3
0960_MW122_210624	MW122	24/06/2021	EP2107276	<1		394	<1	394	441	499	14,100	6.11	7.79	9,130	1,720	26,900		216	319	893	482	2
0960_MW124_210623	MW124	23/06/2021	EP2107189	<1		144	<1	144	1,020	1,180	32,900	6.93	7.54	20,700	4,530	71,000		26	962	2,480	998	2
0960_MW126_210623	MW126	23/06/2021	EP2107189	<1		121	<1	121	624	686	20,800	4.68	7.50	11,300	1,690	47,800		109	1,150	1,490	555	4
0960_MW127_210623	MW127	23/06/2021	EP2107189	<1		152	<1	152	772	842	25,500	4.33	7.33	14,600	2,400	56,400		860	1,080	1,690	553	2
0960_MW134_210624	MW134	24/06/2021	EP2107273	<1		174	<1	174	711	831	22,800	7.79	7.73	14,700	3,090	47,400		1,140	697	1,640	860	4
0960_MW135_210624	MW135	24/06/2021	EP2107273	<1		238	<1	238	398	403	12,900	0.60	7.79	6,890	1,430	24,000	4	6,410	400	901	367	
0960_MW137_210624	MW137	24/06/2021	EP2107276	<1		195	<1	195	942	1,010	30,500	3.57	7.67	17,600	3,730	63,300		232	720	2,240	1,010	3
0960_MW138_210624	MW138	24/06/2021	EP2107276	<1		144	<1	144	897	1,070	29,000	8.69	7.78	18,900	3,670	51,200		114	905	2,130	997	6
0960_MW139_210624	MW139	24/06/2021	EP2107276	<1		198	<1	198	756	905	24,000	8.94	7.60	15,400	3,620	52,300		388	844	2,080	849	2
0960_MW140_6.0-6.5_210624	MW140	24/06/2021	EP2107277	<1		216	<1	216	1,140	1,360	36,600	8.69	7.84	24,200	4,910	81,800		238	884	2,810	1,090	
0960_MW141_7.0-7.5_210624	MW141	24/06/2021	EP2107277	<1		191	<1	191	472	544	15,200	7.10	7.93	9,420	1,870	33,400		622	522	1,150	513	7
0960_MW143_210624	MW143	24/06/2021	EP2107273	<1		174	<1	174	1,020	1,180	32,500	7.31	7.56	20,600	4,830	72,100	6	2,280	1,080	2,510	992	
0960_MW144_210624	MW144	24/06/2021	EP2107273	<1		184	<1	184	430	440	13,000	1.17	7.65	7,090	2,850	26,600	7	13,700	813	959	470	
0960_MW145_210624	MW145	24/06/2021	EP2107273	<1		126	<1	126	1,290	1,430	41,700	5.24	7.71	25,200	5,300	84,300		174	1,180	3,000	1,170	3
0960_MW146_210624	MW146	24/06/2021	EP2107276	<1		128	<1	128	1,190	1,280	38,400	3.69	7.69	22,200	4,900	81,500		49	1,080	2,750	1,290	2
0960_MW147_4.0-4.5_210624	MW147	24/06/2021	EP2107277	<1		154	<1	154	1,230	1,500	39,400	9.88	7.63	26,600	5,620	87,100		82	1,200	3,090	1,190	11
0960_MW148D_210623	MW148D	23/06/2021	EP2107189	<1		165	<1	165	841	982	27,300	7.73	7.71	17,500	3,230	61,800		49	897	1,880	817	5
0960_MW148S_210623	MW148S	23/06/2021	EP2107189	<1		378	<1	378	475	517	15,400	4.20	7.52	8,990	1,590	31,000		1,790	591	1,050	383	5
0960_MW151_210623	MW151	23/06/2021	EP2107189	<1		720	<1	720	171	155	5,060	4.89	7.67	2,840	657	9,770	4	2,500	141	254	133	
0960_MW159_210623	MW159	23/06/2021	EP2107193	<1		447	<1	447	335	355	10,700	2.91	7.54	6,170	1,160	21,800	2	1,820	453	683	306	
0960_MW162_210623	MW162	23/06/2021	EP2107193	<1		487	<1	487	127	131	3,880	1.32	7.80	2,270	398	8,150		149	195	234	123	7
0960_MW163_210623	MW163	23/06/2021	EP2107193	<1		428	<1	428	119	123	3,520	1.49	7.80	2,220	557	7,000		130	157	194	105	11
0960_MW164_210623	MW164	23/06/2021	EP2107193	<1		978	<1	978	67.4	66.6	1,480	0.62	8.28	1,370	293	3,930		123	23	53	57	4
0960_MW165_210623	MW165	23/06/2021	EP2107193	<1		745	<1	745	35.5	33.1	641	3.43	8.26	714	120	2,010		162	7	12	28	<2
0960_MW166_210623	MW166	23/06/2021	EP2107193	26		911	<1	938	31.5	28.5	376	4.98	8.40	625	105	1,900		623	4	6	26	55
0960_MW167_210623	MW167	23/06/2021	EP2107193	<1		877	<1	877	60.2	55.3	1,290	4.29	7.94	1,150	303	3,490		308	24	33	52	3
0960_MW168_210623	MW168	23/06/2021	EP2107193	<1		561	<1	561	130	134	3,680	1.58	7.58	2,400	734	8,250		1,450	191	217	106	2
0960_MW170_210623	MW170	23/06/2021	EP2107189	<1		236	<1	236	529	580	17,500	4.52	7.54	9,950	1,490	37,600		300	995	1,100	255	2
0960_MW172_210623	MW172	23/06/2021	EP2107189	<1		281	<1	281	403	433	12,400	3.66	7.57	7,860	2,270	25,500		675	528	714	246	2
0960_MW175_7.0-7.5_210623	MW175	23/06/2021	EP2107272	<1		303	<1	303	310	340	9,900	4.57	7.56	5,750	1,210	20,600		5,900	332	816	250	20
0960_MW176_3.5-4.0_210623	MW176	23/06/2021	EP2107272	<1		204	<1	204	526	584	16,700	5.30	7.73	9,960	2,430	35,600		10,300	575	1,310	580	3
0960_MW177_3.5-4.0_210623	MW177	23/06/2021	EP2107272	<1		193	<1	193	938	1,100	30,200	8.11	7.53	19,200	3,930	70,600		5,050	872	2,440	925	6
0960_MW178_210624	MW178	24/06/2021	EP2107273	<1		121	<1	121	1,050	1,260	33,400	9.10	7.64	21,900	4,960	73,000		60	1,160	2,680	1,040	4
0960_MW179_210624	MW179	24/06/2021	EP2107273	<1		171	<1	171	891	1,040	28,800	7.59	7.87	18,200	3,600	62,300		186	695	2,290	871	3
0960_MW180_1.0-1.5_210624	MW180	24/06/2021	EP2107277	<1		139	<1	139	1,010	1,160	32,400	7.19	7.64	20,700	4,420	72,000		54	859	2,390	979	3
0960_MW181_5.5-6.0_210624	MW181	24/06/2021	EP2107277	<1		316	<1	316	1,180	1,330	37,900	5.73	7.30	23,500	5,230	79,300		401	1,030	2,760	1,080	4
0960_MW211_210623	MW211	23/06/2021	EP2107193	35		750	<1	786	20.8	19.5	134	3.42	8.51	428	66	1,250		122	2	4	17	3
0960_MW233_210623	MW233	23/06/2021	EP2107193	28		596	<1	625	18.5	17.0	186	4.23	8.49	374	38	1,140		126	3	3	14	4
0960_OTH103_210623	OTH103	23/06/2021	EP2107272	<1		132	<1	132	637	696	20,600	4.42	7.99	12,100	2,560	44,800		10	490			

[illegible]

Note:

	- Fluorotelomer Sulfonic Acids			PFAS - Perfluoroalkyl Sulfonamides								PFAS			Inorganics				
	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	Sum of PFAS (WA DER List)	Sum of PFHxS and PFOS	Sum of PFAS	Exchangeable Sodium Percent	Moisture Content	Exchangeable Calcium	Exchangeable Magnesium	Exchangeable Potassium	
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	%	meq/100g	meq/100g	meq/100g	
LOR - Limit of Reporting	0.0005	0.0005	0.0005	0.0002	0.0005	0.0002	0.0005	0.0005	0.0002	0.0005	0.0002	0.0002	0.0002	0.1	0.1	0.1	0.1	0.1	
PFAS NEMP 2020 Ecological direct exposure																			
PFAS NEMP 2020 Ecological indirect exposure																			
PFAS NEMP 2020 Industrial/ commercial (HIL D)												20							

Field ID	Location Code	Date	Lab Report Number																	
0960_SD199_210624	SD199	24/06/2021	EP2107280	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002		18.2		
0960_SD200_210624	SD200	24/06/2021	EP2107280	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002		25.6		
0960_SD205_210624	SD205	24/06/2021	EP2107279	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	0.5	16.1	47.4	6.4
0960_SD207_210624	SD207	24/06/2021	EP2107279	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	1.8	24.6	18.8	6.2
0960_SD208_210624	SD208	24/06/2021	EP2107279	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	2.8	21.7	7.2	0.9
0960_SD209_210624	SD209	24/06/2021	EP2107275	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	1.4	22.7	15.1	3.6
0960_SD210_210624	SD210	24/06/2021	EP2107275	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0012	0.0012	0.0012	2.5	30.6	15.1	6.6
0960_SD211_210623	SD211	23/06/2021	EP2107271	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0010	0.0010	0.0010	4.0	30.4	20.9	10.5
0960_SD219_210623	SD219	23/06/2021	EP2107194	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0006	0.0006	0.0006	1.0	3.7	19.9	1.8
0960_SD300_210623	SD300	23/06/2021	EP2107271	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0013	0.0013	0.0013	4.5	33.5	19.4	9.7
0960_SD301_210623	SD301	23/06/2021	EP2107271	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	1.8	22.3	20.0	7.9
0960_SD302_210624	SD302	24/06/2021	EP2107275	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	1.2	26.4	17.3	4.3
0960_SD303_210623	SD303	23/06/2021	EP2107271	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	0.6	22.3	54.8	3.6
0960_SD304_210623	SD304	23/06/2021	EP2107271	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	1.1	17.4	20.4	2.7
0960_SD305_210623	SD305	23/06/2021	EP2107271	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	1.0	18.5	18.7	2.2
0960_SS108_210624	SS108	24/06/2021	EP2107280	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0011	0.0011	0.0011		3.3		
0960_SS113_210623	SS113	23/06/2021	EP2107198	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0005	0.0005	0.0005	1.8	3.6	17.6	2.8
0960_SS114_210624	SS114	24/06/2021	EP2107280	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0066	0.0066	0.0083	3.5	28.4	20.8	3.6
0960_SS121_210623	SS121	23/06/2021	EP2107194	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0189	0.0189	0.0258	0.4	10.8	18.8	1.4
0960_SS122_210623	SS122	23/06/2021	EP2107194	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0089	0.0086	0.0095	4.3	13.0	23.3	3.2
0960_SS123_210623	SS123	23/06/2021	EP2107194	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0466	0.0466	0.0474	1.6	9.2	21.7	2.4
0960_SS124_210623	SS124	23/06/2021	EP2107198	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0766	0.0766	0.0839	0.6	7.6	19.8	2.1
0960_SS125_210624	SS125	24/06/2021	EP2107280	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0152	0.0152	0.0152		6.7		
0960_SS157_210623	SS157	23/06/2021	EP2107198	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0013	0.0013	0.0013	1.6	23.2	19.8	5.9
0960_SS166_210623	SS166	23/06/2021	EP2107198	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0004	0.0004	0.0004		21.0		
0960_SS168_210623	SS168	23/06/2021	EP2107198	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0020	0.0020	0.0020		21.7		
0960_SS170_210623	SS170	23/06/2021	EP2107198	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0010	0.0010	0.0010		17.1		
0960_SS174_210623	SS174	23/06/2021	EP2107198	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0157	0.0157	0.0157	4.8	3.5	18.5	2.8
0960_SS176_210623	SS176	23/06/2021	EP2107198	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0035	0.0035	0.0039		22.6		
0960_SS189_210624	SS189	24/06/2021	EP2107275	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0017	0.0017	0.0019	4.2	21.5	18.8	3.8
0960_SS190_210623	SS190	23/06/2021	EP2107271	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0019	0.0019	0.0019	2.9	30.4	20.0	9.5
0960_SS192_210623	SS192	23/06/2021	EP2107271	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	1.7	6.9	3.3	0.3
0960_SS193_210623	SS193	23/06/2021	EP2107271	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	0.7	29.4	13.0	1.4
0960_SS198_210624	SS198	24/06/2021	EP2107280	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002		16.2		
0960_SS227_210624	SS227	24/06/2021	EP2107280	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0508	0.0508	0.0521		12.2		
0960_SS231_210623	SS231	23/06/2021	EP2107198	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0276	0.0276	0.0279	4.4	7.0	23.7	4.6
0960_SS234_210623	SS234	23/06/2021	EP2107198	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0160	0.0160	0.0183		13.4		
0960_SS235_210623	SS235	23/06/2021	EP2107198	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0157	0.0157	0.0157		1.3		
0960_SS243_210623	SS243	23/06/2021	EP2107198	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0074	0.0074	0.0082	0.2	15.9	24.7	2.1
0960_SS265_210623	SS265	23/06/2021	EP2107198	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002.								

	Exchangeable Sodium	CEC	Electrical conductivity * (lab)	pH (lab)	Organic
	meq/100g	meq/100g	µS/cm	pH Units	%
LOR - Limit of Reporting	0.1	0.1	1	0.1	0.5
PFAS NEMP 2020 Ecological direct exposure					
PFAS NEMP 2020 Ecological indirect exposure					
PFAS NEMP 2020 Industrial/ commercial (HIL D)					

Field ID	Location Code	Date	Lab Report Number					
0960_SD199_210624	SD199	24/06/2021	EP2107280					
0960_SD200_210624	SD200	24/06/2021	EP2107280					
0960_SD205_210624	SD205	24/06/2021	EP2107279	0.3	54.4	12,600	8.6	1.7
0960_SD207_210624	SD207	24/06/2021	EP2107279	0.5	26.2	9,470	8.8	2.0
0960_SD208_210624	SD208	24/06/2021	EP2107279	0.2	8.5	2,080	9.2	1.9
0960_SD209_210624	SD209	24/06/2021	EP2107275	0.3	19.3	5,910	8.7	1.0
0960_SD210_210624	SD210	24/06/2021	EP2107275	0.6	23.6	6,210	8.7	5.1
0960_SD211_210623	SD211	23/06/2021	EP2107271	1.4	34.5	5,020	8.7	3.2
0960_SD219_210623	SD219	23/06/2021	EP2107194	0.2	22.4	70	9.2	1.0
0960_SD300_210623	SD300	23/06/2021	EP2107271	1.4	32.2	2,620	8.9	2.5
0960_SD301_210623	SD301	23/06/2021	EP2107271	0.5	29.1	9,760	8.7	1.2
0960_SD302_210624	SD302	24/06/2021	EP2107275	0.3	22.4	6,570	8.6	1.9
0960_SD303_210623	SD303	23/06/2021	EP2107271	0.3	59.1	6,570	8.4	2.8
0960_SD304_210623	SD304	23/06/2021	EP2107271	0.3	23.6	4,190	8.6	1.9
0960_SD305_210623	SD305	23/06/2021	EP2107271	0.2	21.3	6,370	8.5	1.9
0960_SS108_210624	SS108	24/06/2021	EP2107280					
0960_SS113_210623	SS113	23/06/2021	EP2107198	0.4	21.4	91	9.5	0.6
0960_SS114_210624	SS114	24/06/2021	EP2107280	0.9	26.0	120	9.0	0.9
0960_SS121_210623	SS121	23/06/2021	EP2107194	<0.1	21.0	78	8.7	2.2
0960_SS122_210623	SS122	23/06/2021	EP2107194	1.2	28.7	391	10.0	1.4
0960_SS123_210623	SS123	23/06/2021	EP2107194	0.4	25.1	98	9.0	1.2
0960_SS124_210623	SS124	23/06/2021	EP2107198	0.1	23.4	100	8.7	2.2
0960_SS125_210624	SS125	24/06/2021	EP2107280					
0960_SS157_210623	SS157	23/06/2021	EP2107198	0.4	27.5	4,330	8.7	1.3
0960_SS166_210623	SS166	23/06/2021	EP2107198					
0960_SS168_210623	SS168	23/06/2021	EP2107198					
0960_SS170_210623	SS170	23/06/2021	EP2107198					
0960_SS174_210623	SS174	23/06/2021	EP2107198	1.1	23.2	202	9.3	1.4
0960_SS176_210623	SS176	23/06/2021	EP2107198					
0960_SS189_210624	SS189	24/06/2021	EP2107275	1.0	24.3	158	9.2	1.0
0960_SS190_210623	SS190	23/06/2021	EP2107271	0.9	32.2	918	9.1	1.6
0960_SS192_210623	SS192	23/06/2021	EP2107271	<0.1	3.7	610	9.4	1.2
0960_SS193_210623	SS193	23/06/2021	EP2107271	0.1	14.7	3,940	8.5	1.3
0960_SS198_210624	SS198	24/06/2021	EP2107280					
0960_SS227_210624	SS227	24/06/2021	EP2107280					
0960_SS231_210623	SS231	23/06/2021	EP2107198	1.4	31.3	163	9.3	<0.5
0960_SS234_210623	SS234	23/06/2021	EP2107198					
0960_SS235_210623	SS235	23/06/2021	EP2107198					
0960_SS243_210623	SS243	23/06/2021	EP2107198	<0.1	28.0	99	8.7	<0.5
0960_SS265_210623	SS265	23/06/2021	EP2107198	0.9	27.3	354	9.3	1.6
0960_SS277_210623	SS277	23/06/2021	EP2107198	0.9	24.3	175	9.1	0.6
0960_SS278_210623	SS278	23/06/2021	EP2107198	<0.1	18.0	81	8.8	1.6
0960_SS279_210623	SS279	23/06/2021	EP2107198					
0960_SS288_210624	SS288	24/06/2021	EP2107275	<0.1	19.3	1,000	9.4	0.8
0960_SS291_210624	SS291	24/06/2021	EP2107280					
0960_SS292_210624	SS292	24/06/2021	EP2107280					
0960_SS293_210624	SS293	24/06/2021	EP2107275	0.2	32.6	132	8.6	2.0
0960_SS298_210624	SS298	24/06/2021	EP2107279	0.1	22.1	567	9.3	1.0
0960_SS301_210624	SS301	24/06/2021	EP2107279	0.6	39.7	2,590	8.6	3.6

Note:

- First Time detect of PFOA or PFHxS+PFOS
- New exceedance of guideline value



Table B3 Rinsates and Field Blanks Analytical Results

PFAS OMP biannual monitoring event
RAAF Learmonth

	PFAS - Perfluoroalkyl Sulfonic Acids						PFAS - Perfluoroalkyl Carboxylic Acids												PFAS	
	Perfluorobutane sulfonic acid (PFBS) µg/L	Perfluoropentane sulfonic acid (PFPeS) µg/L	Perfluorohexane sulfonic acid (PFHxS) µg/L	Perfluorooheptane sulfonic acid (PFHpS) µg/L	Perfluorooctane sulfonic acid (PFOS) µg/L	Perfluorodecane sulfonic acid (PFDS) µg/L	Perfluorobutanoic acid (PFBA) µg/L	Perfluorohexanoic acid (PFHxA) µg/L	Perfluoropentanoic acid (PFPeA) µg/L	Perfluorooheptanoic acid (PFHpA) µg/L	Perfluorooctanoic acid (PFOA) µg/L	Perfluorodecanoic acid (PFDA) µg/L	Perfluorododecanoic acid (PFDoDA) µg/L	Perfluorononanoic acid (PFNA) µg/L	Perfluorotetradecanoic acid (PFTeDA) µg/L	Perfluorotridecanoic acid (PFTrDA) µg/L	Perfluoroundecanoic acid (PFUnDA) µg/L	4:2 Fluorotelomer sulfonic acid (4:2 FTS) µg/L		
LOR - Limit of Reporting	0.02	0.02	0.02	0.02	0.01	0.02	0.1	0.02	0.02	0.02	0.01	0.02	0.02	0.02	0.05	0.02	0.02	0.05		
PFAS NEMP 2020 Interim Marine 99%					0.00023						19									
PFAS NEMP 2020 Recreational Water											10									

Field ID	Date	Sample Type	Lab Report Number																		
0960_QC301_210623	23/06/2021	Rinsate	EP2107272	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
0960_QC301_210624	24/06/2021	Rinsate	EP2107277	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
0960_QC302_210623	23/06/2021	Rinsate	EP2107272	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
0960_QC302_210624	24/06/2021	Rinsate	EP2107277	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
0960_QC303_210623	23/06/2021	Rinsate	EP2107272	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
0960_QC303_210624	24/06/2021	Rinsate	EP2107277	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
0960_QC401_210623	23/06/2021	Field Blank	EP2107272	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
0960_QC401_210624	24/06/2021	Field Blank	EP2107277	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
0960_QC402_210623	23/06/2021	Field Blank	EP2107272	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
0960_QC402_210624	24/06/2021	Field Blank	EP2107277	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
0960_QC403_210623	23/06/2021	Field Blank	EP2107272	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05
0960_QC403_210624	24/06/2021	Field Blank	EP2107277	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05



Table B3 Rinsates and Field Blanks Analytical Results

	- Fluorotelomer Sulfonic Acids			PFAS - Perfluoroalkyl Sulfonamides							PFAS		
	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	Sum of PFAS (WA DER List)	Sum of PFHxS and PFOS	Sum of PFAS
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR - Limit of Reporting	0.05	0.05	0.05	0.02	0.05	0.02	0.05	0.05	0.02	0.05	0.01	0.01	0.01
PFAS NEMP 2020 Interim Marine 99%													
PFAS NEMP 2020 Recreational Water												2	

Field ID	Date	Sample Type	Lab Report Number													
0960_QC301_210623	23/06/2021	Rinsate	EP2107272	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0960_QC301_210624	24/06/2021	Rinsate	EP2107277	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0960_QC302_210623	23/06/2021	Rinsate	EP2107272	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0960_QC302_210624	24/06/2021	Rinsate	EP2107277	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0960_QC303_210623	23/06/2021	Rinsate	EP2107272	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0960_QC303_210624	24/06/2021	Rinsate	EP2107277	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0960_QC401_210623	23/06/2021	Field Blank	EP2107272	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0960_QC401_210624	24/06/2021	Field Blank	EP2107277	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0960_QC402_210623	23/06/2021	Field Blank	EP2107272	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0960_QC402_210624	24/06/2021	Field Blank	EP2107277	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0960_QC403_210623	23/06/2021	Field Blank	EP2107272	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01
0960_QC403_210624	24/06/2021	Field Blank	EP2107277	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.01	<0.01	<0.01



Table B4 - Water samples RPD Results

PFAS OMP biannual monitoring event
RAAF Learmonth

		Field ID	0960_MW163_210623	0960_OC101_210623		0960_MW163_210623	0960_OC201_210623		0960_SW190_210623	0960_OC103_210623		0960_SW190_210623	0960_OC203_210623		0960_MW164_210623	0960_OC104_210623	
		Date	23/06/2021	23/06/2021		23/06/2021	23/06/2021		23/06/2021	23/06/2021		23/06/2021	23/06/2021		23/06/2021	23/06/2021	
		Matrix Type	Water	Water		Water	Water		Water	Water		Water	Water		Water	Water	
		Lab Report Number	EP2107193	EP2107193	RPD	EP2107193	806235	RPD	EP2107270	EP2107270	RPD	EP2107270	806235	RPD	EP2107193	EP2107193	RPD
	Unit	LOR															
PFAS - Perfluoroalkyl Sulfonic Acids																	
Perfluoropropanesulfonic acid (PFPrS)	µg/L	0.01					0.20						<0.01				
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01	0.60	0.56	7	0.60	0.43	33	<0.02	<0.02	0	<0.02	<0.01	0	0.09	0.11	20
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01	0.84	0.74	13	0.84	0.47	56	<0.02	<0.02	0	<0.02	<0.01	0	0.12	0.13	8
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01	6.68	5.76	15	6.68	7.6	13	<0.02	<0.02	0	<0.02	<0.01	0	1.01	1.10	9
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01	0.40	0.37	8	0.40	0.30	29	<0.02	<0.02	0	<0.02	<0.01	0	0.04	0.05	22
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.01	3.22	2.89	11	3.22	2.9	10	0.04	0.04	0	0.04	0.02	67	1.26	1.43	13
Perfluorononanesulfonic acid (PFNS)	µg/L	0.01					<0.01						<0.01				
Perfluorodecane sulfonic acid (PFDS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0
PFAS - Perfluoroalkyl Carboxylic Acids																	
Perfluorobutanoic acid (PFBA)	µg/L	0.05	0.2	0.2	0	0.2	0.24	18	<0.1	<0.1	0	<0.1	<0.05	0	<0.1	<0.1	0
Perfluorohexanoic acid (PFHxA)	µg/L	0.01	1.72	1.59	8	1.72	1.4	21	<0.02	<0.02	0	<0.02	<0.01	0	0.26	0.28	7
Perfluoropentanoic acid (PFPeA)	µg/L	0.01	0.43	0.40	7	0.43	0.29	39	<0.02	<0.02	0	<0.02	<0.01	0	0.07	0.08	13
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01	0.20	0.18	11	0.20	0.14	35	<0.02	<0.02	0	<0.02	<0.01	0	0.03	0.03	0
Perfluorooctanoic acid (PFOA)	µg/L	0.01	0.30	0.28	7	0.30	0.22	31	<0.01	<0.01	0	<0.01	<0.01	0	0.04	0.05	22
Perfluorodecanoic acid (PFDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0
Perfluorododecanoic acid (PFDoDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0
Perfluorononanoic acid (PFNA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0
Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0
Perfluorotridecanoic acid (PFTrDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0
PFAS - Fluorotelomer Sulfonic Acids																	
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	µg/L	0.05	0.11	0.10	10	0.11	0.11	0	<0.05	<0.05	0	<0.05	<0.05	0	0.14	0.13	7
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0
PFAS - Perfluoroalkyl Sulfonamides																	
Perfluorooctane sulfonamide (FOSA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0
N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
PFAS																	
Sum of PFAS (WA DER List)	µg/L	0.01	13.5	12.0	12	13.5	13.33	1	0.04	0.04	0	0.04	<0.05	0	2.90	3.21	10
Sum of PFHxS and PFOS	µg/L	0.01	9.90	8.65	13	9.90	10.5	6	0.04	0.04	0	0.04	0.02	67	2.27	2.53	11
Sum of PFAS	µg/L	0.01	14.7	13.1	12	14.7	14.3	3	0.04	0.04	0	0.04	<0.1	0	3.06	3.39	10
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)	µg/L	0.01					10.72						0.02				
Sum of PFAS (PFOS + PFOA)	µg/L	0.01					3.12						0.02				
Inorganics																	
Carbonate Alkalinity (as CaCO3)	mg/L	1	<1	<1	0	<1	23	183	22	17	26	22	14	44	<1	<1	0
Alkalinity (Bicarbonate as CaCO3)	mg/L	1	428	436	2	428	1,100	88	88	90	2	88	97	10	978	952	3
Alkalinity (Hydroxide) as CaCO3	mg/L	1	<1	<1	0	<1	<20	0	<1	<1	0	<1	<20	0	<1	<1	0
Alkalinity (total) as CaCO3	mg/L	1	428	436	2	428	1,100	88	110	107	3	110	110	0	978	952	3
Anions Total	meq/L	0.01	119	119	0	119			99.3	99.1	0	99.3			67.4	67.5	0
Cations Total	meq/L	0.01	123	123	0	123			103	94.2	9	103			66.6	67.2	1
Chloride	mg/L	1	3,520	3,500	1	3,520	3,400	3	3,150	3,150	0	3,150	3,000	5	1,480	1,500	1
Ionic Balance	%	0.01	1.49	1.71	14	1.49			1.69	2.51	39	1.69			0.62	0.27	79
pH (Lab)	pH Units	0.01	7.80	7.90	1	7.80	8.5	9	8.71	8.61	1	8.71	8.9	2	8.28	8.20	1
Sodium	mg/L	0.5					2,000						1,700				
Sulphate as SO4 - Turbidimetric (filtered)	mg/L	0.5	2,220	2,220	0	2,220			1,820	1,670	9	1,820			1,370	1,380	1
Sulphate	mg/L	1	557	557	0	557			395	390	1	395			293	297	1
TDS	mg/L	10	7,000	7,150	2	7,000	6,200	12	6,480	6,250	4	6,480	5,200	22	3,930	3,900	1
Total Suspended Solids	mg/L	1	130	173	28	130	200	42	<5	<5	0	<5	9.0	57	123	104	17
Metals																	
Calcium	mg/L	0.5					140						79				
Calcium (filtered)	mg/L	0.5	157	160	2	157			70	65	7	70			23	24	4
Magnesium	mg/L	0.5					170						180				
Magnesium (filtered)	mg/L	0.5	194	194	0	194			205	189	8	205			53	54	2
Potassium	mg/L	0.5					76						78				
Potassium (filtered)	mg/L	0.5	105	104	1	105			124	110	12	124			57	58	2
Organic																	
Dissolved Organic Carbon	mg/L	1	11	15	31	11			6	6	0	6			4	3	29

*RPDs have only been considered where a concentration is greater than 1 times the LOR.

**Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each LOR multiplier range are: No Limit (1 - 10 x LOR); 50 (10 - 20 x LOR); 20 (> 20 x LOR))

***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory



Table B4 - Water samples RPD Results

		Field ID	0960_MW164_210623	0960_OC204_210623		0960_OTH132_210623	0960_OC105_210623		0960_OTH132_210623	0960_OC205_210623		0960_MW127_210623	0960_OC107_210623		0960_MW127_210623	0960_OC207_210623	
		Date	23/06/2021	23/06/2021		23/06/2021	23/06/2021		23/06/2021	23/06/2021		23/06/2021	23/06/2021		23/06/2021	23/06/2021	
		Matrix Type	Water	Water		Water	Water		Water	Water		Water	Water		Water	Water	
		Lab Report Number	EP2107193	806235	RPD	EP2107272	EP2107272	RPD	EP2107272	806235	RPD	EP2107189	EP2107189	RPD	EP2107189	806235	RPD
	Unit	LOR															
PFAS - Perfluoroalkyl Sulfonic Acids																	
Perfluoropropanesulfonic acid (PFPrS)	µg/L	0.01		0.04						<0.01						<0.01	
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01	0.09	0.09	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01	0.12	0.11	9	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01	1.01	1.1	9	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01	0.04	0.05	22	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.01	1.26	1.5	17	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0
Perfluorononanesulfonic acid (PFNS)	µg/L	0.01		<0.01						<0.01						<0.01	
Perfluorodecane sulfonic acid (PFDS)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
PFAS - Perfluoroalkyl Carboxylic Acids																	
Perfluorobutanoic acid (PFBA)	µg/L	0.05	<0.1	<0.05	0	<0.1	<0.1	0	<0.1	<0.05	0	<0.1	<0.1	0	<0.1	<0.05	0
Perfluorohexanoic acid (PFHxA)	µg/L	0.01	0.26	0.26	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoropentanoic acid (PFPeA)	µg/L	0.01	0.07	0.07	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01	0.03	0.03	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorooctanoic acid (PFOA)	µg/L	0.01	0.04	0.04	0	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0
Perfluorodecanoic acid (PFDA)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorododecanoic acid (PFDoDA)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorononanoic acid (PFNA)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.01	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0
Perfluorotridecanoic acid (PFTrDA)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.01	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0
PFAS - Fluorotelomer Sulfonic Acids																	
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.01	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	µg/L	0.05	0.14	0.18	25	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.01	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.01	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0
PFAS - Perfluoroalkyl Sulfonamides																	
Perfluorooctane sulfonamide (FOSA)	µg/L	0.02	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	µg/L	0.02	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0
N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	µg/L	0.02	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0
PFAS																	
Sum of PFAS (WA DER List)	µg/L	0.01	2.90	3.27	12	<0.01	<0.01	0	<0.01	<0.05	0	<0.01	<0.01	0	<0.01	<0.05	0
Sum of PFHxS and PFOS	µg/L	0.01	2.27	2.6	14	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0
Sum of PFAS	µg/L	0.01	3.06	3.47	13	<0.01	<0.01	0	<0.01	<0.1	0	<0.01	<0.01	0	<0.01	<0.1	0
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)	µg/L	0.01		2.64						<0.01						<0.01	
Sum of PFAS (PFOS + PFOA)	µg/L	0.01		1.54						<0.01						<0.01	
Inorganics																	
Carbonate Alkalinity (as CaCO3)	mg/L	1	<1	87	195	<1	<1	0	<1	<10	0	<1	<1	0	<1	<10	0
Alkalinity (Bicarbonate as CaCO3)	mg/L	1	978	910	7	124	141	13	124	140	12	152	151	1	152	210	32
Alkalinity (Hydroxide) as CaCO3	mg/L	1	<1	<20	0	<1	<1	0	<1	<20	0	<1	<1	0	<1	<20	0
Alkalinity (total) as CaCO3	mg/L	1	978	1,000	2	124	141	13	124	150	19	152	151	1	152	210	32
Anions Total	meq/L	0.01	67.4			631	631	0	631			772	759	2	772		
Cations Total	meq/L	0.01	66.6			718	685	5	718			842	883	5	842		
Chloride	mg/L	1	1,480	1,300	13	20,400	20,400	0	20,400	21,000	3	25,500	25,000	2	25,500	27,000	6
Ionic Balance	%	0.01	0.62			6.42	4.08	45	6.42			4.33	7.56	54	4.33		
pH (Lab)	pH Units	0.01	8.28		9	7.98	8.04	1	7.98	8.3	4	7.33	7.41	1	7.33	8.2	11
Sodium	mg/L	0.5		1,300						11,000						16,000	
Sulphate (filtered)	mg/L	0.5	1,370			12,500	11,900	5	12,500			14,600	15,300	5	14,600		
Sulphate as SO4 - Turbidimetric (filtered)	mg/L	1	293			2,560	2,550	0	2,560			2,400	2,420	1	2,400		
Sulphate	mg/L	5		350						3,200						3,000	
TDS	mg/L	10	3,930	3,800	3	43,900	44,400	1	43,900	18,000	84	56,400	57,100	1	56,400	66,000	16
Total Suspended Solids	mg/L	1	123	250	68	86	90	5	86	86	0	860	5,460	146	860	690	22
Metals																	
Calcium	mg/L	0.5		32						450						1,000	
Calcium (filtered)	mg/L	0.5	23			506	484	4	506			1,080	1,140	5	1,080		
Magnesium	mg/L	0.5		61						1,300						1,500	
Magnesium (filtered)	mg/L	0.5	53			1,600	1,540	4	1,600			1,690	1,770	5	1,690		
Potassium	mg/L	0.5		37						420						360	
Potassium (filtered)	mg/L	0.5	57			674	647	4	674			553	573	4	553		
Organic																	
Dissolved Organic Carbon	mg/L	1	4			1	2	67	1			2	2	0	2		



Table B4 - Water samples RPD Results

Field ID	0960_MW167_210623		0960_OC108_210623		RPD	0960_MW167_210623		0960_OC208_210623		RPD	0960_SW001_210623		0960_OC209_210623		RPD	0960_MW105_210623		0960_OC112_210623		RPD	0960_MW105_210623		0960_OC212_210623		RPD	
	Date	Water	Water	Water		Water	Water	Water	Water		Water	Water	Water	Water		Water										
	Matrix Type	Water	Water	Water		Water	Water	Water	Water		Water	Water	Water	Water		Water										
	Lab Report Number	EP2107193	EP2107193	806235		EP2107270	EP2107270	EP2107270	806235		EP2107193	EP2107193	EP2107193	806235		EP2107193	806235									
	Unit	LOR																								
PFAS - Perfluoroalkyl Sulfonic Acids																										
Perfluoropropanesulfonic acid (PFPrS)	µg/L	0.01					0.01						<0.01										0.04			
Perfluorobutane sulfonic acid (PFBS)	µg/L	0.01	0.04	0.04	0	0.04	0.03	29	<0.02	<0.02	0	<0.02	<0.01	0	0.12	0.13	8	0.12	0.11	9						
Perfluoropentane sulfonic acid (PFPeS)	µg/L	0.01	0.06	0.06	0	0.06	0.05	18	<0.02	<0.02	0	<0.02	<0.01	0	0.16	0.16	0	0.16	0.14	13						
Perfluorohexane sulfonic acid (PFHxS)	µg/L	0.01	0.97	1.04	7	0.97	1.0	3	<0.02	<0.02	0	<0.02	<0.01	0	0.73	0.76	4	0.73	0.72	1						
Perfluoroheptane sulfonic acid (PFHpS)	µg/L	0.01	0.05	0.05	0	0.05	0.06	18	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0						
Perfluorooctane sulfonic acid (PFOS)	µg/L	0.01	0.81	0.74	9	0.81	0.92	13	<0.01	<0.01	0	<0.01	<0.01	0	0.03	0.04	29	0.03	0.03	0						
Perfluorononanesulfonic acid (PFNS)	µg/L	0.01					<0.01								<0.01				<0.01							
Perfluorodecane sulfonic acid (PFDS)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0						
PFAS - Perfluoroalkyl Carboxylic Acids																										
Perfluorobutanoic acid (PFBA)	µg/L	0.05	<0.1	<0.1	0	<0.1	0.18	57	<0.1	<0.1	0	<0.1	<0.05	0	<0.1	<0.1	0	<0.1	<0.05	0						
Perfluorohexanoic acid (PFHxA)	µg/L	0.01	0.21	0.21	0	0.21	0.20	5	<0.02	<0.02	0	<0.02	<0.01	0	0.13	0.13	0	0.13	0.12	8						
Perfluoropentanoic acid (PFPeA)	µg/L	0.01	0.10	0.09	11	0.10	0.08	22	<0.02	<0.02	0	<0.02	<0.01	0	0.02	0.03	40	0.02	0.02	0						
Perfluoroheptanoic acid (PFHpA)	µg/L	0.01	0.07	0.07	0	0.07	0.07	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0						
Perfluorooctanoic acid (PFOA)	µg/L	0.01	0.12	0.12	0	0.12	0.11	9	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0	<0.01	<0.01	0						
Perfluorodecanoic acid (PFDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0						
Perfluorododecanoic acid (PFDoDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0						
Perfluorononanoic acid (PFNA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0						
Perfluorotetradecanoic acid (PFTeDA)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0						
Perfluorotridecanoic acid (PFTrDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0						
Perfluoroundecanoic acid (PFUnDA)	µg/L	0.01	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0	<0.02	<0.02	0	<0.02	<0.01	0						
PFAS - Fluorotelomer Sulfonic Acids																										
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0						
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0						
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0						
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	µg/L	0.01	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0	<0.05	<0.05	0	<0.05	<0.01	0						
PFAS - Perfluoroalkyl Sulfonamides																										
Perfluorooctane sulfonamide (FOSA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0						
N-Methyl perfluorooctane sulfonamide (MeFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0						
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0						
N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0						
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0						
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	µg/L	0.02	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0	<0.02	<0.02	0	<0.02	<0.05	0						
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	µg/L	0.05	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0	<0.05	<0.05	0						
PFAS																										
Sum of PFAS (WA DER List)	µg/L	0.01	2.32	2.31	0	2.32	2.59	11	<0.01	<0.01	0	<0.01	<0.05	0	1.03	1.09	6	1.03	1	3						
Sum of PFHxS and PFOS	µg/L	0.01	1.78	1.78	0	1.78	1.92	8	<0.01	<0.01	0	<0.01	<0.01	0	0.76	0.80	5	0.76	0.75	1						
Sum of PFAS	µg/L	0.01	2.43	2.42	0	2.43	2.71	11	<0.01	<0.01	0	<0.01	<0.1	0	1.19	1.25	5	1.19	1.18	1						
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)	µg/L	0.01					2.03								<0.01				0.75							
Sum of PFAS (PFOS + PFOA)	µg/L	0.01					1.03								<0.01				0.03							
Inorganics																										
Carbonate Alkalinity (as CaCO3)	mg/L	1	<1	<1	0	<1	57	193	<1	<1	0	<1	19	180	<1	<1	0	<1	13	171						
Alkalinity (Bicarbonate as CaCO3)	mg/L	1	877	865	1	877	820	7	209	212	1	209	180	15	363	371	2	363	550	41						
Alkalinity (Hydroxide) as CaCO3	mg/L	1	<1	<1	0	<1	<20	0	<1	<1	0	<1	<20	0	<1	<1	0	<1	<20	0						
Alkalinity (total) as CaCO3	mg/L	1	877	865	1	877	880	0	209	212	1	209	200	4	363	371	2	363	570	44						
Anions Total	meq/L	0.01	60.2	62.0	3	60.2			556	559	1	556			479	482	1	479								
Cations Total	meq/L	0.01	55.3	53.2	4	55.3			578	588	2	578			526	522	1	526								
Chloride	mg/L	1	1,290	1,320	2	1,290	1,800	33	17,900	18,000	1	17,900	19,000	6	15,600	15,700	1	15,600	16,000	3						
Ionic Balance	%	0.01	4.29	7.68	57	4.29			1.91	2.48	26	1.91			4.71	4.05	15	4.71								
pH (Lab)	pH Units	0.01	7.94	7.91	0	7.94		11	8.07	8.10	0	8.07	8.6	6	7.73	7.52	3	7.73	8.5	9						
Sodium	mg/L	0.5				1,500							10,000						8,400							
Sodium (filtered)	mg/L	0.5	1,150	1,110	4	1,150			10,000	10,200	2	10,000			9,000	8,940	1	9,000								
Sulphate as SO4 - Turbidimetric (filtered)	mg/L	1	303	359	17	303			2,260	2,280	1	2,260			1,520	1,500	1	1,520								
Sulphate	mg/L	5					500						2,800													

Field ID		0960_SS123_210623	0960_QC102_210623		0960_SS123_210623	0960_QC202_210623		0960_SD305_210623	0960_QC106_210623		0960_SD305_210623	0960_QC206_210623		0960_SD301_210623	0960_QC110_210623		
Date		23/06/2021	23/06/2021		23/06/2021	23/06/2021		23/06/2021	23/06/2021		23/06/2021	23/06/2021					
Matrix Type		Soil	Soil		Soil	Soil		Soil	Soil		Soil	Soil					
Lab Report Number		EP2107194	EP2107194		EP2107194	806235		EP2107271	EP2107271		EP2107271	806235		EP2107271	EP2107271		
	Unit	LOR															
PFAS - Perfluoroalkyl Sulfonic Acids																	
Perfluoropropanesulfonic acid (PFPS)	mg/kg	0.005				<0.005						<0.005					
Perfluorobutane sulfonic acid (PFBS)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
Perfluoropentane sulfonic acid (PFPeS)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
Perfluorohexane sulfonic acid (PFHxS)	mg/kg	0.0002	<0.0002	0.0003	40	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
Perfluoroheptane sulfonic acid (PFHpS)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
Perfluorooctane sulfonic acid (PFOS)	mg/kg	0.0002	0.0466	0.0440	6	0.0466	0.066	34	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	0.0002	0
Perfluorononanesulfonic acid (PFNS)	mg/kg	0.005				<0.005						<0.005					
Perfluorodecane sulfonic acid (PFDS)	mg/kg	0.0002	0.0008	0.0010	22	0.0008	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
PFAS - Perfluoroalkyl Carboxylic Acids																	
Perfluorobutanoic acid (PFBA)	mg/kg	0.001	<0.001	<0.001	0	<0.001	<0.005	0	<0.001	<0.001	0	<0.001	<0.005	0	<0.001	<0.001	0
Perfluorohexanoic acid (PFHxA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
Perfluoropentanoic acid (PFPeA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
Perfluoroheptanoic acid (PFHpA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
Perfluorooctanoic acid (PFOA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
Perfluorodecanoic acid (PFDA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
Perfluorododecanoic acid (PFDoDA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
Perfluorononanoic acid (PFNA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
Perfluorotetradecanoic acid (PFTeDA)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0
Perfluorotridecanoic acid (PFTrDA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
Perfluoroundecanoic acid (PFUnDA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
PFAS - Fluorotelomer Sulfonic Acids																	
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.01	0	<0.0005	<0.0005	0	<0.0005	<0.01	0	<0.0005	<0.0005	0
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0
PFAS - Perfluoroalkyl Sulfonamides																	
Perfluorooctane sulfonamide (FOSA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0
N-Methyl perfluorooctane sulfonamide (MeFOSA)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.01	0	<0.0002	<0.0002	0	<0.0002	<0.01	0	<0.0002	<0.0002	0
N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	mg/kg	0.0002	<0.0002	<0.0002	0	<0.0002	<0.01	0	<0.0002	<0.0002	0	<0.0002	<0.01	0	<0.0002	<0.0002	0
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	mg/kg	0.0005	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0
PFAS																	
Sum of PFAS (WA DER List)	mg/kg	0.0002	0.0466	0.0443	5	0.0466	0.066	34	<0.0002	<0.0002	0	<0.0002	<0.01	0	<0.0002	0.0002	0
Sum of PFHxS and PFOS	mg/kg	0.0002	0.0466	0.0443	5	0.0466	0.066	34	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	0.0002	0
Sum of PFAS	mg/kg	0.0002	0.0474	0.0453	5	0.0474	0.066	33	<0.0002	<0.0002	0	<0.0002	<0.05	0	<0.0002	0.0002	0
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)	mg/kg	0.005					0.066					<0.005					
Sum of PFAS (PFOS + PFOA)	mg/kg	0.005					0.066					<0.005					
Inorganics																	
Conductivity (1:5 aqueous extract)	µS/cm	10					72										
Exchangeable Sodium Percent	%	0.1	1.6	1.5	6	1.6		1.0				1.0			1.8		
pH (1:5 Aqueous extract at 25A°C as rec.)	pH Units	0.1					9.1										
Moisture Content	%	0.1	9.2	9.5	3	9.2	8.4	9	18.5	19.3	4	18.5	20	8	22.3	20.2	10
Exchangeable Calcium	meq/100g	0.1	21.7	20.2	7	21.7			18.7			18.7			20.0		
Exchangeable Magnesium	meq/100g	0.1	2.4	2.3	4	2.4			2.2			2.2			7.9		
Exchangeable Potassium	meq/100g	0.1	0.6	0.6	0	0.6			0.2			0.2			0.7		
Exchangeable Sodium	meq/100g	0.1	0.4	0.4	0	0.4			0.2			0.2			0.5		
CEC	meq/100g	0.05	25.1	23.4	7	25.1	31	21	21.3			21.3			29.1		
Electrical conductivity *(lab)	µS/cm	1	98	94	4	98			6,370			6,370			9,760		
pH (Lab)	pH Units	0.1	9.0	8.9	1	9.0			8.5			8.5			8.7		
TOC	mg/kg	1.000					4.000										
Organic																	
Organic Matter	%	0.5	1.2	1.5	22	1.2		1.9				1.9			1.2		

*RPDs have only been considered where a concentration is greater than 1 times the LOR.

**Elevated RPDs are highlighted as per QAQC Profile settings (Acceptable RPDs for each LOR multiplier range are: No Limit (1 - 10 x LOR); 50 (10 - 20 x LOR); 20 (> 20 x LOR))

***Interlab Duplicates are matched on a per compound basis as methods vary between laboratories. Any methods in the row header relate to those used in the primary laboratory

Field ID			0960_SD301_210623	0960_QC210_210623		0960_SS122_210623	0960_QC111_210623		0960_SS122_210623	0960_QC211_210623		0960_SS193_210623	0960_QC113_210623		0960_SS193_210623	0960_QC213_210623	
Date			23/06/2021	23/06/2021		23/06/2021	23/06/2021		23/06/2021	23/06/2021		23/06/2021	23/06/2021		23/06/2021	23/06/2021	
Matrix Type			Soil	Soil		Soil	Soil		Soil	Soil		Soil	Soil		Soil	Soil	
Lab Report Number			EP2107271	806235	RPD	EP2107194	EP2107194	RPD	EP2107194	806235	RPD	EP2107271	EP2107271	RPD	EP2107271	806235	RPD
	Unit	LOR															
PFAS - Perfluoroalkyl Sulfonic Acids																	
Perfluoropropanesulfonic acid (PFPrS)	mg/kg	0.005		<0.005						<0.005						<0.005	
Perfluorobutane sulfonic acid (PFBS)	mg/kg	0.0002	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluoropentane sulfonic acid (PFPeS)	mg/kg	0.0002	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorohexane sulfonic acid (PFHxS)	mg/kg	0.0002	<0.0002	<0.005	0	0.0004	0.0004	0	0.0004	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluoroheptane sulfonic acid (PFHpS)	mg/kg	0.0002	<0.0002	<0.005	0	0.0006	0.0005	18	0.0006	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorooctane sulfonic acid (PFOS)	mg/kg	0.0002	<0.0002	<0.005	0	0.0082	0.0073	12	0.0082	0.0066	22	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorononanesulfonic acid (PFNS)	mg/kg	0.005		<0.005						<0.005						<0.005	
Perfluorodecane sulfonic acid (PFDS)	mg/kg	0.0002	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
PFAS - Perfluoroalkyl Carboxylic Acids																	
Perfluorobutanoic acid (PFBA)	mg/kg	0.001	<0.001	<0.005	0	<0.001	<0.001	0	<0.001	<0.005	0	<0.001	<0.001	0	<0.001	<0.005	0
Perfluorohexanoic acid (PFHxA)	mg/kg	0.0002	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluoropentanoic acid (PFPeA)	mg/kg	0.0002	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluoroheptanoic acid (PFHpA)	mg/kg	0.0002	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorooctanoic acid (PFOA)	mg/kg	0.0002	<0.0002	<0.005	0	0.0003	0.0002	40	0.0003	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorodecanoic acid (PFDA)	mg/kg	0.0002	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorododecanoic acid (PFDoDA)	mg/kg	0.0002	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorononanoic acid (PFNA)	mg/kg	0.0002	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluorotetradecanoic acid (PFTeDA)	mg/kg	0.0005	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
Perfluorotridecanoic acid (PFTrDA)	mg/kg	0.0002	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
Perfluoroundecanoic acid (PFUnDA)	mg/kg	0.0002	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
PFAS - Fluorotelomer Sulfonic Acids																	
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	mg/kg	0.0005	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	mg/kg	0.0005	<0.0005	<0.01	0	<0.0005	<0.0005	0	<0.0005	<0.01	0	<0.0005	<0.0005	0	<0.0005	<0.01	0
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	mg/kg	0.0005	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	mg/kg	0.0005	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
PFAS - Perfluoroalkyl Sulfonamides																	
Perfluorooctane sulfonamide (FOSA)	mg/kg	0.0002	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0	<0.0002	<0.0002	0	<0.0002	<0.005	0
N-Methyl perfluorooctane sulfonamide (MeFOSA)	mg/kg	0.0005	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	mg/kg	0.0002	<0.0002	<0.01	0	<0.0002	<0.0002	0	<0.0002	<0.01	0	<0.0002	<0.0002	0	<0.0002	<0.01	0
N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	mg/kg	0.0005	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	mg/kg	0.0005	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	mg/kg	0.0002	<0.0002	<0.01	0	<0.0002	<0.0002	0	<0.0002	<0.01	0	<0.0002	<0.0002	0	<0.0002	<0.01	0
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	mg/kg	0.0005	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0	<0.0005	<0.0005	0	<0.0005	<0.005	0
PFAS																	
Sum of PFAS (WA DER List)	mg/kg	0.0002	<0.0002	<0.01	0	0.0089	0.0079	12	0.0089	<0.01	0	<0.0002	<0.0002	0	<0.0002	<0.01	0
Sum of PFHxS and PFOS	mg/kg	0.0002	<0.0002	<0.005	0	0.0086	0.0077	11	0.0086	0.0066	26	<0.0002	<0.0002	0	<0.0002	<0.005	0
Sum of PFAS	mg/kg	0.0002	<0.0002	<0.05	0	0.0095	0.0084	12	0.0095	<0.05	0	<0.0002	<0.0002	0	<0.0002	<0.05	0
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)	mg/kg	0.005		<0.005						0.0066						<0.005	
Sum of PFAS (PFOS + PFOA)	mg/kg	0.005		<0.005						0.0066						<0.005	
Inorganics																	
Conductivity (1:5 aqueous extract)	µS/cm	10								310							
Exchangeable Sodium Percent	%	0.1	1.8			4.3	2.1	69	4.3			0.7	0.6	15	0.7		
pH (1:5 Aqueous extract at 25A°C as rec.)	pH Units	0.1								9.7							
Moisture Content	%	0.1	22.3	20	11	13.0	9.0	36	13.0	13	0	29.4	26.7	10	29.4	35	17
Exchangeable Calcium	meq/100g	0.1	20.0			23.3	21.2	9	23.3			13.0	11.7	11	13.0		
Exchangeable Magnesium	meq/100g	0.1	7.9			3.2	2.9	10	3.2			1.4	1.2	15	1.4		
Exchangeable Potassium	meq/100g	0.1	0.7			1.0	0.9	11	1.0			<0.1	<0.1	0	<0.1		
Exchangeable Sodium	meq/100g	0.1	0.5			1.2	0.5	82	1.2			0.1	<0.1	0	0.1		
CEC	meq/100g	0.05	29.1			28.7	25.5	12	28.7	38	28	14.7	13.0	12	14.7		
Electrical conductivity *(lab)	µS/cm	1	9.760			391	370	6	391			3.940	3.660	7	3.940		
pH (Lab)	pH Units	0.1	8.7			10.0	9.6	4	10.0			8.5	8.6	1	8.5		
TOC	mg/kg	1.000								<1.000							
Organic																	
Organic Matter	%	0.5	1.2			1.4	1.4	0	1.4			1.3	1.1	17	1.3		

APPENDIX

C

LABORATORY CERTIFICATES



CHAIN OF CUSTODY

COC#: 24505

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: ah DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS: 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	TOC additional WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0960_MW151		23/06/2021 12:48 PM	Water	ALS: 4 Non ALS: 0	No	Partial 7/8	X		
002	0960_MW106		23/06/2021 12:53 PM	Water	ALS: 4 Non ALS: 0	No	Partial 7/8	X		
003	0960_MW172		23/06/2021 12:57 PM	Water	ALS: 4 Non ALS: 0	No	X			
004	0960_MW170		23/06/2021 12:59 PM	Water	ALS: 4 Non ALS: 0	No	X			
005	0960_MW102		23/06/2021 01:04 PM	Water	ALS: 4 Non ALS: 0	No	Partial 7/8	X		
006	0960_MW104		23/06/2021 01:05 PM	Water	ALS: 4 Non ALS: 0	No	X			
007	0960_MW127		23/06/2021 01:34 PM	Water	ALS: 5 Non ALS: 0	No	X			
008	0960_QC107		23/06/2021 01:35 PM	Water	ALS: 4 Non ALS: 0	No	X			
009	0960_MW126		23/06/2021 02:09 PM	Water	ALS: 4 Non ALS: 0	No	X			

**CHAIN OF CUSTODY**

COC#: 24505

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFASOMP

SITE: ah DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS: 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

°C

Other comments:

SAMPLE DETAILS**ANALYSIS REQUIRED**

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	TOC additional WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
010	0960_MW103		23/06/2021 03:02 PM	Water	ALS: 4 Non ALS: 0	No	Partial 7/8	X		
011	0960_MW148D	extra for qc	23/06/2021 03:24 PM	Water	ALS: 6 Non ALS: 0	No	X			
012	0960_MW148S	extra for qc	23/06/2021 03:29 PM	Water	ALS: 6 Non ALS: 0	No	X			
013	0960_MW124		23/06/2021 04:04 PM	Water	ALS: 4 Non ALS: 0	No	X			



CHAIN OF CUSTODY

COC#: 24505

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: ah DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS: 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)


Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	PARTIAL ANALYSIS GROUP NAME	MATRIX	SELECTED ANALYSIS NAME
001	0960_MW151	Ground Waters Primary WATER	Water	<ul style="list-style-type: none">- EA005P pH (PCT)- NT-02 Major Anions (Chloride, Sulphate, Alkalinity)- NT-01 Major Cations (Ca, Mg, Na, K)- EA025H Suspended Solids - Standard Level- EA015H Total Dissolved Solids - Standard Level- EN055 - PG Ionic Balance by ED037P, ED041G, ED045G & ED093F- EP231X PFAS - Full Suite (28 analytes)
002	0960_MW106	Ground Waters Primary WATER	Water	<ul style="list-style-type: none">- EA005P pH (PCT)- NT-02 Major Anions (Chloride, Sulphate, Alkalinity)- NT-01 Major Cations (Ca, Mg, Na, K)- EA025H Suspended Solids - Standard Level- EA015H Total Dissolved Solids - Standard Level- EN055 - PG Ionic Balance by ED037P, ED041G, ED045G & ED093F- EP231X PFAS - Full Suite (28 analytes)
005	0960_MW102	Ground Waters Primary WATER	Water	<ul style="list-style-type: none">- EA005P pH (PCT)- NT-02 Major Anions (Chloride, Sulphate, Alkalinity)- NT-01 Major Cations (Ca, Mg, Na, K)- EA025H Suspended Solids - Standard Level- EA015H Total Dissolved Solids - Standard Level- EN055 - PG Ionic Balance by ED037P, ED041G, ED045G & ED093F- EP231X PFAS - Full Suite (28 analytes)
010	0960_MW103	Ground Waters Primary WATER	Water	<ul style="list-style-type: none">- EA005P pH (PCT)- NT-02 Major Anions (Chloride, Sulphate, Alkalinity)- NT-01 Major Cations (Ca, Mg, Na, K)- EA025H Suspended Solids - Standard Level- EA015H Total Dissolved Solids - Standard Level- EN055 - PG Ionic Balance by ED037P, ED041G, ED045G & ED093F- EP231X PFAS - Full Suite (28 analytes)

 CHAIN OF CUSTODY COC#: 24505 ALS Laboratory: EP Perth		RELINQUISHED BY: DATE TIME:	RECEIVED BY: DATE TIME:	RELINQUISHED BY: DATE TIME:	RECEIVED BY: DATE TIME:
CLIENT: CARBSD - CARDNO (WA) PTY LTD PROJECT: WA_0960_PFSOMP		TURNAROUND REQUIREMENTS: 5 Days		LABORATORY USE ONLY (Circle)	
SITE: ah DEF19009/Learmonth GW ORDER NO: DEF19009/0960		Biohazard info:		Custody Seal intact? Yes No N/A Free ice / frozen ice bricks present upon receipt? Yes No N/A Random Sample Temperature on Receipt: °C Other comments:	
PROJECT MANAGER: Maelle Bourdais PRIMARY SAMPLER: Maelle Bourdais		CONTACT PH: SAMPLER MOBILE: QUOTE NO: SY/139/19 / ES2019CARBSD0002			
EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au					

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0960_MW151	HDPE (no PTFE)	20 mL	00352005016108	Grey	No	
001	0960_MW151	HDPE (no PTFE)	20 mL	00352005016329	Grey	No	
001	0960_MW151	Clear Plastic Bottle - Natural	250 mL	00070719042832	Green	No	
001	0960_MW151	Amber TOC Vial - Sulfuric Acid	40 mL	00180220056109	Purple	No	
002	0960_MW106	Amber TOC Vial - Sulfuric Acid	40 mL	00180220056558	Purple	No	
002	0960_MW106	Clear Plastic Bottle - Natural	250 mL	00070719042751	Green	No	
002	0960_MW106	HDPE (no PTFE)	20 mL	00352005016176	Grey	No	
002	0960_MW106	HDPE (no PTFE)	20 mL	00352005016142	Grey	No	
003	0960_MW172	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023882	Purple	No	
003	0960_MW172	Clear Plastic Bottle - Natural	250 mL	00071119012706	Green	No	
003	0960_MW172	HDPE (no PTFE)	20 mL	00350019112610	Grey	No	
003	0960_MW172	HDPE (no PTFE)	20 mL	00350019165657	Grey	No	
004	0960_MW170	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023788	Purple	No	
004	0960_MW170	Clear Plastic Bottle - Natural	250 mL	00071119012703	Green	No	
004	0960_MW170	HDPE (no PTFE)	20 mL	00350019112540	Grey	No	
004	0960_MW170	HDPE (no PTFE)	20 mL	00350019165690	Grey	No	
005	0960_MW102	Amber TOC Vial - Sulfuric Acid	40 mL	00180220056630	Purple	No	
005	0960_MW102	Clear Plastic Bottle - Natural	250 mL	00070719042700	Green	No	
005	0960_MW102	HDPE (no PTFE)	20 mL	00352005016138	Grey	No	
005	0960_MW102	HDPE (no PTFE)	20 mL	00352005016265	Grey	No	
006	0960_MW104	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023756	Purple	No	
006	0960_MW104	Clear Plastic Bottle - Natural	250 mL	00070719042920	Green	No	
006	0960_MW104	HDPE (no PTFE)	20 mL	00350019106928	Grey	No	
006	0960_MW104	HDPE (no PTFE)	20 mL	00350019106715	Grey	No	
007	0960_MW127	Clear Plastic Bottle - Natural	250 mL	00070220143112	Green	No	
007	0960_MW127	HDPE (no PTFE)	20 mL	00352010039912	Grey	No	



CHAIN OF CUSTODY

COC#: 24505

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFASOMP

SITE: ah DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS: 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

007	0960_MW127	HDPE (no PTFE)	20 mL	00352010039985	Grey	No	
007	0960_MW127	Clear Plastic Bottle - Natural	250 mL	00070220143172	Green	No	
007	0960_MW127	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003947	Purple	No	
008	0960_QC107	HDPE (no PTFE)	20 mL	00352005016322	Grey	No	
008	0960_QC107	HDPE (no PTFE)	20 mL	00352005016205	Grey	No	
008	0960_QC107	Clear Plastic Bottle - Natural	250 mL	00070719042902	Green	No	
008	0960_QC107	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220056626	Purple	No	
009	0960_MW126	HDPE (no PTFE)	20 mL	00352005016170	Grey	No	
009	0960_MW126	HDPE (no PTFE)	20 mL	00352005016293	Grey	No	
009	0960_MW126	Clear Plastic Bottle - Natural	250 mL	00070719042737	Green	No	
009	0960_MW126	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220056621	Purple	No	
010	0960_MW103	Clear Plastic Bottle - Natural	250 mL	00070719042958	Green	No	
010	0960_MW103	HDPE (no PTFE)	20 mL	00350019106854	Grey	No	
010	0960_MW103	HDPE (no PTFE)	20 mL	00350019106912	Grey	No	
010	0960_MW103	Amber TOC Vial - Sulfuric Acid	40 mL	00181019023752	Purple	No	
011	0960_MW148D	HDPE (no PTFE)	20 mL	00350019106700	Grey	No	
011	0960_MW148D	HDPE (no PTFE)	20 mL	00350019106730	Grey	No	
011	0960_MW148D	Clear Plastic Bottle - Natural	250 mL	00070719042948	Green	No	
011	0960_MW148D	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023741	Purple	No	
011	0960_MW148D	HDPE (no PTFE)	20 mL	00350019165879	Grey	No	
011	0960_MW148D	HDPE (no PTFE)	20 mL	00350019030687	Grey	No	
012	0960_MW148S	HDPE (no PTFE)	20 mL	00352005016048	Grey	No	
012	0960_MW148S	HDPE (no PTFE)	20 mL	00352005016084	Grey	No	
012	0960_MW148S	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220056220	Purple	No	
012	0960_MW148S	Clear Plastic Bottle - Natural	250 mL	00070719042795	Green	No	
012	0960_MW148S	HDPE (no PTFE)	20 mL	00350019112560	Grey	No	
012	0960_MW148S	HDPE (no PTFE)	20 mL	00350019165864	Grey	No	



CHAIN OF CUSTODY

COC#: 24505

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: ah DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

TURNAROUND REQUIREMENTS: 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

013	0960_MW124	Clear Plastic Bottle - Natural	250 mL	00070719042800	Green	No	
013	0960_MW124	HDPE (no PTFE)	20 mL	00352005016287	Grey	No	
013	0960_MW124	HDPE (no PTFE)	20 mL	00352005016195	Grey	No	
013	0960_MW124	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220056564	Purple	No	

Total Bottle Count: ALS: 57, Non ALS: 0

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : EP2107189

<p>Client : CARDNO (WA) PTY LTD</p> <p>Contact : MAELLE BOURDAIS</p> <p>Address : 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006</p> <p>E-mail : maelle.bourdais@cardno.com.au</p> <p>Telephone : ----</p> <p>Facsimile : ----</p> <p>Project : WA_0960_PFASOMP</p> <p>Order number : DEF19009/0960</p> <p>C-O-C number : 24505</p> <p>Site : DEF19009/Learmonth</p> <p>Sampler : ASHLEY BROWN, MAELLE BOURDAIS</p>	<p>Laboratory : Environmental Division Perth</p> <p>Contact : Nick Courts</p> <p>Address : 26 Rigali Way Wangara WA Australia 6065</p> <p>E-mail : nick.courts@alsglobal.com</p> <p>Telephone : +61-8-9406 1301</p> <p>Facsimile : +61-8-9406 1399</p> <p>Page : 1 of 3</p> <p>Quote number : ES2019CARBSD0002 (SY/139/19)</p> <p>QC Level : NEPM 2013 B3 & ALS QC Standard</p>
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Dates

Date Samples Received : 28-Jun-2021 13:25	Issue Date : 29-Jun-2021
Client Requested Due : 09-Jul-2021	Scheduled Reporting Date : 09-Jul-2021
Date	

Delivery Details

Mode of Delivery : Carrier	Security Seal : Not Available
No. of coolers/boxes : 5	Temperature : 15.9 - Ice present
Receipt Detail :	No. of samples received / analysed : 13 / 13

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepancies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.



Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP005 Total Organic Carbon (TOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2107189-001	23-Jun-2021 12:48	0960_MW151_210623	✓	✓	✓	✓	✓	✓	✓
EP2107189-002	23-Jun-2021 12:53	0960_MW106_210623	✓	✓	✓	✓	✓	✓	✓
EP2107189-003	23-Jun-2021 12:57	0960_MW172_210623	✓	✓	✓	✓	✓	✓	✓
EP2107189-004	23-Jun-2021 12:59	0960_MW170_210623	✓	✓	✓	✓	✓	✓	✓
EP2107189-005	23-Jun-2021 13:04	0960_MW102_210623	✓	✓	✓	✓	✓	✓	✓
EP2107189-006	23-Jun-2021 13:05	0960_MW104_210623	✓	✓	✓	✓	✓	✓	✓
EP2107189-007	23-Jun-2021 13:34	0960_MW127_210623	✓	✓	✓	✓	✓	✓	✓
EP2107189-008	23-Jun-2021 13:35	0960_QC107_210623	✓	✓	✓	✓	✓	✓	✓
EP2107189-009	23-Jun-2021 14:09	0960_MW126_210623	✓	✓	✓	✓	✓	✓	✓
EP2107189-010	23-Jun-2021 15:02	0960_MW103_210623	✓	✓	✓	✓	✓	✓	✓
EP2107189-011	23-Jun-2021 15:24	0960_MW148D_210623	✓	✓	✓	✓	✓	✓	✓
EP2107189-012	23-Jun-2021 15:29	0960_MW148S_210623	✓	✓	✓	✓	✓	✓	✓
EP2107189-013	23-Jun-2021 16:04	0960_MW124_210623	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2107189-001	23-Jun-2021 12:48	0960_MW151_210623	✓	✓
EP2107189-002	23-Jun-2021 12:53	0960_MW106_210623	✓	✓
EP2107189-003	23-Jun-2021 12:57	0960_MW172_210623	✓	✓
EP2107189-004	23-Jun-2021 12:59	0960_MW170_210623	✓	✓
EP2107189-005	23-Jun-2021 13:04	0960_MW102_210623	✓	✓
EP2107189-006	23-Jun-2021 13:05	0960_MW104_210623	✓	✓
EP2107189-007	23-Jun-2021 13:34	0960_MW127_210623	✓	✓
EP2107189-008	23-Jun-2021 13:35	0960_QC107_210623	✓	✓
EP2107189-009	23-Jun-2021 14:09	0960_MW126_210623	✓	✓
EP2107189-010	23-Jun-2021 15:02	0960_MW103_210623	✓	✓
EP2107189-011	23-Jun-2021 15:24	0960_MW148D_210623	✓	✓



			WATER - EP002 Dissolved Organic Carbon (DOC)	
			WATER - EP231X PFAS - Full Suite (28 analytes)	
EP2107189-012	23-Jun-2021 15:29	0960_MW148S_210623	✓	✓
EP2107189-013	23-Jun-2021 16:04	0960_MW124_210623	✓	✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Client Sample ID(s)	Container	Due for extraction	Due for analysis	Samples Received		Instructions Received	
					Date	Evaluation	Date	Evaluation
EA005-P: pH by PC Titrator								
0960_MW102_21062	Clear Plastic Bottle - Natural	----	23-Jun-2021	28-Jun-2021	✗	----	----	
0960_MW103_21062	Clear Plastic Bottle - Natural	----	23-Jun-2021	28-Jun-2021	✗	----	----	
0960_MW104_21062	Clear Plastic Bottle - Natural	----	23-Jun-2021	28-Jun-2021	✗	----	----	
0960_MW106_21062	Clear Plastic Bottle - Natural	----	23-Jun-2021	28-Jun-2021	✗	----	----	
0960_MW124_21062	Clear Plastic Bottle - Natural	----	23-Jun-2021	28-Jun-2021	✗	----	----	
0960_MW126_21062	Clear Plastic Bottle - Natural	----	23-Jun-2021	28-Jun-2021	✗	----	----	
0960_MW127_21062	Clear Plastic Bottle - Natural	----	23-Jun-2021	28-Jun-2021	✗	----	----	
0960_MW148D_2106	Clear Plastic Bottle - Natural	----	23-Jun-2021	28-Jun-2021	✗	----	----	
0960_MW148S_2106	Clear Plastic Bottle - Natural	----	23-Jun-2021	28-Jun-2021	✗	----	----	
0960_MW151_21062	Clear Plastic Bottle - Natural	----	23-Jun-2021	28-Jun-2021	✗	----	----	
0960_MW170_21062	Clear Plastic Bottle - Natural	----	23-Jun-2021	28-Jun-2021	✗	----	----	
0960_MW172_21062	Clear Plastic Bottle - Natural	----	23-Jun-2021	28-Jun-2021	✗	----	----	
0960_QC107_210623	Clear Plastic Bottle - Natural	----	23-Jun-2021	28-Jun-2021	✗	----	----	

Requested Deliverables

CLAIRE ARMSTRONG

- A4 - AU Tax Invoice (INV)

Email claire.armstrong@cardno.com.au

DERP LAB REPORTS

- EDI Format - ESDAT (ESDAT)

Email derp.labreports@esdat.com.au

Laura Beames

- A4 - AU Tax Invoice (INV)

Email laura.beames@cardno.com.au

MAELLE BOURDAIS

- *AU Certificate of Analysis - NATA (COA)
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)
- Chain of Custody (CoC) (COC)
- EDI Format - ESDAT (ESDAT)
- EDI Format - XTab (XTAB)

[illegible]

CERTIFICATE OF ANALYSIS

Work Order : **EP2107189**
Client : **CARDNO (WA) PTY LTD**
Contact : **MAELLE BOURDAIS**
Address : **11 HARVEST TERRACE PO BOX 155**
WEST PERTH WA, AUSTRALIA 6006
Telephone : **----**
Project : **WA_0960_PFASOMP**
Order number : **DEF19009/0960**
C-O-C number : **24505**
Sampler : **ASHLEY BROWN, MAELLE BOURDAIS**
Site : **DEF19009/Learmonth**
Quote number : **SY/139/19**
No. of samples received : **13**
No. of samples analysed : **13**

Page : 1 of 12
Laboratory : Environmental Division Perth
Contact : Nick Courts
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 28-Jun-2021 13:25
Date Analysis Commenced : 29-Jun-2021
Issue Date : 08-Jul-2021 12:34



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

Ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- EA025H: It is noted sample #8 maybe a duplicate of #7, however, upon visual inspection of the bottles, sample #8 contains much more sediments than sample #7.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW151_210623	0960_MW106_210623	0960_MW172_210623	0960_MW170_210623	0960_MW102_210623
Sampling date / time				23-Jun-2021 12:48	23-Jun-2021 12:53	23-Jun-2021 12:57	23-Jun-2021 12:59	23-Jun-2021 13:04
Compound	CAS Number	LOR	Unit	EP2107189-001	EP2107189-002	EP2107189-003	EP2107189-004	EP2107189-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.67	7.92	7.57	7.54	7.34
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	9770	4820	25500	37600	78700
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	2500	1990	675	300	691
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L	720	1160	281	236	137
Total Alkalinity as CaCO ₃	----	1	mg/L	720	1160	281	236	137
ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA								
Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L	657	565	2270	1490	3820
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	5060	1540	12400	17500	35000
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	141	25	528	995	1450
Magnesium	7439-95-4	1	mg/L	254	52	714	1100	2410
Sodium	7440-23-5	1	mg/L	2840	1500	7860	9950	21800
Potassium	7440-09-7	1	mg/L	133	81	246	255	765
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	171	78.4	403	529	1070
∅ Total Cations	----	0.01	meq/L	155	72.8	433	580	1240
∅ Ionic Balance	----	0.01	%	4.89	3.66	3.66	4.52	7.32
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	----	----	2	2	----
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	4	4	----	----	<1
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	2.48	9.12	0.76	0.04	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	3.35	10.5	1.06	0.04	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	13.2	56.9	6.00	0.27	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW151_210623	0960_MW106_210623	0960_MW172_210623	0960_MW170_210623	0960_MW102_210623
Sampling date / time				23-Jun-2021 12:48	23-Jun-2021 12:53	23-Jun-2021 12:57	23-Jun-2021 12:59	23-Jun-2021 13:04
Compound	CAS Number	LOR	Unit	EP2107189-001	EP2107189-002	EP2107189-003	EP2107189-004	EP2107189-005
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	3.03	3.80	0.24	<0.02	<0.02
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	13.9	25.3	1.58	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	0.8	2.4	0.2	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	1.18	6.06	0.59	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	4.91	30.4	2.27	0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.64	1.76	0.36	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	1.59	2.30	0.40	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW151_210623	0960_MW106_210623	0960_MW172_210623	0960_MW170_210623	0960_MW102_210623
Sampling date / time				23-Jun-2021 12:48	23-Jun-2021 12:53	23-Jun-2021 12:57	23-Jun-2021 12:59	23-Jun-2021 13:04
Compound	CAS Number	LOR	Unit	EP2107189-001	EP2107189-002	EP2107189-003	EP2107189-004	EP2107189-005
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	45.1	148	13.5	0.37	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	27.1	82.2	7.58	0.27	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L	38.7	134	12.2	0.33	<0.01
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	86.0	88.2	92.5	89.1	88.9
13C8-PFOA	----	0.02	%	99.6	97.3	95.7	96.8	99.9



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW104_210623	0960_MW127_210623	0960_QC107_210623	0960_MW126_210623	0960_MW103_210623
Sampling date / time				23-Jun-2021 13:05	23-Jun-2021 13:34	23-Jun-2021 13:35	23-Jun-2021 14:09	23-Jun-2021 15:02
Compound	CAS Number	LOR	Unit	EP2107189-006	EP2107189-007	EP2107189-008	EP2107189-009	EP2107189-010
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.50	7.33	7.41	7.50	7.40
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	69300	56400	57100	47800	66800
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	161	860	5460	109	11400
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	233	152	151	121	154
Total Alkalinity as CaCO3	----	1	mg/L	233	152	151	121	154
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	3920	2400	2420	1690	2640
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	29900	25500	25000	20800	28300
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	816	1080	1140	1150	1400
Magnesium	7439-95-4	1	mg/L	2450	1690	1770	1490	2220
Sodium	7440-23-5	1	mg/L	19400	14600	15300	11300	16800
Potassium	7440-09-7	1	mg/L	956	553	573	555	832
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	930	772	759	624	856
∅ Total Cations	----	0.01	meq/L	1110	842	883	686	1000
∅ Ionic Balance	----	0.01	%	8.87	4.33	7.56	4.68	7.97
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	5	2	2	4	----
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	----	----	----	----	3
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.07	<0.02	<0.02	<0.02	0.13
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	0.04
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.05	<0.02	<0.02	<0.02	0.13



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW104_210623	0960_MW127_210623	0960_QC107_210623	0960_MW126_210623	0960_MW103_210623
Sampling date / time				23-Jun-2021 13:05	23-Jun-2021 13:34	23-Jun-2021 13:35	23-Jun-2021 14:09	23-Jun-2021 15:02
Compound	CAS Number	LOR	Unit	EP2107189-006	EP2107189-007	EP2107189-008	EP2107189-009	EP2107189-010
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	0.03
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW104_210623	0960_MW127_210623	0960_QC107_210623	0960_MW126_210623	0960_MW103_210623
Sampling date / time				23-Jun-2021 13:05	23-Jun-2021 13:34	23-Jun-2021 13:35	23-Jun-2021 14:09	23-Jun-2021 15:02
Compound	CAS Number	LOR	Unit	EP2107189-006	EP2107189-007	EP2107189-008	EP2107189-009	EP2107189-010
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	0.12	<0.01	<0.01	<0.01	0.33
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	0.05	<0.01	<0.01	<0.01	0.13
Sum of PFAS (WA DER List)	----	0.01	µg/L	0.12	<0.01	<0.01	<0.01	0.29
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	85.3	92.0	86.7	92.7	88.9
13C8-PFOA	----	0.02	%	96.5	99.9	102	103	97.6



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW148D_21062 3	0960_MW148S_21062 3	0960_MW124_210623	----	----
Sampling date / time				23-Jun-2021 15:24	23-Jun-2021 15:29	23-Jun-2021 16:04	----	----
Compound	CAS Number	LOR	Unit	EP2107189-011	EP2107189-012	EP2107189-013	-----	-----
Result				Result	Result	Result	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.71	7.52	7.54	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	61800	31000	71000	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	49	1790	26	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	165	378	144	----	----
Total Alkalinity as CaCO3	----	1	mg/L	165	378	144	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	3230	1590	4530	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	27300	15400	32900	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	897	591	962	----	----
Magnesium	7439-95-4	1	mg/L	1880	1050	2480	----	----
Sodium	7440-23-5	1	mg/L	17500	8990	20700	----	----
Potassium	7440-09-7	1	mg/L	817	383	998	----	----
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	841	475	1020	----	----
∅ Total Cations	----	0.01	meq/L	982	517	1180	----	----
∅ Ionic Balance	----	0.01	%	7.73	4.20	6.93	----	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	5	5	2	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	1.64	9.03	<0.02	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	1.23	6.80	<0.02	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	5.00	25.5	<0.02	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.41	3.06	<0.02	----	----



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW148D_21062 3	0960_MW148S_21062 3	0960_MW124_210623	----	----
Sampling date / time				23-Jun-2021 15:24	23-Jun-2021 15:29	23-Jun-2021 16:04	----	----
Compound	CAS Number	LOR	Unit	EP2107189-011	EP2107189-012	EP2107189-013	-----	-----
				Result	Result	Result	----	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	3.13	20.8	<0.01	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	0.3	1.5	<0.1	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.40	1.95	<0.02	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	1.81	9.77	<0.02	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.23	1.10	<0.02	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.35	1.63	<0.01	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	----	----



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW148D_21062 3	0960_MW148S_21062 3	0960_MW124_210623	----	----
Sampling date / time				23-Jun-2021 15:24	23-Jun-2021 15:29	23-Jun-2021 16:04	----	----
Compound	CAS Number	LOR	Unit	EP2107189-011	EP2107189-012	EP2107189-013	-----	-----
				Result	Result	Result	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	14.5	81.1	<0.01	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	8.13	46.3	<0.01	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	12.9	71.3	<0.01	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	86.5	86.8	84.3	----	----
13C8-PFOA	----	0.02	%	98.1	99.6	78.6	----	----



Surrogate Control Limits

Sub-Matrix: GROUNDWATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EP231A: Perfluoroalkyl Sulfonic Acids

(WATER) EP231B: Perfluoroalkyl Carboxylic Acids

(WATER) EP231C: Perfluoroalkyl Sulfonamides

(WATER) EP231D: (n:2) Fluorotelomer Sulfonic Acids

(WATER) EP231P: PFAS Sums

(WATER) EP231S: PFAS Surrogate

QUALITY CONTROL REPORT

Work Order	: EP2107189	Page	: 1 of 13
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 28-Jun-2021
Order number	: DEF19009/0960	Date Analysis Commenced	: 29-Jun-2021
C-O-C number	: 24505	Issue Date	: 08-Jul-2021
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		
Site	: DEF19009/Learmonth		
Quote number	: SY/139/19		
No. of samples received	: 13		
No. of samples analysed	: 13		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
= Indicates failed QC

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA005P: pH by PC Titrator (QC Lot: 3776024)									
EP2107188-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.62	7.53	1.2	0% - 20%
EP2107189-007	0960_MW127_210623	EA005-P: pH Value	----	0.01	pH Unit	7.33	7.33	0.0	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3764976)									
EP2107188-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	19100	18800	1.7	0% - 20%
EP2107189-004	0960_MW170_210623	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	37600	37000	1.6	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3765019)									
EP2107189-005	0960_MW102_210623	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	78700	76600	2.8	0% - 20%
EP2107189-013	0960_MW124_210623	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	71000	69800	1.6	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3764977)									
EP2107188-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	189	205	8.0	0% - 20%
EP2107361-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.0	No Limit
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3765020)									
EP2107189-005	0960_MW102_210623	EA025H: Suspended Solids (SS)	----	5	mg/L	691	642	7.4	0% - 20%
EP2107385-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	9	11	20.5	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 3776023)									
EP2107188-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	317	318	0.4	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	317	318	0.4	0% - 20%
EP2107189-007	0960_MW127_210623	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	152	153	0.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	152	153	0.0	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3764405)									

Page : 3 of 13
 Work Order : EP2107189
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFSASOMP



Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3764405) - continued									
EP2107189-001	0960_MW151_210623	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	657	656	0.0	0% - 20%
EP2107189-011	0960_MW148D_210623	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	3230	3230	0.1	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3764406)									
EP2107189-001	0960_MW151_210623	ED045G: Chloride	16887-00-6	1	mg/L	5060	5080	0.3	0% - 20%
EP2107189-011	0960_MW148D_210623	ED045G: Chloride	16887-00-6	1	mg/L	27300	28000	2.7	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3762889)									
EP2107189-001	0960_MW151_210623	ED093F: Calcium	7440-70-2	1	mg/L	141	149	5.5	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	254	270	5.7	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	2840	3000	5.5	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	133	139	4.3	0% - 20%
EP2107189-011	0960_MW148D_210623	ED093F: Calcium	7440-70-2	1	mg/L	897	937	4.3	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	1880	1940	2.9	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	17500	18200	4.0	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	817	852	4.2	0% - 20%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3774022)									
EP2107188-001	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	28	25	12.9	0% - 20%
EP2107193-008	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	<2	2	0.0	No Limit
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3776981)									
EP2107189-008	0960_QC107_210623	EP002: Dissolved Organic Carbon	----	1	mg/L	2	2	0.0	No Limit
EP2107270-005	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	4	4	0.0	No Limit
EP005: Total Organic Carbon (TOC) (QC Lot: 3763379)									
EP2107189-001	0960_MW151_210623	EP005: Total Organic Carbon	----	1	mg/L	4	3	32.0	No Limit
EP2107408-001	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	7	7	0.0	No Limit
EP005: Total Organic Carbon (TOC) (QC Lot: 3771720)									
EP2107189-010	0960_MW103_210623	EP005: Total Organic Carbon	----	1	mg/L	3	2	39.2	No Limit
EP2107531-002	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	<1	<1	0.0	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3775220)									
EP2107188-002	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.02	0.03	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP2107189-012	0960_MW148S_210623	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	20.8	23.2	10.9	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	9.03	10.0	10.5	0% - 20%
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	6.80	7.83	14.1	0% - 20%
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	25.5	29.3	14.1	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	3.06	3.23	5.4	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3775610)									
ES2124445-009	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	37.6	43.8	15.2	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.06	0.06	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.07	0.10	29.2	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	2.40	2.67	10.6	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	1.16	1.30	10.7	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	0.18	0.22	18.6	0% - 50%
ES2124445-011	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	12.1	12.3	1.5	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.03	0.03	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.03	0.04	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	1.07	1.02	5.2	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.38	0.41	7.8	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	0.04	0.04	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3775220)									
EP2107188-002	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EP2107189-012	0960_MW148S_210623	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	1.63	1.75	7.0	0% - 20%
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	1.95	2.18	11.0	0% - 20%
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	9.77	11.6	17.4	0% - 20%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	1.10	1.20	9.0	0% - 20%
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	1.5	1.8	20.8	0% - 50%
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3775610)									
ES2124445-009	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	2.61	2.83	8.2	0% - 20%
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.38	0.40	5.0	0% - 20%
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	1.82	1.91	4.9	0% - 20%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	1.24	1.27	2.0	0% - 20%



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3775610) - continued									
ES2124445-009	Anonymous	EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	1.96	2.16	9.8	0% - 20%
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	1.54	1.79	14.9	0% - 20%
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	0.69	0.76	10.3	0% - 20%
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	0.24	0.26	7.7	0% - 50%
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	0.08	0.09	17.8	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	0.2	0.2	0.0	No Limit
ES2124445-011	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.83	0.88	6.0	0% - 20%
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.15	0.17	7.9	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.66	0.70	5.4	0% - 20%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.41	0.47	12.0	0% - 20%
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	0.25	0.29	14.0	0% - 50%
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	0.10	0.12	17.1	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	0.06	0.06	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	0.03	0.02	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3775220)									
EP2107188-002	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP2107189-012	0960_MW148S_210623	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3775220) - continued									
EP2107189-012	0960_MW148S_210623	EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3775610)									
ES2124445-009	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	0.51	0.60	15.6	0% - 20%
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
ES2124445-011	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	0.12	0.13	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3775220)									
EP2107188-002	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3775220) - continued									
EP2107189-012	0960_MW148S_210623	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3775610)									
ES2124445-009	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	0.20	0.22	12.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	1.54	1.80	15.2	0% - 20%
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
ES2124445-011	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	0.06	0.07	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	0.29	0.29	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231P: PFAS Sums (QC Lot: 3775220)									
EP2107188-002	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	0.02	0.03	40.0	No Limit
EP2107189-012	0960_MW148S_210623	EP231X: Sum of PFAS	----	0.01	µg/L	81.1	92.1	12.6	0% - 20%
EP231P: PFAS Sums (QC Lot: 3775610)									
ES2124445-009	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	54.5	62.4	13.6	0% - 20%
ES2124445-011	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	16.6	17.0	2.6	0% - 20%

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
	Spike Concentration	Spike Recovery (%)	Acceptable Limits (%)	
		LCS	Low	High
Result				
----	4 pH Unit	101	98.5	102
----	7 pH Unit	100	98.5	102
<10	246 mg/L	102	88.1	114
<10	1000 mg/L	99.4	88.1	114
<10	246 mg/L	114	88.1	114
<10	1000 mg/L	105	88.1	114
<5	95 mg/L	103	89.1	120
<5	1000 mg/L	99.0	89.1	120
<5	95 mg/L	97.9	89.1	120
<5	1000 mg/L	95.0	89.1	120
<1	----	----	----	----
<1	----	----	----	----
<1	----	----	----	----
<1	20 mg/L	106	81.2	126
<1	200 mg/L	99.6	90.0	110
<1	25 mg/L	101	87.7	113
<1	500 mg/L	97.6	87.7	113
<1	10 mg/L	99.3	87.9	114
<1	1000 mg/L	104	87.9	114
<1	50 mg/L	98.4	85.9	113
<1	50 mg/L	98.1	88.0	110
<1	50 mg/L	104	87.3	118
<1	50 mg/L	92.2	89.7	108

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3774022) - continued								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	95.4	73.2	116
				<1	100 mg/L	102	73.2	116
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3776981)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	95.3	73.2	116
				<1	100 mg/L	99.6	73.2	116
EP005: Total Organic Carbon (TOC) (QCLot: 3763379)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	99.4	87.2	116
				<1	100 mg/L	101	87.2	116
EP005: Total Organic Carbon (TOC) (QCLot: 3771720)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	102	87.2	116
				<1	100 mg/L	103	87.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3775220)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	96.4	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	81.6	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	74.6	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	75.4	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	91.4	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	90.6	53.0	142
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3775610)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	79.4	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	105	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	83.6	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	91.8	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	89.4	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	98.0	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3775220)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	90.2	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	89.6	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	85.4	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	112	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	110	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	112	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	113	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	117	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	118	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	97.6	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	93.0	71.0	132
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3775610)								



Sub-Matrix: **WATER**

Method: Compound				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%)	
							Low	High
CAS Number	LOR	Unit	Result					
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3775610) - continued								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	84.6	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	99.0	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	91.4	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	91.8	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	104	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	109	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	106	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	101	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	105	72.0	134
EP231X: Perfluorotridecanoic acid (PFTriDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	91.2	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	91.6	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3775220)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	110	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	109	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	91.7	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	103	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	100	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	114	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	109	61.0	135
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3775610)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	104	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	107	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	91.4	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	90.7	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	111	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	118	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	108	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3775220)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	105	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	101	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	82.8	67.0	138



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3775220) - continued								
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	109	71.4	144
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3775610)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	89.4	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	99.0	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	99.6	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	91.8	71.4	144

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike Concentration	Spike Recovery (%) MS	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number			Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3764405)							
EP2107189-001	0960_MW151_210623	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3764406)							
EP2107189-001	0960_MW151_210623	ED045G: Chloride	16887-00-6	1000 mg/L	# Not Determined	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3774022)							
EP2107188-002	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	109	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3776981)							
EP2107189-009	0960_MW126_210623	EP002: Dissolved Organic Carbon	----	100 mg/L	102	70.0	130
EP005: Total Organic Carbon (TOC) (QCLot: 3763379)							
EP2107189-002	0960_MW106_210623	EP005: Total Organic Carbon	----	100 mg/L	104	70.0	130
EP005: Total Organic Carbon (TOC) (QCLot: 3771720)							
EP2107190-001	Anonymous	EP005: Total Organic Carbon	----	100 mg/L	104	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3775220)							
EP2107189-011	0960_MW148D_210623	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	# Not Determined	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	# Not Determined	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	# Not Determined	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	100	69.0	134



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3775220) - continued							
EP2107189-011	0960_MW148D_210623	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	# Not Determined	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	99.4	53.0	142
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3775610)							
ES2124445-007	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	89.9	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	86.7	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	# Not Determined	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	112	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	# Not Determined	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	106	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3775220)							
EP2107189-011	0960_MW148D_210623	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	94.8	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	94.2	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	# Not Determined	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	128	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	109	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	128	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	114	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	115	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	117	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	111	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	96.2	71.0	132		
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3775610)							
ES2124445-007	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	83.2	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	117	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	# Not Determined	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	106	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	# Not Determined	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	121	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	117	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	105	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	108	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	96.0	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	87.7	71.0	132		



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3775220)							
EP2107189-011	0960_MW148D_210623	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	111	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	112	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	96.7	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	106	66.0	145
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	81.4	57.6	145
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	118	65.0	136
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	102	61.0	135
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3775610)							
ES2124445-007	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	119	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	109	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	84.5	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	95.0	66.0	145
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	97.0	57.6	145
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	96.6	65.0	136
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	100	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3775220)							
EP2107189-011	0960_MW148D_210623	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	97.0	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	97.8	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	93.8	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	123	71.4	144
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3775610)							
ES2124445-007	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	86.4	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	120	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	132	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	84.4	71.4	144

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2107189	Page	: 1 of 10
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 28-Jun-2021
Site	: DEF19009/Learmonth	Issue Date	: 08-Jul-2021
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS	No. of samples received	: 13
Order number	: DEF19009/0960	No. of samples analysed	: 13

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- Matrix Spike outliers exist - please see following pages for full details.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- **NO** Quality Control Sample Frequency Outliers exist.

Duplicates. Method Blanks. Laboratory Control Samples and Matrix Spikes

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA	EP2107189--001	0960_MW151_210623	Sulfate as SO4 - Turbidimetric	14808-79-8	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
ED045G: Chloride by Discrete Analyser	EP2107189--001	0960_MW151_210623	Chloride	16887-00-6	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EP231A: Perfluoroalkyl Sulfonic Acids	EP2107189--011	0960_MW148D_210623	Perfluorobutane sulfonic acid (PFBS)	375-73-5	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EP231A: Perfluoroalkyl Sulfonic Acids	EP2107189--011	0960_MW148D_210623	Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EP231A: Perfluoroalkyl Sulfonic Acids	EP2107189--011	0960_MW148D_210623	Perfluorohexane sulfonic acid (PFHxS)	355-46-4	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EP231A: Perfluoroalkyl Sulfonic Acids	ES2124445--007	Anonymous	Perfluorohexane sulfonic acid (PFHxS)	355-46-4	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EP231A: Perfluoroalkyl Sulfonic Acids	EP2107189--011	0960_MW148D_210623	Perfluorooctane sulfonic acid (PFOS)	1763-23-1	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EP231A: Perfluoroalkyl Sulfonic Acids	ES2124445--007	Anonymous	Perfluorooctane sulfonic acid (PFOS)	1763-23-1	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EP231B: Perfluoroalkyl Carboxylic Acids	EP2107189--011	0960_MW148D_210623	Perfluorohexanoic acid (PFHxA)	307-24-4	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EP231B: Perfluoroalkyl Carboxylic Acids	ES2124445--007	Anonymous	Perfluorohexanoic acid (PFHxA)	307-24-4	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EP231B: Perfluoroalkyl Carboxylic Acids	ES2124445--007	Anonymous	Perfluorooctanoic acid (PFOA)	335-67-1	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

Method	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator						

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 Work Order : EP2107189
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Matrix: **WATER**

Method Container / Client Sample ID(s)	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator - Analysis Holding Time Compliance						
Clear Plastic Bottle - Natural						
0960_MW151_210623, 0960_MW172_210623, 0960_MW102_210623, 0960_MW127_210623, 0960_MW126_210623, 0960_MW148D_210623, 0960_MW124_210623	0960_MW106_210623, 0960_MW170_210623, 0960_MW104_210623, 0960_QC107_210623, 0960_MW103_210623, 0960_MW148S_210623,	----	----	06-Jul-2021	23-Jun-2021	13

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for **VOC in soils** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA005P: pH by PC Titrator								
Clear Plastic Bottle - Natural (EA005-P)	23-Jun-2021	----	----	----	06-Jul-2021	23-Jun-2021	✘	
0960_MW151_210623,								0960_MW106_210623,
0960_MW172_210623,								0960_MW170_210623,
0960_MW102_210623,								0960_MW104_210623,
0960_MW127_210623,								0960_QC107_210623,
0960_MW126_210623,								0960_MW103_210623,
0960_MW148D_210623,								0960_MW148S_210623,
0960_MW124_210623								
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Clear Plastic Bottle - Natural (EA015H)	23-Jun-2021	----	----	----	30-Jun-2021	30-Jun-2021	✔	
0960_MW151_210623,								0960_MW106_210623,
0960_MW172_210623,								0960_MW170_210623,
0960_MW102_210623,								0960_MW104_210623,
0960_MW127_210623,								0960_QC107_210623,
0960_MW126_210623,								0960_MW103_210623,
0960_MW148D_210623,								0960_MW148S_210623,
0960_MW124_210623								



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA025: Total Suspended Solids dried at 104 ± 2°C								
Clear Plastic Bottle - Natural (EA025H)		23-Jun-2021	----	----	----	30-Jun-2021	30-Jun-2021	✓
0960_MW151_210623,	0960_MW106_210623,							
0960_MW172_210623,	0960_MW170_210623,							
0960_MW102_210623,	0960_MW104_210623,							
0960_MW127_210623,	0960_QC107_210623,							
0960_MW126_210623,	0960_MW103_210623,							
0960_MW148D_210623,	0960_MW148S_210623,							
0960_MW124_210623								
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P)		23-Jun-2021	----	----	----	06-Jul-2021	07-Jul-2021	✓
0960_MW151_210623,	0960_MW106_210623,							
0960_MW172_210623,	0960_MW170_210623,							
0960_MW102_210623,	0960_MW104_210623,							
0960_MW127_210623,	0960_QC107_210623,							
0960_MW126_210623,	0960_MW103_210623,							
0960_MW148D_210623,	0960_MW148S_210623,							
0960_MW124_210623								
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G)		23-Jun-2021	----	----	----	07-Jul-2021	21-Jul-2021	✓
0960_MW151_210623,	0960_MW106_210623,							
0960_MW172_210623,	0960_MW170_210623,							
0960_MW102_210623,	0960_MW104_210623,							
0960_MW127_210623,	0960_QC107_210623,							
0960_MW126_210623,	0960_MW103_210623,							
0960_MW148D_210623,	0960_MW148S_210623,							
0960_MW124_210623								
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G)		23-Jun-2021	----	----	----	07-Jul-2021	21-Jul-2021	✓
0960_MW151_210623,	0960_MW106_210623,							
0960_MW172_210623,	0960_MW170_210623,							
0960_MW102_210623,	0960_MW104_210623,							
0960_MW127_210623,	0960_QC107_210623,							
0960_MW126_210623,	0960_MW103_210623,							
0960_MW148D_210623,	0960_MW148S_210623,							
0960_MW124_210623								



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F)		23-Jun-2021	----	----	----	30-Jun-2021	30-Jun-2021	✓
0960_MW151_210623,	0960_MW106_210623,							
0960_MW172_210623,	0960_MW170_210623,							
0960_MW102_210623,	0960_MW104_210623,							
0960_MW127_210623,	0960_QC107_210623,							
0960_MW126_210623,	0960_MW103_210623,							
0960_MW148D_210623,	0960_MW148S_210623,							
0960_MW124_210623								
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002)		23-Jun-2021	----	----	----	05-Jul-2021	21-Jul-2021	✓
0960_MW172_210623,	0960_MW170_210623,							
0960_MW104_210623,	0960_MW127_210623							
Amber DOC Filtered- Sulfuric Preserved (EP002)		23-Jun-2021	----	----	----	06-Jul-2021	21-Jul-2021	✓
0960_QC107_210623,	0960_MW126_210623,							
0960_MW148D_210623,	0960_MW148S_210623,							
0960_MW124_210623								
EP005: Total Organic Carbon (TOC)								
Amber TOC Vial - Sulfuric Acid (EP005)		23-Jun-2021	----	----	----	02-Jul-2021	21-Jul-2021	✓
0960_MW103_210623								
Amber TOC Vial - Sulfuric Acid (EP005)		23-Jun-2021	----	----	----	29-Jun-2021	21-Jul-2021	✓
0960_MW151_210623,	0960_MW106_210623,							
0960_MW102_210623								
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X)		23-Jun-2021	06-Jul-2021	20-Dec-2021	✓	06-Jul-2021	20-Dec-2021	✓
0960_MW151_210623,	0960_MW106_210623,							
0960_MW172_210623,	0960_MW170_210623,							
0960_MW102_210623,	0960_MW104_210623,							
0960_MW127_210623,	0960_QC107_210623,							
0960_MW126_210623,	0960_MW103_210623,							
0960_MW148D_210623,	0960_MW148S_210623,							
0960_MW124_210623								
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X)		23-Jun-2021	06-Jul-2021	20-Dec-2021	✓	06-Jul-2021	20-Dec-2021	✓
0960_MW151_210623,	0960_MW106_210623,							
0960_MW172_210623,	0960_MW170_210623,							
0960_MW102_210623,	0960_MW104_210623,							
0960_MW127_210623,	0960_QC107_210623,							
0960_MW126_210623,	0960_MW103_210623,							
0960_MW148D_210623,	0960_MW148S_210623,							
0960_MW124_210623								



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X) 0960_MW151_210623, 0960_MW172_210623, 0960_MW102_210623, 0960_MW127_210623, 0960_MW126_210623, 0960_MW148D_210623, 0960_MW124_210623	0960_MW106_210623, 0960_MW170_210623, 0960_MW104_210623, 0960_QC107_210623, 0960_MW103_210623, 0960_MW148S_210623,	23-Jun-2021	06-Jul-2021	20-Dec-2021	✔	06-Jul-2021	20-Dec-2021	✔
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X) 0960_MW151_210623, 0960_MW172_210623, 0960_MW102_210623, 0960_MW127_210623, 0960_MW126_210623, 0960_MW148D_210623, 0960_MW124_210623	0960_MW106_210623, 0960_MW170_210623, 0960_MW104_210623, 0960_QC107_210623, 0960_MW103_210623, 0960_MW148S_210623,	23-Jun-2021	06-Jul-2021	20-Dec-2021	✔	06-Jul-2021	20-Dec-2021	✔
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X) 0960_MW151_210623, 0960_MW172_210623, 0960_MW102_210623, 0960_MW127_210623, 0960_MW126_210623, 0960_MW148D_210623, 0960_MW124_210623	0960_MW106_210623, 0960_MW170_210623, 0960_MW104_210623, 0960_QC107_210623, 0960_MW103_210623, 0960_MW148S_210623,	23-Jun-2021	06-Jul-2021	20-Dec-2021	✔	06-Jul-2021	20-Dec-2021	✔



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)		Quality Control Specification	
Analytical Methods	Method	QC	Regular	Actual	Expected		Evaluation
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	4	37	10.81	10.00	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	4	23	17.39	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	4	38	10.53	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	4	38	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	37	5.41	5.00	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	4	23	17.39	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	4	38	10.53	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	4	38	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	37	5.41	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	23	8.70	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	38	5.26	5.26	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	38	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	37	5.41	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Matrix: **WATER** Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)		Quality Control Specification	
Analytical Methods	Method	QC	Regular	Actual	Expected		Evaluation
Matrix Spikes (MS) - Continued							
Total Organic Carbon	EP005	2	38	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of 'filterable' residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high temperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.
Total Organic Carbon	EP005	WATER	In house: Referenced to APHA 5310 B, The automated TOC analyzer determines Total and Inorganic Carbon by IR cell. TOC is calculated as the difference. This method is compliant with NEPM Schedule B(3)



<i>Analytical Methods</i>	<i>Method</i>	<i>Matrix</i>	<i>Method Descriptions</i>
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
<i>Preparation Methods</i>	<i>Method</i>	<i>Matrix</i>	<i>Method Descriptions</i>
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.



CHAIN OF CUSTODY

COC#: 24506

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFASOMP

SITE: ah DEF19009/Learmonth SW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

°C

Other comments:

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Surface Waters Primary WATER	TOC additional WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0960_SW625	not filtered	23/06/2021 12:47 PM	Water	ALS: 4 Non ALS: 1	No	Partial 7/8	X		



CHAIN OF CUSTODY

COC#: 24506

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFASOMP

SITE: ah DEF19009/Learmonth SW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	PARTIAL ANALYSIS GROUP NAME	MATRIX	SELECTED ANALYSIS NAME
001	0960_SW625	Surface Waters Primary WATER	Water	<ul style="list-style-type: none">- EA005P pH (PCT)- NT-02 Major Anions (Chloride, Sulphate, Alkalinity)- NT-01 Major Cations (Ca, Mg, Na, K)- EA025H Suspended Solids - Standard Level- EA015H Total Dissolved Solids - Standard Level- EN055 - PG Ionic Balance by ED037P, ED041G, ED045G & ED093F- EP231X PFAS - Full Suite (28 analytes)



CHAIN OF CUSTODY

COC#: 24506

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: ah DEF19009/Learmonth SW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

TURNAROUND REQUIREMENTS: 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0960_SW625	Clear Plastic Bottle - Natural	250 mL	00070220143105	Green	No	
001	0960_SW625	HDPE (no PTFE)	20 mL	00352010040267	Grey	No	
001	0960_SW625	HDPE (no PTFE)	20 mL	00352010040126	Grey	No	
001	0960_SW625	Clear Plastic Bottle - Natural	250 mL	00070220143141	Green	No	

Total Bottle Count: ALS: 4, Non ALS: 1

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : EP2107190

<p>Client : CARDNO (WA) PTY LTD</p> <p>Contact : MAELLE BOURDAIS</p> <p>Address : 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006</p> <p>E-mail : maelle.bourdais@cardno.com.au</p> <p>Telephone : ----</p> <p>Facsimile : ----</p> <p>Project : WA_0960_PFASOMP</p> <p>Order number : DEF19009/0960</p> <p>C-O-C number : 24506</p> <p>Site : DEF19009/Learmonth</p> <p>Sampler : ASHLEY BROWN, MAELLE BOURDAIS</p>	<p>Laboratory : Environmental Division Perth</p> <p>Contact : Nick Courts</p> <p>Address : 26 Rigali Way Wangara WA Australia 6065</p> <p>E-mail : nick.courts@alsglobal.com</p> <p>Telephone : +61-8-9406 1301</p> <p>Facsimile : +61-8-9406 1399</p> <p>Page : 1 of 3</p> <p>Quote number : ES2019CARBSD0002 (SY/139/19)</p> <p>QC Level : NEPM 2013 B3 & ALS QC Standard</p>
---	--

Dates

Date Samples Received : 28-Jun-2021 13:25	Issue Date : 29-Jun-2021
Client Requested Due : 09-Jul-2021	Scheduled Reporting Date : 09-Jul-2021
Date	

Delivery Details

Mode of Delivery : Carrier	Security Seal : Not Available
No. of coolers/boxes : 5	Temperature : 15.9 - Ice present
Receipt Detail :	No. of samples received / analysed : 1 / 1

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepancies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.



Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP005 Total Organic Carbon (TOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2107190-001	23-Jun-2021 12:47	0960_SW625_210623	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2107190-001	23-Jun-2021 12:47	0960_SW625_210623	✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **WATER**

Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method	Container	Due for extraction	Due for analysis	Samples Received		Instructions Received	
Client Sample ID(s)				Date	Evaluation	Date	Evaluation
EA005-P: pH by PC Titrator							
0960_SW625_210623	Clear Plastic Bottle - Natural	----	23-Jun-2021	28-Jun-2021	✗	----	----

CERTIFICATE OF ANALYSIS

Work Order : **EP2107190**
Client : **CARDNO (WA) PTY LTD**
Contact : **MAELLE BOURDAIS**
Address : **11 HARVEST TERRACE PO BOX 155**
WEST PERTH WA, AUSTRALIA 6006
Telephone : **----**
Project : **WA_0960_PFASOMP**
Order number : **DEF19009/0960**
C-O-C number : **24506**
Sampler : **ASHLEY BROWN, MAELLE BOURDAIS**
Site : **DEF19009/Learmonth**
Quote number : **SY/139/19**
No. of samples received : **1**
No. of samples analysed : **1**

Page : 1 of 6
Laboratory : Environmental Division Perth
Contact : Nick Courts
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 28-Jun-2021 13:25
Date Analysis Commenced : 30-Jun-2021
Issue Date : 08-Jul-2021 11:53



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

0960_SW625_210623

Sampling date / time			23-Jun-2021 12:47	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2107190-001	-----	-----	-----
Result				----	----	----	----
EA005P: pH by PC Titrator							
pH Value	----	0.01	pH Unit	7.90	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Total Dissolved Solids @180°C	----	10	mg/L	1650	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C							
Suspended Solids (SS)	----	5	mg/L	1380	----	----	----
ED037P: Alkalinity by PC Titrator							
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	214	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	214	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	79	----	----	----
ED045G: Chloride by Discrete Analyser							
Chloride	16887-00-6	1	mg/L	752	----	----	----
ED093F: Dissolved Major Cations							
Calcium	7440-70-2	1	mg/L	38	----	----	----
Magnesium	7439-95-4	1	mg/L	43	----	----	----
Sodium	7440-23-5	1	mg/L	383	----	----	----
Potassium	7440-09-7	1	mg/L	36	----	----	----
EN055: Ionic Balance							
∅ Total Anions	----	0.01	meq/L	27.1	----	----	----
∅ Total Cations	----	0.01	meq/L	23.0	----	----	----
∅ Ionic Balance	----	0.01	%	8.21	----	----	----
EP005: Total Organic Carbon (TOC)							
Total Organic Carbon	----	1	mg/L	4	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids							
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	----	----	----



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

0960_SW625_210623

Sampling date / time

23-Jun-2021 12:47

Compound

CAS Number

LOR

Unit

EP2107190-001

Result

EP231A: Perfluoroalkyl Sulfonic Acids - Continued

Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.18	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	----	----	----	----

EP231B: Perfluoroalkyl Carboxylic Acids

Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	----	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	----	----	----	----
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	----	----	----	----

EP231C: Perfluoroalkyl Sulfonamides

Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	----	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	----	----	----	----



Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)			Sample ID	0960_SW625_210623	----	----	----	----
			Sampling date / time	23-Jun-2021 12:47	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2107190-001	-----	-----	-----	-----
				Result	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	----	----	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	0.18	----	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	0.18	----	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	0.18	----	----	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	76.6	----	----	----	----
13C8-PFOA	----	0.02	%	81.8	----	----	----	----



Surrogate Control Limits

Sub-Matrix: GROUNDWATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EP231A: Perfluoroalkyl Sulfonic Acids

(WATER) EP231B: Perfluoroalkyl Carboxylic Acids

(WATER) EP231C: Perfluoroalkyl Sulfonamides

(WATER) EP231D: (n:2) Fluorotelomer Sulfonic Acids

(WATER) EP231P: PFAS Sums

(WATER) EP231S: PFAS Surrogate

QUALITY CONTROL REPORT

Work Order	: EP2107190	Page	: 1 of 9
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 28-Jun-2021
Order number	: DEF19009/0960	Date Analysis Commenced	: 30-Jun-2021
C-O-C number	: 24506	Issue Date	: 08-Jul-2021
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		
Site	: DEF19009/Learmonth		
Quote number	: SY/139/19		
No. of samples received	: 1		
No. of samples analysed	: 1		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
= Indicates failed QC

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: WATER					Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA005P: pH by PC Titrator (QC Lot: 3776024)									
EP2107188-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.62	7.53	1.2	0% - 20%
EP2107189-007	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.33	7.33	0.0	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3765019)									
EP2107189-005	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	78700	76600	2.8	0% - 20%
EP2107189-013	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	71000	69800	1.6	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3765020)									
EP2107189-005	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	691	642	7.4	0% - 20%
EP2107385-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	9	11	20.5	No Limit
ED037P: Alkalinity by PC Titrator (QC Lot: 3776023)									
EP2107188-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	317	318	0.4	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	317	318	0.4	0% - 20%
EP2107189-007	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	152	153	0.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	152	153	0.0	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3764400)									
EP2107190-001	0960_SW625_210623	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	79	79	0.0	0% - 20%
EP2107193-010	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	66	54	19.3	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3764401)									
EP2107190-001	0960_SW625_210623	ED045G: Chloride	16887-00-6	1	mg/L	752	739	1.8	0% - 20%
EP2107193-010	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	134	137	2.0	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3762889)									



Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report		
--	--	--	--	-----------------------------------	--	--

Page : 5 of 9
 Work Order : EP2107190
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method:							

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2107190	Page	: 1 of 6
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 28-Jun-2021
Site	: DEF19009/Learmonth	Issue Date	: 08-Jul-2021
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS	No. of samples received	: 1
Order number	: DEF19009/0960	No. of samples analysed	: 1

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- Matrix Spike outliers exist - please see following pages for full details.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- **NO** Quality Control Sample Frequency Outliers exist.



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EP231A: Perfluoroalkyl Sulfonic Acids	ES2124445--007	Anonymous	Perfluorohexane sulfonic acid (PFHxS)	355-46-4	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EP231A: Perfluoroalkyl Sulfonic Acids	ES2124445--007	Anonymous	Perfluorooctane sulfonic acid (PFOS)	1763-23-1	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EP231B: Perfluoroalkyl Carboxylic Acids	ES2124445--007	Anonymous	Perfluorohexanoic acid (PFHxA)	307-24-4			



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H) 0960_SW625_210623	23-Jun-2021	----	----	----	30-Jun-2021	30-Jun-2021	✔
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P							



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of 'filterable' residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H</		

Page : 6 of 6
Work Order : EP2107190
Client : CARDNO (WA) PTY LTD
Project : WA_0960_PPFASOMP



Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.



CHAIN OF CUSTODY

COC#: 24512 ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: SC-DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:

DATE TIME:

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DATE TIME:

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DATE TIME:



CHAIN OF CUSTODY

COC#: 24512 ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFASOMP

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RELINQUISHED BY:

DATE TIME:

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DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
010	0960_MW211		23/06/2021 12:02 PM	Water	ALS: 4 Non ALS: 1	No	X		TOC- filtered
011	0960_MW113		23/06/2021 12:36 PM	Water	ALS: 4 Non ALS: 1	No	X		DOC - Filtered
012	0960_MW162		23/06/2021 12:52 PM	Water	ALS: 5 Non ALS: 0	No	X		
013	0960_MW166		23/06/2021 01:41 PM	Water	ALS: 5 Non ALS: 0	No	X		
014	0960_MW167		23/06/2021 02:08 PM	Water	ALS: 6 Non ALS: 0	No	X		
015	0960_QC108		23/06/2021 02:09 PM	Water	ALS: 5 Non ALS: 0	No	X		
016	0960_MW159		23/06/2021 03:10 PM	Water	ALS: 4 Non ALS: 0	No	X		
017	0960_MW105		23/06/2021 03:48 PM	Water	ALS: 5 Non ALS: 0	No	X		
018	0960_QC112		23/06/2021 03:49 PM	Water	ALS: 5 Non ALS: 0	No	X		



CHAIN OF CUSTODY

COC#: 24512

ALS Laboratory: EP Perth

RELINQUISHED BY:

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RELINQUISHED BY:

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DATE TIME:

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DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

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SITE: SC-DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

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EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
019	0960_MW168		23/06/2021 04:14 PM	Water	ALS: 7 Non ALS: 0	No	X		

**CHAIN OF CUSTODY**

COC#: 24512

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

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RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0960_MW021	Clear Plastic Bottle - Natural	250 mL	00070220142793	Green	No	
001	0960_MW021	Clear Plastic Bottle - Natural	250 mL	00070220142724	Green	No	
001	0960_MW021	HDPE (no PTFE)	20 mL	00352005019860	Grey	No	
001	0960_MW021	HDPE (no PTFE)	20 mL	00352005019885	Grey	No	
001	0960_MW021	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002537	Purple	No	
002	0960_MW114	Clear Plastic Bottle - Natural	250 mL	00070220142653	Green	No	
002	0960_MW114	Clear Plastic Bottle - Natural	250 mL	00070220142745	Green	No	
002	0960_MW114	HDPE (no PTFE)	20 mL	00352005019743	Grey	No	
002	0960_MW114	HDPE (no PTFE)	20 mL	00352005019669	Grey	No	
002	0960_MW114	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002460	Purple	No	
003	0960_MW233	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003951	Purple	No	
003	0960_MW233	Clear Plastic Bottle - Natural	250 mL	00070220142936	Green	No	
003	0960_MW233	HDPE (no PTFE)	20 mL	00352010040508	Grey	No	
003	0960_MW233	HDPE (no PTFE)	20 mL	00352010039967	Grey	No	
003	0960_MW233	Clear Plastic Bottle - Natural	250 mL	00070220143090	Green	No	
004	0960_MW163	Clear Plastic Bottle - Natural	250 mL	00070220143153	Green	No	
004	0960_MW163	HDPE (no PTFE)	20 mL	00352010040085	Grey	No	
004	0960_MW163	HDPE (no PTFE)	20 mL	00352010040086	Grey	No	
004	0960_MW163	Clear Plastic Bottle - Natural	250 mL	00070220143134	Green	No	
005	0960_QC101	Clear Plastic Bottle - Natural	250 mL	00070719042840	Green	No	
005	0960_QC101	HDPE (no PTFE)	20 mL	00352005016299	Grey	No	
005	0960_QC101	HDPE (no PTFE)	20 mL	00352005016207	Grey	No	
005	0960_QC101	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023429	Purple	No	
006	0960_MW164	Clear Plastic Bottle - Natural	250 mL	00070220142990	Green	No	
006	0960_MW164	Clear Plastic Bottle - Natural	250 mL	00070220142938	Green	No	
006	0960_MW164	HDPE (no PTFE)	20 mL	00350019177323	Grey	No	



CHAIN OF CUSTODY

COC#: 24512

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFASOMP

SITE: SC-DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

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DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

°C

Other comments:

006	0960_MW164	HDPE (no PTFE)	20 mL	00352010040076	Grey	No	
006	0960_MW164	HDPE (no PTFE)	20 mL	00352010040121	Grey	No	
006	0960_MW164	HDPE (no PTFE)	20 mL	00350019177370	Grey	No	
007	0960_QC104	Clear Plastic Bottle - Natural	250 mL	00070220143057	Green	No	
007	0960_QC104	Clear Plastic Bottle - Natural	250 mL	00070220143207	Green	No	
007	0960_QC104	HDPE (no PTFE)	20 mL	00352010040080	Grey	No	
007	0960_QC104	HDPE (no PTFE)	20 mL	00352010040485	Grey	No	
008	0960_MW165	Clear Plastic Bottle - Natural	250 mL	00070220143209	Green	No	
008	0960_MW165	Clear Plastic Bottle - Natural	250 mL	00070220143017	Green	No	
008	0960_MW165	HDPE (no PTFE)	20 mL	00352010039997	Grey	No	
008	0960_MW165	HDPE (no PTFE)	20 mL	00352010039953	Grey	No	
009	0960_MW018	Clear Plastic Bottle - Natural	250 mL	00070220143211	Green	No	
009	0960_MW018	Clear Plastic Bottle - Natural	250 mL	00070220142930	Green	No	
009	0960_MW018	HDPE (no PTFE)	20 mL	00352010040428	Grey	No	
009	0960_MW018	HDPE (no PTFE)	20 mL	00352010040122	Grey	No	
010	0960_MW211	Clear Plastic Bottle - Natural	250 mL	00070220143041	Green	No	
010	0960_MW211	Clear Plastic Bottle - Natural	250 mL	00070220143118	Green	No	
010	0960_MW211	HDPE (no PTFE)	20 mL	00352010040302	Grey	No	
010	0960_MW211	HDPE (no PTFE)	20 mL	00352010040062	Grey	No	
011	0960_MW113	Clear Plastic Bottle - Natural	250 mL	00070220143068	Green	No	
011	0960_MW113	Clear Plastic Bottle - Natural	250 mL	00070220143194	Green	No	
011	0960_MW113	HDPE (no PTFE)	20 mL	00352010039919	Grey	No	
011	0960_MW113	HDPE (no PTFE)	20 mL	00352010040368	Grey	No	
012	0960_MW162	Clear Plastic Bottle - Natural	250 mL	00070220186694	Green	No	
012	0960_MW162	Clear Plastic Bottle - Natural	250 mL	00070220186680	Green	No	
012	0960_MW162	HDPE (no PTFE)	20 mL	00352005019455	Grey	No	
012	0960_MW162	HDPE (no PTFE)	20 mL	00352005019396	Grey	No	

**CHAIN OF CUSTODY**

COC#: 24512

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: SC-DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

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TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

012	0960_MW162	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002590	Purple	No	
013	0960_MW166	Clear Plastic Bottle - Natural	250 mL	00070220186566	Green	No	
013	0960_MW166	Clear Plastic Bottle - Natural	250 mL	00070220186413	Green	No	
013	0960_MW166	HDPE (no PTFE)	20 mL	00352005019430	Grey	No	
013	0960_MW166	HDPE (no PTFE)	20 mL	00352005019898	Grey	No	
013	0960_MW166	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002677	Purple	No	
014	0960_MW167	Clear Plastic Bottle - Natural	250 mL	00070220142704	Green	No	
014	0960_MW167	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002512	Purple	No	
014	0960_MW167	HDPE (no PTFE)	20 mL	00352010040205	Grey	No	
014	0960_MW167	HDPE (no PTFE)	20 mL	00352010040393	Grey	No	
014	0960_MW167	HDPE (no PTFE)	20 mL	00352010040377	Grey	No	
014	0960_MW167	HDPE (no PTFE)	20 mL	00350019112626	Grey	No	
015	0960_QC108	Clear Plastic Bottle - Natural	250 mL	00070220142553	Green	No	
015	0960_QC108	Clear Plastic Bottle - Natural	250 mL	00070220142427	Green	No	
015	0960_QC108	HDPE (no PTFE)	20 mL	00352005019795	Grey	No	
015	0960_QC108	HDPE (no PTFE)	20 mL	00350019165790	Grey	No	
015	0960_QC108	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002738	Purple	No	
016	0960_MW159	Clear Plastic Bottle - Natural	250 mL	00070220142790	Green	No	
016	0960_MW159	Amber TOC Vial - Sulfuric Acid	40 mL	00181020003877	Purple	No	
016	0960_MW159	HDPE (no PTFE)	20 mL	00352010039976	Grey	No	
016	0960_MW159	HDPE (no PTFE)	20 mL	00352005019874	Grey	No	
017	0960_MW105	Clear Plastic Bottle - Natural	250 mL	00070220142818	Green	No	
017	0960_MW105	Clear Plastic Bottle - Natural	250 mL	00070220142313	Green	No	
017	0960_MW105	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002567	Purple	No	
017	0960_MW105	HDPE (no PTFE)	20 mL	00352005019414	Grey	No	
017	0960_MW105	HDPE (no PTFE)	20 mL	00352005019891	Grey	No	
018	0960_QC112	Clear Plastic Bottle - Natural	250 mL	00070220142801	Green	No	



CHAIN OF CUSTODY

COC#: 24512 ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: SC-DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

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DATE TIME:

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DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

018	0960_QC112	Clear Plastic Bottle - Natural	250 mL	00070220142736	Green	No	
018	0960_QC112	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020017513	Purple	No	
018	0960_QC112	HDPE (no PTFE)	20 mL	00352005019890	Grey	No	
018	0960_QC112	HDPE (no PTFE)	20 mL	00352005019656	Grey	No	
019	0960_MW168	Clear Plastic Bottle - Natural	250 mL	00070220142725	Green	No	
019	0960_MW168	Clear Plastic Bottle - Natural	250 mL	00070220142678	Green	No	
019	0960_MW168	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003494	Purple	No	
019	0960_MW168	HDPE (no PTFE)	20 mL	00352005019583	Grey	No	
019	0960_MW168	HDPE (no PTFE)	20 mL	00350019030705	Grey	No	
019	0960_MW168	HDPE (no PTFE)	20 mL	00350019008200	Grey	No	
019	0960_MW168	HDPE (no PTFE)	20 mL	00352005019760	Grey	No	

Total Bottle Count: ALS: 91, Non ALS: 7

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : EP2107193

<p>Client : CARDNO (WA) PTY LTD</p> <p>Contact : MAELLE BOURDAIS</p> <p>Address : 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006</p> <p>E-mail : maelle.bourdais@cardno.com.au</p> <p>Telephone : ----</p> <p>Facsimile : ----</p> <p>Project : WA_0960_PFASOMP</p> <p>Order number : DEF19009/0960</p> <p>C-O-C number : 24512</p> <p>Site : DEF19009/Learmonth</p> <p>Sampler : MAELLE BOURDAIS, Shaun Chambers</p>	<p>Laboratory : Environmental Division Perth</p> <p>Contact : Nick Courts</p> <p>Address : 26 Rigali Way Wangara WA Australia 6065</p> <p>E-mail : nick.courts@alsglobal.com</p> <p>Telephone : +61-8-9406 1301</p> <p>Facsimile : +61-8-9406 1399</p> <p>Page : 1 of 4</p> <p>Quote number : ES2019CARBSD0002 (SY/139/19)</p> <p>QC Level : NEPM 2013 B3 & ALS QC Standard</p>
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Dates

Date Samples Received : 29-Jun-2021 13:25	Issue Date : 29-Jun-2021
Client Requested Due Date : 07-Jul-2021	Scheduled Reporting Date : 07-Jul-2021

Delivery Details

Mode of Delivery : Carrier	Security Seal : Not Available
No. of coolers/boxes : 5	Temperature : 15.9 - Ice present
Receipt Detail :	No. of samples received / analysed : 19 / 19

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- Please see scanned COC for sample discrepancies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.



Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2107193-001	23-Jun-2021 09:05	0960_MW021_210623	✓	✓	✓	✓	✓	✓	✓
EP2107193-002	23-Jun-2021 09:24	0960_MW114_210623	✓	✓	✓	✓	✓	✓	✓
EP2107193-003	23-Jun-2021 10:04	0960_MW233_210623	✓	✓	✓	✓	✓	✓	✓
EP2107193-004	23-Jun-2021 10:33	0960_MW163_210623	✓	✓	✓	✓	✓	✓	✓
EP2107193-005	23-Jun-2021 10:33	0960_QC101_210623	✓	✓	✓	✓	✓	✓	✓
EP2107193-006	23-Jun-2021 11:00	0960_MW164_210623	✓	✓	✓	✓	✓	✓	✓
EP2107193-007	23-Jun-2021 11:02	0960_QC104_210623	✓	✓	✓	✓	✓	✓	✓
EP2107193-008	23-Jun-2021 11:18	0960_MW165_210623	✓	✓	✓	✓	✓	✓	✓
EP2107193-009	23-Jun-2021 11:44	0960_MW018_210623	✓	✓	✓	✓		✓	✓
EP2107193-010	23-Jun-2021 12:02	0960_MW211_210623	✓	✓	✓	✓	✓	✓	✓
EP2107193-011	23-Jun-2021 12:36	0960_MW113_210623	✓	✓	✓	✓	✓	✓	✓
EP2107193-012	23-Jun-2021 12:52	0960_MW162_210623	✓	✓	✓	✓	✓	✓	✓
EP2107193-013	23-Jun-2021 13:41	0960_MW166_210623	✓	✓	✓	✓	✓	✓	✓
EP2107193-014	23-Jun-2021 14:08	0960_MW167_210623	✓	✓	✓	✓	✓	✓	✓
EP2107193-015	23-Jun-2021 14:09	0960_QC108_210623	✓	✓	✓	✓	✓	✓	✓
EP2107193-016	23-Jun-2021 15:10	0960_MW159_210623	✓	✓	✓	✓		✓	✓
EP2107193-017	23-Jun-2021 15:48	0960_MW105_210623	✓	✓	✓	✓	✓	✓	✓
EP2107193-018	23-Jun-2021 15:49	0960_QC112_210623	✓	✓	✓	✓	✓	✓	✓
EP2107193-019	23-Jun-2021 16:14	0960_MW168_210623	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP005 Total Organic Carbon (TOC)	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2107193-001	23-Jun-2021 09:05	0960_MW021_210623		✓
EP2107193-002	23-Jun-2021 09:24	0960_MW114_210623		✓
EP2107193-003	23-Jun-2021 10:04	0960_MW233_210623		✓
EP2107193-004	23-Jun-2021 10:33	0960_MW163_210623		✓
EP2107193-005	23-Jun-2021 10:33	0960_QC101_210623		✓



			WATER - EP005 Total Organic Carbon (TOC)	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2107193-006	23-Jun-2021 11:00	0960_MW164_210623		✓
EP2107193-007	23-Jun-2021 11:02	0960_QC104_210623		✓
EP2107193-008	23-Jun-2021 11:18	0960_MW165_210623		✓
EP2107193-009	23-Jun-2021 11:44	0960_MW018_210623	✓	✓
EP2107193-010	23-Jun-2021 12:02	0960_MW211_210623		✓
EP2107193-011	23-Jun-2021 12:36	0960_MW113_210623		✓
EP2107193-012	23-Jun-2021 12:52	0960_MW162_210623		✓
EP2107193-013	23-Jun-2021 13:41	0960_MW166_210623		✓
EP2107193-014	23-Jun-2021 14:08	0960_MW167_210623		✓
EP2107193-015	23-Jun-2021 14:09	0960_QC108_210623		✓
EP2107193-016	23-Jun-2021 15:10	0960_MW159_210623	✓	✓
EP2107193-017	23-Jun-2021 15:48	0960_MW105_210623		✓
EP2107193-018	23-Jun-2021 15:49	0960_QC112_210623		✓
EP2107193-019	23-Jun-2021 16:14	0960_MW168_210623		✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **WATER**

Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method Client Sample ID(s)	Container	Due for extraction	Due for analysis	Samples Received		Instructions Received	
				Date	Evaluation	Date	Evaluation
EA005-P: pH by PC Titrator							
0960_MW018_210623	Clear Plastic Bottle - Natural	----	23-Jun-2021	29-Jun-2021	✗	----	----
0960_MW021_210623	Clear Plastic Bottle - Natural	----	23-Jun-2021	29-Jun-2021	✗	----	----
0960_MW105_210623	Clear Plastic Bottle - Natural	----	23-Jun-2021	29-Jun-2021	✗	----	----
0960_MW113_210623	Clear Plastic Bottle - Natural	----	23-Jun-2021	29-Jun-2021	✗	----	----
0960_MW114_210623	Clear Plastic Bottle - Natural	----	23-Jun-2021	29-Jun-2021	✗	----	----
0960_MW159_210623	Clear Plastic Bottle - Natural	----	23-Jun-2021	29-Jun-2021	✗	----	----
0960_MW162_210623	Clear Plastic Bottle - Natural	----	23-Jun-2021	29-Jun-2021	✗	----	----
0960_MW163_210623	Clear Plastic Bottle - Natural	----	23-Jun-2021	29-Jun-2021	✗	----	----
0960_MW164_210623	Clear Plastic Bottle - Natural	----	23-Jun-2021	29-Jun-2021	✗	----	----
0960_MW165_210623	Clear Plastic Bottle - Natural	----	23-Jun-2021	29-Jun-2021	✗	----	----
0960_MW166_210623	Clear Plastic Bottle - Natural	----	23-Jun-2021	29-Jun-2021	✗	----	----
0960_MW167_210623	Clear Plastic Bottle - Natural	----	23-Jun-2021	29-Jun-2021	✗	----	----
0960_MW168_210623	Clear Plastic Bottle - Natural	----	23-Jun-2021	29-Jun-2021	✗	----	----
0960_MW211_210623	Clear Plastic Bottle - Natural	----	23-Jun-2021	29-Jun-2021	✗	----	----
0960_MW233_210623	Clear Plastic Bottle - Natural	----	23-Jun-2021	29-Jun-2021	✗	----	----
0960_QC101_210623	Clear Plastic Bottle - Natural	----	23-Jun-2021	29-Jun-2021	✗	----	----
0960_QC104_210623	Clear Plastic Bottle - Natural	----	23-Jun-2021	29-Jun-2021	✗	----	----
0960_QC108_210623	Clear Plastic Bottle - Natural	----	23-Jun-2021	29-Jun-2021	✗	----	----
0960_QC112_210623	Clear Plastic Bottle - Natural	----	23-Jun-2021	29-Jun-2021	✗	----	----

CERTIFICATE OF ANALYSIS

Work Order : **EP2107193**
Client : **CARDNO (WA) PTY LTD**
Contact : MAELLE BOURDAIS
Address : 11 HARVEST TERRACE PO BOX 155
 WEST PERTH WA, AUSTRALIA 6006
Telephone : ----
Project : WA_0960_PFASOMP
Order number : DEF19009/0960
C-O-C number : 24512
Sampler : MAELLE BOURDAIS, Shaun Chambers
Site : DEF19009/Learmonth
Quote number : SY/139/19
No. of samples received : 19
No. of samples analysed : 19

Page : 1 of 15
Laboratory : Environmental Division Perth
Contact : Nick Courts
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 29-Jun-2021 13:25
Date Analysis Commenced : 30-Jun-2021
Issue Date : 07-Jul-2021 15:53



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

Ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- EP002: LOR raised on sample #008 due to possible sample matrix interference.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW021_210623	0960_MW114_210623	0960_MW233_210623	0960_MW163_210623	0960_QC101_210623
Sampling date / time				23-Jun-2021 09:05	23-Jun-2021 09:24	23-Jun-2021 10:04	23-Jun-2021 10:33	23-Jun-2021 10:33
Compound	CAS Number	LOR	Unit	EP2107193-001	EP2107193-002	EP2107193-003	EP2107193-004	EP2107193-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.98	7.89	8.49	7.80	7.90
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	4660	5070	1140	7000	7150
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	514	73	126	130	173
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	28	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	702	456	596	428	436
Total Alkalinity as CaCO3	----	1	mg/L	702	456	625	428	436
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	312	260	38	557	557
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	2180	2650	186	3520	3500
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	82	116	3	157	160
Magnesium	7439-95-4	1	mg/L	91	111	3	194	194
Sodium	7440-23-5	1	mg/L	1400	1640	374	2220	2220
Potassium	7440-09-7	1	mg/L	53	62	14	105	104
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	82.0	89.3	18.5	119	119
∅ Total Cations	----	0.01	meq/L	73.8	87.8	17.0	123	123
∅ Ionic Balance	----	0.01	%	5.25	0.81	4.23	1.49	1.71
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	4	3	4	11	15
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.08	<0.02	0.06	0.60	0.56
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.08	<0.02	0.14	0.84	0.74
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.47	<0.02	3.89	6.68	5.76
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.30	0.40	0.37



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW021_210623	0960_MW114_210623	0960_MW233_210623	0960_MW163_210623	0960_QC101_210623
Sampling date / time				23-Jun-2021 09:05	23-Jun-2021 09:24	23-Jun-2021 10:04	23-Jun-2021 10:33	23-Jun-2021 10:33
Compound	CAS Number	LOR	Unit	EP2107193-001	EP2107193-002	EP2107193-003	EP2107193-004	EP2107193-005
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.21	<0.01	2.07	3.22	2.89
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	0.2	0.2
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.02	<0.02	0.05	0.43	0.40
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.09	<0.02	0.22	1.72	1.59
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.04	0.20	0.18
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.01	<0.01	0.59	0.30	0.28
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW021_210623	0960_MW114_210623	0960_MW233_210623	0960_MW163_210623	0960_QC101_210623
Sampling date / time				23-Jun-2021 09:05	23-Jun-2021 09:24	23-Jun-2021 10:04	23-Jun-2021 10:33	23-Jun-2021 10:33
Compound	CAS Number	LOR	Unit	EP2107193-001	EP2107193-002	EP2107193-003	EP2107193-004	EP2107193-005
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	0.11	0.10
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	0.96	<0.01	7.36	14.7	13.1
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	0.68	<0.01	5.96	9.90	8.65
Sum of PFAS (WA DER List)	----	0.01	µg/L	0.88	<0.01	6.92	13.5	12.0
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	80.3	83.6	86.9	84.2	80.4
13C8-PFOA	----	0.02	%	83.5	83.2	78.9	81.0	82.8



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW164_210623	0960_QC104_210623	0960_MW165_210623	0960_MW018_210623	0960_MW211_210623
Sampling date / time				23-Jun-2021 11:00	23-Jun-2021 11:02	23-Jun-2021 11:18	23-Jun-2021 11:44	23-Jun-2021 12:02
Compound	CAS Number	LOR	Unit	EP2107193-006	EP2107193-007	EP2107193-008	EP2107193-009	EP2107193-010
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	8.28	8.20	8.26	8.38	8.51
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	3930	3900	2010	2070	1250
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	123	104	162	4530	122
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	<1	<1	<1	24	35
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L	978	952	745	933	750
Total Alkalinity as CaCO ₃	----	1	mg/L	978	952	745	956	786
ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA								
Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L	293	297	120	174	66
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	1480	1500	641	307	134
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	23	24	7	6	2
Magnesium	7439-95-4	1	mg/L	53	54	12	9	4
Sodium	7440-23-5	1	mg/L	1370	1380	714	636	428
Potassium	7440-09-7	1	mg/L	57	58	28	22	17
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	67.4	67.5	35.5	31.4	20.8
∅ Total Cations	----	0.01	meq/L	66.6	67.2	33.1	29.3	19.5
∅ Ionic Balance	----	0.01	%	0.62	0.27	3.43	3.49	3.42
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	4	3	<2	----	3
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	----	----	----	3	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.09	0.11	<0.02	0.06	0.09
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.12	0.13	<0.02	0.10	0.11
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	1.01	1.10	0.06	1.02	1.23



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW164_210623	0960_QC104_210623	0960_MW165_210623	0960_MW018_210623	0960_MW211_210623
Sampling date / time				23-Jun-2021 11:00	23-Jun-2021 11:02	23-Jun-2021 11:18	23-Jun-2021 11:44	23-Jun-2021 12:02
Compound	CAS Number	LOR	Unit	EP2107193-006	EP2107193-007	EP2107193-008	EP2107193-009	EP2107193-010
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.04	0.05	<0.02	0.03	0.05
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	1.26	1.43	0.02	0.33	2.92
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.07	0.08	<0.02	0.12	0.08
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.26	0.28	<0.02	0.29	0.24
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.03	0.03	<0.02	0.06	0.04
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.04	0.05	<0.01	0.06	0.06
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW164_210623	0960_QC104_210623	0960_MW165_210623	0960_MW018_210623	0960_MW211_210623
Sampling date / time				23-Jun-2021 11:00	23-Jun-2021 11:02	23-Jun-2021 11:18	23-Jun-2021 11:44	23-Jun-2021 12:02
Compound	CAS Number	LOR	Unit	EP2107193-006	EP2107193-007	EP2107193-008	EP2107193-009	EP2107193-010
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	0.14	0.13	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	3.06	3.39	0.08	2.07	4.82
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	2.27	2.53	0.08	1.35	4.15
Sum of PFAS (WA DER List)	----	0.01	µg/L	2.90	3.21	0.08	1.94	4.66
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	81.0	79.9	78.9	81.7	79.9
13C8-PFOA	----	0.02	%	78.6	86.1	80.3	81.3	79.9



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW113_210623	0960_MW162_210623	0960_MW166_210623	0960_MW167_210623	0960_QC108_210623
Sampling date / time				23-Jun-2021 12:36	23-Jun-2021 12:52	23-Jun-2021 13:41	23-Jun-2021 14:08	23-Jun-2021 14:09
Compound	CAS Number	LOR	Unit	EP2107193-011	EP2107193-012	EP2107193-013	EP2107193-014	EP2107193-015
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.68	7.80	8.40	7.94	7.91
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	6930	8150	1900	3490	3270
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	1470	149	623	308	380
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	<1	<1	26	<1	<1
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L	379	487	911	877	865
Total Alkalinity as CaCO ₃	----	1	mg/L	379	487	938	877	865
ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA								
Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L	254	398	105	303	359
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	3240	3880	376	1290	1320
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	197	195	4	24	22
Magnesium	7439-95-4	1	mg/L	176	234	6	33	30
Sodium	7440-23-5	1	mg/L	1820	2270	625	1150	1110
Potassium	7440-09-7	1	mg/L	77	123	26	52	51
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	104	127	31.5	60.2	62.0
∅ Total Cations	----	0.01	meq/L	105	131	28.5	55.3	53.2
∅ Ionic Balance	----	0.01	%	0.57	1.32	4.98	4.29	7.68
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	2	7	55	3	3
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.32	0.05	0.04	0.04
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.34	0.05	0.06	0.06
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	2.02	0.34	0.97	1.04
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.02	<0.02	0.05	0.05



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW113_210623	0960_MW162_210623	0960_MW166_210623	0960_MW167_210623	0960_QC108_210623
Sampling date / time				23-Jun-2021 12:36	23-Jun-2021 12:52	23-Jun-2021 13:41	23-Jun-2021 14:08	23-Jun-2021 14:09
Compound	CAS Number	LOR	Unit	EP2107193-011	EP2107193-012	EP2107193-013	EP2107193-014	EP2107193-015
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.15	0.35	0.81	0.74
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.17	0.13	0.10	0.09
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.68	0.16	0.21	0.21
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.05	0.09	0.07	0.07
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.05	0.06	0.12	0.12
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW113_210623	0960_MW162_210623	0960_MW166_210623	0960_MW167_210623	0960_QC108_210623
Sampling date / time				23-Jun-2021 12:36	23-Jun-2021 12:52	23-Jun-2021 13:41	23-Jun-2021 14:08	23-Jun-2021 14:09
Compound	CAS Number	LOR	Unit	EP2107193-011	EP2107193-012	EP2107193-013	EP2107193-014	EP2107193-015
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	3.90	1.23	2.43	2.42
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	2.17	0.69	1.78	1.78
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	3.54	1.18	2.32	2.31
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	91.7	79.5	85.9	81.5	79.3
13C8-PFOA	----	0.02	%	83.4	81.3	83.9	80.1	81.0



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW159_210623	0960_MW105_210623	0960_QC112_210623	0960_MW168_210623	----
Sampling date / time				23-Jun-2021 15:10	23-Jun-2021 15:48	23-Jun-2021 15:49	23-Jun-2021 16:14	----
Compound	CAS Number	LOR	Unit	EP2107193-016	EP2107193-017	EP2107193-018	EP2107193-019	-----
				Result	Result	Result	Result	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.54	7.73	7.52	7.58	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	21800	33500	32500	8250	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	1820	527	384	1450	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	<1	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L	447	363	371	561	----
Total Alkalinity as CaCO ₃	----	1	mg/L	447	363	371	561	----
ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA								
Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L	1160	1520	1500	734	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	10700	15600	15700	3680	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	453	556	546	191	----
Magnesium	7439-95-4	1	mg/L	683	1150	1140	217	----
Sodium	7440-23-5	1	mg/L	6170	9000	8940	2400	----
Potassium	7440-09-7	1	mg/L	306	486	480	106	----
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	335	479	482	130	----
∅ Total Cations	----	0.01	meq/L	355	526	522	134	----
∅ Ionic Balance	----	0.01	%	2.91	4.71	4.05	1.58	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	----	3	2	2	----
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	2	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.12	0.13	0.08	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.16	0.16	0.09	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.73	0.76	0.76	----



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW159_210623	0960_MW105_210623	0960_QC112_210623	0960_MW168_210623	----
Sampling date / time				23-Jun-2021 15:10	23-Jun-2021 15:48	23-Jun-2021 15:49	23-Jun-2021 16:14	----
Compound	CAS Number	LOR	Unit	EP2107193-016	EP2107193-017	EP2107193-018	EP2107193-019	-----
				Result	Result	Result	Result	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.03	0.04	0.10	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.02	0.03	0.06	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.13	0.13	0.22	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	0.02	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	0.02	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW159_210623	0960_MW105_210623	0960_QC112_210623	0960_MW168_210623	----
Sampling date / time				23-Jun-2021 15:10	23-Jun-2021 15:48	23-Jun-2021 15:49	23-Jun-2021 16:14	----
Compound	CAS Number	LOR	Unit	EP2107193-016	EP2107193-017	EP2107193-018	EP2107193-019	-----
				Result	Result	Result	Result	----
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	1.19	1.25	1.35	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	0.76	0.80	0.86	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	1.03	1.09	1.26	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	73.1	79.9	78.3	80.6	----
13C8-PFOA	----	0.02	%	83.6	81.9	81.2	81.6	----



Surrogate Control Limits

Sub-Matrix: GROUNDWATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EP231B: Perfluoroalkyl Carboxylic Acids

(WATER) EP231C: Perfluoroalkyl Sulfonamides

(WATER) EP231D: (n:2) Fluorotelomer Sulfonic Acids

(WATER) EP231P: PFAS Sums

(WATER) EP231S: PFAS Surrogate

(WATER) EP231A: Perfluoroalkyl Sulfonic Acids

QUALITY CONTROL REPORT

Work Order	: EP2107193	Page	: 1 of 9
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 29-Jun-2021
Order number	: DEF19009/0960	Date Analysis Commenced	: 30-Jun-2021
C-O-C number	: 24512	Issue Date	: 07-Jul-2021
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: DEF19009/Learmonth		
Quote number	: SY/139/19		
No. of samples received	: 19		
No. of samples analysed	: 19		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key :
 Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
 CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
 LOR = Limit of reporting
 RPD = Relative Percentage Difference
 # = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA005P: pH by PC Titrator (QC Lot: 3772349)									
EP2107185-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.86	7.93	0.9	0% - 20%
EP2107185-012	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.91	7.91	0.0	0% - 20%
EA005P: pH by PC Titrator (QC Lot: 3772351)									
EP2107193-007	0960_QC104_210623	EA005-P: pH Value	----	0.01	pH Unit	8.20	8.20	0.0	0% - 20%
EP2107193-017	0960_MW105_210623	EA005-P: pH Value	----	0.01	pH Unit	7.73	7.64	1.2	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3765003)									
EP2107193-001	0960_MW021_210623	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	4660	4650	0.3	0% - 20%
EP2107270-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	6480	6470	0.1	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3765009)									
EP2107193-009	0960_MW018_210623	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	2070	2050	0.9	0% - 20%
EP2107193-017	0960_MW105_210623	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	33500	33600	0.4	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2 °C (QC Lot: 3765004)									
EP2107193-001	0960_MW021_210623	EA025H: Suspended Solids (SS)	----	5	mg/L	514	496	3.7	0% - 20%
EP2107272-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	86	90	4.3	0% - 50%
EA025: Total Suspended Solids dried at 104 ± 2 °C (QC Lot: 3765010)									
EP2107193-009	0960_MW018_210623	EA025H: Suspended Solids (SS)	----	5	mg/L	4530	4580	1.1	0% - 20%
EP2107193-019	0960_MW168_210623	EA025H: Suspended Solids (SS)	----	5	mg/L	1450	1400	3.4	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3772348)									
EP2107185-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L	114	116	1.9	0% - 20%
		ED037-P: Total Alkalinity as CaCO ₃	----	1	mg/L	114	116	1.9	0% - 20%
EP2107185-012	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	<1	<1	0.0	No Limit

Page : 3 of 9
 Work Order : EP2107193
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFSOMP



Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
ED037P: Alkalinity by PC Titrator (QC Lot: 3772348) - continued									
EP2107185-012	Anonymous	ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	120	119	1.3	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	120	119	1.3	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3772350)									
EP2107193-007	0960_QC104_210623	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	952	974	2.4	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	952	974	2.4	0% - 20%
EP2107193-017	0960_MW105_210623	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	363	378	4.2	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	363	378	4.2	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3764400)									
EP2107190-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	79	79	0.0	0% - 20%
EP2107193-010	0960_MW211_210623	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	66	54	19.3	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3764401)									
EP2107190-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	752	739	1.8	0% - 20%
EP2107193-010	0960_MW211_210623	ED045G: Chloride	16887-00-6	1	mg/L	134	137	2.0	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3765513)									
EP2107193-001	0960_MW021_210623	ED093F: Calcium	7440-70-2	1	mg/L	82	80	1.8	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	91	90	0.0	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	1400	1390	0.8	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	53	53	0.0	0% - 20%
EP2107193-011	0960_MW113_210623	ED093F: Calcium	7440-70-2	1	mg/L	197	199	1.0	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	176	177	0.7	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	1820	1830	0.4	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	77	78	0.0	0% - 20%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3771630)									
EP2107185-001	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	5	4	0.0	No Limit
EP2107185-011	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	4	4	0.0	No Limit
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3774022)									
EP2107188-001	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	28	25	12.9	0% - 20%
EP2107193-008	0960_MW165_210623	EP002: Dissolved Organic Carbon	----	1	mg/L	<2	2	0.0	No Limit
EP005: Total Organic Carbon (TOC) (QC Lot: 3771720)									
EP2107189-010	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	3	2	39.2	No Limit
EP2107531-002	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	<1	<1	0.0	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3774579)									
EP2107193-006	0960_MW164_210623	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	1.26	1.48	16.0	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.09	0.10	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.12	0.14	13.0	No Limit



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3774579) - continued									
EP2107193-006	0960_MW164_210623	EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	1.01	1.10	9.0	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.04	0.04	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP2107193-019	0960_MW168_210623	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.10	0.09	12.6	0% - 50%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.08	0.07	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.09	0.10	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.76	0.81	6.1	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3774579)							
EP2107193-006	0960_MW164_210623	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.04	0.04	0.0	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.07	0.07	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.26	0.26	0.0	0% - 50%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.03	0.03	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
		EP2107193-019	0960_MW168_210623	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.02	0.02
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3			0.02	µg/L	0.06	0.06	0.0	No Limit
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4			0.02	µg/L	0.22	0.23	0.0	0% - 50%
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9			0.02	µg/L	0.02	0.02	0.0	No Limit
EP231X: Perfluorononanoic acid (PFNA)	375-95-1			0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2			0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8			0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1			0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8			0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7			0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4			0.1	µg/L	<0.1	<0.1	0.0	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3774579)									
EP2107193-006	0960_MW164_210623	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.0	No Limit



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3774579) - continued									
EP2107193-006	0960_MW164_210623	EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP2107193-019	0960_MW168_210623	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3774579)									
EP2107193-006	0960_MW164_210623	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	0.14	0.14	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP2107193-019	0960_MW168_210623	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231P: PFAS Sums (QC Lot: 3774579)									
EP2107193-006	0960_MW164_210623	EP231X: Sum of PFAS	----	0.01	µg/L	3.06	3.40	10.5	0% - 20%
EP2107193-019	0960_MW168_210623	EP231X: Sum of PFAS	----	0.01	µg/L	1.35	1.40	3.6	0% - 20%



Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result		LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 3772349)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	101	98.5	102
				----	7 pH Unit	100	98.5	102
EA005P: pH by PC Titrator (QCLot: 3772351)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3765003)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	246 mg/L	107	88.1	114
				<10	1000 mg/L	102	88.1	114
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3765009)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	246 mg/L	108	88.1	114
				<10	1000 mg/L	102	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3765004)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	95 mg/L	106	89.1	120
				<5	1000 mg/L	103	89.1	120
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3765010)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	95 mg/L	102	89.1	120
				<5	1000 mg/L	98.7	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3772348)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	104	81.2	126
				<1	200 mg/L	97.8	90.0	110
ED037P: Alkalinity by PC Titrator (QCLot: 3772350)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	109	81.2	126
				<1	200 mg/L	98.2	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3764400)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	105	87.7	113
				<1	500 mg/L	100	87.7	113



Sub-Matrix: **WATER**

Method Blank (MB) Report				Laboratory Control Spike (LCS) Report				
				Spike Concentration	Spike Recovery (%)		Acceptable Limits (%)	
					LCS		Low	High
Method: Compound	CAS Number	LOR	Unit	Result				
ED045G: Chloride by Discrete Analyser (QCLot: 3764401)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	99.6	87.9	114
				<1	1000 mg/L	103	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3765513)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	100	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	100	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	106	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	94.2	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3771630)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	96.3	73.2	116
				<1	100 mg/L	103	73.2	116
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3774022)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	95.4	73.2	116
				<1	100 mg/L	102	73.2	116
EP005: Total Organic Carbon (TOC) (QCLot: 3771720)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	102	87.2	116
				<1	100 mg/L	103	87.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3774579)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	81.4	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	84.0	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	78.8	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	76.6	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	77.2	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	78.2	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3774579)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	78.5	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	81.8	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	79.8	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	82.0	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	87.6	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	84.2	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	78.8	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	84.8	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	83.2	72.0	134
EP231X: Perfluorotridecanoic acid (PFTriDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	76.4	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	75.0	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3774579)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	85.6	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	80.6	68.0	141



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3774579) - continued								
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	83.2	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	79.7	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	72.8	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	79.4	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	84.2	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3774579)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	82.8	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	82.0	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	84.0	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	83.2	71.4	144

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike Concentration	Spike Recovery (%) MS	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number			Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3764400)							
EP2107190-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	90.2	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3764401)							
EP2107190-001	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	92.4	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3771630)							
EP2107185-002	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	104	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3774022)							
EP2107188-002	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	109	70.0	130
EP005: Total Organic Carbon (TOC) (QCLot: 3771720)							
EP2107190-001	Anonymous	EP005: Total Organic Carbon	----	100 mg/L	104	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3774579)							
EP2107193-014	0960_MW167_210623	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	81.0	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	82.2	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	# Not Determined	68.0	131



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3774579) - continued							
EP2107193-014	0960_MW167_210623	EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	69.6	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	# Not Determined	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	75.2	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3774579)							
EP2107193-014	0960_MW167_210623	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	77.8	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	78.2	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	75.2	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	75.0	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	74.0	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	75.2	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	79.0	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	79.4	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	79.2	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	84.0	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	81.1	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3774579)							
EP2107193-014	0960_MW167_210623	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	76.6	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	74.7	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	76.6	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	72.6	66.0	145
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	73.2	57.6	145
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	76.2	65.0	136
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	75.8	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3774579)							
EP2107193-014	0960_MW167_210623	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	86.8	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	70.6	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	76.2	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	78.8	71.4	144

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2107193	Page	: 1 of 11
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 29-Jun-2021
Site	: DEF19009/Learmonth	Issue Date	: 07-Jul-2021
Sampler	: MAELLE BOURDAIS, Shaun Chambers	No. of samples received	: 19
Order number	: DEF19009/0960	No. of samples analysed	: 19

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- Matrix Spike outliers exist - please see following pages for full details.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- **NO** Quality Control Sample Frequency Outliers exist.



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EP231A: Perfluoroalkyl Sulfonic Acids	EP2107193--014	0960_MW167_210623	Perfluorohexane sulfonic acid (PFHxS)	355-46-4	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EP231A: Perfluoroalkyl Sulfonic Acids	EP2107193--014	0960_MW167_210623	Perfluorooctane sulfonic acid (PFOS)	1763-23-1	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method		Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural							
0960_MW021_210623,	0960_MW114_210623,	----	----	----	03-Jul-2021	23-Jun-2021	10
0960_MW233_210623,	0960_MW163_210623,						
0960_QC101_210623,	0960_MW164_210623,						
0960_QC104_210623,	0960_MW165_210623,						
0960_MW018_210623,	0960_MW211_210623,						
0960_MW113_210623,	0960_MW162_210623,						
0960_MW166_210623,	0960_MW167_210623,						
0960_QC108_210623,	0960_MW159_210623,						
0960_MW105_210623,	0960_QC112_210623,						
0960_MW168_210623							

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator								
Clear Plastic Bottle - Natural (EA005-P)		23-Jun-2021	----	----	----	03-Jul-2021	23-Jun-2021	✖
0960_MW021_210623,	0960_MW114_210623,							
0960_MW233_210623,	0960_MW163_210623,							
0960_QC101_210623,	0960_MW164_210623,							
0960_QC104_210623,	0960_MW165_210623,							
0960_MW018_210623,	0960_MW211_210623,							
0960_MW113_210623,	0960_MW162_210623,							
0960_MW166_210623,	0960_MW167_210623,							
0960_QC108_210623,	0960_MW159_210623,							
0960_MW105_210623,	0960_QC112_210623,							
0960_MW168_210623								
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Clear Plastic Bottle - Natural (EA015H)		23-Jun-2021	----	----	----	30-Jun-2021	30-Jun-2021	✔
0960_MW021_210623,	0960_MW114_210623,							
0960_MW233_210623,	0960_MW163_210623,							
0960_QC101_210623,	0960_MW164_210623,							
0960_QC104_210623,	0960_MW165_210623,							
0960_MW018_210623,	0960_MW211_210623,							
0960_MW113_210623,	0960_MW162_210623,							
0960_MW166_210623,	0960_MW167_210623,							
0960_QC108_210623,	0960_MW159_210623,							
0960_MW105_210623,	0960_QC112_210623,							
0960_MW168_210623								
EA025: Total Suspended Solids dried at 104 ± 2°C								
Clear Plastic Bottle - Natural (EA025H)		23-Jun-2021	----	----	----	30-Jun-2021	30-Jun-2021	✔
0960_MW021_210623,	0960_MW114_210623,							
0960_MW233_210623,	0960_MW163_210623,							
0960_QC101_210623,	0960_MW164_210623,							
0960_QC104_210623,	0960_MW165_210623,							
0960_MW018_210623,	0960_MW211_210623,							
0960_MW113_210623,	0960_MW162_210623,							
0960_MW166_210623,	0960_MW167_210623,							
0960_QC108_210623,	0960_MW159_210623,							
0960_MW105_210623,	0960_QC112_210623,							
0960_MW168_210623								



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P)		23-Jun-2021	----	----	----	03-Jul-2021	07-Jul-2021	✓
0960_MW021_210623,	0960_MW114_210623,							
0960_MW233_210623,	0960_MW163_210623,							
0960_QC101_210623,	0960_MW164_210623,							
0960_QC104_210623,	0960_MW165_210623,							
0960_MW018_210623,	0960_MW211_210623,							
0960_MW113_210623,	0960_MW162_210623,							
0960_MW166_210623,	0960_MW167_210623,							
0960_QC108_210623,	0960_MW159_210623,							
0960_MW105_210623,	0960_QC112_210623,							
0960_MW168_210623								
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G)		23-Jun-2021	----	----	----	06-Jul-2021	21-Jul-2021	✓
0960_MW021_210623,	0960_MW114_210623,							
0960_MW233_210623,	0960_MW163_210623,							
0960_QC101_210623,	0960_MW164_210623,							
0960_QC104_210623,	0960_MW165_210623,							
0960_MW018_210623,	0960_MW211_210623,							
0960_MW113_210623,	0960_MW162_210623,							
0960_MW166_210623,	0960_MW167_210623,							
0960_QC108_210623,	0960_MW159_210623,							
0960_MW105_210623,	0960_QC112_210623,							
0960_MW168_210623								
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G)		23-Jun-2021	----	----	----	06-Jul-2021	21-Jul-2021	✓
0960_MW021_210623,	0960_MW114_210623,							
0960_MW233_210623,	0960_MW163_210623,							
0960_QC101_210623,	0960_MW164_210623,							
0960_QC104_210623,	0960_MW165_210623,							
0960_MW018_210623,	0960_MW211_210623,							
0960_MW113_210623,	0960_MW162_210623,							
0960_MW166_210623,	0960_MW167_210623,							
0960_QC108_210623,	0960_MW159_210623,							
0960_MW105_210623,	0960_QC112_210623,							
0960_MW168_210623								



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F) 0960_MW021_210623, 0960_MW233_210623, 0960_QC101_210623, 0960_QC104_210623, 0960_MW018_210623, 0960_MW113_210623, 0960_MW166_210623, 0960_QC108_210623, 0960_MW105_210623, 0960_MW168_210623	0960_MW114_210623, 0960_MW163_210623, 0960_MW164_210623, 0960_MW165_210623, 0960_MW211_210623, 0960_MW162_210623, 0960_MW167_210623, 0960_MW159_210623, 0960_QC112_210623,	23-Jun-2021	----	----	----	30-Jun-2021	30-Jun-2021	✓
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002) 0960_MW021_210623, 0960_MW233_210623,	0960_MW114_210623, 0960_MW163_210623	23-Jun-2021	----	----	----	02-Jul-2021	21-Jul-2021	✓
Amber DOC Filtered- Sulfuric Preserved (EP002) 0960_QC101_210623, 0960_QC104_210623, 0960_MW211_210623, 0960_MW162_210623, 0960_MW167_210623, 0960_MW105_210623, 0960_MW168_210623	0960_MW164_210623, 0960_MW165_210623, 0960_MW113_210623, 0960_MW166_210623, 0960_QC108_210623, 0960_QC112_210623,	23-Jun-2021	----	----	----	05-Jul-2021	21-Jul-2021	✓
EP005: Total Organic Carbon (TOC)								
Amber TOC Vial - Sulfuric Acid (EP005) 0960_MW018_210623,	0960_MW159_210623	23-Jun-2021	----	----	----	02-Jul-2021	21-Jul-2021	✓
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X) 0960_MW021_210623, 0960_MW233_210623, 0960_QC101_210623, 0960_QC104_210623, 0960_MW018_210623, 0960_MW113_210623, 0960_MW166_210623, 0960_QC108_210623, 0960_MW105_210623, 0960_MW168_210623	0960_MW114_210623, 0960_MW163_210623, 0960_MW164_210623, 0960_MW165_210623, 0960_MW211_210623, 0960_MW162_210623, 0960_MW167_210623, 0960_MW159_210623, 0960_QC112_210623,	23-Jun-2021	06-Jul-2021	20-Dec-2021	✓	06-Jul-2021	20-Dec-2021	✓



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X)		23-Jun-2021	06-Jul-2021	20-Dec-2021	✔	06-Jul-2021	20-Dec-2021	✔
0960_MW021_210623,	0960_MW114_210623,							
0960_MW233_210623,	0960_MW163_210623,							
0960_QC101_210623,	0960_MW164_210623,							
0960_QC104_210623,	0960_MW165_210623,							
0960_MW018_210623,	0960_MW211_210623,							
0960_MW113_210623,	0960_MW162_210623,							
0960_MW166_210623,	0960_MW167_210623,							
0960_QC108_210623,	0960_MW159_210623,							
0960_MW105_210623,	0960_QC112_210623,							
0960_MW168_210623								
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X)		23-Jun-2021	06-Jul-2021	20-Dec-2021	✔	06-Jul-2021	20-Dec-2021	✔
0960_MW021_210623,	0960_MW114_210623,							
0960_MW233_210623,	0960_MW163_210623,							
0960_QC101_210623,	0960_MW164_210623,							
0960_QC104_210623,	0960_MW165_210623,							
0960_MW018_210623,	0960_MW211_210623,							
0960_MW113_210623,	0960_MW162_210623,							
0960_MW166_210623,	0960_MW167_210623,							
0960_QC108_210623,	0960_MW159_210623,							
0960_MW105_210623,	0960_QC112_210623,							
0960_MW168_210623								
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X)		23-Jun-2021	06-Jul-2021	20-Dec-2021	✔	06-Jul-2021	20-Dec-2021	✔
0960_MW021_210623,	0960_MW114_210623,							
0960_MW233_210623,	0960_MW163_210623,							
0960_QC101_210623,	0960_MW164_210623,							
0960_QC104_210623,	0960_MW165_210623,							
0960_MW018_210623,	0960_MW211_210623,							
0960_MW113_210623,	0960_MW162_210623,							
0960_MW166_210623,	0960_MW167_210623,							
0960_QC108_210623,	0960_MW159_210623,							
0960_MW105_210623,	0960_QC112_210623,							
0960_MW168_210623								

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X)		23-Jun-2021	06-Jul-2021	20-Dec-2021	✓	06-Jul-2021	20-Dec-2021	✓
0960_MW021_210623,	0960_MW114_210623,							
0960_MW233_210623,	0960_MW163_210623,							
0960_QC101_210623,	0960_MW164_210623,							
0960_QC104_210623,	0960_MW165_210623,							
0960_MW018_210623,	0960_MW211_210623,							
0960_MW113_210623,	0960_MW162_210623,							
0960_MW166_210623,	0960_MW167_210623,							
0960_QC108_210623,	0960_MW159_210623,							
0960_MW105_210623,	0960_QC112_210623,							
0960_MW168_210623								



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)		Quality Control Specification	
Analytical Methods	Method	QC	Regular	Actual	Expected		Evaluation
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	4	34	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	4	38	10.53	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	4	34	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	4	38	10.53	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	34	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	38	5.26	5.26	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Matrix Spikes (MS) - Continued							
Total Organic Carbon	EP005	1	18	5.56	5.00	✔	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of 'filterable' residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high temperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.
Total Organic Carbon	EP005	WATER	In house: Referenced to APHA 5310 B, The automated TOC analyzer determines Total and Inorganic Carbon by IR cell. TOC is calculated as the difference. This method is compliant with NEPM Schedule B(3)



<i>Analytical Methods</i>	<i>Method</i>	<i>Matrix</i>	<i>Method Descriptions</i>
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
<i>Preparation Methods</i>	<i>Method</i>	<i>Matrix</i>	<i>Method Descriptions</i>
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.



CHAIN OF CUSTODY

COC#: 24516 ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFASOMP

SITE: SC-DEF19009/Learmonth SED

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes

No

N/A

Free ice / frozen ice bricks present upon receipt?

Yes

No

N/A

Random Sample Temperature on Receipt:

15.9 °C

Other comments:

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Sediments SEDIMENT	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0960_SS123		23/06/2021 09:42 AM	Soil	ALS: 2 Non ALS: 0	No	X		
002	0960_QC102		23/06/2021 09:42 AM	Soil	ALS: 2 Non ALS: 0	No	X		
003	0960_SS121		23/06/2021 01:02 PM	Soil	ALS: 2 Non ALS: 0	No	X		
004	0960_SS122		23/06/2021 02:22 PM	Soil	ALS: 2 Non ALS: 0	No	X		
005	0960_QC111		23/06/2021 02:23 PM	Soil	ALS: 2 Non ALS: 0	No	X		
006	0960_SD219		23/06/2021 02:43 PM	Soil	ALS: 2 Non ALS: 0	No	X		



CHAIN OF CUSTODY

COC#: 24516

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFASOMP

SITE: SC-DEF19009/Learmonth SED

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0960_SS123	Soil Glass Jar - Unpreserved	150 mL	00260321005806	Orange	No	
001	0960_SS123	HDPE Soil Jar	200 mL	00620719063181	Grey	No	
002	0960_QC102	HDPE Soil Jar	200 mL	00620719063126	Grey	No	
002	0960_QC102	Soil Glass Jar - Unpreserved	150 mL	00260321005816	Orange	No	
003	0960_SS121	Soil Glass Jar - Unpreserved	150 mL	00260321005752	Orange	No	
003	0960_SS121	HDPE Soil Jar	200 mL	00620719063200	Grey	No	
004	0960_SS122	Soil Glass Jar - Unpreserved	150 mL	00260321005805	Orange	No	
004	0960_SS122	HDPE Soil Jar	200 mL	00620719063082	Grey	No	
005	0960_QC111	HDPE Soil Jar	200 mL	00620719063133	Grey	No	
005	0960_QC111	Soil Glass Jar - Unpreserved	150 mL	00260321005815	Orange	No	
006	0960_SD219	Soil Glass Jar - Unpreserved	150 mL	00260321005739	Orange	No	
006	0960_SD219	HDPE Soil Jar	200 mL	00620719063172	Grey	No	

Total Bottle Count: ALS: 12, Non ALS: 0

**SAMPLE RECEIPT NOTIFICATION (SRN)****Work Order : EP2107194**

Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: maelle.bourdais@cardno.com.au	E-mail	: nick.courts@alsglobal.com
Telephone	: ----	Telephone	: +61-8-9406 1301
Facsimile	: ----	Facsimile	: +61-8-9406 1399
Project	: WA_0960_PFASOMP	Page	: 1 of 2
Order number	: DEF19009/0960	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 24516	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/Learmonth		
Sampler	: MAELLE BOURDAIS, Shaun Chambers		

Dates

Date Samples Received	: 28-Jun-2021 13:25	Issue Date	: 28-Jun-2021
Client Requested Due Date	: 06-Jul-2021	Scheduled Reporting Date	: 06-Jul-2021

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not intact.
No. of coolers/boxes	: 5	Temperature	: 15.9 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 6 / 6

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepancies: extra samples, samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- ### Summary of Sample(s) and Requested Analysis

Laboratory sample ID	Sampling date / time	Sample ID	SOIL - A - Agriculture	SOIL - E - Moisture	SOIL - E - Organic	SOIL - E - PFAS
EP2107194-001	23-Jun-2021 09:42	0960_SS123_210623	✓	✓	✓	✓
EP2107194-002	23-Jun-2021 09:42	0960_QC102_210623	✓	✓	✓	✓
EP2107194-003	23-Jun-2021 13:02	0960_SS121_210623	✓	✓	✓	✓
EP2107194-004	23-Jun-2021 14:22	0960_SS122_210623	✓	✓	✓	✓
EP2107194-005	23-Jun-2021 14:23	0960_QC111_210623	✓	✓	✓	✓
EP2107194-006	23-Jun-2021 14:43	0960_SD219_210623	✓	✓	✓	✓

Sample(s) have been received within the recommended holding times for the requested analysis.

Email maelle.bourdais@cardno.com.au

CERTIFICATE OF ANALYSIS

Work Order : **EP2107194**
Client : **CARDNO (WA) PTY LTD**
Contact : **MAELLE BOURDAIS**
Address : **11 HARVEST TERRACE PO BOX 155**
WEST PERTH WA, AUSTRALIA 6006
Telephone : **----**
Project : **WA_0960_PFASOMP**
Order number : **DEF19009/0960**
C-O-C number : **24516**
Sampler : **MAELLE BOURDAIS, Shaun Chambers**
Site : **DEF19009/Learmonth**
Quote number : **SY/139/19**
No. of samples received : **6**
No. of samples analysed : **6**

Page : 1 of 9
Laboratory : Environmental Division Perth
Contact : Nick Courts
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 28-Jun-2021 13:25
Date Analysis Commenced : 01-Jul-2021
Issue Date : 06-Jul-2021 15:09



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H⁺ + Al³⁺).
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SS123_210623	0960_QC102_210623	0960_SS121_210623	0960_SS122_210623	0960_QC111_210623
Sampling date / time					23-Jun-2021 09:42	23-Jun-2021 09:42	23-Jun-2021 13:02	23-Jun-2021 14:22	23-Jun-2021 14:23
Compound	CAS Number	LOR	Unit		EP2107194-001	EP2107194-002	EP2107194-003	EP2107194-004	EP2107194-005
				Result	Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		9.0	8.9	8.7	10.0	9.6
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		98	94	78	391	370
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		9.2	9.5	10.8	13.0	9.0
ED007: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		21.7	20.2	18.8	----	----
Exchangeable Magnesium	----	0.1	meq/100g		2.4	2.3	1.4	----	----
Exchangeable Potassium	----	0.1	meq/100g		0.6	0.6	0.7	----	----
Exchangeable Sodium	----	0.1	meq/100g		0.4	0.4	<0.1	----	----
Cation Exchange Capacity	----	0.1	meq/100g		25.1	23.4	21.0	----	----
Exchangeable Sodium Percent	----	0.1	%		1.6	1.5	0.4	----	----
ED008: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		----	----	----	23.3	21.2
Exchangeable Magnesium	----	0.1	meq/100g		----	----	----	3.2	2.9
Exchangeable Potassium	----	0.1	meq/100g		----	----	----	1.0	0.9
Exchangeable Sodium	----	0.1	meq/100g		----	----	----	1.2	0.5
Cation Exchange Capacity	----	0.1	meq/100g		----	----	----	28.7	25.5
Exchangeable Sodium Percent	----	0.1	%		----	----	----	4.3	2.1
EP004: Organic Matter									
Organic Matter	----	0.5	%		1.2	1.5	2.2	1.4	1.4
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		<0.0002	0.0003	0.0002	0.0004	0.0004
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	0.0006	0.0005
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		0.0466	0.0440	0.0187	0.0082	0.0073
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		0.0008	0.0010	0.0052	<0.0002	<0.0002



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SS123_210623	0960_QC102_210623	0960_SS121_210623	0960_SS122_210623	0960_QC111_210623
Sampling date / time					23-Jun-2021 09:42	23-Jun-2021 09:42	23-Jun-2021 13:02	23-Jun-2021 14:22	23-Jun-2021 14:23
Compound	CAS Number	LOR	Unit	EP2107194-001	EP2107194-002	EP2107194-003	EP2107194-004	EP2107194-005	
				Result	Result	Result	Result	Result	
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	<0.001	<0.001	<0.001	
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	0.0003	0.0002	
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.0005	<0.0002	<0.0002	
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0006	<0.0002	<0.0002	
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.0006	<0.0002	<0.0002	
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
Perfluorotetradecanoic acid (PFTTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				0960_SS123_210623	0960_QC102_210623	0960_SS121_210623	0960_SS122_210623	0960_QC111_210623
Sampling date / time				23-Jun-2021 09:42	23-Jun-2021 09:42	23-Jun-2021 13:02	23-Jun-2021 14:22	23-Jun-2021 14:23
Compound	CAS Number	LOR	Unit	EP2107194-001	EP2107194-002	EP2107194-003	EP2107194-004	EP2107194-005
				Result	Result	Result	Result	Result
EP231D: (n:2) Fluorotelomer Sulfonic Acids - Continued								
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	0.0474	0.0453	0.0258	0.0095	0.0084
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	0.0466	0.0443	0.0189	0.0086	0.0077
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	0.0466	0.0443	0.0189	0.0089	0.0079
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	71.0	79.5	88.5	84.0	75.5
13C8-PFOA	----	0.0002	%	81.5	83.5	82.5	79.0	84.0



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)		Sample ID		0960_SD219_210623	----	----	----	----
		Sampling date / time		23-Jun-2021 14:43	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2107194-006	-----	-----	-----	-----
Result				----	----	----	----	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	9.2	----	----	----	----
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	70	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	3.7	----	----	----	----
ED007: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	19.9	----	----	----	----
Exchangeable Magnesium	----	0.1	meq/100g	1.8	----	----	----	----
Exchangeable Potassium	----	0.1	meq/100g	0.5	----	----	----	----
Exchangeable Sodium	----	0.1	meq/100g	0.2	----	----	----	----
Cation Exchange Capacity	----	0.1	meq/100g	22.4	----	----	----	----
Exchangeable Sodium Percent	----	0.1	%	1.0	----	----	----	----
EP004: Organic Matter								
Organic Matter	----	0.5	%	1.0	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0006	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	----	----	----	----



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

0960_SD219_210623

Sampling date / time				23-Jun-2021 14:43	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2107194-006	-----	-----	-----	-----
Result				----	----	----	----	----

EP231B: Perfluoroalkyl Carboxylic Acids - Continued

Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	----	----	----	----

EP231C: Perfluoroalkyl Sulfonamides

Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	----	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	----	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	----	----	----	----

EP231D: (n:2) Fluorotelomer Sulfonic Acids

4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	----	----	----	----

EP231P: PFAS Sums

Sum of PFAS	----	0.0002	mg/kg	0.0006	----	----	----	----
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Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SD219_210623	----	----	----	----
				Sampling date / time	23-Jun-2021 14:43	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2107194-006	-----	-----	-----	-----
				Result	----	----	----	----	----
EP231P: PFAS Sums - Continued									
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		0.0006	----	----	----	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		0.0006	----	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		81.5	----	----	----	----
13C8-PFOA	----	0.0002	%		84.5	----	----	----	----

Page : 9 of 9
Work Order : EP2107194
Client : CARDNO (WA) PTY LTD
Project : WA_0960_PFASOMP



Surrogate Control Limits

Sub-Matrix: SEDIMENT		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(SOIL) EP231B: Perfluoroalkyl Carboxylic Acids

(SOIL) EP231D: (n:2) Fluorotelomer Sulfonic Acids

(SOIL) EP231C: Perfluoroalkyl Sulfonamides

(SOIL) EP231A: Perfluoroalkyl Sulfonic Acids

(SOIL) EP231P: PFAS Sums

(SOIL) EP231S: PFAS Surrogate

QUALITY CONTROL REPORT

Work Order	: EP2107194	Page	: 1 of 8
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 28-Jun-2021
Order number	: DEF19009/0960	Date Analysis Commenced	: 01-Jul-2021
C-O-C number	: 24516	Issue Date	: 06-Jul-2021
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: DEF19009/Learmonth		
Quote number	: SY/139/19		
No. of samples received	: 6		
No. of samples analysed	: 6		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key :
 Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
 CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
 LOR = Limit of reporting
 RPD = Relative Percentage Difference
 # = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA002: pH 1:5 (Soils) (QC Lot: 3764010)									
EP2107093-001	Anonymous	EA002: pH Value	----	0.1	pH Unit	8.6	8.6	0.0	0% - 20%
EP2107194-003	0960_SS121_210623	EA002: pH Value	----	0.1	pH Unit	8.7	8.7	0.0	0% - 20%
EA010: Conductivity (1:5) (QC Lot: 3764009)									
EP2107093-001	Anonymous	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	1800	1800	0.4	0% - 20%
EP2107194-003	0960_SS121_210623	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	78	78	0.0	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3770471)									
EP2107194-001	0960_SS123_210623	EA055: Moisture Content	----	0.1	%	9.2	9.1	0.0	0% - 20%
ED007: Exchangeable Cations (QC Lot: 3770959)									
EP2107026-006	Anonymous	ED007: Exchangeable Sodium Percent	----	0.1	%	0.6	0.8	31.5	No Limit
		ED007: Exchangeable Calcium	----	0.1	meq/100g	6.9	7.5	8.6	0% - 20%
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	0.4	0.5	0.0	No Limit
		ED007: Exchangeable Potassium	----	0.1	meq/100g	0.4	0.4	0.0	No Limit
		ED007: Exchangeable Sodium	----	0.1	meq/100g	<0.1	<0.1	0.0	No Limit
		ED007: Cation Exchange Capacity	----	0.1	meq/100g	7.8	8.5	8.9	0% - 20%
ED008: Exchangeable Cations (QC Lot: 3770345)									
EP2107026-001	Anonymous	ED008: Exchangeable Sodium Percent	----	0.1	%	1.9	2.2	16.1	0% - 20%
		ED008: Exchangeable Calcium	----	0.1	meq/100g	14.0	13.7	2.6	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	4.4	4.7	6.3	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	0.2	0.3	0.0	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	0.4	0.4	0.0	No Limit
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	19.0	19.1	0.0	0% - 20%
EP2107187-002	Anonymous	ED008: Exchangeable Sodium Percent	----	0.1	%	0.4	0.4	0.0	No Limit
		ED008: Exchangeable Calcium	----	0.1	meq/100g	40.0	46.8	15.6	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	2.5	2.6	0.0	0% - 20%



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
ED008: Exchangeable Cations (QC Lot: 3770345) - continued									
EP2107187-002	Anonymous	ED008: Exchangeable Potassium	----	0.1	meq/100g	0.2	0.2	0.0	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	0.2	0.2	0.0	No Limit
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	42.9	49.8	14.9	0% - 20%
EP004: Organic Matter (QC Lot: 3770456)									
EP2107194-001	0960_SS123_210623	EP004: Organic Matter	----	0.5	%	1.2	1.4	14.6	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3771752)									
EP2107194-001	0960_SS123_210623	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0466	0.0432	7.6	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	0.0008	0.0006	28.6	No Limit
EP2107368-032	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3771752)									
EP2107194-001	0960_SS123_210623	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTriDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.0	No Limit
		EP2107368-032	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4			0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9			0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1			0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EP231X: Perfluorononanoic acid (PFNA)	375-95-1			0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2			0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8			0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1			0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EP231X: Perfluorotridecanoic acid (PFTriDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit		
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit		



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3771752) - continued									
EP2107368-032	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.0	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3771752)									
EP2107194-001	0960_SS123_210623	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP2107368-032	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3771752)									
EP2107194-001	0960_SS123_210623	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP2107368-032	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3771752) - continued									
EP2107368-032	Anonymous	EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit



Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report			



Sub-Matrix: **SOIL**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS		



Sub-Matrix: SOIL

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3771752)							
EP2107194-001							

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2107194	Page	: 1 of 6
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 28-Jun-2021
Site	: DEF19009/Learmonth	Issue Date	: 06-Jul-2021
Sampler	: MAELLE BOURDAIS, Shaun Chambers	No. of samples received	: 6
Order number	: DEF19009/0960	No. of samples analysed	: 6

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							



Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation		
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Matrix: SOIL

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Electrical Conductivity (1:5)	EA010	2	13	15.38	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	6	16.67	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	2	18	11.11	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	1	6	16.67	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	6	16.67	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	17				



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	In house: Referenced to Rayment and Lyons 4A1 and APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Electrical Conductivity (1:5)	EA010	SOIL	In house: Referenced to Rayment and Lyons 3A1 and APHA 2510. Conductivity is determined on soil samples using a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Exchangeable Cations	ED007	SOIL	In house: Referenced to Rayment & Lyons Method 15A1. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM Schedule B(3).
Exchangeable Cations with pre-treatment	ED008	SOIL	In house: Referenced to Rayment & Lyons Method 15A2. Soluble salts are removed from the sample prior to analysis. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM Schedule B(3).
Organic Matter	EP004	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3)
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	SOIL	In-house: Analysis of soils by solvent extraction followed by LC-Electrospray-MS-MS, Negative Mode using MRM using internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15



CHAIN OF CUSTODY

COC#: 5923

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: ah DEF19009/Learmonth SED

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:



CHAIN OF CUSTODY

COC#: 5923

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFASOMP

SITE: ah DEF19009/Learmonth SED

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS



CHAIN OF CUSTODY

COC#: 5923

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFASOMP

SITE: ah DEF19009/Learmonth SED

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

**CHAIN OF CUSTODY**

COC#: 5923

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: ah DEF19009/Learmonth SED

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : EP2107198

<p>Client : CARDNO (WA) PTY LTD</p> <p>Contact : MAELLE BOURDAIS</p> <p>Address : 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006</p> <p>E-mail : maelle.bourdais@cardno.com.au</p> <p>Telephone : ----</p> <p>Facsimile : ----</p> <p>Project : WA_0960_PFASOMP</p> <p>Order number : DEF19009/0960</p> <p>C-O-C number : 5923</p> <p>Site : DEF19009/Learmonth</p> <p>Sampler : ASHLEY BROWN, MAELLE BOURDAIS</p>	<p>Laboratory : Environmental Division Perth</p> <p>Contact : Nick Courts</p> <p>Address : 26 Rigali Way Wangara WA Australia 6065</p> <p>E-mail : nick.courts@alsglobal.com</p> <p>Telephone : +61-8-9406 1301</p> <p>Facsimile : +61-8-9406 1399</p> <p>Page : 1 of 2</p> <p>Quote number : ES2019CARBSD0002 (SY/139/19)</p> <p>QC Level : NEPM 2013 B3 & ALS QC Standard</p>
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Dates

Date Samples Received : 28-Jun-2021 13:25	Issue Date : 28-Jun-2021
Client Requested Due : 07-Jul-2021	Scheduled Reporting Date : 07-Jul-2021
Date	

Delivery Details

</



Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: SOIL

Laboratory sample ID	Sampling date / time	Sample ID	SOIL - AG-1 Agricultural Soil Suite 1	SOIL - EA055-103 Moisture Content	SOIL - EP004 Organic Matter in Soil (Walkley Black)	SOIL - EP231X (solids)	PFAS - Full Suite (28 analytes)
EP2107198-001	23-Jun-2021 12:30	0960_SS279_210623		✓		✓	
EP2107198-002	23-Jun-2021 12:31	0960_SS176_210623		✓		✓	
EP2107198-003	23-Jun-2021 12:31	0960_SS166_210623		✓		✓	
EP2107198-004	23-Jun-2021 12:32	0960_SS168_210623		✓		✓	
EP2107198-005	23-Jun-2021 12:32	0960_ss170_210623		✓		✓	
EP2107198-006	23-Jun-2021 12:33	0960_SS157_210623	✓	✓	✓	✓	
EP2107198-007	23-Jun-2021 12:35	0960_SS277_210623	✓	✓	✓	✓	
EP2107198-008	23-Jun-2021 12:36	0960_SS113_210623	✓	✓	✓	✓	
EP2107198-009	23-Jun-2021 12:38	0960_SS174_210623	✓	✓	✓	✓	

CERTIFICATE OF ANALYSIS

Work Order : **EP2107198**
Client : **CARDNO (WA) PTY LTD**
Contact : **MAELLE BOURDAIS**
Address : **11 HARVEST TERRACE PO BOX 155**
WEST PERTH WA, AUSTRALIA 6006
Telephone : **----**
Project : **WA_0960_PFASOMP**
Order number : **DEF19009/0960**
C-O-C number : **5923**
Sampler : **ASHLEY BROWN, MAELLE BOURDAIS**
Site : **DEF19009/Learmonth**
Quote number : **SY/139/19**
No. of samples received : **16**
No. of samples analysed : **16**

Page : 1 of 13
Laboratory : Environmental Division Perth
Contact : Nick Courts
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 28-Jun-2021 13:25
Date Analysis Commenced : 01-Jul-2021
Issue Date : 07-Jul-2021 13:11



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Inorganics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H⁺ + Al³⁺).
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				0960_SS279_210623	0960_SS176_210623	0960_SS166_210623	0960_SS168_210623	0960_ss170_210623
Sampling date / time				23-Jun-2021 12:30	23-Jun-2021 12:31	23-Jun-2021 12:31	23-Jun-2021 12:32	23-Jun-2021 12:32
Compound	CAS Number	LOR	Unit	EP2107198-001	EP2107198-002	EP2107198-003	EP2107198-004	EP2107198-005
				Result	Result	Result	Result	Result
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	12.9	22.6	21.0	21.7	17.1
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg</					



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				0960_SS279_210623	0960_SS176_210623	0960_SS166_210623	0960_SS168_210623	0960_ss170_210623
Sampling date / time				23-Jun-2021 12:30	23-Jun-2021 12:31	23-Jun-2021 12:31	23-Jun-2021 12:32	23-Jun-2021 12:32
Compound	CAS Number	LOR	Unit	EP2107198-001	EP2107198-002	EP2107198-003	EP2107198-004	EP2107198-005
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.000



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SS157_210623	0960_SS277_210623	0960_SS113_210623	0960_SS174_210623	0960_SS243_210623
Sampling date / time					23-Jun-2021 12:33	23-Jun-2021 12:35	23-Jun-2021 12:36	23-Jun-2021 12:38	23-Jun-2021 12:37
Compound	CAS Number	LOR	Unit		EP2107198-006	EP2107198-007	EP2107198-008	EP2107198-009	EP2107198-010
				Result	Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		8.7	9.1	9.5	9.3	8.7
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		4330	175	91	202	99
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		23.2	7.5	3.6	3.5	15.9
ED007: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		----	17.0	17.6	18.5	24.7
Exchangeable Magnesium									



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				0960_SS157_210623	0960_SS277_210623	0960_SS113_210623	0960_SS174_210623	0960_SS243_210623
Sampling date / time				23-Jun-2021 12:33	23-Jun-2021 12:35	23-Jun-2021 12:36	23-Jun-2021 12:38	23-Jun-2021 12:37
Compound	CAS Number	LOR	Unit	EP2107198-006	EP2107198-007	EP2107198-008	EP2107198-009	EP2107198-010
				Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perflu								



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				0960_SS157_210623	0960_SS277_210623	0960_SS113_210623	0960_SS174_210623	0960_SS243_210623
Sampling date / time				23-Jun-2021 12:33	23-Jun-2021 12:35	23-Jun-2021 12:36	23-Jun-2021 12:38	23-Jun-2021 12:37
Compound	CAS Number	LOR	Unit	EP2107198-006	EP2107198-007	EP2107198-008	EP2107198-009	EP2107198-010
				Result	Result	Result	Result	Result
EP231D: (n:2) Fluorotelomer Sulfonic Acids - Continued								
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	0.0013	0.0014	0.0005	0.0157	0.0082
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	0.0013	0.0014	0.0005	0.0157	0.0074
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	0.0013	0.0014	0.0005	0.0157	0.0074
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	85.0	82.5	83.0	73.5	84.5
13C8-PFOA	----	0.0002	%	80.5	81.0	83.0	81.0	86.5



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SS124_210623	0960_SS231_210623	0960_SS278_210623	0960_SS625_210623	0960_SS235_210623
Sampling date / time					23-Jun-2021 12:39	23-Jun-2021 12:40	23-Jun-2021 12:41	23-Jun-2021 12:42	23-Jun-2021 15:05
Compound	CAS Number	LOR	Unit		EP2107198-011	EP2107198-012	EP2107198-013	EP2107198-014	EP2107198-015
				Result	Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		8.7	9.3	8.8	9.3	----
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		100	163	81	354	----
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		7.6	7.0	7.2	27.5	1.3
ED007: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		19.8	23.7	16.3	----	----
Exchangeable Magnesium	----	0.1	meq/100g		2.1	4.6	1.1	----	----
Exchangeable Potassium	----	0.1	meq/100g		1.3	1.6	0.5	----	----
Exchangeable Sodium	----	0.1	meq/100g		0.1	1.4	<0.1	----	----
Cation Exchange Capacity	----	0.1	meq/100g		23.4	31.3	18.0	----	----
Exchangeable Sodium Percent	----	0.1	%		0.6	4.4	<0.1	----	----
ED008: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		----	----	----	17.8	----
Exchangeable Magnesium	----	0.1	meq/100g		----	----	----	6.8	----
Exchangeable Potassium	----	0.1	meq/100g		----	----	----	1.9	----
Exchangeable Sodium	----	0.1	meq/100g		----	----	----	0.9	----
Cation Exchange Capacity	----	0.1	meq/100g		----	----	----	27.3	----
Exchangeable Sodium Percent	----	0.1	%		----	----	----	3.2	----
EP004: Organic Matter									



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				0960_SS124_210623	0960_SS231_210623	0960_SS278_210623	0960_SS625_210623	0960_SS235_210623
Sampling date / time				23-Jun-2021 12:39	23-Jun-2021 12:40	23-Jun-2021 12:41	23-Jun-2021 12:42	23-Jun-2021 15:05
Compound	CAS Number	LOR	Unit	EP2107198-011	EP2107198-012	EP2107198-013	EP2107198-014	EP2107198-015
				Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	0.0008	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	0.0019	0.0003	<0.0002	<0.0002	<0.0002
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	0.0008	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	0.0007	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Methyl perfluoroo								



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				0960_SS124_210623	0960_SS231_210623	0960_SS278_210623	0960_SS625_210623	0960_SS235_210623
Sampling date / time				23-Jun-2021 12:39	23-Jun-2021 12:40	23-Jun-2021 12:41	23-Jun-2021 12:42	23-Jun-2021 15:05
Compound	CAS Number	LOR	Unit	EP2107198-011	EP2107198-012	EP2107198-013	EP2107198-014	EP2107198-015
				Result	Result	Result	Result	Result
EP231D: (n:2) Fluorotelomer Sulfonic Acids - Continued								
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	0.0839	0.0279	0.0039	0.0038	0.0157
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	0.0766	0.0276	0.0039	0.0032	0.0157
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	0.0766	0.0276	0.0039	0.0032	0.0157
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	83.5	81.0	89.0	83.0	82.5
13C8-PFOA	----	0.0002	%	84.5	82.0	81.0	78.0	82.5



Analytical Results

Sub-Matrix: **SEDIMENT**
 (Matrix: **SOIL**)

Sample ID

0960_SS234_210623

Sampling date / time				23-Jun-2021 15:54	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2107198-016	-----	-----	-----	-----
Result				----	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	13.4	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0160	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	0.0010	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	0.0002	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	0.0008	----	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	0.0003	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1							



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

0960_SS234_210623

Sampling date / time

23-Jun-2021 15:54

Compound

CAS Number

LOR

Unit

EP2107198-016

Result

EP231C: Perfluoroalkyl Sulfonamides - Continued

N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	----	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	----	----	----	----

EP231D: (n:2) Fluorotelomer Sulfonic Acids

4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)								



Surrogate Control Limits

Sub-Matrix: SEDIMENT		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(SOIL) EP231B: Perfluoroalkyl Carboxylic Acids

(SOIL) EP231D: (n:2) Fluorotelomer Sulfonic Acids

(SOIL) EP231C: Perfluoroalkyl Sulfonamides

(SOIL) EP231A: Perfluoroalkyl Sulfonic Acids

(SOIL) EP231P: PFAS Sums

(SOIL) EP231S: PFAS Surrogate

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology). Only applies to samples EP2107198 (001, 002, 003, 004, 005, 015, 016).

(SOIL) EA055: Moisture Content (Dried @ 105-110°C)

QUALITY CONTROL REPORT

Work Order	: EP2107198	Page	: 1 of 12
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 28-Jun-2021
Order number	: DEF19009/0960	Date Analysis Commenced	: 01-Jul-2021
C-O-C number	: 5923	Issue Date	: 07-Jul-2021
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		
Site	: DEF19009/Learmonth		
Quote number	: SY/139/19		
No. of samples received	: 16		
No. of samples analysed	: 16		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Inorganics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key :
 Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
 CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
 LOR = Limit of reporting
 RPD = Relative Percentage Difference
 # = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA002: pH 1:5 (Soils) (QC Lot: 3764036)									
EP2107198-006	0960_SS157_210623	EA002: pH Value	----	0.1	pH Unit	8.7	8.7	0.0	0% - 20%
EP2107271-001	Anonymous	EA002: pH Value	----	0.1	pH Unit	9.1	9.3	2.4	0% - 20%
EA010: Conductivity (1:5) (QC Lot: 3764035)									
EP2107198-006	0960_SS157_210623	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	4330	4340	0.2	0% - 20%
EP2107271-001	Anonymous	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	918	917	0.1	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3767600)									
EP2107198-003	0960_SS166_210623	EA055: Moisture Content	----	0.1	%	21.0	19.6	6.8	0% - 20%
EP2107280-006	Anonymous	EA055: Moisture Content	----	0.1	%	12.2	11.5	5.9	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3770473)									
EP2107198-006	0960_SS157_210623	EA055: Moisture Content	----	0.1	%	23.2	23.8	2.3	0% - 20%
ED007: Exchangeable Cations (QC Lot: 3774488)									
EP2107198-008	0960_SS113_210623	ED007: Exchangeable Sodium Percent							



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
ED008: Exchangeable Cations (QC Lot: 3770345) - continued									
EP2107187-002	Anonymous	ED008: Exchangeable Sodium Percent	----	0.1	%	0.4	0.4	0.0	No Limit
		ED008: Exchangeable Calcium	----	0.1	meq/100g	40.0	46.8	15.6	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	2.5	2.6	0.0	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	0.2	0.2	0.0	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	0.2	0.2	0.0	No Limit
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	42.9	49.8	14.9	0% - 20%
EP004: Organic Matter (QC Lot: 3770464)									
EP2107198-006	0960_SS157_210623	EP004: Organic Matter	----	0.5	%	1.3	1.3	0.0	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3773262)									
EP2107198-001	0960_SS279_210623	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0320	0.0310	3.3	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
ES2123832-028	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3773262) - continued									
EP2107198-001	0960_SS279_210623	EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.0	No Limit
ES2123832-028	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: Perflu							

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 Work Order : EP2107198
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3774403) - continued									
EP2107198-015	0960_SS235_210623	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.0	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3773262)									
EP2107198-001	0960_SS279_210623	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
ES2123832-028	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP231C: Perfluoroalkyl Sulfonamides (



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3774403) - continued									
EP2107198-005	0960_ss170_210623	EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP2107198-015	0960_SS235_210623	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3773262)									
EP2107198-001	0960_SS279_210623	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
ES2123832-028	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005		

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 Work Order : EP2107198
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3774403) - continued									
EP2107198-015	0960_SS235_210623	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit



Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

Sub-Matrix: SOIL				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EA002: pH 1:5 (Soils) (QCLot: 3764036)								
EA002: pH Value	----	----	pH Unit	----	4 pH Unit	100	70.0	130
				----	7 pH Unit	100	70.0	130
EA010: Conductivity (1:5) (QCLot: 3764035)								
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	12890 µS/cm	99.4	93.6	106
ED007: Exchangeable Cations (QCLot: 3774488)								
ED007: Exchangeable Calcium	----	0.1	meq/100g	<0.1	21.6 meq/100g	100	82.9	117
ED007: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.76 meq/100g	96.6	78.4	119
ED007: Exchangeable Potassium	----	0.1	meq/100g	<0.1	1 meq/100g	109	87.9	129
ED007: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.9 meq/100g	106	92.9	132
ED007: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	25.3 meq/100g	100	84.7	117
ED007: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
ED008: Exchangeable Cations (QCLot: 3770345)								
ED008: Exchangeable Calcium	----	0.1	meq/100g	<0.1	22.1 meq/100g	89.3	78.7	111
ED008: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.56 meq/100g	87.8	77.6	111
ED008: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.91 meq/100g	100	86.9	116
ED008: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.38 meq/100g	100	72.3	129
ED008: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
ED008: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	24.95 meq/100g	89.8	79.9	110
EP004: Organic Matter (QCLot: 3770464)								
EP004: Organic Matter	----	0.5	%	<0.5	2.3 %	102	70.0	120
				<0.5	85 %	88.5	70.0	120
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3773262)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	77.2	72.0	128
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	90.0	73.0	123
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.0	67.0	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	72.4	70.0	132
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.8	68.0	136
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	76.0	59.0	134
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3774403)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	82.0	72.0	128
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	75.6	73.0	123
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	72.8	67.0	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	74.8	70.0	132
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	76.0	68.0	136

Laboratory Control Spike (LCS) Report

Acceptable Limits (%)

High

EP 2516: Perfluorobiphenyl Sulfonamides (QCEOL: 5774403)

Laboratory Control Spike (LCS) Report

Matrix Spike (MS) Report

Sub-matrix: SOL				Matrix Spike (MS) Report			
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Spike Concentration	Recovery(%) MS	Acceptable Limits (%)	
						Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3773262)							
EP2107198-001	0960_SS279_210623	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	72.8	72.0	128
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	79.2	73.0	123
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	74.4	67.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	79.6	70.0	132
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	# Not Determined	68.0	136
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	82.4	59.0	134
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3774403)							



Sub-Matrix: **SOIL**

Sub-Matrix: SOIL				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3774403) - continued							
EP2107198-005	0960_ss170_210623	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	77.6	72.0	128
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	# 70.8	73.0	123
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	70.4	67.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	70.8	70.0	132
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	70.4	68.0	136
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	74.4	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3773262)							
EP2107198-001	0960_SS279_210623	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	73.2	71.0	135
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	78.8	69.0	132
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	77.6	70.0	132
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	81.6	71.0	131
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	82.0	69.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	85.2	72.0	129
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	80.0	69.0	133
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	85.6	64.0	136
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	84.0	69.0	135
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	66.4	66.0	139
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	74.4	69.0	133
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3774403)							
EP2107198-005	0960_ss170_210623	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	75.8	71.0	135
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	74.0	69.0	132
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	71.6	70.0	132
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	76.4	71.0	131
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	70.0	69.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	75.6	72.0	129
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	72.4	69.0	133
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	71.6	64.0	136
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	76.4	69.0	135
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	70.0	66.0	139
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	79.2	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3773262)							
EP2107198-001	0960_SS279_210623	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	89.2	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	89.4	71.6	129
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	89.4	69.8	131
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	83.2	68.7	130



Sub-Matrix: **SOIL**

Sub-Matrix: SOIL				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3773262) - continued							
EP2107198-001	0960_SS279_210623	EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	80.9	65.1	134
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	71.2	63.0	144
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	66.0	61.0	139
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3774403)							
EP2107198-005	0960_ss170_210623	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	85.6	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	76.8	71.6	129
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	71.3	69.8	131
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	82.7	68.7	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	77.1	65.1	134
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	76.8	63.0	144
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	74.8	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3773262)							
EP2107198-001	0960_SS279_210623	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	75.6	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	76.4	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	80.4	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	84.8	69.2	143
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3774403)							
EP2107198-005	0960_ss170_210623	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	76.4	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	75.6	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	73.6	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	81.2	69.2	143

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2107198	Page	: 1 of 7
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 28-Jun-2021
Site	: DEF19009/Learmonth	Issue Date	: 07-Jul-2021
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS	No. of samples received	: 16
Order number	: DEF19009/0960	No. of samples analysed	: 16

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- Matrix Spike outliers exist - please see following pages for full details.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- **NO** Quality Control Sample Frequency Outliers exist.



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
EP231A: Perfluoroalkyl Sulfonic Acids	EP2107198--005	0960_ss170_210623	Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	70.8 %	73.0-123%	Recovery less than lower data quality objective
EP231A: Perfluoroalkyl Sulfonic Acids	EP2107198--001	0960_SS279_210623	Perfluorooctane sulfonic acid (PFOS)	1763-23-1	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

Outliers : Analysis Holding Time Compliance

Matrix: **SOIL**

Method		Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA002: pH 1:5 (Soils)							
Soil Glass Jar - Unpreserved		01-Jul-2021	30-Jun-2021	1	----	----	----
0960_SS157_210623,	0960_SS277_210623,						
0960_SS113_210623,	0960_SS174_210623,						
0960_SS243_210623,	0960_SS124_210623,						
0960_SS231_210623,	0960_SS278_210623,						
0960_SS625_210623							
EA010: Conductivity (1:5)							
Soil Glass Jar - Unpreserved		01-Jul-2021	30-Jun-2021	1	----	----	----
0960_SS157_210623,	0960_SS277_210623,						
0960_SS113_210623,	0960_SS174_210623,						
0960_SS243_210623,	0960_SS124_210623,						
0960_SS231_210623,	0960_SS278_210623,						
0960_SS625_210623							

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation



Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA002: pH 1:5 (Soils)								
Soil Glass Jar - Unpreserved (EA002)								
0960_SS157_210623,	0960_SS277_210623,	23-Jun-2021	01-Jul-2021	30-Jun-2021	✖	01-Jul-2021	01-Jul-2021	✓
0960_SS113_210623,	0960_SS174_210623,							
0960_SS243_210623,	0960_SS124_210623,							
0960_SS231_210623,	0960_SS278_210623,							
0960_SS625_210623								
EA010: Conductivity (1:5)								
Soil Glass Jar - Unpreserved (EA010)								
0960_SS157_210623,	0960_SS277_210623,	23-Jun-2021	01-Jul-2021	30-Jun-2021	✖	01-Jul-2021	29-Jul-2021	✓
0960_SS113_210623,	0960_SS174_210623,							
0960_SS243_210623,	0960_SS124_210623,							
0960_SS231_210623,	0960_SS278_210623,							
0960_SS625_210623								
EA055: Moisture Content (Dried @ 105-110°C)								
HDPE Soil Jar (EA055)								
0960_SS279_210623,	0960_SS176_210623,	23-Jun-2021	----	----	----	01-Jul-2021	07-Jul-2021	✓
0960_SS166_210623,	0960_SS168_210623,							
0960_ss170_210623,	0960_SS235_210623,							
0960_SS234_210623								
Soil Glass Jar - Unpreserved (EA055)								
0960_SS157_210623,	0960_SS277_210623,	23-Jun-2021	----	----	----	02-Jul-2021	07-Jul-2021	✓
0960_SS113_210623,	0960_SS174_210623,							
0960_SS243_210623,	0960_SS124_210623,							
0960_SS231_210623,	0960_SS278_210623,							
0960_SS625_210623								
ED007: Exchangeable Cations								
Soil Glass Jar - Unpreserved (ED007)								
0960_SS277_210623,	0960_SS113_210623,	23-Jun-2021	06-Jul-2021	21-Jul-2021	✓	06-Jul-2021	21-Jul-2021	✓
0960_SS174_210623,	0960_SS243_210623,							
0960_SS124_210623,	0960_SS231_210623,							
0960_SS278_210623								
ED008: Exchangeable Cations								
Soil Glass Jar - Unpreserved (ED008)								
0960_SS157_210623,	0960_SS625_210623	23-Jun-2021	02-Jul-2021	21-Jul-2021	✓	02-Jul-2021	21-Jul-2021	✓
EP004: Organic Matter								
Soil Glass Jar - Unpreserved (EP004)								
0960_SS157_210623,	0960_SS277_210623,	23-Jun-2021	07-Jul-2021	21-Jul-2021	✓	07-Jul-2021	21-Jul-2021	✓
0960_SS113_210623,	0960_SS174_210623,							
0960_SS243_210623,	0960_SS124_210623,							
0960_SS231_210623,	0960_SS278_210623,							
0960_SS625_210623								



Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE Soil Jar (EP231X) 0960_SS279_210623, 0960_SS166_210623,	0960_SS176_210623, 0960_SS168_210623	23-Jun-2021	05-Jul-2021	20-Dec-2021	✔	05-Jul-2021	14-Aug-2021	✔
HDPE Soil Jar (EP231X) 0960_ss170_210623, 0960_SS277_210623, 0960_SS174_210623, 0960_SS124_210623, 0960_SS278_210623, 0960_SS235_210623,	0960_SS157_210623, 0960_SS113_210623, 0960_SS243_210623, 0960_SS231_210623, 0960_SS625_210623, 0960_SS234_210623	23-Jun-2021	06-Jul-2021	20-Dec-2021	✔	06-Jul-2021	15-Aug-2021	✔
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE Soil Jar (EP231X) 0960_SS279_210623, 0960_SS166_210623,	0960_SS176_210623, 0960_SS168_210623	23-Jun-2021	05-Jul-2021	20-Dec-2021	✔	05-Jul-2021	14-Aug-2021	✔
HDPE Soil Jar (EP231X) 0960_ss170_210623, 0960_SS277_210623, 0960_SS174_210623, 0960_SS124_210623, 0960_SS278_210623, 0960_SS235_210623,	0960_SS157_210623, 0960_SS113_210623, 0960_SS243_210623, 0960_SS231_210623, 0960_SS625_210623, 0960_SS234_210623	23-Jun-2021	06-Jul-2021	20-Dec-2021	✔	06-Jul-2021	15-Aug-2021	✔
EP231C: Perfluoroalkyl Sulfonamides								
HDPE Soil Jar (EP231X) 0960_SS279_210623, 0960_SS166_210623,	0960_SS176_210623, 0960_SS168_210623	23-Jun-2021	05-Jul-2021	20-Dec-2021	✔	05-Jul-2021	14-Aug-2021	✔
HDPE Soil Jar (EP231X) 0960_ss170_210623, 0960_SS277_210623, 0960_SS174_210623, 0960_SS124_210623, 0960_SS278_210623, 0960_SS235_210623,	0960_SS157_210623, 0960_SS113_210623, 0960_SS243_210623, 0960_SS231_210623, 0960_SS625_210623, 0960_SS234_210623	23-Jun-2021	06-Jul-2021	20-Dec-2021	✔	06-Jul-2021	15-Aug-2021	✔



Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE Soil Jar (EP231X) 0960_SS279_210623, 0960_SS166_210623,	0960_SS176_210623, 0960_SS168_210623	23-Jun-2021	05-Jul-2021	20-Dec-2021	✔	05-Jul-2021	14-Aug-2021	✔
HDPE Soil Jar (EP231X) 0960_ss170_210623, 0960_SS277_210623, 0960_SS174_210623, 0960_SS124_210623, 0960_SS278_210623, 0960_SS235_210623,	0960_SS157_210623, 0960_SS113_210623, 0960_SS243_210623, 0960_SS231_210623, 0960_SS625_210623, 0960_SS234_210623	23-Jun-2021	06-Jul-2021	20-Dec-2021	✔	06-Jul-2021	15-Aug-2021	✔
EP231P: PFAS Sums								
HDPE Soil Jar (EP231X) 0960_SS279_210623, 0960_SS166_210623,	0960_SS176_210623, 0960_SS168_210623	23-Jun-2021	05-Jul-2021	20-Dec-2021	✔	05-Jul-2021	14-Aug-2021	✔
HDPE Soil Jar (EP231X) 0960_ss170_210623, 0960_SS277_210623, 0960_SS174_210623, 0960_SS124_210623, 0960_SS278_210623, 0960_SS235_210623,	0960_SS157_210623, 0960_SS113_210623, 0960_SS243_210623, 0960_SS231_210623, 0960_SS625_210623, 0960_SS234_210623	23-Jun-2021	06-Jul-2021	20-Dec-2021	✔	06-Jul-2021	15-Aug-2021	✔



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)		Quality Control Specification	
Analytical Methods	Method	QC	Regular	Actual	Expected		Evaluation
Laboratory Duplicates (DUP)							
Electrical Conductivity (1:5)	EA010	2	19	10.53	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	10	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	2	18	11.11	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	1	9	11.11	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	9	11.11	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	4	40	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	19	10.53	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Electrical Conductivity (1:5)	EA010	1	19	5.26	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	10	10.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	18	5.56	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	9	22.22	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	40	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	19	10.53	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Electrical Conductivity (1:5)	EA010	1	19	5.26	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	10	10.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	18	5.56	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	9	11.11	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	40	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	40	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	In house: Referenced to Rayment and Lyons 4A1 and APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Electrical Conductivity (1:5)	EA010	SOIL	In house: Referenced to Rayment and Lyons 3A1 and APHA 2510. Conductivity is determined on soil samples using a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Exchangeable Cations	ED007	SOIL	In house: Referenced to Rayment & Lyons Method 15A1. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM Schedule B(3).
Exchangeable Cations with pre-treatment	ED008	SOIL	In house: Referenced to Rayment & Lyons Method 15A2. Soluble salts are removed from the sample prior to analysis. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM Schedule B(3).
Organic Matter	EP004	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3)
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	SOIL	In-house: Analysis of soils by solvent extraction followed by LC-Electrospray-MS-MS, Negative Mode using MRM using internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Exchangeable Cations Preparation Method	ED007PR	SOIL	In house: Referenced to Rayment & Lyons method 15A1. A 1M NH4Cl extraction by end over end tumbling at a ratio of 1:20. There is no pretreatment for soluble salts. Extracts can be run by ICP for cations.
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
Organic Matter	EP004-PR	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3).
QuEChERS Extraction of Solids	ORG71	SOIL	In house: Sequential extractions with Acetonitrile/Methanol by shaking. Extraction efficiency aided by the addition of salts under acidic conditions. Where relevant, interferences from co-extracted organics are removed with dispersive clean-up media (dSPE). The extract is either diluted or concentrated and exchanged into the analytical solvent.



CHAIN OF CUSTODY

COC#: 24520 ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: MB DEF19009/Learmonth SW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Surface Waters Primary WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0960_SW190		23/06/2021 10:44 AM	Water	ALS: 5 Non ALS: 0	No	X		
002	0960_QC103		23/06/2021 10:46 AM	Water	ALS: 5 Non ALS: 0	No	X		
003	0960_SW305		23/06/2021 12:33 PM	Water	ALS: 5 Non ALS: 0	No	X		
004	0960_SW304		23/06/2021 12:51 PM	Water	ALS: 5 Non ALS: 0	No	X		
005	0960_SW303		23/06/2021 12:52 PM	Water	ALS: 5 Non ALS: 0	No	X		
006	0960_SW301		23/06/2021 02:12 PM	Water	ALS: 4 Non ALS: 1	No	X		DOC vial filtered
007	0960_QC109		23/06/2021 02:13 PM	Water	ALS: 5 Non ALS: 0	No	X		
008	0960_SW300		23/06/2021 02:32 PM	Water	ALS: 5 Non ALS: 0	No	X		
009	0960_SW211		23/06/2021 02:47 PM	Water	ALS: 5 Non ALS: 0	No	X		



CHAIN OF CUSTODY

COC#: 24520

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFASOMP

SITE: MB DEF19009/Learmonth SW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

°C

Other comments:

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Surface Waters Primary WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
010	0960_SW193		23/06/2021 03:39 PM	Water	ALS: 7 Non ALS: 0	No	X		extra PFAS bottles for lab QC

**CHAIN OF CUSTODY**

COC#: 24520

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: MB DEF19009/Learmonth SW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0960_SW190	Clear Plastic Bottle - Natural	250 mL	00070220143164	Green	No	
001	0960_SW190	Clear Plastic Bottle - Natural	250 mL	00070220143012	Green	No	
001	0960_SW190	HDPE (no PTFE)	20 mL	00352010040104	Grey	No	
001	0960_SW190	HDPE (no PTFE)	20 mL	00352010039995	Grey	No	
001	0960_SW190	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003960	Purple	No	
002	0960_QC103	Clear Plastic Bottle - Natural	250 mL	00070220142950	Green	No	
002	0960_QC103	Clear Plastic Bottle - Natural	250 mL	00070220143203	Green	No	
002	0960_QC103	HDPE (no PTFE)	20 mL	00352010039924	Grey	No	
002	0960_QC103	HDPE (no PTFE)	20 mL	00352010039925	Grey	No	
002	0960_QC103	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003966	Purple	No	
003	0960_SW305	Clear Plastic Bottle - Natural	250 mL	00070220143098	Green	No	
003	0960_SW305	HDPE (no PTFE)	20 mL	00352010040252	Grey	No	
003	0960_SW305	HDPE (no PTFE)	20 mL	00352010040200	Grey	No	
003	0960_SW305	Clear Plastic Bottle - Natural	250 mL	00070220143137	Green	No	
003	0960_SW305	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020004097	Purple	No	
004	0960_SW304	Clear Plastic Bottle - Natural	250 mL	00070220143149	Green	No	
004	0960_SW304	Clear Plastic Bottle - Natural	250 mL	00070220143162	Green	No	
004	0960_SW304	HDPE (no PTFE)	20 mL	00352010040047	Grey	No	
004	0960_SW304	HDPE (no PTFE)	20 mL	00352010040028	Grey	No	
004	0960_SW304	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003905	Purple	No	
005	0960_SW303	Clear Plastic Bottle - Natural	250 mL	00070220143170	Green	No	
005	0960_SW303	Clear Plastic Bottle - Natural	250 mL	00070220143119	Green	No	
005	0960_SW303	HDPE (no PTFE)	20 mL	00352010039973	Grey	No	
005	0960_SW303	HDPE (no PTFE)	20 mL	00352010039932	Grey	No	
005	0960_SW303	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003990	Purple	No	
006	0960_SW301	HDPE (no PTFE)	20 mL	00352010040010	Grey	No	



CHAIN OF CUSTODY

COC#: 24520

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: MB DEF19009/Learmonth SW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

006	0960_SW301	HDPE (no PTFE)	20 mL	00352010039989	Grey	No	
006	0960_SW301	Clear Plastic Bottle - Natural	250 mL	00070220143122	Green	No	
006	0960_SW301	Clear Plastic Bottle - Natural	250 mL	00070220143200	Green	No	
007	0960_QC109	Clear Plastic Bottle - Natural	250 mL	00070220143179	Green	No	
007	0960_QC109	Clear Plastic Bottle - Natural	250 mL	00070220142983	Green	No	
007	0960_QC109	HDPE (no PTFE)	20 mL	00352010040124	Grey	No	
007	0960_QC109	HDPE (no PTFE)	20 mL	00352010039917	Grey	No	
007	0960_QC109	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003918	Purple	No	
008	0960_SW300	Clear Plastic Bottle - Natural	250 mL	00070220143189	Green	No	
008	0960_SW300	Clear Plastic Bottle - Natural	250 mL	00070220143048	Green	No	
008	0960_SW300	HDPE (no PTFE)	20 mL	00352010040007	Grey	No	
008	0960_SW300	HDPE (no PTFE)	20 mL	00352010040031	Grey	No	
008	0960_SW300	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003921	Purple	No	
009	0960_SW211	Clear Plastic Bottle - Natural	250 mL	00070220143045	Green	No	
009	0960_SW211	Clear Plastic Bottle - Natural	250 mL	00070220143276	Green	No	
009	0960_SW211	HDPE (no PTFE)	20 mL	00352010040137	Grey	No	
009	0960_SW211	HDPE (no PTFE)	20 mL	00352010040157	Grey	No	
009	0960_SW211	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020004140	Purple	No	
010	0960_SW193	HDPE (no PTFE)	20 mL	00352005006408	Grey	No	
010	0960_SW193	HDPE (no PTFE)	20 mL	00350019164275	Grey	No	
010	0960_SW193	HDPE (no PTFE)	20 mL	00352010040043	Grey	No	
010	0960_SW193	HDPE (no PTFE)	20 mL	00352010040065	Grey	No	
010	0960_SW193	Clear Plastic Bottle - Natural	250 mL	00070220143062	Green	No	
010	0960_SW193	Clear Plastic Bottle - Natural	250 mL	00070220143101	Green	No	
010	0960_SW193	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003953	Purple	No	

Total Bottle Count: ALS: 51, Non ALS: 1

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : EP2107270

Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: maelle.bourdais@cardno.com.au	E-mail	: nick.courts@alsglobal.com
Telephone	: ----	Telephone	: +61-8-9406 1301
Facsimile	: ----	Facsimile	: +61-8-9406 1399
Project	: WA_0960_PFASOMP	Page	: 1 of 3
Order number	: DEF19009/0960	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 24520	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/Learmonth		
Sampler	: MAELLE BOURDAIS		

Dates

Date Samples Received	: 28-Jun-2021 13:25	Issue Date	: 29-Jun-2021
Client Requested Due Date	: 09-Jul-2021	Scheduled Reporting Date	: 09-Jul-2021

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 1	Temperature	: 15.9 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 10 / 10

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepancies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.



Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2107270-001	23-Jun-2021 10:44	0960_SW190_210623	✓	✓	✓	✓	✓	✓	✓
EP2107270-002	23-Jun-2021 10:46	0960_QC103_210623	✓	✓	✓	✓	✓	✓	✓
EP2107270-003	23-Jun-2021 12:33	0960_SW305_210623	✓	✓	✓	✓	✓	✓	✓
EP2107270-004	23-Jun-2021 12:51	0960_SW304_210623	✓	✓	✓	✓	✓	✓	✓
EP2107270-005	23-Jun-2021 12:52	0960_SW303_210623	✓	✓	✓	✓	✓	✓	✓
EP2107270-006	23-Jun-2021 14:12	0960_SW001_210623	✓	✓	✓	✓	✓	✓	✓
EP2107270-007	23-Jun-2021 14:13	0960_QC109_210623	✓	✓	✓	✓	✓	✓	✓
EP2107270-008	23-Jun-2021 14:32	0960_SW300_210623	✓	✓	✓	✓	✓	✓	✓
EP2107270-009	23-Jun-2021 14:47	0960_SW211_210623	✓	✓	✓	✓	✓	✓	✓
EP2107270-010	23-Jun-2021 15:39	0960_SW193_210623	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2107270-001	23-Jun-2021 10:44	0960_SW190_210623	✓
EP2107270-002	23-Jun-2021 10:46	0960_QC103_210623	✓
EP2107270-003	23-Jun-2021 12:33	0960_SW305_210623	✓
EP2107270-004	23-Jun-2021 12:51	0960_SW304_210623	✓
EP2107270-005	23-Jun-2021 12:52	0960_SW303_210623	✓
EP2107270-006	23-Jun-2021 14:12	0960_SW001_210623	✓
EP2107270-007	23-Jun-2021 14:13	0960_QC109_210623	✓
EP2107270-008	23-Jun-2021 14:32	0960_SW300_210623	✓
EP2107270-009	23-Jun-2021 14:47	0960_SW211_210623	✓
EP2107270-010	23-Jun-2021 15:39	0960_SW193_210623	✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Evaluation: ✖ = Holding time breach : ✔ = Within holding time.

Requested Deliverables

Email claire.armstrong@cardno.com.au

Email derp.labreports@esdat.com.au

Email laura.beames@cardno.com.au

Email maelle.bourdais@cardno.com.au

- Email maelle.bourdais@cardno.com.au
Email maelle.bourdais@cardno.com.au
Email maelle.bourdais@cardno.com.au
Email maelle.bourdais@cardno.com.au
Email maelle.bourdais@cardno.com.au
Email maelle.bourdais@cardno.com.au

CERTIFICATE OF ANALYSIS

Work Order : **EP2107270**
Client : **CARDNO (WA) PTY LTD**
Contact : **MAELLE BOURDAIS**
Address : **11 HARVEST TERRACE PO BOX 155**
WEST PERTH WA, AUSTRALIA 6006
Telephone : **----**
Project : **WA_0960_PFASOMP**
Order number : **DEF19009/0960**
C-O-C number : **24520**
Sampler : **MAELLE BOURDAIS**
Site : **DEF19009/Learmonth**
Quote number : **SY/139/19**
No. of samples received : **10**
No. of samples analysed : **10**

Page : 1 of 9
Laboratory : Environmental Division Perth
Contact : Nick Courts
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 28-Jun-2021 13:25
Date Analysis Commenced : 30-Jun-2021
Issue Date : 08-Jul-2021 17:39



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: SURFACE WATER
 (Matrix: WATER)

Sample ID

				0960_SW190_210623	0960_QC103_210623	0960_SW305_210623	0960_SW304_210623	0960_SW303_210623
Sampling date / time				23-Jun-2021 10:44	23-Jun-2021 10:46	23-Jun-2021 12:33	23-Jun-2021 12:51	23-Jun-2021 12:52
Compound	CAS Number	LOR	Unit	EP2107270-001	EP2107270-002	EP2107270-003	EP2107270-004	EP2107270-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	8.71	8.61	7.97	7.85	7.85
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	6480	6250	45500	39100	38900
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	<5	<5	20	85	164
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	22	17	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	88	90	149	214	215
Total Alkalinity as CaCO3	----	1	mg/L	110	107	149	214	215
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	395	390	2640	2280	2290
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	3150	3150	20700	18400	18400
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	70	65	486	442	441
Magnesium	7439-95-4	1	mg/L	205	189	1540	1350	1340
Sodium	7440-23-5	1	mg/L	1820	1670	11900	10400	10300
Potassium	7440-09-7	1	mg/L	124	110	624	538	534
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	99.3	99.1	642	571	571
∅ Total Cations	----	0.01	meq/L	103	94.2	684	599	594
∅ Ionic Balance	----	0.01	%	1.69	2.51	3.22	2.44	1.97
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	6	6	3	5	4
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: SURFACE WATER
 (Matrix: WATER)

Sample ID

				0960_SW190_210623	0960_QC103_210623	0960_SW305_210623	0960_SW304_210623	0960_SW303_210623
Sampling date / time				23-Jun-2021 10:44	23-Jun-2021 10:46	23-Jun-2021 12:33	23-Jun-2021 12:51	23-Jun-2021 12:52
Compound	CAS Number	LOR	Unit	EP2107270-001	EP2107270-002	EP2107270-003	EP2107270-004	EP2107270-005
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.04	0.04	<0.01	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: SURFACE WATER
 (Matrix: WATER)

Sample ID

				0960_SW190_210623	0960_QC103_210623	0960_SW305_210623	0960_SW304_210623	0960_SW303_210623
Sampling date / time				23-Jun-2021 10:44	23-Jun-2021 10:46	23-Jun-2021 12:33	23-Jun-2021 12:51	23-Jun-2021 12:52
Compound	CAS Number	LOR	Unit	EP2107270-001	EP2107270-002	EP2107270-003	EP2107270-004	EP2107270-005
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	0.04	0.04	<0.01	<0.01	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	0.04	0.04	<0.01	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L	0.04	0.04	<0.01	<0.01	<0.01
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	79.2	84.4	78.4	83.3	82.5
13C8-PFOA	----	0.02	%	80.8	81.3	79.7	80.5	81.1



Analytical Results

Sub-Matrix: SURFACE WATER
 (Matrix: WATER)

Sample ID

				0960_SW001_210623	0960_QC109_210623	0960_SW300_210623	0960_SW211_210623	0960_SW193_210623
Sampling date / time				23-Jun-2021 14:12	23-Jun-2021 14:13	23-Jun-2021 14:32	23-Jun-2021 14:47	23-Jun-2021 15:39
Compound	CAS Number	LOR	Unit	EP2107270-006	EP2107270-007	EP2107270-008	EP2107270-009	EP2107270-010
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	8.07	8.10	8.21	8.30	8.22
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	38100	38000	38600	38500	36400
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	129	127	196	59	10
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	209	212	236	211	163
Total Alkalinity as CaCO3	----	1	mg/L	209	212	236	211	163
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2260	2280	2460	2420	2160
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	17900	18000	18600	18400	17600
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	424	431	430	426	404
Magnesium	7439-95-4	1	mg/L	1320	1330	1360	1360	1270
Sodium	7440-23-5	1	mg/L	10000	10200	10400	10500	9700
Potassium	7440-09-7	1	mg/L	512	519	519	530	510
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	556	559	581	574	545
∅ Total Cations	----	0.01	meq/L	578	588	599	603	560
∅ Ionic Balance	----	0.01	%	1.91	2.48	1.56	2.53	1.35
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	5	5	6	6	7
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: SURFACE WATER
 (Matrix: WATER)

Sample ID

				0960_SW001_210623	0960_QC109_210623	0960_SW300_210623	0960_SW211_210623	0960_SW193_210623
Sampling date / time				23-Jun-2021 14:12	23-Jun-2021 14:13	23-Jun-2021 14:32	23-Jun-2021 14:47	23-Jun-2021 15:39
Compound	CAS Number	LOR	Unit	EP2107270-006	EP2107270-007	EP2107270-008	EP2107270-009	EP2107270-010
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.02	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: SURFACE WATER
 (Matrix: WATER)

Sample ID

				0960_SW001_210623	0960_QC109_210623	0960_SW300_210623	0960_SW211_210623	0960_SW193_210623
Sampling date / time				23-Jun-2021 14:12	23-Jun-2021 14:13	23-Jun-2021 14:32	23-Jun-2021 14:47	23-Jun-2021 15:39
Compound	CAS Number	LOR	Unit	EP2107270-006	EP2107270-007	EP2107270-008	EP2107270-009	EP2107270-010
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.02	<0.01	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	0.02	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	<0.01	0.02	<0.01	<0.01
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	85.1	79.3	74.9	91.4	100
13C8-PFOA	----	0.02	%	82.1	81.2	79.6	91.9	98.4

Page : 9 of 9
Work Order : EP2107270
Client : CARDNO (WA) PTY LTD
Project : WA_0960_PFASOMP



Surrogate Control Limits

Sub-Matrix: SURFACE WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EP231C: Perfluoroalkyl Sulfonamides

(WATER) EP231D: (n:2) Fluorotelomer Sulfonic Acids

(WATER) EP231P: PFAS Sums

(WATER) EP231A: Perfluoroalkyl Sulfonic Acids

(WATER) EP231B: Perfluoroalkyl Carboxylic Acids

(WATER) EP231S: PFAS Surrogate

QUALITY CONTROL REPORT

Work Order	: EP2107270	Page	: 1 of 14
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 28-Jun-2021
Order number	: DEF19009/0960	Date Analysis Commenced	: 30-Jun-2021
C-O-C number	: 24520	Issue Date	: 08-Jul-2021
Sampler	: MAELLE BOURDAIS		
Site	: DEF19009/Learmonth		
Quote number	: SY/139/19		
No. of samples received	: 10		
No. of samples analysed	: 10		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
= Indicates failed QC

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA005P: pH by PC Titrator (QC Lot: 3776024)									
EP2107188-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.62	7.53	1.2	0% - 20%
EP2107189-007	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.33	7.33	0.0	0% - 20%
EA005P: pH by PC Titrator (QC Lot: 3776026)									
EP2107270-002	0960_QC103_210623	EA005-P: pH Value	----	0.01	pH Unit	8.61	8.70	1.0	0% - 20%
EP2107272-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.04	8.05	0.1	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3765003)									
EP2107193-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	4660	4650	0.3	0% - 20%
EP2107270-001	0960_SW190_210623	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	6480	6470	0.1	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3765009)									
EP2107193-009	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	2070	2050	0.9	0% - 20%
EP2107193-017	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	33500	33600	0.4	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3765026)									
EP2107270-006	0960_SW001_210623	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	38100	37200	2.5	0% - 20%
EP2107333-004	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	277	278	0.0	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3765004)									
EP2107193-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	514	496	3.7	0% - 20%
EP2107272-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	86	90	4.3	0% - 50%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3765010)									
EP2107193-009	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	4530	4580	1.1	0% - 20%
EP2107193-019	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	1450	1400	3.4	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3765027)									
EP2107270-006	0960_SW001_210623	EA025H: Suspended Solids (SS)	----	5	mg/L	129	130	0.0	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3776023)									



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
ED037P: Alkalinity by PC Titrator (QC Lot: 3776023) - continued									
EP2107188-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	317	318	0.4	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	317	318	0.4	0% - 20%
EP2107189-007	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	152	153	0.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	152	153	0.0	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3776025)									
EP2107270-002	0960_QC103_210623	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	17	21	19.5	0% - 20%
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	90	88	2.5	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	107	109	1.4	0% - 20%
EP2107272-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	141	124	12.7	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	141	124	12.7	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3764408)									
EP2107188-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1240	1240	0.0	0% - 20%
EP2107270-006	0960_SW001_210623	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2260	2310	2.4	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3764409)									
EP2107188-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	8770	8780	0.2	0% - 20%
EP2107270-006	0960_SW001_210623	ED045G: Chloride	16887-00-6	1	mg/L	17900	18300	2.0	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3762880)									
EP2107188-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	341	326	4.4	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	730	703	3.7	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	5580	5420	3.0	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	304	296	2.5	0% - 20%
EP2107270-005	0960_SW303_210623	ED093F: Calcium	7440-70-2	1	mg/L	441	445	0.8	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	1340	1360	1.5	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	10300	10400	1.1	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	534	545	2.0	0% - 20%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3776981)									
EP2107189-008	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	2	2	0.0	No Limit
EP2107270-005	0960_SW303_210623	EP002: Dissolved Organic Carbon	----	1	mg/L	4	4	0.0	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3775610)									
ES2124445-009	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	37.6	43.8	15.2	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.06	0.06	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.07	0.10	29.2	No Limit



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3775610) - continued									
ES2124445-009	Anonymous	EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	2.40	2.67	10.6	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	1.16	1.30	10.7	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	0.18	0.22	18.6	0% - 50%
ES2124445-011	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	12.1	12.3	1.5	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.03	0.03	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.03	0.04	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	1.07	1.02	5.2	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.38	0.41	7.8	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	0.04	0.04	0.0	No Limit
		EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3776993)							
ES2124445-003	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	7.67	7.44	3.1	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	1.49	1.55	4.2	0% - 20%
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.30	0.27	9.6	0% - 50%
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	3.72	3.60	3.1	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.41	0.37	10.3	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	0.02	0.03	0.0	No Limit
		EP2107272-006	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5			0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4			0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4			0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8			0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3			0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3775610)									
ES2124445-009	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	2.61	2.83	8.2	0% - 20%
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.38	0.40	5.0	0% - 20%
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	1.82	1.91	4.9	0% - 20%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	1.24	1.27	2.0	0% - 20%
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	1.96	2.16	9.8	0% - 20%
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	1.54	1.79	14.9	0% - 20%
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	0.69	0.76	10.3	0% - 20%
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	0.24	0.26	7.7	0% - 50%
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	0.08	0.09	17.8	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	0.2	0.2	0.0	No Limit
		ES2124445-011	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.83	0.88
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3			0.02	µg/L	0.15	0.17	7.9	No Limit
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4			0.02	µg/L	0.66	0.70	5.4	0% - 20%
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9			0.02	µg/L	0.41	0.47	12.0	0% - 20%
EP231X: Perfluorononanoic acid (PFNA)	375-95-1			0.02	µg/L	0.25	0.29	14.0	0% - 50%
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2			0.02	µg/L	0.10	0.12	17.1	No Limit



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3775610) - continued									
ES2124445-011	Anonymous	EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	0.06	0.06	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	0.03	0.02	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3776993)									
ES2124445-003	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	1.02	1.05	2.6	0% - 20%
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.83	0.78	6.5	0% - 20%
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	3.25	3.32	2.0	0% - 20%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.69	0.74	6.6	0% - 20%
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	0.12	0.12	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	0.04	0.04	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	0.07	0.07	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	0.04	0.05	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	0.04	0.04	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	0.3	0.3	0.0	No Limit
EP2107272-006	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3775610)									
ES2124445-009	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	0.51	0.60	15.6	0% - 20%
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3775610) - continued									
ES2124445-009	Anonymous	EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
ES2124445-011	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	0.12	0.13	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3776993)							
ES2124445-003	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP2107272-006	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9			0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6			0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8			0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2			0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7			0.05	µg/L	<0.05	<0.05	0.0	No Limit



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3776993) - continued									
EP2107272-006	Anonymous	EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3775610)									
ES2124445-009	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	0.20	0.22	12.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	1.54	1.80	15.2	0% - 20%
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
ES2124445-011	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	0.06	0.07	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	0.29	0.29	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3776993)									
ES2124445-003	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	0.30	0.30	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	1.22	1.18	2.8	0% - 20%
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP2107272-006	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231P: PFAS Sums (QC Lot: 3775610)									
ES2124445-009	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	54.5	62.4	13.6	0% - 20%
ES2124445-011	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	16.6	17.0	2.6	0% - 20%
EP231P: PFAS Sums (QC Lot: 3776993)									
ES2124445-003	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	21.5	21.2	1.3	0% - 20%



Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231P: PFAS Sums (QC Lot: 3776993) - continued									
EP2107272-006	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.0	No Limit



Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

				Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit				Low	High
EA005P: pH by PC Titrator (QCLot: 3776024)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	101	98.5	102
				----	7 pH Unit	100	98.5	102
EA005P: pH by PC Titrator (QCLot: 3776026)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3765003)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	246 mg/L	107	88.1	114
				<10	1000 mg/L	102	88.1	114
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3765009)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	246 mg/L	108	88.1	114
				<10	1000 mg/L	102	88.1	114
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3765026)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	246 mg/L	101	88.1	114
				<10	1000 mg/L	100	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2 °C (QCLot: 3765004)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	95 mg/L	106	89.1	120
				<5	1000 mg/L	103	89.1	120
EA025: Total Suspended Solids dried at 104 ± 2 °C (QCLot: 3765010)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	95 mg/L	102	89.1	120
				<5	1000 mg/L	98.7	89.1	120
EA025: Total Suspended Solids dried at 104 ± 2 °C (QCLot: 3765027)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	95 mg/L	112	89.1	120
				<5	1000 mg/L	98.2	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3776023)								
ED037-P: Hydroxide Alkalinity as CaCO ₃	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO ₃	----	1	mg/L	<1	20 mg/L	106	81.2	126
				<1	200 mg/L	99.6	90.0	110
ED037P: Alkalinity by PC Titrator (QCLot: 3776025)								
ED037-P: Hydroxide Alkalinity as CaCO ₃	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	<1	----	----	----	----



Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result			Low	High
ED037P: Alkalinity by PC Titrator (QCLot: 3776025) - continued								
ED037-P: Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO ₃	----	1	mg/L	<1	20 mg/L	102	81.2	126
				<1	200 mg/L	100	90.0	110
ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA (QCLot: 3764408)								
ED041G: Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	108	87.7	113
				<1	500 mg/L	105	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3764409)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	104	87.9	114
				<1	1000 mg/L	106	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3762880)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	97.8	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	99.6	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	104	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	92.4	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3776981)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	95.3	73.2	116
				<1	100 mg/L	99.6	73.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3775610)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	79.4	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	105	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	83.6	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	91.8	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	89.4	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	98.0	53.0	142
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3776993)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	94.8	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	89.4	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	86.2	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	82.2	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	90.2	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	98.2	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3775610)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	84.6	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	99.0	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	91.4	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	91.8	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	104	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	109	69.0	130



Sub-Matrix: **WATER**

Method: Compound				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%)	
							Low	High
CAS Number	LOR	Unit	Result					
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3775610) - continued								
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	106	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	101	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	105	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	91.2	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	91.6	71.0	132
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3776993)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	95.6	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	99.2	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	91.0	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	112	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	114	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	112	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	122	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	127	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	124	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	104	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	125	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3775610)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	104	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	107	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	91.4	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	90.7	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	111	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	118	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	108	61.0	135
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3776993)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	113	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	107	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	95.7	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	123	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	79.2	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	121	65.0	136



Sub-Matrix: **WATER**

Method: Compound				Method Blank (MB) Report Result	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Acceptable Limits (%)	
						LCS	Low	High
CAS Number	LOR	Unit						
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3776993) - continued								
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	116	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3775610)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	89.4	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	99.0	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	99.6	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	91.8	71.4	144
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3776993)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	112	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	101	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	102	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	93.2	71.4	144

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Laboratory sample ID				Matrix Spike (MS) Report			
				Spike Concentration	Spike Recovery(%)	Acceptable Limits (%)	
					MS	Low	High
Sample ID	Method: Compound	CAS Number					
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3764408)							
EP2107188-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3764409)							
EP2107188-001	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	# Not Determined	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3776981)							
EP2107189-009	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	102	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3775610)							
ES2124445-007	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	89.9	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	86.7	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	# Not Determined	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	112	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	# Not Determined	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	106	53.0	142



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3776993)							
EP2107270-010	0960_SW193_210623	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	102	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	91.8	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	79.6	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	85.6	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	98.4	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	101	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3775610)							
ES2124445-007	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	83.2	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	117	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	# Not Determined	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	106	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	# Not Determined	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	121	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	117	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	105	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	108	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.25 µg/L	96.0	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	87.7	71.0	132
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3776993)							
EP2107270-010	0960_SW193_210623	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	91.4	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	110	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	98.8	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	113	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	112	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	119	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	103	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	125	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	125	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.25 µg/L	120	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	120	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3775610)							
ES2124445-007	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	119	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	109	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	84.5	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	95.0	66.0	145



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3775610) - continued							
ES2124445-007	Anonymous	EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	97.0	57.6	145
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	96.6	65.0	136
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	100	61.0	135
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3776993)							
EP2107270-010	0960_SW193_210623	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	107	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	109	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	101	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	120	66.0	145
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	110	57.6	145
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	119	65.0	136
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	116	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3775610)							
ES2124445-007	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	86.4	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	120	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	132	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	84.4	71.4	144
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3776993)							
EP2107270-010	0960_SW193_210623	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	107	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	106	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	103	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	80.0	71.4	144

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2107270	Page	: 1 of 8
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 28-Jun-2021
Site	: DEF19009/Learmonth	Issue Date	: 08-Jul-2021
Sampler	: MAELLE BOURDAIS	No. of samples received	: 10
Order number	: DEF19009/0960	No. of samples analysed	: 10

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- Matrix Spike outliers exist - please see following pages for full details.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- **NO** Quality Control Sample Frequency Outliers exist.



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO ₄ 2- by DA	EP2107188--001	Anonymous	Sulfate as SO ₄ - Turbidimetric	14808-79-8	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
ED045G: Chloride by Discrete Analyser	EP2107188--001	Anonymous	Chloride	16887-00-6	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EP231A: Perfluoroalkyl Sulfonic Acids	ES2124445--007	Anonymous	Perfluorohexane sulfonic acid (PFHxS)	355-46-4	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EP231A: Perfluoroalkyl Sulfonic Acids	ES2124445--007	Anonymous	Perfluorooctane sulfonic acid (PFOS)	1763-23-1	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EP231B: Perfluoroalkyl Carboxylic Acids	ES2124445--007	Anonymous	Perfluorohexanoic acid (PFHxA)	307-24-4	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
EP231B: Perfluoroalkyl Carboxylic Acids	ES2124445--007	Anonymous	Perfluorooctanoic acid (PFOA)	335-67-1	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator						
Clear Plastic Bottle - Natural						
0960_SW190_210623,	0960_QC103_210623,					
0960_SW305_210623,	0960_SW304_210623,					
0960_SW303_210623,	0960_SW001_210623,					
0960_QC109_210623,	0960_SW300_210623,					
0960_SW211_210623,	0960_SW193_210623					
	----	----	----	06-Jul-2021	23-Jun-2021	13

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural (EA005-P) 0960_SW190_210623, 0960_QC103_210623, 0960_SW305_210623, 0960_SW304_210623, 0960_SW303_210623, 0960_SW001_210623, 0960_QC109_210623, 0960_SW300_210623, 0960_SW211_210623, 0960_SW193_210623	23-Jun-2021	----	----	----	06-Jul-2021	23-Jun-2021	✗
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H) 0960_SW190_210623, 0960_QC103_210623, 0960_SW305_210623, 0960_SW304_210623, 0960_SW303_210623, 0960_SW001_210623, 0960_QC109_210623, 0960_SW300_210623, 0960_SW211_210623, 0960_SW193_210623	23-Jun-2021	----	----	----	30-Jun-2021	30-Jun-2021	✓
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H) 0960_SW190_210623, 0960_QC103_210623, 0960_SW305_210623, 0960_SW304_210623, 0960_SW303_210623, 0960_SW001_210623, 0960_QC109_210623, 0960_SW300_210623, 0960_SW211_210623, 0960_SW193_210623	23-Jun-2021	----	----	----	30-Jun-2021	30-Jun-2021	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P) 0960_SW190_210623, 0960_QC103_210623, 0960_SW305_210623, 0960_SW304_210623, 0960_SW303_210623, 0960_SW001_210623, 0960_QC109_210623, 0960_SW300_210623, 0960_SW211_210623, 0960_SW193_210623	23-Jun-2021	----	----	----	06-Jul-2021	07-Jul-2021	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G) 0960_SW190_210623, 0960_QC103_210623, 0960_SW305_210623, 0960_SW304_210623, 0960_SW303_210623, 0960_SW001_210623, 0960_QC109_210623, 0960_SW300_210623, 0960_SW211_210623, 0960_SW193_210623	23-Jun-2021	----	----	----	08-Jul-2021	21-Jul-2021	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G) 0960_SW190_210623, 0960_QC103_210623, 0960_SW305_210623, 0960_SW304_210623, 0960_SW303_210623, 0960_SW001_210623, 0960_QC109_210623, 0960_SW300_210623, 0960_SW211_210623, 0960_SW193_210623	23-Jun-2021	----	----	----	08-Jul-2021	21-Jul-2021	✓



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F)		23-Jun-2021	----	----	----	30-Jun-2021	30-Jun-2021	✓
0960_SW190_210623,	0960_QC103_210623,							
0960_SW305_210623,	0960_SW304_210623,							
0960_SW303_210623,	0960_SW001_210623,							
0960_QC109_210623,	0960_SW300_210623,							
0960_SW211_210623,	0960_SW193_210623							
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002)		23-Jun-2021	----	----	----	06-Jul-2021	21-Jul-2021	✓
0960_SW190_210623,	0960_QC103_210623,							
0960_SW305_210623,	0960_SW304_210623,							
0960_SW303_210623,	0960_SW001_210623,							
0960_QC109_210623,	0960_SW300_210623,							
0960_SW211_210623,	0960_SW193_210623							
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X)		23-Jun-2021	06-Jul-2021	20-Dec-2021	✓	06-Jul-2021	20-Dec-2021	✓
0960_SW190_210623,	0960_QC103_210623,							
0960_SW305_210623,	0960_SW304_210623,							
0960_SW303_210623,	0960_SW001_210623,							
0960_QC109_210623,	0960_SW300_210623							
HDPE (no PTFE) (EP231X)		23-Jun-2021	07-Jul-2021	20-Dec-2021	✓	07-Jul-2021	20-Dec-2021	✓
0960_SW211_210623,	0960_SW193_210623							
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X)		23-Jun-2021	06-Jul-2021	20-Dec-2021	✓	06-Jul-2021	20-Dec-2021	✓
0960_SW190_210623,	0960_QC103_210623,							
0960_SW305_210623,	0960_SW304_210623,							
0960_SW303_210623,	0960_SW001_210623,							
0960_QC109_210623,	0960_SW300_210623							
HDPE (no PTFE) (EP231X)		23-Jun-2021	07-Jul-2021	20-Dec-2021	✓	07-Jul-2021	20-Dec-2021	✓
0960_SW211_210623,	0960_SW193_210623							
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X)		23-Jun-2021	06-Jul-2021	20-Dec-2021	✓	06-Jul-2021	20-Dec-2021	✓
0960_SW190_210623,	0960_QC103_210623,							
0960_SW305_210623,	0960_SW304_210623,							
0960_SW303_210623,	0960_SW001_210623,							
0960_QC109_210623,	0960_SW300_210623							
HDPE (no PTFE) (EP231X)		23-Jun-2021	07-Jul-2021	20-Dec-2021	✓	07-Jul-2021	20-Dec-2021	✓
0960_SW211_210623,	0960_SW193_210623							



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X) 0960_SW190_210623, 0960_SW305_210623, 0960_SW303_210623, 0960_QC109_210623,	0960_QC103_210623, 0960_SW304_210623, 0960_SW001_210623, 0960_SW300_210623	23-Jun-2021	06-Jul-2021	20-Dec-2021	✔	06-Jul-2021	20-Dec-2021	✔
HDPE (no PTFE) (EP231X) 0960_SW211_210623,	0960_SW193_210623	23-Jun-2021	07-Jul-2021	20-Dec-2021	✔	07-Jul-2021	20-Dec-2021	✔
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X) 0960_SW190_210623, 0960_SW305_210623, 0960_SW303_210623, 0960_QC109_210623,	0960_QC103_210623, 0960_SW304_210623, 0960_SW001_210623, 0960_SW300_210623	23-Jun-2021	06-Jul-2021	20-Dec-2021	✔	06-Jul-2021	20-Dec-2021	✔
HDPE (no PTFE) (EP231X) 0960_SW211_210623,	0960_SW193_210623	23-Jun-2021	07-Jul-2021	20-Dec-2021	✔	07-Jul-2021	20-Dec-2021	✔



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	4	38	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	5	44	11.36	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	6	47	12.77	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	38	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	17	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	6	44	13.64	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	6	47	12.77	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	38	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	3	44	6.82	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	3	47	6.38	5.26	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	38	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of 'filterable' residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C. This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high temperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.



Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.



CHAIN OF CUSTODY

ALS COC#: 24522

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFASOMP

SITE: MB DEF19009/Learmonth SED

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

15.9 °C

Other comments:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Sediments SEDIMENT	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0960_SS190		23/06/2021 10:50 AM	Soil	ALS: 2 Non ALS: 0	No	X		
002	0960_SS192		23/06/2021 11:22 AM	Soil	ALS: 2 Non ALS: 0	No	X		
003	0960_SD305		23/06/2021 12:24 PM	Soil	ALS: 2 Non ALS: 0	No	X		
004	0960_QC106		23/06/2021 12:25 PM	Soil	ALS: 1 Non ALS: 0	No	Partial 1/4		
005	0960_SD304		23/06/2021 12:53 PM	Soil	ALS: 2 Non ALS: 0	No	X		
006	0960_SD303		23/06/2021 12:54 PM	Soil	ALS: 2 Non ALS: 0	No	X		
007	0960_SD301		23/06/2021 02:00 PM	Soil	ALS: 2 Non ALS: 0	No	X		
008	0960_QC110		23/06/2021 02:00 PM	Soil	ALS: 1 Non ALS: 0	No	Partial 1/4		
009	0960_SD300		23/06/2021 02:29 PM	Soil	ALS: 2 Non ALS: 0	No	X		

**CHAIN OF CUSTODY**

COC#: 24522

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: MB DEF19009/Learmonth SED

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS**ANALYSIS REQUIRED**

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Sediments SEDIMENT	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
010	0960_SD211		23/06/2021 02:46 PM	Soil	ALS: 2 Non ALS: 0	No	X		
011	0960_SS193		23/06/2021 03:41 PM	Soil	ALS: 2 Non ALS: 0	No	X		
012	0960_QC113		23/06/2021 03:42 PM	Soil	ALS: 2 Non ALS: 0	No	X		



CHAIN OF CUSTODY

COC#: 24522

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFASOMP

SITE: MB DEF19009/Learmonth SED

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	PARTIAL ANALYSIS GROUP NAME	MATRIX	SELECTED ANALYSIS NAME
004	0960_QC106	Sediments SEDIMENT	Soil	- EP231X (solids) PFAS - Full Suite (28 analytes)
008	0960_QC110	Sediments SEDIMENT	Soil	- EP231X (solids) PFAS - Full Suite (28 analytes)



CHAIN OF CUSTODY

ALS COC#: 24522 ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFASOMP

SITE: MB DEF19009/Learmonth SED

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0960_SS190	Soil Glass Jar - Unpreserved	150 mL	00260321005717	Orange	No	
001	0960_SS190	HDPE Soil Jar	200 mL	00620719063144	Grey	No	
002	0960_SS192	HDPE Soil Jar	200 mL	00620719063120	Grey	No	
002	0960_SS192	Soil Glass Jar - Unpreserved	150 mL	00260321005791	Orange	No	
003	0960_SD305	HDPE Soil Jar	200 mL	00620719063116	Grey	No	
003	0960_SD305	Soil Glass Jar - Unpreserved	150 mL	00260321005779	Orange	No	
004	0960_QC106	HDPE Soil Jar	200 mL	00620719069361	Grey	No	
005	0960_SD304	Soil Glass Jar - Unpreserved	150 mL	00260321005723	Orange	No	
005	0960_SD304	HDPE Soil Jar	200 mL	00620719063076	Grey	No	
006	0960_SD303	Soil Glass Jar - Unpreserved	150 mL	00260321005788	Orange	No	
006	0960_SD303	HDPE Soil Jar	200 mL	00620719063160	Grey	No	
007	0960_SD301	Soil Glass Jar - Unpreserved	150 mL	00260321005778	Orange	No	
007	0960_SD301	HDPE Soil Jar	200 mL	00620719063210	Grey	No	
008	0960_QC110	HDPE Soil Jar	200 mL	00620719069349	Grey	No	
009	0960_SD300	HDPE Soil Jar	200 mL	00620719063085	Grey	No	
009	0960_SD300	Soil Glass Jar - Unpreserved	150 mL	00260321005761	Orange	No	
010	0960_SD211	Soil Glass Jar - Unpreserved	150 mL	00260321005722	Orange	No	
010	0960_SD211	HDPE Soil Jar	200 mL	00620719063132	Grey	No	
011	0960_SS193	HDPE Soil Jar	200 mL	00620719063111	Grey	No	
011	0960_SS193	Soil Glass Jar - Unpreserved	150 mL	00260321005770	Orange	No	
012	0960_QC113	HDPE Soil Jar	200 mL	00620719063078	Grey	No	
012	0960_QC113	Soil Glass Jar - Unpreserved	150 mL	00260321005561	Orange	No	

Total Bottle Count: ALS: 22, Non ALS: 0

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : EP2107271

<p>Client : CARDNO (WA) PTY LTD</p> <p>Contact : MAELLE BOURDAIS</p> <p>Address : 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006</p> <p>E-mail : maelle.bourdais@cardno.com.au</p> <p>Telephone : ----</p> <p>Facsimile : ----</p> <p>Project : WA_0960_PFASOMP</p> <p>Order number : DEF19009/0960</p> <p>C-O-C number : 24522</p> <p>Site : DEF19009/Learmonth</p> <p>Sampler : MAELLE BOURDAIS</p>	<p>Laboratory : Environmental Division Perth</p> <p>Contact : Nick Courts</p> <p>Address : 26 Rigali Way Wangara WA Australia 6065</p> <p>E-mail : nick.courts@alsglobal.com</p> <p>Telephone : +61-8-9406 1301</p> <p>Facsimile : +61-8-9406 1399</p> <p>Page : 1 of 2</p> <p>Quote number : ES2019CARBSD0002 (SY/139/19)</p> <p>QC Level : NEPM 2013 B3 & ALS QC Standard</p>
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Dates

Date Samples Received : 28-Jun-2021 13:25	Issue Date : 28-Jun-2021
Client Requested Due : 07-Jul-2021	Scheduled Reporting Date : 07-Jul-2021
Date	

Delivery Details

Mode of Delivery : Carrier	Security Seal : Not intact.
No. of coolers/boxes : 5	Temperature : 15.9 - Ice present
Receipt Detail :	No. of samples received / analysed : 12 / 12

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepancies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- ### Summary of Sample(s) and Requested Analysis

Matrix: **SOIL**

Laboratory sample ID	Sampling date / time	Sample ID	SOL - A Agricuilture	SOL - E Moisture	SOL - E Organic	SOL - E PFAS - I
EP2107271-001	23-Jun-2021 10:50	0960_SS190_210623	✓	✓	✓	✓
EP2107271-002	23-Jun-2021 11:22	0960_SS192_210623	✓	✓	✓	✓
EP2107271-003	23-Jun-2021 12:24	0960_SD305_210623	✓	✓	✓	✓
EP2107271-004	23-Jun-2021 12:25	0960_QC106_210623		✓		✓
EP2107271-005	23-Jun-2021 12:53	0960_SD304_210623	✓	✓	✓	✓
EP2107271-006	23-Jun-2021 12:54	0960_SD303_210623	✓	✓	✓	✓
EP2107271-007	23-Jun-2021 14:00	0960_SD301_210623	✓	✓	✓	✓
EP2107271-008	23-Jun-2021 14:00	0960_QC110_210623		✓		✓
EP2107271-009	23-Jun-2021 14:29	0960_SD300_210623	✓	✓	✓	✓
EP2107271-010	23-Jun-2021 14:46	0960_SD211_210623	✓	✓	✓	✓
EP2107271-011	23-Jun-2021 15:41	0960_SS193_210623	✓	✓	✓	✓
EP2107271-012	23-Jun-2021 15:42	0960_QC113_210623	✓	✓	✓	✓

CERTIFICATE OF ANALYSIS

Work Order : **EP2107271**
Client : **CARDNO (WA) PTY LTD**
Contact : MAELLE BOURDAIS
Address : 11 HARVEST TERRACE PO BOX 155
 WEST PERTH WA, AUSTRALIA 6006
Telephone : ----
Project : WA_0960_PFASOMP
Order number : DEF19009/0960
C-O-C number : 24522
Sampler : MAELLE BOURDAIS
Site : DEF19009/Learmonth
Quote number : SY/139/19
No. of samples received : 12
No. of samples analysed : 12

Page : 1 of 12
Laboratory : Environmental Division Perth
Contact : Nick Courts
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 28-Jun-2021 13:25
Date Analysis Commenced : 01-Jul-2021
Issue Date : 07-Jul-2021 15:54



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Inorganics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- ED008: Poor duplicate precision was obtained for some analytes due to possible sample heterogeneity. Results have been confirmed by re-extraction and re-analysis
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H⁺ + Al³⁺).
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				0960_SS190_210623	0960_SS192_210623	0960_SD305_210623	0960_QC106_210623	0960_SD304_210623
Sampling date / time				23-Jun-2021 10:50	23-Jun-2021 11:22	23-Jun-2021 12:24	23-Jun-2021 12:25	23-Jun-2021 12:53
Compound	CAS Number	LOR	Unit	EP2107271-001	EP2107271-002	EP2107271-003	EP2107271-004	EP2107271-005
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	9.1	9.4	8.5	----	8.6
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	918	610	6370	----	4190
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	30.4	6.9	18.5	19.3	17.4
ED008: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	20.0	3.3	18.7	----	20.4
Exchangeable Magnesium	----	0.1	meq/100g	9.5	0.3	2.2	----	2.7
Exchangeable Potassium	----	0.1	meq/100g	1.8	<0.1	0.2	----	0.3
Exchangeable Sodium	----	0.1	meq/100g	0.9	<0.1	0.2	----	0.3
Cation Exchange Capacity	----	0.1	meq/100g	32.2	3.7	21.3	----	23.6
Exchangeable Sodium Percent	----	0.1	%	2.9	1.7	1.0	----	1.1
EP004: Organic Matter								
Organic Matter	----	0.5	%	1.6	1.2	1.9	----	1.9
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0019	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				0960_SS190_210623	0960_SS192_210623	0960_SD305_210623	0960_QC106_210623	0960_SD304_210623
Sampling date / time				23-Jun-2021 10:50	23-Jun-2021 11:22	23-Jun-2021 12:24	23-Jun-2021 12:25	23-Jun-2021 12:53
Compound	CAS Number	LOR	Unit	EP2107271-001	EP2107271-002	EP2107271-003	EP2107271-004	EP2107271-005
				Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids - Continued								
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	0.0019	<0.0002	<0.0002	<0.0002	<0.0002



Analytical Results

Sub-Matrix: **SEDIMENT**
 (Matrix: **SOIL**)

Sample ID

				0960_SS190_210623	0960_SS192_210623	0960_SD305_210623	0960_QC106_210623	0960_SD304_210623
Sampling date / time				23-Jun-2021 10:50	23-Jun-2021 11:22	23-Jun-2021 12:24	23-Jun-2021 12:25	23-Jun-2021 12:53
Compound	CAS Number	LOR	Unit	EP2107271-001	EP2107271-002	EP2107271-003	EP2107271-004	EP2107271-005
				Result	Result	Result	Result	Result
EP231P: PFAS Sums - Continued								
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	0.0019	<0.0002	<0.0002	<0.0002	<0.0002
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	0.0019	<0.0002	<0.0002	<0.0002	<0.0002
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	91.0	95.0	85.0	90.5	80.5
13C8-PFOA	----	0.0002	%	85.0	100	84.0	87.0	85.5



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SD303_210623	0960_SD301_210623	0960_QC110_210623	0960_SD300_210623	0960_SD211_210623
Sampling date / time					23-Jun-2021 12:54	23-Jun-2021 14:00	23-Jun-2021 14:00	23-Jun-2021 14:29	23-Jun-2021 14:46
Compound	CAS Number	LOR	Unit		EP2107271-006	EP2107271-007	EP2107271-008	EP2107271-009	EP2107271-010
				Result	Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		8.4	8.7	----	8.9	8.7
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		6570	9760	----	2620	5020
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		22.3	22.3	20.2	33.5	30.4
ED008: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		54.8	20.0	----	19.4	20.9
Exchangeable Magnesium	----	0.1	meq/100g		3.6	7.9	----	9.7	10.5
Exchangeable Potassium	----	0.1	meq/100g		0.3	0.7	----	1.6	1.7
Exchangeable Sodium	----	0.1	meq/100g		0.3	0.5	----	1.4	1.4
Cation Exchange Capacity	----	0.1	meq/100g		59.1	29.1	----	32.2	34.5
Exchangeable Sodium Percent	----	0.1	%		0.6	1.8	----	4.5	4.0
EP004: Organic Matter									
Organic Matter	----	0.5	%		2.8	1.2	----	2.5	3.2
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		<0.0002	<0.0002	0.0002	0.0013	0.0010
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg		<0.001	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				0960_SD303_210623	0960_SD301_210623	0960_QC110_210623	0960_SD300_210623	0960_SD211_210623
Sampling date / time				23-Jun-2021 12:54	23-Jun-2021 14:00	23-Jun-2021 14:00	23-Jun-2021 14:29	23-Jun-2021 14:46
Compound	CAS Number	LOR	Unit	EP2107271-006	EP2107271-007	EP2107271-008	EP2107271-009	EP2107271-010
				Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids - Continued								
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	<0.0002	<0.0002	0.0002	0.0013	0.0010



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SD303_210623	0960_SD301_210623	0960_QC110_210623	0960_SD300_210623	0960_SD211_210623
Sampling date / time					23-Jun-2021 12:54	23-Jun-2021 14:00	23-Jun-2021 14:00	23-Jun-2021 14:29	23-Jun-2021 14:46
Compound	CAS Number	LOR	Unit		EP2107271-006	EP2107271-007	EP2107271-008	EP2107271-009	EP2107271-010
				Result	Result	Result	Result	Result	Result
EP231P: PFAS Sums - Continued									
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		<0.0002	<0.0002	0.0002	0.0013	0.0010
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		<0.0002	<0.0002	0.0002	0.0013	0.0010
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		80.0	83.0	85.0	87.5	86.0
13C8-PFOA	----	0.0002	%		87.5	82.0	84.5	78.5	82.0



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SS193_210623	0960_QC113_210623	----	----	----
Sampling date / time					23-Jun-2021 15:41	23-Jun-2021 15:42	----	----	----
Compound	CAS Number	LOR	Unit		EP2107271-011	EP2107271-012	-----	-----	-----
				Result	Result		----	----	----
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		8.5	8.6	----	----	----
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		3940	3660	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		29.4	26.7	----	----	----
ED008: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		13.0	11.7	----	----	----
Exchangeable Magnesium	----	0.1	meq/100g		1.4	1.2	----	----	----
Exchangeable Potassium	----	0.1	meq/100g		<0.1	<0.1	----	----	----
Exchangeable Sodium	----	0.1	meq/100g		0.1	<0.1	----	----	----
Cation Exchange Capacity	----	0.1	meq/100g		14.7	13.0	----	----	----
Exchangeable Sodium Percent	----	0.1	%		0.7	0.6	----	----	----
EP004: Organic Matter									
Organic Matter	----	0.5	%		1.3	1.1	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	<0.0002	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		<0.0002	<0.0002	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		<0.0002	<0.0002	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		<0.0002	<0.0002	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		<0.0002	<0.0002	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		<0.0002	<0.0002	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg		<0.001	<0.001	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		<0.0002	<0.0002	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		<0.0002	<0.0002	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		<0.0002	<0.0002	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		<0.0002	<0.0002	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		<0.0002	<0.0002	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		<0.0002	<0.0002	----	----	----



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				0960_SS193_210623	0960_QC113_210623	----	----	----
Sampling date / time				23-Jun-2021 15:41	23-Jun-2021 15:42	----	----	----
Compound	CAS Number	LOR	Unit	EP2107271-011	EP2107271-012	-----	-----	-----
				Result	Result	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids - Continued								
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	----	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	----	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	<0.0002	<0.0002	----	----	----



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SS193_210623	0960_QC113_210623	----	----	----
				Sampling date / time	23-Jun-2021 15:41	23-Jun-2021 15:42	----	----	----
Compound	CAS Number	LOR	Unit		EP2107271-011	EP2107271-012	-----	-----	-----
					Result	Result	----	----	----
EP231P: PFAS Sums - Continued									
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		<0.0002	<0.0002	----	----	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		<0.0002	<0.0002	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		85.0	82.5	----	----	----
13C8-PFOA	----	0.0002	%		84.0	87.5	----	----	----

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Work Order : EP2107271
Client : CARDNO (WA) PTY LTD
Project : WA_0960_PFASOMP



Surrogate Control Limits

Sub-Matrix: SEDIMENT		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(SOIL) EP231A: Perfluoroalkyl Sulfonic Acids

(SOIL) EP231D: (n:2) Fluorotelomer Sulfonic Acids

(SOIL) EP231C: Perfluoroalkyl Sulfonamides

(SOIL) EP231B: Perfluoroalkyl Carboxylic Acids

(SOIL) EP231P: PFAS Sums

(SOIL) EP231S: PFAS Surrogate

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology). Only applies to samples EP2107271 (004, 008).

(SOIL) EA055: Moisture Content (Dried @ 105-110°C)

QUALITY CONTROL REPORT

Work Order	: EP2107271	Page	: 1 of 12
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 28-Jun-2021
Order number	: DEF19009/0960	Date Analysis Commenced	: 01-Jul-2021
C-O-C number	: 24522	Issue Date	: 07-Jul-2021
Sampler	: MAELLE BOURDAIS		
Site	: DEF19009/Learmonth		
Quote number	: SY/139/19		
No. of samples received	: 12		
No. of samples analysed	: 12		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Inorganics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key :
 Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
 CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
 LOR = Limit of reporting
 RPD = Relative Percentage Difference
 # = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA002: pH 1:5 (Soils) (QC Lot: 3764036)									
EP2107198-006	Anonymous	EA002: pH Value	----	0.1	pH Unit	8.7	8.7	0.0	0% - 20%
EP2107271-001	0960_SS190_210623	EA002: pH Value	----	0.1	pH Unit	9.1	9.3	2.4	0% - 20%
EA010: Conductivity (1:5) (QC Lot: 3764035)									
EP2107198-006	Anonymous	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	4330	4340	0.2	0% - 20%
EP2107271-001	0960_SS190_210623	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	918	917	0.1	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3767600)									
EP2107198-003	Anonymous	EA055: Moisture Content	----	0.1	%	21.0	19.6	6.8	0% - 20%
EP2107280-006	Anonymous	EA055: Moisture Content	----	0.1	%	12.2	11.5	5.9	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3770475)									
EP2107271-001	0960_SS190_210623	EA055: Moisture Content	----	0.1	%	30.4	30.7	1.0	0% - 20%
EP2107271-012	0960_QC113_210623	EA055: Moisture Content	----	0.1	%	26.7	27.5	2.9	0% - 20%
ED008: Exchangeable Cations (QC Lot: 3770345)									
EP2107026-001	Anonymous	ED008: Exchangeable Sodium Percent	----	0.1	%	1.9	2.2	16.1	0% - 20%
		ED008: Exchangeable Calcium	----	0.1	meq/100g	14.0	13.7	2.6	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	4.4	4.7	6.3	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	0.2	0.3	0.0	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	0.4	0.4	0.0	No Limit
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	19.0	19.1	0.0	0% - 20%
EP2107187-002	Anonymous	ED008: Exchangeable Sodium Percent	----	0.1	%	0.4	0.4	0.0	No Limit
		ED008: Exchangeable Calcium	----	0.1	meq/100g	40.0	46.8	15.6	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	2.5	2.6	0.0	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	0.2	0.2	0.0	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	0.2	0.2	0.0	No Limit
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	42.9	49.8	14.9	0% - 20%



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
ED008: Exchangeable Cations (QC Lot: 3770346)									
EP2107271-005	0960_SD304_210623	ED008: Exchangeable Sodium Percent	----	0.1	%	1.1	0.8	31.0	0% - 50%
		ED008: Exchangeable Calcium	----	0.1	meq/100g	20.4	# 30.7	40.5	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	2.7	2.8	4.3	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	0.3	0.3	0.0	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	0.3	0.3	0.0	No Limit
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	23.6	# 34.1	36.2	0% - 20%
ED008: Exchangeable Cations (QC Lot: 3774498)									
EP2107271-011	0960_SS193_210623	ED008: Exchangeable Sodium Percent	----	0.1	%	0.7	<0.1	153	No Limit
		ED008: Exchangeable Calcium	----	0.1	meq/100g	13.0	12.9	1.3	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	1.4	1.4	0.0	0% - 50%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	<0.1	<0.1	0.0	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	0.1	<0.1	0.0	No Limit
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	14.7	14.4	1.9	0% - 20%
EP004: Organic Matter (QC Lot: 3770465)									
EP2107271-001	0960_SS190_210623	EP004: Organic Matter	----	0.5	%	1.6	1.6	0.0	No Limit
EP2107275-001	Anonymous	EP004: Organic Matter	----	0.5	%	1.0	1.0	0.0	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3774403)									
EP2107198-005	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0010	0.0007	34.4	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EP2107198-015	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0157	0.0140	11.2	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3775211)									
EP2107271-009	0960_SD300_210623	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0013	0.0014	12.2	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
ES2123706-018	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	0.0008	0.0008	0.0	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3775211) - continued									
ES2123706-018	Anonymous	EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	0.0013	0.0013	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.265	0.254	4.0	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3774403)									
EP2107198-005	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.0	No Limit
EP2107198-015	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3775211)									
EP2107271-009	0960_SD300_210623	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.0	No Limit
ES2123706-018	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3775211) - continued									
ES2123706-018	Anonymous	EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	0.0002	0.0002	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	0.0003	0.0004	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.0	No Limit		
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3774403)									
EP2107198-005	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP2107198-015	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002		mg/kg	<0.0002	<0.0002	0.0	No Limit	
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002		mg/kg	<0.0002	<0.0002	0.0	No Limit	
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005		mg/kg	<0.0005	<0.0005	0.0	No Limit	
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005		mg/kg	<0.0005	<0.0005	0.0	No Limit	
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005		mg/kg	<0.0005	<0.0005	0.0	No Limit	
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005		mg/kg	<0.0005	<0.0005	0.0	No Limit	
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3775211)									
EP2107271-009	0960_SD300_210623	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit

Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3775211) - continued									
EP2107271-009	0960_SD300_210623	EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
ES2123706-018	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3774403)									
EP2107198-005	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP2107198-015	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3775211)									

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 Work Order : EP2107271
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3775211) - continued									
EP2107271-009	0960_SD300_210623	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
ES2123706-018	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit



Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

Sub-Matrix: SOIL				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EA002: pH 1:5 (Soils) (QCLot: 3764036)								
EA002: pH Value	----	----	pH Unit	----	4 pH Unit	100	70.0	130
				----	7 pH Unit	100	70.0	130
EA010: Conductivity (1:5) (QCLot: 3764035)								
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	12890 µS/cm	99.4	93.6	106
ED008: Exchangeable Cations (QCLot: 3770345)								
ED008: Exchangeable Calcium	----	0.1	meq/100g	<0.1	22.1 meq/100g	89.3	78.7	111
ED008: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.56 meq/100g	87.8	77.6	111
ED008: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.91 meq/100g	100	86.9	116
ED008: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.38 meq/100g	100	72.3	129
ED008: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
ED008: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	24.95 meq/100g	89.8	79.9	110
ED008: Exchangeable Cations (QCLot: 3770346)								
ED008: Exchangeable Calcium	----	0.1	meq/100g	<0.1	22.1 meq/100g	96.7	78.7	111
ED008: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.56 meq/100g	91.3	77.6	111
ED008: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.91 meq/100g	102	86.9	116
ED008: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.38 meq/100g	101	72.3	129
ED008: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
ED008: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	24.95 meq/100g	96.6	79.9	110
ED008: Exchangeable Cations (QCLot: 3774498)								
ED008: Exchangeable Calcium	----	0.1	meq/100g	<0.1	22.1 meq/100g	93.4	78.7	111
ED008: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.56 meq/100g	90.6	77.6	111
ED008: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.91 meq/100g	95.3	86.9	116
ED008: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.38 meq/100g	88.9	72.3	129
ED008: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
ED008: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	24.95 meq/100g	93.2	79.9	110
EP004: Organic Matter (QCLot: 3770465)								
EP004: Organic Matter	----	0.5	%	<0.5	2.3 %	102	70.0	120
				<0.5	85 %	88.5	70.0	120
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3774403)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	82.0	72.0	128
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	75.6	73.0	123
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	72.8	67.0	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	74.8	70.0	132
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	76.0	68.0	136



Sub-Matrix: **SOIL**

Sub-Matrix: SOIL				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3774403) - continued								
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	77.6	59.0	134
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3775211)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	77.2	72.0	128
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	82.0	73.0	123
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	89.2	67.0	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	85.2	70.0	132
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	85.6	68.0	136
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	91.6	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3774403)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	80.6	71.0	135
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	74.4	69.0	132
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	73.2	70.0	132
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.0	71.0	131
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	75.6	69.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	73.2	72.0	129
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	70.0	69.0	133
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	73.2	64.0	136
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	70.0	69.0	135
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	71.6	66.0	139
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	80.6	69.0	133
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3775211)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	83.0	71.0	135
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	90.8	69.0	132
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	88.4	70.0	132
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	85.6	71.0	131
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	87.2	69.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.8	72.0	129
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	82.8	69.0	133
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	79.2	64.0	136
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	97.6	69.0	135
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	79.6	66.0	139
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	95.4	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3774403)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	81.2	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	73.6	71.6	129
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	72.1	69.8	131
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	77.6	68.7	130



Sub-Matrix: SOIL				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3774403) - continued								
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	83.3	65.1	134
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	75.2	63.0	144
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.0	61.0	139
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3775211)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	100	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	111	71.6	129
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	83.6	69.8	131
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	98.6	68.7	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	99.4	65.1	134
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	76.8	63.0	144
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	85.2	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3774403)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	86.8	62.0	145
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	76.4	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	79.2	65.0	137
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	86.8	69.2	143
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3775211)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	77.2	62.0	145
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	87.2	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	91.6	65.0	137
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	82.4	69.2	143

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: SOIL				Matrix Spike (MS) Report			
				Spike Concentration	SpikeRecovery(%) MS	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number			Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3774403)							
EP2107198-005	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	77.6	72.0	128
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	# 70.8	73.0	123



Sub-Matrix: **SOIL**

Sub-Matrix: SOIL				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3774403) - continued							
EP2107198-005	Anonymous	EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	70.4	67.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	70.8	70.0	132
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	70.4	68.0	136
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	74.4	59.0	134
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3775211)							
EP2107271-009	0960_SD300_210623	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	73.2	72.0	128
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	# 72.0	73.0	123
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	85.2	67.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	75.6	70.0	132
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	84.0	68.0	136
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	86.0	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3774403)							
EP2107198-005	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	75.8	71.0	135
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	74.0	69.0	132
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	71.6	70.0	132
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	76.4	71.0	131
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	70.0	69.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	75.6	72.0	129
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	72.4	69.0	133
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	71.6	64.0	136
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	76.4	69.0	135
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	70.0	66.0	139
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	79.2	69.0	133
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3775211)							
EP2107271-009	0960_SD300_210623	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	76.2	71.0	135
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	83.6	69.0	132
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	80.0	70.0	132
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	82.8	71.0	131
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	80.0	69.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	76.8	72.0	129
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	71.2	69.0	133
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	70.8	64.0	136
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	89.6	69.0	135
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	70.8	66.0	139
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	82.2	69.0	133
		EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3774403)					
EP2107198-005	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	85.6	67.0	137



Sub-Matrix: **SOIL**

Sub-Matrix: SOIL				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3774403) - continued							
EP2107198-005	Anonymous	EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	76.8	71.6	129
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	71.3	69.8	131
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	82.7	68.7	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	77.1	65.1	134
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	76.8	63.0	144
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	74.8	61.0	139
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3775211)							
EP2107271-009	0960_SD300_210623	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	93.6	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	88.1	71.6	129
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	73.6	69.8	131
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	84.4	68.7	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	97.3	65.1	134
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	74.0	63.0	144
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	77.2	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3774403)							
EP2107198-005	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	76.4	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	75.6	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	73.6	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	81.2	69.2	143
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3775211)							
EP2107271-009	0960_SD300_210623	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	73.2	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	86.8	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	83.2	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	86.8	69.2	143

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2107271	Page	: 1 of 6
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 28-Jun-2021
Site	: DEF19009/Learmonth	Issue Date	: 07-Jul-2021
Sampler	: MAELLE BOURDAIS	No. of samples received	: 12
Order number	: DEF19009/0960	No. of samples analysed	: 12

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Laboratory Control outliers occur.
- Duplicate outliers exist - please see following pages for full details.
- Matrix Spike outliers exist - please see following pages for full details.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- **NO** Quality Control Sample Frequency Outliers exist.



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Duplicate (DUP) RPDs							
ED008: Exchangeable Cations	EP2107271--005	0960_SD304_210623	Exchangeable Calcium	----	40.5 %	0% - 20%	RPD exceeds LOR based limits
ED008: Exchangeable Cations	EP2107271--005	0960_SD304_210623	Cation Exchange Capacity	----	36.2 %	0% - 20%	RPD exceeds LOR based limits
Matrix Spike (MS) Recoveries							
EP231A: Perfluoroalkyl Sulfonic Acids	EP2107198--005	Anonymous	Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	70.8 %	73.0-123%	Recovery less than lower data quality objective
EP231A: Perfluoroalkyl Sulfonic Acids	EP2107271--009	0960_SD300_210623	Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	72.0 %	73.0-123%	Recovery less than lower data quality objective

Outliers : Analysis Holding Time Compliance

Matrix: **SOIL**

Method		Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA002: pH 1:5 (Soils)							
Soil Glass Jar - Unpreserved							
0960_SS190_210623, 0960_SD305_210623, 0960_SD303_210623, 0960_SD300_210623, 0960_SS193_210623,	0960_SS192_210623, 0960_SD304_210623, 0960_SD301_210623, 0960_SD211_210623, 0960_QC113_210623	01-Jul-2021	30-Jun-2021	1	----	----	----
EA010: Conductivity (1:5)							
Soil Glass Jar - Unpreserved							
0960_SS190_210623, 0960_SD305_210623, 0960_SD303_210623, 0960_SD300_210623, 0960_SS193_210623,	0960_SS192_210623, 0960_SD304_210623, 0960_SD301_210623, 0960_SD211_210623, 0960_QC113_210623	01-Jul-2021	30-Jun-2021	1	----	----	----

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: * = Holding time breach ; ✓ = Within holding time.



Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA002: pH 1:5 (Soils)								
Soil Glass Jar - Unpreserved (EA002)		23-Jun-2021	01-Jul-2021	30-Jun-2021	✖	01-Jul-2021	01-Jul-2021	✔
0960_SS190_210623,	0960_SS192_210623,							
0960_SD305_210623,	0960_SD304_210623,							
0960_SD303_210623,	0960_SD301_210623,							
0960_SD300_210623,	0960_SD211_210623,							
0960_SS193_210623,	0960_QC113_210623							
EA010: Conductivity (1:5)								
Soil Glass Jar - Unpreserved (EA010)		23-Jun-2021	01-Jul-2021	30-Jun-2021	✖	01-Jul-2021	29-Jul-2021	✔
0960_SS190_210623,	0960_SS192_210623,							
0960_SD305_210623,	0960_SD304_210623,							
0960_SD303_210623,	0960_SD301_210623,							
0960_SD300_210623,	0960_SD211_210623,							
0960_SS193_210623,	0960_QC113_210623							
EA055: Moisture Content (Dried @ 105-110°C)								
HDPE Soil Jar (EA055)		23-Jun-2021	----	----	----	01-Jul-2021	07-Jul-2021	✔
0960_QC106_210623,	0960_QC110_210623							
Soil Glass Jar - Unpreserved (EA055)		23-Jun-2021	----	----	----	02-Jul-2021	07-Jul-2021	✔
0960_SS190_210623,	0960_SS192_210623,							
0960_SD305_210623,	0960_SD304_210623,							
0960_SD303_210623,	0960_SD301_210623,							
0960_SD300_210623,	0960_SD211_210623,							
0960_SS193_210623,	0960_QC113_210623							
ED008: Exchangeable Cations								
Soil Glass Jar - Unpreserved (ED008)		23-Jun-2021	02-Jul-2021	21-Jul-2021	✔	02-Jul-2021	21-Jul-2021	✔
0960_SS190_210623,	0960_SS192_210623,							
0960_SD305_210623,	0960_SD304_210623,							
0960_SD303_210623,	0960_SD301_210623,							
0960_SD300_210623								
Soil Glass Jar - Unpreserved (ED008)		23-Jun-2021	06-Jul-2021	21-Jul-2021	✔	06-Jul-2021	21-Jul-2021	✔
0960_SD211_210623,	0960_SS193_210623,							
0960_QC113_210623								
EP004: Organic Matter								
Soil Glass Jar - Unpreserved (EP004)		23-Jun-2021	07-Jul-2021	21-Jul-2021	✔	07-Jul-2021	21-Jul-2021	✔
0960_SS190_210623,	0960_SS192_210623,							
0960_SD305_210623,	0960_SD304_210623,							
0960_SD303_210623,	0960_SD301_210623,							
0960_SD300_210623,	0960_SD211_210623,							
0960_SS193_210623,	0960_QC113_210623							



Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE Soil Jar (EP231X)		23-Jun-2021	06-Jul-2021	20-Dec-2021	✔	06-Jul-2021	15-Aug-2021	✔
0960_SS190_210623,	0960_SS192_210623,							
0960_SD305_210623,	0960_QC106_210623,							
0960_SD304_210623,	0960_SD303_210623,							
0960_SD301_210623,	0960_QC110_210623,							
0960_SD300_210623,	0960_SD211_210623,							
0960_SS193_210623,	0960_QC113_210623							
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE Soil Jar (EP231X)		23-Jun-2021	06-Jul-2021	20-Dec-2021	✔	06-Jul-2021	15-Aug-2021	✔
0960_SS190_210623,	0960_SS192_210623,							
0960_SD305_210623,	0960_QC106_210623,							
0960_SD304_210623,	0960_SD303_210623,							
0960_SD301_210623,	0960_QC110_210623,							
0960_SD300_210623,	0960_SD211_210623,							
0960_SS193_210623,	0960_QC113_210623							
EP231C: Perfluoroalkyl Sulfonamides								
HDPE Soil Jar (EP231X)		23-Jun-2021	06-Jul-2021	20-Dec-2021	✔	06-Jul-2021	15-Aug-2021	✔
0960_SS190_210623,	0960_SS192_210623,							
0960_SD305_210623,	0960_QC106_210623,							
0960_SD304_210623,	0960_SD303_210623,							
0960_SD301_210623,	0960_QC110_210623,							
0960_SD300_210623,	0960_SD211_210623,							
0960_SS193_210623,	0960_QC113_210623							
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE Soil Jar (EP231X)		23-Jun-2021	06-Jul-2021	20-Dec-2021	✔	06-Jul-2021	15-Aug-2021	✔
0960_SS190_210623,	0960_SS192_210623,							
0960_SD305_210623,	0960_QC106_210623,							
0960_SD304_210623,	0960_SD303_210623,							
0960_SD301_210623,	0960_QC110_210623,							
0960_SD300_210623,	0960_SD211_210623,							
0960_SS193_210623,	0960_QC113_210623							
EP231P: PFAS Sums								
HDPE Soil Jar (EP231X)		23-Jun-2021	06-Jul-2021	20-Dec-2021	✔	06-Jul-2021	15-Aug-2021	✔
0960_SS190_210623,	0960_SS192_210623,							
0960_SD305_210623,	0960_QC106_210623,							
0960_SD304_210623,	0960_SD303_210623,							
0960_SD301_210623,	0960_QC110_210623,							
0960_SD300_210623,	0960_SD211_210623,							
0960_SS193_210623,	0960_QC113_210623							



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)		Quality Control Specification	
Analytical Methods	Method	QC	Regular	Actual	Expected		Evaluation
Laboratory Duplicates (DUP)							
Electrical Conductivity (1:5)	EA010	2	19	10.53	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	4	26	15.38	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	2	20	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	20	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	4	40	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	19	10.53	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Electrical Conductivity (1:5)	EA010	1	19	5.26	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	3	26	11.54	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	20	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	40	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	19	10.53	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Electrical Conductivity (1:5)	EA010	1	19	5.26	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	3	26	11.54	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	40	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	40	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	In house: Referenced to Rayment and Lyons 4A1 and APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Electrical Conductivity (1:5)	EA010	SOIL	In house: Referenced to Rayment and Lyons 3A1 and APHA 2510. Conductivity is determined on soil samples using a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Exchangeable Cations with pre-treatment	ED008	SOIL	In house: Referenced to Rayment & Lyons Method 15A2. Soluble salts are removed from the sample prior to analysis. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM Schedule B(3).
Organic Matter	EP004	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3)
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	SOIL	In-house: Analysis of soils by solvent extraction followed by LC-Electrospray-MS-MS, Negative Mode using MRM using internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
Preparation Methods	Method	Matrix	Method Descriptions
Exchangeable Cations Preparation Method	ED007PR	SOIL	In house: Referenced to Rayment & Lyons method 15A1. A 1M NH4Cl extraction by end over end tumbling at a ratio of 1:20. There is no pretreatment for soluble salts. Extracts can be run by ICP for cations.
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
Organic Matter	EP004-PR	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3).
QuEChERS Extraction of Solids	ORG71	SOIL	In house: Sequential extractions with Acetonitrile/Methanol by shaking. Extraction efficiency aided by the addition of salts under acidic conditions. Where relevant, interferences from co-extracted organics are removed with dispersive clean-up media (dSPE). The extract is either diluted or concentrated and exchanged into the analytical solvent.



CHAIN OF CUSTODY

COC#: 24523

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFASOMP

SITE: MB DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	Rinsate WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0960_OTH132		23/06/2021 11:07 AM	Water	ALS: 5 Non ALS: 0	No	X			
002	0960_QC105		23/06/2021 11:09 AM	Water	ALS: 4 Non ALS: 1	No	X			DOC vial filtered
003	0960_OTH134		23/06/2021 11:30 AM	Water	ALS: 5 Non ALS: 0	No	X			
004	0960_MW175_7.0-7.5		23/06/2021 11:51 AM	Water	ALS: 4 Non ALS: 1	No	X			DOC vial filtered
005	0960_OTH103		23/06/2021 12:07 PM	Water	ALS: 5 Non ALS: 0	No	X			
006	0960_MW177_3.5-4.0		23/06/2021 01:15 PM	Water	ALS: 7 Non ALS: 0	No	X			extra PFAS bottles for lab QC
007	0960_MW176_3.5-4.0		23/06/2021 03:04 PM	Water	ALS: 5 Non ALS: 0	No	X			
008	0960_OTH129		23/06/2021 03:20 PM	Water	ALS: 5 Non ALS: 0	No	X			
009	0960_QC301		23/06/2021 04:59 PM	Water	ALS: 2 Non ALS: 0	No		X		



CHAIN OF CUSTODY

(ALS) COC#: 24523 ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: MB DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

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RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	Rinsate WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
010	0960_QC302		23/06/2021 04:59 PM	Water	ALS: 2 Non ALS: 0	No		X		
011	0960_QC303		23/06/2021 05:07 PM	Water	ALS: 2 Non ALS: 0	No		X		
012	0960_QC401		23/06/2021 05:07 PM	Water	ALS: 2 Non ALS: 0	No		X		
013	0960_QC402		23/06/2021 05:08 PM	Water	ALS: 2 Non ALS: 0	No		X		
014	0960_QC403		23/06/2021 05:09 PM	Water	ALS: 2 Non ALS: 0	No		X		



CHAIN OF CUSTODY

COC#: 24523

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: MB DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0960_OTH132	Clear Plastic Bottle - Natural	250 mL	00070220143070	Green	No	
001	0960_OTH132	Clear Plastic Bottle - Natural	250 mL	00070220143159	Green	No	
001	0960_OTH132	HDPE (no PTFE)	20 mL	00352010040179	Grey	No	
001	0960_OTH132	HDPE (no PTFE)	20 mL	00352010040190	Grey	No	
001	0960_OTH132	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003845	Purple	No	
002	0960_QC105	HDPE (no PTFE)	20 mL	00352010040132	Grey	No	
002	0960_QC105	HDPE (no PTFE)	20 mL	00352010039918	Grey	No	
002	0960_QC105	Clear Plastic Bottle - Natural	250 mL	00070220143014	Green	No	
002	0960_QC105	Clear Plastic Bottle - Natural	250 mL	00070220143133	Green	No	
003	0960_OTH134	HDPE (no PTFE)	20 mL	00352010040168	Grey	No	
003	0960_OTH134	HDPE (no PTFE)	20 mL	00352010040273	Grey	No	
003	0960_OTH134	Clear Plastic Bottle - Natural	250 mL	00070220143190	Green	No	
003	0960_OTH134	Clear Plastic Bottle - Natural	250 mL	00070220143152	Green	No	
003	0960_OTH134	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003862	Purple	No	
004	0960_MW175_7.0-7.5	Clear Plastic Bottle - Natural	250 mL	00070220142939	Green	No	
004	0960_MW175_7.0-7.5	Clear Plastic Bottle - Natural	250 mL	00070220143217	Green	No	
004	0960_MW175_7.0-7.5	HDPE (no PTFE)	20 mL	00352010040131	Grey	No	
004	0960_MW175_7.0-7.5	HDPE (no PTFE)	20 mL	00352010040356	Grey	No	
005	0960_OTH103	Clear Plastic Bottle - Natural	250 mL	00070220143127	Green	No	
005	0960_OTH103	HDPE (no PTFE)	20 mL	00352010039948	Grey	No	
005	0960_OTH103	Clear Plastic Bottle - Natural	250 mL	00070220143124	Green	No	
005	0960_OTH103	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003957	Purple	No	
006	0960_MW177_3.5-4.0	HDPE (no PTFE)	20 mL	00350019154416	Grey	No	
006	0960_MW177_3.5-4.0	HDPE (no PTFE)	20 mL	00352010040082	Grey	No	
006	0960_MW177_3.5-4.0	HDPE (no PTFE)	20 mL	00352010040164	Grey	No	



CHAIN OF CUSTODY

COC#: 24523

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: MB DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

°C

Other comments:

006	0960_MW177_3.5-4.0	HDPE (no PTFE)	20 mL	00350019154414	Grey	No	
006	0960_MW177_3.5-4.0	Clear Plastic Bottle - Natural	250 mL	00070220143231	Green	No	
006	0960_MW177_3.5-4.0	Clear Plastic Bottle - Natural	250 mL	00070220143143	Green	No	
006	0960_MW177_3.5-4.0	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020004151	Purple	No	
007	0960_MW176_3.5-4.0	Clear Plastic Bottle - Natural	250 mL	00070220143125	Green	No	
007	0960_MW176_3.5-4.0	Clear Plastic Bottle - Natural	250 mL	00070220143206	Green	No	
007	0960_MW176_3.5-4.0	HDPE (no PTFE)	20 mL	00352010040038	Grey	No	
007	0960_MW176_3.5-4.0	HDPE (no PTFE)	20 mL	00352010040139	Grey	No	
007	0960_MW176_3.5-4.0	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003958	Purple	No	
008	0960_OTH129	Clear Plastic Bottle - Natural	250 mL	00070220143049	Green	No	
008	0960_OTH129	Clear Plastic Bottle - Natural	250 mL	00070220142954	Green	No	
008	0960_OTH129	HDPE (no PTFE)	20 mL	00352010040023	Grey	No	
008	0960_OTH129	HDPE (no PTFE)	20 mL	00352010039952	Grey	No	
008	0960_OTH129	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003991	Purple	No	
009	0960_QC301	HDPE (no PTFE)	20 mL	00352010058984	Grey	No	
009	0960_QC301	HDPE (no PTFE)	20 mL	00352010058968	Grey	No	
010	0960_QC302	HDPE (no PTFE)	20 mL	00352010059146	Grey	No	
010	0960_QC302	HDPE (no PTFE)	20 mL	00352010059037	Grey	No	
011	0960_QC303	HDPE (no PTFE)	20 mL	00352010059100	Grey	No	
011	0960_QC303	HDPE (no PTFE)	20 mL	00352010058893	Grey	No	
012	0960_QC401	HDPE (no PTFE)	20 mL	00352010058878	Grey	No	
012	0960_QC401	HDPE (no PTFE)	20 mL	00352010058910	Grey	No	
013	0960_QC402	HDPE (no PTFE)	20 mL	00352010059012	Grey	No	
013	0960_QC402	HDPE (no PTFE)	20 mL	00352010059132	Grey	No	
014	0960_QC403	HDPE (no PTFE)	20 mL	00352010059139	Grey	No	
014	0960_QC403	HDPE (no PTFE)	20 mL	00350019177393	Grey	No	

Total Bottle Count: ALS: 52, Non ALS: 2

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : EP2107272

<p>Client : CARDNO (WA) PTY LTD</p> <p>Contact : MAELLE BOURDAIS</p> <p>Address : 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006</p> <p>E-mail : maelle.bourdais@cardno.com.au</p> <p>Telephone : ----</p> <p>Facsimile : ----</p> <p>Project : WA_0960_PFASOMP</p> <p>Order number : DEF19009/0960</p> <p>C-O-C number : 24523</p> <p>Site : DEF19009/Learmonth</p> <p>Sampler : MAELLE BOURDAIS</p>	<p>Laboratory : Environmental Division Perth</p> <p>Contact : Nick Courts</p> <p>Address : 26 Rigali Way Wangara WA Australia 6065</p> <p>E-mail : nick.courts@alsglobal.com</p> <p>Telephone : +61-8-9406 1301</p> <p>Facsimile : +61-8-9406 1399</p> <p>Page : 1 of 3</p> <p>Quote number : ES2019CARBSD0002 (SY/139/19)</p> <p>QC Level : NEPM 2013 B3 & ALS QC Standard</p>
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Dates

Date Samples Received : 28-Jun-2021 13:25	Issue Date : 29-Jun-2021
Client Requested Due : 09-Jul-2021	Scheduled Reporting Date : 09-Jul-2021
Date	

Delivery Details

Mode of Delivery : Carrier	Security Seal : Not Available
No. of coolers/boxes : 5	Temperature : 15.9 - Ice present
Receipt Detail :	No. of samples received / analysed : 14 / 14

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepancies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.



Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- No sample container / preservation non-compliance exists.

Any sample identifications that cannot be displayed entirely in the analysis summary table will be listed below.

EP2107272-004 : 23-Jun-2021 11:51 : 0960_MW175_7.0-7.5_210623
EP2107272-006 : 23-Jun-2021 13:15 : 0960_MW177_3.5-4.0_210623
EP2107272-007 : 23-Jun-2021 15:04 : 0960_MW176_3.5-4.0_210623

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2107272-001	23-Jun-2021 11:07	0960_OTH132_210623	✓	✓	✓	✓	✓	✓	✓
EP2107272-002	23-Jun-2021 11:09	0960_QC105_210623	✓	✓	✓	✓	✓	✓	✓
EP2107272-003	23-Jun-2021 11:30	0960_OTH134_210623	✓	✓	✓	✓	✓	✓	✓
EP2107272-004	23-Jun-2021 11:51	0960_MW175_7.0-7.5_2...	✓	✓	✓	✓	✓	✓	✓
EP2107272-005	23-Jun-2021 12:07	0960_OTH103_210623	✓	✓	✓	✓	✓	✓	✓
EP2107272-006	23-Jun-2021 13:15	0960_MW177_3.5-4.0_2...	✓	✓	✓	✓	✓	✓	✓
EP2107272-007	23-Jun-2021 15:04	0960_MW176_3.5-4.0_2...	✓	✓	✓	✓	✓	✓	✓
EP2107272-008	23-Jun-2021 15:20	0960_OTH129_210623	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2107272-001	23-Jun-2021 11:07	0960_OTH132_210623	✓
EP2107272-002	23-Jun-2021 11:09	0960_QC105_210623	✓
EP2107272-003	23-Jun-2021 11:30	0960_OTH134_210623	✓
EP2107272-004	23-Jun-2021 11:51	0960_MW175_7.0-7.5_2...	✓
EP2107272-005	23-Jun-2021 12:07	0960_OTH103_210623	✓
EP2107272-006	23-Jun-2021 13:15	0960_MW177_3.5-4.0_2...	✓
EP2107272-007	23-Jun-2021 15:04	0960_MW176_3.5-4.0_2...	✓
EP2107272-008	23-Jun-2021 15:20	0960_OTH129_210623	✓
EP2107272-009	23-Jun-2021 16:59	0960_QC301_210623	✓
EP2107272-010	23-Jun-2021 16:59	0960_QC302_210623	✓
EP2107272-011	23-Jun-2021 17:07	0960_QC303_210623	✓
EP2107272-012	23-Jun-2021 17:07	0960_QC401_210623	✓

Proactive Holding Time Report

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Requested Deliverables

- A4 - AU Tax Invoice (INV)

Email claire.armstrong@cardno.com.au

- EDI Format - ESDAT (ESDAT)

Email derp.labreports@esdat.com.au

- A4 - AU Tax Invoice (INV)

Email laura.beames@cardno.com.au

- *AU Certificate of Analysis - NATA (COA)
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)
- Chain of Custody (CoC) (COC)
- EDI Format - ESDAT (ESDAT)
- EDI Format - XTab (XTAB)

[illegible]

CERTIFICATE OF ANALYSIS

Work Order : **EP2107272**
Client : **CARDNO (WA) PTY LTD**
Contact : **MAELLE BOURDAIS**
Address : **11 HARVEST TERRACE PO BOX 155**
WEST PERTH WA, AUSTRALIA 6006
Telephone : **----**
Project : **WA_0960_PFASOMP**
Order number : **DEF19009/0960**
C-O-C number : **24523**
Sampler : **MAELLE BOURDAIS**
Site : **DEF19009/Learmonth**
Quote number : **SY/139/19**
No. of samples received : **14**
No. of samples analysed : **14**

Page : 1 of 13
Laboratory : Environmental Division Perth
Contact : Nick Courts
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 28-Jun-2021 13:25
Date Analysis Commenced : 30-Jun-2021
Issue Date : 09-Jul-2021 19:29



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

Ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- TDS by method EA-015 may bias high for sample #4 due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW175_7.0-7.5 _210623	0960_MW177_3.5-4.0 _210623	0960_MW176_3.5-4.0 _210623	----	----
Sampling date / time				23-Jun-2021 11:51	23-Jun-2021 13:15	23-Jun-2021 15:04	----	----
Compound	CAS Number	LOR	Unit	EP2107272-004	EP2107272-006	EP2107272-007	-----	-----
Result				Result	Result	Result	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.56	7.53	7.73	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	20600	70600	35600	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	5900	5050	10300	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	303	193	204	----	----
Total Alkalinity as CaCO3	----	1	mg/L	303	193	204	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1210	3930	2430	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	9900	30200	16700	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	332	872	575	----	----
Magnesium	7439-95-4	1	mg/L	816	2440	1310	----	----
Sodium	7440-23-5	1	mg/L	5750	19200	9960	----	----
Potassium	7440-09-7	1	mg/L	250	925	580	----	----
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	310	938	526	----	----
∅ Total Cations	----	0.01	meq/L	340	1100	584	----	----
∅ Ionic Balance	----	0.01	%	4.57	8.11	5.30	----	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	20	6	3	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	----	----



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW175_7.0-7.5 _210623	0960_MW177_3.5-4.0 _210623	0960_MW176_3.5-4.0 _210623	----	----
Sampling date / time				23-Jun-2021 11:51	23-Jun-2021 13:15	23-Jun-2021 15:04	----	----
Compound	CAS Number	LOR	Unit	EP2107272-004	EP2107272-006	EP2107272-007	-----	-----
				Result	Result	Result	----	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.03	<0.01	<0.01	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.02	<0.02	<0.02	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.10	<0.02	<0.02	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.01	<0.01	<0.01	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	----	----



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW175_7.0-7.5 _210623	0960_MW177_3.5-4.0 _210623	0960_MW176_3.5-4.0 _210623	----	----
Sampling date / time				23-Jun-2021 11:51	23-Jun-2021 13:15	23-Jun-2021 15:04	----	----
Compound	CAS Number	LOR	Unit	EP2107272-004	EP2107272-006	EP2107272-007	-----	-----
				Result	Result	Result	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	0.06	<0.05	<0.05	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	0.22	<0.01	<0.01	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	0.03	<0.01	<0.01	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	0.22	<0.01	<0.01	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	91.9	94.7	95.4	----	----
13C8-PFOA	----	0.02	%	96.1	95.5	93.2	----	----



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				0960_OTH132_21062 3	0960_QC105_210623	0960_OTH134_21062 3	0960_OTH103_21062 3	0960_OTH129_21062 3
Sampling date / time				23-Jun-2021 11:07	23-Jun-2021 11:09	23-Jun-2021 11:30	23-Jun-2021 12:07	23-Jun-2021 15:20
Compound	CAS Number	LOR	Unit	EP2107272-001	EP2107272-002	EP2107272-003	EP2107272-005	EP2107272-008
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.98	8.04	8.04	7.99	8.17
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	43900	44400	44000	44800	45100
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	86	90	31	10	<5
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	124	141	125	132	124
Total Alkalinity as CaCO3	----	1	mg/L	124	141	125	132	124
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2560	2550	2550	2560	2580
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	20400	20400	20400	20600	20800
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	506	484	493	490	506
Magnesium	7439-95-4	1	mg/L	1600	1540	1580	1560	1600
Sodium	7440-23-5	1	mg/L	12500	11900	12200	12100	12400
Potassium	7440-09-7	1	mg/L	674	647	666	657	680
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	631	631	631	637	643
∅ Total Cations	----	0.01	meq/L	718	685	702	696	714
∅ Ionic Balance	----	0.01	%	6.42	4.08	5.35	4.42	5.22
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	1	2	2	2	3
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				0960_OTH132_21062 3	0960_QC105_210623	0960_OTH134_21062 3	0960_OTH103_21062 3	0960_OTH129_21062 3
Sampling date / time				23-Jun-2021 11:07	23-Jun-2021 11:09	23-Jun-2021 11:30	23-Jun-2021 12:07	23-Jun-2021 15:20
Compound	CAS Number	LOR	Unit	EP2107272-001	EP2107272-002	EP2107272-003	EP2107272-005	EP2107272-008
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				0960_OTH132_21062 3	0960_QC105_210623	0960_OTH134_21062 3	0960_OTH103_21062 3	0960_OTH129_21062 3
Sampling date / time				23-Jun-2021 11:07	23-Jun-2021 11:09	23-Jun-2021 11:30	23-Jun-2021 12:07	23-Jun-2021 15:20
Compound	CAS Number	LOR	Unit	EP2107272-001	EP2107272-002	EP2107272-003	EP2107272-005	EP2107272-008
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	87.9	97.7	88.6	88.0	91.1
13C8-PFOA	----	0.02	%	94.8	96.1	97.5	90.4	104



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	0960_QC301_210623	0960_QC302_210623	0960_QC303_210623	0960_QC401_210623	0960_QC402_210623
Sampling date / time				23-Jun-2021 16:59	23-Jun-2021 16:59	23-Jun-2021 17:07	23-Jun-2021 17:07	23-Jun-2021 17:07	23-Jun-2021 17:08
Compound	CAS Number	LOR	Unit	EP2107272-009	EP2107272-010	EP2107272-011	EP2107272-012	EP2107272-013	
				Result	Result	Result	Result	Result	
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1	
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01	
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	
EP231C: Perfluoroalkyl Sulfonamides									
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02	
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05	



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				0960_QC301_210623	0960_QC302_210623	0960_QC303_210623	0960_QC401_210623	0960_QC402_210623
Sampling date / time				23-Jun-2021 16:59	23-Jun-2021 16:59	23-Jun-2021 17:07	23-Jun-2021 17:07	23-Jun-2021 17:08
Compound	CAS Number	LOR	Unit	EP2107272-009	EP2107272-010	EP2107272-011	EP2107272-012	EP2107272-013
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	90.1	91.8	95.0	99.4	87.3
13C8-PFOA	----	0.02	%	95.0	97.0	93.0	94.3	93.4



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

0960_QC403_210623

Sampling date / time				23-Jun-2021 17:09	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2107272-014	-----	-----	-----	-----
Result				----	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	----	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	----	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	----	----	----	----



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	0960_QC403_210623	----	----	----	----
Sampling date / time					23-Jun-2021 17:09	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2107272-014	-----	-----	-----	-----
				Result		----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05		----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05		----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02		----	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02		----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05		----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05		----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05		----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05		----	----	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L	<0.01		----	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01		----	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01		----	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%	99.9		----	----	----	----
13C8-PFOA	----	0.02	%	96.6		----	----	----	----



Surrogate Control Limits

Sub-Matrix: GROUNDWATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EP231B: Perfluoroalkyl Carboxylic Acids
(WATER) EP231C: Perfluoroalkyl Sulfonamides
(WATER) EP231D: (n:2) Fluorotelomer Sulfonic Acids
(WATER) EP231P: PFAS Sums
(WATER) EP231A: Perfluoroalkyl Sulfonic Acids
(WATER) EP231S: PFAS Surrogate

QUALITY CONTROL REPORT

Work Order	: EP2107272	Page	: 1 of 9
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 28-Jun-2021
Order number	: DEF19009/0960	Date Analysis Commenced	: 30-Jun-2021
C-O-C number	: 24523	Issue Date	: 09-Jul-2021
Sampler	: MAELLE BOURDAIS		
Site	: DEF19009/Learmonth		
Quote number	: SY/139/19		
No. of samples received	: 14		
No. of samples analysed	: 14		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
= Indicates failed QC

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA005P: pH by PC Titrator (QC Lot: 3776026)									
EP2107270-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.61	8.70	1.0	0% - 20%
EP2107272-002	0960_QC105_210623	EA005-P: pH Value	----	0.01	pH Unit	8.04	8.05	0.1	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3765003)									
EP2107193-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	4660	4650	0.3	0% - 20%
EP2107270-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	6480	6470	0.1	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3765009)									
EP2107193-009	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	2070	2050	0.9	0% - 20%
EP2107193-017	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	33500	33600	0.4	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3765004)									
EP2107193-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	514	496	3.7	0% - 20%
EP2107272-001	0960_OTH132_210623	EA025H: Suspended Solids (SS)	----	5	mg/L	86	90	4.3	0% - 50%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3765010)									
EP2107193-009	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	4530	4580	1.1	0% - 20%
EP2107193-019	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	1450	1400	3.4	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3776025)									
EP2107270-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	17	21	19.5	0% - 20%
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	90	88	2.5	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	107	109	1.4	0% - 20%
EP2107272-002	0960_QC105_210623	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	141	124	12.7	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	141	124	12.7	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3766621)									



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3766621) - continued									
EP2107191-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	56	56	0.0	0% - 20%
EP2107437-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	150	149	0.0	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3766622)									
EP2107191-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	72	73	0.0	0% - 20%
EP2107437-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	129	131	1.5	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3762889)									
EP2107189-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	141	149	5.5	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	254	270	5.7	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	2840	3000	5.5	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	133	139	4.3	0% - 20%
EP2107189-011	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	897	937	4.3	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	1880	1940	2.9	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	17500	18200	4.0	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	817	852	4.2	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3762890)									
EP2107272-007	0960_MW176_3.5-4.0_210 623	ED093F: Calcium	7440-70-2	1	mg/L	575	574	0.2	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	1310	1300	0.4	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	9960	9920	0.4	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	580	586	1.0	0% - 20%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3776981)									
EP2107189-008	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	2	2	0.0	No Limit
EP2107270-005	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	4	4	0.0	No Limit
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3778890)									
EP2107272-005	0960_OTH103_210623	EP002: Dissolved Organic Carbon	----	1	mg/L	2	2	0.0	No Limit
EP2107274-003	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	4	2	60.2	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3776993)									
ES2124445-003	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	7.67	7.44	3.1	0% - 20%
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	1.49	1.55	4.2	0% - 20%
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.30	0.27	9.6	0% - 50%
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	3.72	3.60	3.1	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	0.41	0.37	10.3	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	0.02	0.03	0.0	No Limit
EP2107272-006	0960_MW177_3.5-4.0_210 623	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3776993) - continued									
EP2107272-006	0960_MW177_3.5-4.0_210 623	EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3776993)									
ES2124445-003	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	1.02	1.05	2.6	0% - 20%
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	0.83	0.78	6.5	0% - 20%
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	3.25	3.32	2.0	0% - 20%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	0.69	0.74	6.6	0% - 20%
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	0.12	0.12	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	0.04	0.04	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	0.07	0.07	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	0.04	0.05	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	0.04	0.04	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP2107272-006	0960_MW177_3.5-4.0_210 623	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	0.3	0.3	0.0	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3776993)	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3776993) - continued									
EP2107272-006	0960_MW177_3.5-4.0_210 623	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3776993)									
ES2124445-003	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	0.30	0.30	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	1.22	1.18	2.8	0% - 20%
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP2107272-006	0960_MW177_3.5-4.0_210 623	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231P: PFAS Sums (QC Lot: 3776993)									
ES2124445-003	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	21.5	21.2	1.3	0% - 20%
EP2107272-006	0960_MW177_3.5-4.0_210 623	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.0	No Limit



Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result		LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 3776026)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3765003)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	246 mg/L	107	88.1	114
				<10	1000 mg/L	102	88.1	114
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3765009)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	246 mg/L	108	88.1	114
				<10	1000 mg/L	102	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3765004)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	95 mg/L	106	89.1	120
				<5	1000 mg/L	103	89.1	120
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3765010)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	95 mg/L	102	89.1	120
				<5	1000 mg/L	98.7	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3776025)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	102	81.2	126
				<1	200 mg/L	100	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3766621)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	104	87.7	113
				<1	500 mg/L	99.0	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3766622)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	108	87.9	114
				<1	1000 mg/L	105	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3762889)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	98.4	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	98.1	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	104	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	92.2	89.7	108
ED093F: Dissolved Major Cations (QCLot: 3762890)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	99.0	85.9	113



Sub-Matrix: **WATER**

Method: Compound				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%)	
							Low	High
CAS Number	LOR	Unit	Result					
ED093F: Dissolved Major Cations (QCLot: 3762890) - continued								
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	98.9	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	105	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	92.9	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3776981)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	95.3	73.2	116
				<1	100 mg/L	99.6	73.2	116
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3778890)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	103	73.2	116
				<1	100 mg/L	102	73.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3776993)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	94.8	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	89.4	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	86.2	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	82.2	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	90.2	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	98.2	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3776993)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	95.6	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	99.2	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	91.0	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	112	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	114	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	112	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	122	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	127	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	124	72.0	134
EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	104	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	125	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3776993)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	113	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	107	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	95.7	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	123	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	79.2	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	121	65.0	136



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3776993) - continued								
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	116	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3776993)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	112	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	101	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	102	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	93.2	71.4	144

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3766621)							
EP2107191-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	89.3	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3766622)							
EP2107191-001	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	105	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3776981)							
EP2107189-009	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	102	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3778890)							
EP2107272-006	0960_MW177_3.5-4.0_210623	EP002: Dissolved Organic Carbon	----	100 mg/L	104	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3776993)							
EP2107270-010	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	102	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	91.8	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	79.6	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	85.6	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	98.4	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	101	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3776993)							
EP2107270-010	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	91.4	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	110	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	98.8	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	113	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	112	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	119	69.0	130



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3776993) - continued							
EP2107270-010	Anonymous	EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	103	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	125	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	125	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	120	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	120	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3776993)							
EP2107270-010	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	107	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	109	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	101	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	120	66.0	145
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	110	57.6	145
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	119	65.0	136
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	116	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3776993)							
EP2107270-010	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	107	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	106	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	103	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	80.0	71.4	144

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2107272	Page	: 1 of 7
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 28-Jun-2021
Site	: DEF19009/Learmonth	Issue Date	: 09-Jul-2021
Sampler	: MAELLE BOURDAIS	No. of samples received	: 14
Order number	: DEF19009/0960	No. of samples analysed	: 14

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- **NO** Matrix Spike outliers occur.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- **NO** Quality Control Sample Frequency Outliers exist.



Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator						
Clear Plastic Bottle - Natural 0960_OTH132_210623, 0960_QC105_210623, 0960_OTH134_210623, 0960_MW175_7.0-7.5_210623, 0960_OTH103_210623, 0960_MW177_3.5-4.0_210623, 0960_MW176_3.5-4.0_210623, 0960_OTH129_210623	----	----	----	06-Jul-2021	23-Jun-2021	13

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA005P: pH by PC Titrator								
Clear Plastic Bottle - Natural (EA005-P) 0960_OTH132_210623, 0960_OTH134_210623, 0960_OTH103_210623, 0960_MW176_3.5-4.0_210623,	0960_QC105_210623, 0960_MW175_7.0-7.5_210623, 0960_MW177_3.5-4.0_210623, 0960_OTH129_210623	23-Jun-2021	----	----	----	06-Jul-2021	23-Jun-2021	✘
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Clear Plastic Bottle - Natural (EA015H) 0960_OTH132_210623, 0960_OTH134_210623, 0960_OTH103_210623, 0960_MW176_3.5-4.0_210623,	0960_QC105_210623, 0960_MW175_7.0-7.5_210623, 0960_MW177_3.5-4.0_210623, 0960_OTH129_210623	23-Jun-2021	----	----	----	30-Jun-2021	30-Jun-2021	✔
EA025: Total Suspended Solids dried at 104 ± 2°C								
Clear Plastic Bottle - Natural (EA025H) 0960_OTH132_210623, 0960_OTH134_210623, 0960_OTH103_210623, 0960_MW176_3.5-4.0_210623,	0960_QC105_210623, 0960_MW175_7.0-7.5_210623, 0960_MW177_3.5-4.0_210623, 0960_OTH129_210623	23-Jun-2021	----	----	----	30-Jun-2021	30-Jun-2021	✔



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P) 0960_OTH132_210623, 0960_OTH134_210623, 0960_OTH103_210623, 0960_MW176_3.5-4.0_210623,	0960_QC105_210623, 0960_MW175_7.0-7.5_210623, 0960_MW177_3.5-4.0_210623, 0960_OTH129_210623	23-Jun-2021	----	----	----	06-Jul-2021	07-Jul-2021	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G) 0960_OTH132_210623, 0960_OTH134_210623, 0960_OTH103_210623, 0960_MW176_3.5-4.0_210623,	0960_QC105_210623, 0960_MW175_7.0-7.5_210623, 0960_MW177_3.5-4.0_210623, 0960_OTH129_210623	23-Jun-2021	----	----	----	07-Jul-2021	21-Jul-2021	✓
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G) 0960_OTH132_210623, 0960_OTH134_210623, 0960_OTH103_210623, 0960_MW176_3.5-4.0_210623,	0960_QC105_210623, 0960_MW175_7.0-7.5_210623, 0960_MW177_3.5-4.0_210623, 0960_OTH129_210623	23-Jun-2021	----	----	----	07-Jul-2021	21-Jul-2021	✓
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F) 0960_OTH132_210623, 0960_OTH134_210623, 0960_OTH103_210623, 0960_MW176_3.5-4.0_210623,	0960_QC105_210623, 0960_MW175_7.0-7.5_210623, 0960_MW177_3.5-4.0_210623, 0960_OTH129_210623	23-Jun-2021	----	----	----	30-Jun-2021	30-Jun-2021	✓
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002) 0960_OTH132_210623, 0960_OTH134_210623,	0960_QC105_210623, 0960_MW175_7.0-7.5_210623	23-Jun-2021	----	----	----	06-Jul-2021	21-Jul-2021	✓
Amber DOC Filtered- Sulfuric Preserved (EP002) 0960_OTH103_210623, 0960_MW176_3.5-4.0_210623,	0960_MW177_3.5-4.0_210623, 0960_OTH129_210623	23-Jun-2021	----	----	----	07-Jul-2021	21-Jul-2021	✓
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X) 0960_OTH132_210623, 0960_OTH134_210623, 0960_OTH103_210623, 0960_MW176_3.5-4.0_210623, 0960_QC301_210623, 0960_QC303_210623, 0960_QC402_210623,	0960_QC105_210623, 0960_MW175_7.0-7.5_210623, 0960_MW177_3.5-4.0_210623, 0960_OTH129_210623, 0960_QC302_210623, 0960_QC401_210623, 0960_QC403_210623	23-Jun-2021	07-Jul-2021	20-Dec-2021	✓	07-Jul-2021	20-Dec-2021	✓



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X) 0960_OTH132_210623, 0960_OTH134_210623, 0960_OTH103_210623, 0960_MW176_3.5-4.0_210623, 0960_QC301_210623, 0960_QC303_210623, 0960_QC402_210623,	0960_QC105_210623, 0960_MW175_7.0-7.5_210623, 0960_MW177_3.5-4.0_210623, 0960_OTH129_210623, 0960_QC302_210623, 0960_QC401_210623, 0960_QC403_210623	23-Jun-2021	07-Jul-2021	20-Dec-2021	✔	07-Jul-2021	20-Dec-2021	✔
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X) 0960_OTH132_210623, 0960_OTH134_210623, 0960_OTH103_210623, 0960_MW176_3.5-4.0_210623, 0960_QC301_210623, 0960_QC303_210623, 0960_QC402_210623,	0960_QC105_210623, 0960_MW175_7.0-7.5_210623, 0960_MW177_3.5-4.0_210623, 0960_OTH129_210623, 0960_QC302_210623, 0960_QC401_210623, 0960_QC403_210623	23-Jun-2021	07-Jul-2021	20-Dec-2021	✔	07-Jul-2021	20-Dec-2021	✔
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X) 0960_OTH132_210623, 0960_OTH134_210623, 0960_OTH103_210623, 0960_MW176_3.5-4.0_210623, 0960_QC301_210623, 0960_QC303_210623, 0960_QC402_210623,	0960_QC105_210623, 0960_MW175_7.0-7.5_210623, 0960_MW177_3.5-4.0_210623, 0960_OTH129_210623, 0960_QC302_210623, 0960_QC401_210623, 0960_QC403_210623	23-Jun-2021	07-Jul-2021	20-Dec-2021	✔	07-Jul-2021	20-Dec-2021	✔
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X) 0960_OTH132_210623, 0960_OTH134_210623, 0960_OTH103_210623, 0960_MW176_3.5-4.0_210623, 0960_QC301_210623, 0960_QC303_210623, 0960_QC402_210623,	0960_QC105_210623, 0960_MW175_7.0-7.5_210623, 0960_MW177_3.5-4.0_210623, 0960_OTH129_210623, 0960_QC302_210623, 0960_QC401_210623, 0960_QC403_210623	23-Jun-2021	07-Jul-2021	20-Dec-2021	✔	07-Jul-2021	20-Dec-2021	✔



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	14	14.29	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	3	30	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	14	14.29	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	4	34	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	4	38	10.53	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	14	14.29	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	30	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	14	14.29	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	4	34	11.76	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	4	38	10.53	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	30	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	34	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	38	5.26	5.26	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of 'filterable' residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C. This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high temperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.



<i>Analytical Methods</i>	<i>Method</i>	<i>Matrix</i>	<i>Method Descriptions</i>
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
<i>Preparation Methods</i>	<i>Method</i>	<i>Matrix</i>	<i>Method Descriptions</i>
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.



CHAIN OF CUSTODY

ALS COC#: 24562 ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFASOMP

SITE: SC-DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0960_MW134		24/06/2021 08:28 AM	Water	ALS: 7 Non ALS: 0	No	X		
002	0960_MW144		24/06/2021 09:18 AM	Water	ALS: 5 Non ALS: 0	No	X		
003	0960_MW135		24/06/2021 10:04 AM	Water	ALS: 5 Non ALS: 0	No	X		
004	0960_MW178		24/06/2021 10:27 AM	Water	ALS: 5 Non ALS: 0	No	X		
005	0960_MW143		24/06/2021 10:58 AM	Water	ALS: 5 Non ALS: 0	No	X		
006	0960_MW145		24/06/2021 11:32 AM	Water	ALS: 5 Non ALS: 0	No	X		
007	0960_MW179		24/06/2021 12:08 PM	Water	ALS: 5 Non ALS: 0	No	X		

**CHAIN OF CUSTODY**

COC#: 24562 ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: SC-DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

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EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0960_MW134	Clear Plastic Bottle - Natural	250 mL	00070220142797	Green	No	
001	0960_MW134	Clear Plastic Bottle - Natural	250 mL	00070220142764	Green	No	
001	0960_MW134	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003835	Purple	No	
001	0960_MW134	HDPE (no PTFE)	20 mL	00350019165675	Grey	No	
001	0960_MW134	HDPE (no PTFE)	20 mL	00352010039950	Grey	No	
001	0960_MW134	HDPE (no PTFE)	20 mL	00350019112619	Grey	No	
001	0960_MW134	HDPE (no PTFE)	20 mL	00352010040048	Grey	No	
002	0960_MW144	Clear Plastic Bottle - Natural	250 mL	00070220142727	Green	No	
002	0960_MW144	Clear Plastic Bottle - Natural	250 mL	00070220142765	Green	No	
002	0960_MW144	Amber TOC Vial - Sulfuric Acid	40 mL	00181020003761	Purple	No	
002	0960_MW144	HDPE (no PTFE)	20 mL	00352005019869	Grey	No	
002	0960_MW144	HDPE (no PTFE)	20 mL	00352010039946	Grey	No	
003	0960_MW135	Clear Plastic Bottle - Natural	250 mL	00070220142833	Green	No	
003	0960_MW135	Clear Plastic Bottle - Natural	250 mL	00070220142802	Green	No	
003	0960_MW135	HDPE (no PTFE)	20 mL	00352005019866	Grey	No	
003	0960_MW135	HDPE (no PTFE)	20 mL	00352005019627	Grey	No	
003	0960_MW135	Amber TOC Vial - Sulfuric Acid	40 mL	00181020003876	Purple	No	
004	0960_MW178	HDPE (no PTFE)	20 mL	00352010040187	Grey	No	
004	0960_MW178	HDPE (no PTFE)	20 mL	00352005019733	Grey	No	
004	0960_MW178	Clear Plastic Bottle - Natural	250 mL	00070220142838	Green	No	
004	0960_MW178	Clear Plastic Bottle - Natural	250 mL	00070220142822	Green	No	
004	0960_MW178	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002715	Purple	No	
005	0960_MW143	Clear Plastic Bottle - Natural	250 mL	00070220142730	Green	No	
005	0960_MW143	Clear Plastic Bottle - Natural	250 mL	00070220142696	Green	No	
005	0960_MW143	Amber TOC Vial - Sulfuric Acid	40 mL	00181020003885	Purple	No	
005	0960_MW143	HDPE (no PTFE)	20 mL	00352010039981	Grey	No	



CHAIN OF CUSTODY

ALS COC#: 24562 ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: SC-DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

005	0960_MW143	HDPE (no PTFE)	20 mL	00352010039964	Grey	No	
006	0960_MW145	Clear Plastic Bottle - Natural	250 mL	00070220142752	Green	No	
006	0960_MW145	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003887	Purple	No	
006	0960_MW145	Clear Plastic Bottle - Natural	250 mL	00070220142798	Green	No	
006	0960_MW145	HDPE (no PTFE)	20 mL	00352005019752	Grey	No	
006	0960_MW145	HDPE (no PTFE)	20 mL	00352005019317	Grey	No	
007	0960_MW179	Clear Plastic Bottle - Natural	250 mL	00070220142753	Green	No	
007	0960_MW179	Clear Plastic Bottle - Natural	250 mL	00070220142723	Green	No	
007	0960_MW179	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020017372	Purple	No	
007	0960_MW179	HDPE (no PTFE)	20 mL	00352005019421	Grey	No	
007	0960_MW179	HDPE (no PTFE)	20 mL	00352005019772	Grey	No	

Total Bottle Count: ALS: 37, Non ALS: 0

**SAMPLE RECEIPT NOTIFICATION (SRN)****Work Order : EP2107273**

Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: maelle.bourdais@cardno.com.au	E-mail	: nick.courts@alsglobal.com
Telephone	: ----	Telephone	: +61-8-9406 1301
Facsimile	: ----	Facsimile	: +61-8-9406 1399
Project	: WA_0960_PFASOMP	Page	: 1 of 3
Order number	: DEF19009/0960	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 24562	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/Learmonth		
Sampler	: MAELLE BOURDAIS, Shaun Chambers		

Dates

Date Samples Received	: 28-Jun-2021 13:25	Issue Date	: 28-Jun-2021
Client Requested Due Date	: 09-Jul-2021	Scheduled Reporting Date	: 09-Jul-2021

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 3	Temperature	: 15.8 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 7 / 7

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepancies: extra samples, samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.



Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2107273-001	24-Jun-2021 08:28	0960_MW134_210624	✓	✓	✓	✓	✓	✓	✓
EP2107273-002	24-Jun-2021 09:18	0960_MW144_210624	✓	✓	✓	✓	✓	✓	✓
EP2107273-003	24-Jun-2021 10:04	0960_MW135_210624	✓	✓	✓	✓	✓	✓	✓
EP2107273-004	24-Jun-2021 10:27	0960_MW178_210624	✓	✓	✓	✓	✓	✓	✓
EP2107273-005	24-Jun-2021 10:58	0960_MW143_210624	✓	✓	✓	✓	✓	✓	✓
EP2107273-006	24-Jun-2021 11:32	0960_MW145_210624	✓	✓	✓	✓	✓	✓	✓
EP2107273-007	24-Jun-2021 12:08	0960_MW179_210624	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP005 Total Organic Carbon (TOC)	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2107273-001	24-Jun-2021 08:28	0960_MW134_210624	✓	✓
EP2107273-002	24-Jun-2021 09:18	0960_MW144_210624	✓	✓
EP2107273-003	24-Jun-2021 10:04	0960_MW135_210624	✓	✓
EP2107273-004	24-Jun-2021 10:27	0960_MW178_210624	✓	✓
EP2107273-005	24-Jun-2021 10:58	0960_MW143_210624	✓	✓
EP2107273-006	24-Jun-2021 11:32	0960_MW145_210624	✓	✓
EP2107273-007	24-Jun-2021 12:08	0960_MW179_210624	✓	✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **WATER**

Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method	Due for extraction	Due for analysis	Samples Received		Instructions Received	
Client Sample ID(s)	Container		Date	Evaluation	Date	Evaluation
EA005-P: pH by PC Titrator						
0960_MW134_210624	Clear Plastic Bottle - Natural	----	24-Jun-2021	28-Jun-2021	✗	----
0960_MW135_210624	Clear Plastic Bottle - Natural	----	24-Jun-2021	28-Jun-2021	✗	----
0960_MW143_210624	Clear Plastic Bottle - Natural	----	24-Jun-2021	28-Jun-2021	✗	----



Requested Deliverables

- A4 - AU Tax Invoice (INV)

Email claire.armstrong@cardno.com.au

- EDI Format - ESDAT (ESDAT)

Email derp.labreports@esdat.com.au

- A4 - AU Tax Invoice (INV)

Email laura.beames@cardno.com.au

- *AU Certificate of Analysis - NATA (COA)
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)
- Chain of Custody (CoC) (COC)
- EDI Format - ESDAT (ESDAT)
- EDI Format - XTab (XTAB)

[illegible]

CERTIFICATE OF ANALYSIS

Work Order : **EP2107273**
Client : **CARDNO (WA) PTY LTD**
Contact : **MAELLE BOURDAIS**
Address : **11 HARVEST TERRACE PO BOX 155**
WEST PERTH WA, AUSTRALIA 6006
Telephone : **----**
Project : **WA_0960_PFASOMP**
Order number : **DEF19009/0960**
C-O-C number : **24562**
Sampler : **MAELLE BOURDAIS, Shaun Chambers**
Site : **DEF19009/Learmonth**
Quote number : **SY/139/19**
No. of samples received : **7**
No. of samples analysed : **7**

Page : 1 of 9
Laboratory : Environmental Division Perth
Contact : Nick Courts
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 28-Jun-2021 13:25
Date Analysis Commenced : 30-Jun-2021
Issue Date : 08-Jul-2021 15:28



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

Ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- TDS by method EA-015 may bias high due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW134_210624	0960_MW144_210624	0960_MW135_210624	0960_MW178_210624	0960_MW143_210624
Sampling date / time				24-Jun-2021 08:28	24-Jun-2021 09:18	24-Jun-2021 10:04	24-Jun-2021 10:27	24-Jun-2021 10:58
Compound	CAS Number	LOR	Unit	EP2107273-001	EP2107273-002	EP2107273-003	EP2107273-004	EP2107273-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.73	7.65	7.79	7.64	7.56
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	47400	26600	24000	73000	72100
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	1140	13700	6410	60	2280
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	174	184	238	121	174
Total Alkalinity as CaCO3	----	1	mg/L	174	184	238	121	174
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	3090	2850	1430	4960	4830
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	22800	13000	12900	33400	32500
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	697	813	400	1160	1080
Magnesium	7439-95-4	1	mg/L	1640	959	901	2680	2510
Sodium	7440-23-5	1	mg/L	14700	7090	6890	21900	20600
Potassium	7440-09-7	1	mg/L	860	470	367	1040	992
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	711	430	398	1050	1020
∅ Total Cations	----	0.01	meq/L	831	440	403	1260	1180
∅ Ionic Balance	----	0.01	%	7.79	1.17	0.60	9.10	7.31
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	4	----	----	4	----
EP005: Total Organic Carbon (TOC)								
Total Organic Carbon	----	1	mg/L	----	7	4	----	6
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW134_210624	0960_MW144_210624	0960_MW135_210624	0960_MW178_210624	0960_MW143_210624
Sampling date / time				24-Jun-2021 08:28	24-Jun-2021 09:18	24-Jun-2021 10:04	24-Jun-2021 10:27	24-Jun-2021 10:58
Compound	CAS Number	LOR	Unit	EP2107273-001	EP2107273-002	EP2107273-003	EP2107273-004	EP2107273-005
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW134_210624	0960_MW144_210624	0960_MW135_210624	0960_MW178_210624	0960_MW143_210624
Sampling date / time				24-Jun-2021 08:28	24-Jun-2021 09:18	24-Jun-2021 10:04	24-Jun-2021 10:27	24-Jun-2021 10:58
Compound	CAS Number	LOR	Unit	EP2107273-001	EP2107273-002	EP2107273-003	EP2107273-004	EP2107273-005
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	93.8	87.9	87.4	85.0	83.2
13C8-PFOA	----	0.02	%	81.4	82.6	78.6	81.1	82.6



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW145_210624	0960_MW179_210624	----	----	----
Sampling date / time				24-Jun-2021 11:32	24-Jun-2021 12:08	----	----	----
Compound	CAS Number	LOR	Unit	EP2107273-006	EP2107273-007	-----	-----	-----
Result				Result	Result	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.71	7.87	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	84300	62300	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	174	186	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	126	171	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	126	171	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	5300	3600	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	41700	28800	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	1180	695	----	----	----
Magnesium	7439-95-4	1	mg/L	3000	2290	----	----	----
Sodium	7440-23-5	1	mg/L	25200	18200	----	----	----
Potassium	7440-09-7	1	mg/L	1170	871	----	----	----
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	1290	891	----	----	----
∅ Total Cations	----	0.01	meq/L	1430	1040	----	----	----
∅ Ionic Balance	----	0.01	%	5.24	7.59	----	----	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	3	3	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	----	----	----



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW145_210624	0960_MW179_210624	----	----	----
Sampling date / time				24-Jun-2021 11:32	24-Jun-2021 12:08	----	----	----
Compound	CAS Number	LOR	Unit	EP2107273-006	EP2107273-007	-----	-----	-----
				Result	Result	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	----	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	----	----	----



Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0960_MW145_210624	0960_MW179_210624	----	----	----
Sampling date / time					24-Jun-2021 11:32	24-Jun-2021 12:08	----	----	----
Compound	CAS Number	LOR	Unit		EP2107273-006	EP2107273-007	-----	-----	-----
				Result	Result		----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	----	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	<0.01	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	<0.01	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	<0.01	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		85.3	85.8	----	----	----
13C8-PFOA	----	0.02	%		83.3	84.8	----	----	----

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Work Order : EP2107273
Client : CARDNO (WA) PTY LTD
Project : WA_0960_PFASOMP



Surrogate Control Limits

Sub-Matrix: GROUNDWATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EP231A: Perfluoroalkyl Sulfonic Acids

(WATER) EP231B: Perfluoroalkyl Carboxylic Acids

(WATER) EP231C: Perfluoroalkyl Sulfonamides

(WATER) EP231D: (n:2) Fluorotelomer Sulfonic Acids

(WATER) EP231P: PFAS Sums

(WATER) EP231S: PFAS Surrogate

QUALITY CONTROL REPORT

Work Order	: EP2107273	Page	: 1 of 8
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 28-Jun-2021
Order number	: DEF19009/0960	Date Analysis Commenced	: 30-Jun-2021
C-O-C number	: 24562	Issue Date	: 08-Jul-2021
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: DEF19009/Learmonth		
Quote number	: SY/139/19		
No. of samples received	: 7		
No. of samples analysed	: 7		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
 CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
 LOR = Limit of reporting
 RPD = Relative Percentage Difference
 # = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA005P: pH by PC Titrator (QC Lot: 3776026)									
EP2107270-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.61	8.70	1.0	0% - 20%
EP2107272-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.04	8.05	0.1	0% - 20%
EA005P: pH by PC Titrator (QC Lot: 3776028)									
EP2107273-004	0960_MW178_210624	EA005-P: pH Value	----	0.01	pH Unit	7.64	7.68	0.5	0% - 20%
EP2107276-003	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.60	7.62	0.3	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3767504)									
EP2107273-001	0960_MW134_210624	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	47400	46400	2.3	0% - 20%
EP2107276-003	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	52300	45200	14.4	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3767526)									
EP2107273-006	0960_MW145_210624	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	84300	85900	1.8	0% - 20%
EP2107276-007	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	63300	62600	1.1	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2 °C (QC Lot: 3767505)									
EP2107273-001	0960_MW134_210624	EA025H: Suspended Solids (SS)	----	5	mg/L	1140	1140	0.0	0% - 20%
EP2107277-002	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	110	123	10.5	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2 °C (QC Lot: 3767527)									
EP2107273-006	0960_MW145_210624	EA025H: Suspended Solids (SS)	----	5	mg/L	174	191	9.3	0% - 20%
EP2107277-005	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	82	99	18.8	0% - 50%
ED037P: Alkalinity by PC Titrator (QC Lot: 3776025)									
EP2107270-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	17	21	19.5	0% - 20%
		ED037-P: Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L	90	88	2.5	0% - 20%
		ED037-P: Total Alkalinity as CaCO ₃	----	1	mg/L	107	109	1.4	0% - 20%
EP2107272-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	<1	<1	0.0	No Limit

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 Work Order : EP2107273
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFSOMP



Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
ED037P: Alkalinity by PC Titrator (QC Lot: 3776025) - continued									
EP2107272-002	Anonymous	ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	141	124	12.7	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	141	124	12.7	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3776027)									
EP2107273-004	0960_MW178_210624	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	121	121	0.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	121	121	0.0	0% - 20%
EP2107276-003	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	198	217	9.4	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	198	217	9.4	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3761927)									
EP2107184-015	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	905	915	1.0	0% - 20%
EP2107274-002	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2270	2340	3.1	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3761926)									
EP2107184-015	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	6220	6270	0.7	0% - 20%
EP2107274-002	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	19300	19200	0.3	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3762890)									
EP2107272-007	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	575	574	0.2	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	1310	1300	0.4	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	9960	9920	0.4	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	580	586	1.0	0% - 20%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3778890)									
EP2107272-005	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	2	2	0.0	No Limit
EP2107274-003	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	4	2	60.2	No Limit
EP005: Total Organic Carbon (TOC) (QC Lot: 3771720)									
EP2107189-010	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	3	2	39.2	No Limit
EP2107531-002	Anonymous	EP005: Total Organic Carbon	----	1	mg/L	<1	<1	0.0	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3777895)									
EP2107273-001	0960_MW134_210624	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3777895)									
EP2107273-001	0960_MW134_210624	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3777895) - continued									
EP2107273-001	0960_MW134_210624	EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3777895)									
EP2107273-001	0960_MW134_210624	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3777895)							
EP2107273-001	0960_MW134_210624	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231P: PFAS Sums (QC Lot: 3777895)									
EP2107273-001	0960_MW134_210624	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.0	No Limit



Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result		LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 3776026)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.5	102
				----	7 pH Unit	100	98.5	102
EA005P: pH by PC Titrator (QCLot: 3776028)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3767504)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	246 mg/L	102	88.1	114
				<10	1000 mg/L	101	88.1	114
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3767526)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	246 mg/L	99.6	88.1	114
				<10	1000 mg/L	102	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3767505)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	95 mg/L	112	89.1	120
				<5	1000 mg/L	99.0	89.1	120
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3767527)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	95 mg/L	98.9	89.1	120
				<5	1000 mg/L	101	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3776025)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	102	81.2	126
				<1	200 mg/L	100	90.0	110
ED037P: Alkalinity by PC Titrator (QCLot: 3776027)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	90.7	81.2	126
				<1	200 mg/L	99.9	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3761927)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	98.0	87.7	113
				<1	500 mg/L	96.8	87.7	113



Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result			Low	High
ED045G: Chloride by Discrete Analyser (QCLot: 3761926)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	101	87.9	114
				<1	1000 mg/L	104	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3762890)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	99.0	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	98.9	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	105	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	92.9	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3778890)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	103	73.2	116
				<1	100 mg/L	102	73.2	116
EP005: Total Organic Carbon (TOC) (QCLot: 3771720)								
EP005: Total Organic Carbon	----	1	mg/L	<1	10 mg/L	102	87.2	116
				<1	100 mg/L	103	87.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3777895)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	75.2	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	89.4	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	96.4	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	79.0	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	76.6	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	131	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3777895)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	77.8	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	90.0	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	86.8	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	87.0	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	88.0	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	95.4	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	81.0	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	81.4	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	80.0	72.0	134
EP231X: Perfluorotridecanoic acid (PFTriDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	74.4	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	90.0	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3777895)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	89.0	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	71.4	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	75.6	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	79.2	66.0	145

Matrix Spike (MS) Report

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3761927)							
EP2107184-015	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3761926)							
EP2107184-015	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	# Not Determined	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3778890)							
EP2107272-006	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	104	70.0	130
EP005: Total Organic Carbon (TOC) (QCLot: 3771720)							
EP2107190-001	Anonymous	EP005: Total Organic Carbon	----	100 mg/L	104	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3777895)							
EP2107274-003	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	81.6	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	94.2	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	96.6	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	82.4	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	89.6	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	117	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3777895)							



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3777895) - continued							
EP2107274-003	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	77.4	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	94.2	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	88.4	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	89.4	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	91.8	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	99.2	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	87.2	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	86.6	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	90.8	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	81.2	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	97.4	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3777895)							
EP2107274-003	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	101	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	84.2	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	78.6	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	82.3	66.0	145
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	82.2	57.6	145
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	88.2	65.0	136
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	82.0	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3777895)							
EP2107274-003	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	106	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	111	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	106	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	110	71.4	144

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2107273	Page	: 1 of 8
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 28-Jun-2021
Site	: DEF19009/Learmonth	Issue Date	: 08-Jul-2021
Sampler	: MAELLE BOURDAIS, Shaun Chambers	No. of samples received	: 7
Order number	: DEF19009/0960	No. of samples analysed	: 7

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- Matrix Spike outliers exist - please see following pages for full details.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- Quality Control Sample Frequency Outliers exist - please see following pages for full details.



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO ₄ 2- by DA	EP2107184--015	Anonymous	Sulfate as SO₄ - Turbidimetric	14808-79-8	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
ED045G: Chloride by Discrete Analyser	EP2107184--015	Anonymous	Chloride	16887-00-6	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method		<i>Extraction / Preparation</i>			<i>Analysis</i>		
Container / Client Sample ID(s)		<i>Date extracted</i>	<i>Due for extraction</i>	<i>Days overdue</i>	<i>Date analysed</i>	<i>Due for analysis</i>	<i>Days overdue</i>
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural							
0960_MW134_210624,	0960_MW144_210624,	----	----	----	06-Jul-2021	24-Jun-2021	12
0960_MW135_210624,	0960_MW178_210624,						
0960_MW143_210624,	0960_MW145_210624,						
0960_MW179_210624							

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	1	18	5.56	10.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator								
Clear Plastic Bottle - Natural (EA005-P)		24-Jun-2021	----	----	----	06-Jul-2021	24-Jun-2021	✘
0960_MW134_210624,	0960_MW144_210624,							
0960_MW135_210624,	0960_MW178_210624,							
0960_MW143_210624,	0960_MW145_210624,							
0960_MW179_210624								
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Clear Plastic Bottle - Natural (EA015H)		24-Jun-2021	----	----	----	01-Jul-2021	01-Jul-2021	✔
0960_MW134_210624,	0960_MW144_210624,							
0960_MW135_210624,	0960_MW178_210624,							
0960_MW143_210624,	0960_MW145_210624,							
0960_MW179_210624								
EA025: Total Suspended Solids dried at 104 ± 2°C								
Clear Plastic Bottle - Natural (EA025H)		24-Jun-2021	----	----	----	01-Jul-2021	01-Jul-2021	✔
0960_MW134_210624,	0960_MW144_210624,							
0960_MW135_210624,	0960_MW178_210624,							
0960_MW143_210624,	0960_MW145_210624,							
0960_MW179_210624								
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P)		24-Jun-2021	----	----	----	06-Jul-2021	08-Jul-2021	✔
0960_MW134_210624,	0960_MW144_210624,							
0960_MW135_210624,	0960_MW178_210624,							
0960_MW143_210624,	0960_MW145_210624,							
0960_MW179_210624								
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G)		24-Jun-2021	----	----	----	07-Jul-2021	22-Jul-2021	✔
0960_MW134_210624,	0960_MW144_210624,							
0960_MW135_210624,	0960_MW178_210624,							
0960_MW143_210624,	0960_MW145_210624,							
0960_MW179_210624								
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G)		24-Jun-2021	----	----	----	07-Jul-2021	22-Jul-2021	✔
0960_MW134_210624,	0960_MW144_210624,							
0960_MW135_210624,	0960_MW178_210624,							
0960_MW143_210624,	0960_MW145_210624,							
0960_MW179_210624								
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F)		24-Jun-2021	----	----	----	30-Jun-2021	01-Jul-2021	✔
0960_MW134_210624,	0960_MW144_210624,							
0960_MW135_210624,	0960_MW178_210624,							
0960_MW143_210624,	0960_MW145_210624,							
0960_MW179_210624								



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002)								
0960_MW134_210624, 0960_MW145_210624,	0960_MW178_210624, 0960_MW179_210624	24-Jun-2021	----	----	----	07-Jul-2021	22-Jul-2021	✓
EP005: Total Organic Carbon (TOC)								
Amber TOC Vial - Sulfuric Acid (EP005)								
0960_MW144_210624, 0960_MW143_210624	0960_MW135_210624,	24-Jun-2021	----	----	----	02-Jul-2021	22-Jul-2021	✓
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X)								
0960_MW134_210624, 0960_MW135_210624, 0960_MW143_210624, 0960_MW179_210624	0960_MW144_210624, 0960_MW178_210624, 0960_MW145_210624,	24-Jun-2021	07-Jul-2021	21-Dec-2021	✓	07-Jul-2021	21-Dec-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X)								
0960_MW134_210624, 0960_MW135_210624, 0960_MW143_210624, 0960_MW179_210624	0960_MW144_210624, 0960_MW178_210624, 0960_MW145_210624,	24-Jun-2021	07-Jul-2021	21-Dec-2021	✓	07-Jul-2021	21-Dec-2021	✓
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X)								
0960_MW134_210624, 0960_MW135_210624, 0960_MW143_210624, 0960_MW179_210624	0960_MW144_210624, 0960_MW178_210624, 0960_MW145_210624,	24-Jun-2021	07-Jul-2021	21-Dec-2021	✓	07-Jul-2021	21-Dec-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X)								
0960_MW134_210624, 0960_MW135_210624, 0960_MW143_210624, 0960_MW179_210624	0960_MW144_210624, 0960_MW178_210624, 0960_MW145_210624,	24-Jun-2021	07-Jul-2021	21-Dec-2021	✓	07-Jul-2021	21-Dec-2021	✓
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X)								
0960_MW134_210624, 0960_MW135_210624, 0960_MW143_210624, 0960_MW179_210624	0960_MW144_210624, 0960_MW178_210624, 0960_MW145_210624,	24-Jun-2021	07-Jul-2021	21-Dec-2021	✓	07-Jul-2021	21-Dec-2021	✓



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)		Quality Control Specification	
Analytical Methods	Method	QC	Regular	Actual	Expected		Evaluation
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	10	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	5.56	10.00	✗	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	4	36	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	4	38	10.53	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	10	10.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	4	36	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	4	38	10.53	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	10	10.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	36	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	38	5.26	5.26	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP005	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Matrix Spikes (MS) - Continued							
Total Organic Carbon	EP005	1	18	5.56	5.00	✔	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of 'filterable' residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high temperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.
Total Organic Carbon	EP005	WATER	In house: Referenced to APHA 5310 B, The automated TOC analyzer determines Total and Inorganic Carbon by IR cell. TOC is calculated as the difference. This method is compliant with NEPM Schedule B(3)



Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

**CHAIN OF CUSTODY**

COC#: 24563

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: SC-DEF19009/Learmonth SW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

°C

Other comments:

SAMPLE DETAILS**ANALYSIS REQUIRED**

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Surface Waters Primary WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0960_SW189		24/06/2021 08:51 AM	Water	ALS: 5 Non ALS: 0	No	X		
002	0960_SW302		24/06/2021 12:44 PM	Water	ALS: 5 Non ALS: 0	No	X		
003	0960_SW209		24/06/2021 12:45 PM	Water	ALS: 7 Non ALS: 0	No	X		
004	0960_SW210		24/06/2021 01:24 PM	Water	ALS: 5 Non ALS: 0	No	X		



CHAIN OF CUSTODY

COC#: 24563

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFASOMP

SITE: SC-DEF19009/Learmonth SW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0960_SW189	Clear Plastic Bottle - Natural	250 mL	00070220186528	Green	No	
001	0960_SW189	HDPE (no PTFE)	20 mL	00352005019606	Grey	No	
001	0960_SW189	Clear Plastic Bottle - Natural	250 mL	00070220186499	Green	No	
001	0960_SW189	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002716	Purple	No	
001	0960_SW189	HDPE (no PTFE)	20 mL	00352005019712	Grey	No	
002	0960_SW302	Clear Plastic Bottle - Natural	250 mL	00070220142709	Green	No	
002	0960_SW302	Clear Plastic Bottle - Natural	250 mL	00070220142757	Green	No	
002	0960_SW302	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002572	Purple	No	
002	0960_SW302	HDPE (no PTFE)	20 mL	00352005019894	Grey	No	
002	0960_SW302	HDPE (no PTFE)	20 mL	00352010040500	Grey	No	
003	0960_SW209	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020002614	Purple	No	
003	0960_SW209	Clear Plastic Bottle - Natural	250 mL	00070220186363	Green	No	
003	0960_SW209	Clear Plastic Bottle - Natural	250 mL	00070220186402	Green	No	
003	0960_SW209	HDPE (no PTFE)	20 mL	00350019165839	Grey	No	
003	0960_SW209	HDPE (no PTFE)	20 mL	00352005019791	Grey	No	
003	0960_SW209	HDPE (no PTFE)	20 mL	00352005019658	Grey	No	
003	0960_SW209	HDPE (no PTFE)	20 mL	00350019165817	Grey	No	
004	0960_SW210	Clear Plastic Bottle - Natural	250 mL	00070220142934	Green	No	
004	0960_SW210	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003915	Purple	No	
004	0960_SW210	HDPE (no PTFE)	20 mL	00352010040105	Grey	No	
004	0960_SW210	Clear Plastic Bottle - Natural	250 mL	00070220143100	Green	No	
004	0960_SW210	HDPE (no PTFE)	20 mL	00352010040112	Grey	No	

Total Bottle Count: ALS: 22, Non ALS: 0

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : EP2107274

<p>Client : CARDNO (WA) PTY LTD</p> <p>Contact : MAELLE BOURDAIS</p> <p>Address : 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006</p> <p>E-mail : maelle.bourdais@cardno.com.au</p> <p>Telephone : ----</p> <p>Facsimile : ----</p> <p>Project : WA_0960_PFASOMP</p> <p>Order number : DEF19009/0960</p> <p>C-O-C number : 24563</p> <p>Site : DEF19009/Learmonth</p> <p>Sampler : MAELLE BOURDAIS, Shaun Chambers</p>	<p>Laboratory : Environmental Division Perth</p> <p>Contact : Nick Courts</p> <p>Address : 26 Rigali Way Wangara WA Australia 6065</p> <p>E-mail : nick.courts@alsglobal.com</p> <p>Telephone : +61-8-9406 1301</p> <p>Facsimile : +61-8-9406 1399</p> <p>Page : 1 of 3</p> <p>Quote number : ES2019CARBSD0002 (SY/139/19)</p> <p>QC Level : NEPM 2013 B3 & ALS QC Standard</p>
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Dates

Date Samples Received : 28-Jun-2021 13:25	Issue Date : 28-Jun-2021
Client Requested Due Date : 09-Jul-2021	Scheduled Reporting Date : 09-Jul-2021

Delivery Details

Mode of Delivery : Carrier	Security Seal : Not Available
No. of coolers/boxes : 3	Temperature : 15.8 - Ice present
Receipt Detail :	No. of samples received / analysed : 4 / 4

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepancies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.



Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2107274-001	24-Jun-2021 08:51	0960_SW189_210624	✓	✓	✓	✓	✓	✓	✓
EP2107274-002	24-Jun-2021 12:44	0960_SW302_210624	✓	✓	✓	✓	✓	✓	✓
EP2107274-003	24-Jun-2021 12:45	0960_SW209_210624	✓	✓	✓	✓	✓	✓	✓
EP2107274-004	24-Jun-2021 13:24	0960_SW210_210624	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2107274-001	24-Jun-2021 08:51	0960_SW189_210624	✓
EP2107274-002	24-Jun-2021 12:44	0960_SW302_210624	✓
EP2107274-003	24-Jun-2021 12:45	0960_SW209_210624	✓
EP2107274-004	24-Jun-2021 13:24	0960_SW210_210624	✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **WATER**

Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method	Due for extraction	Due for analysis	Samples Received		Instructions Received	
Client Sample ID(s)	Container		Date	Evaluation	Date	Evaluation
EA005-P: pH by PC Titrator						
0960_SW189_210624	Clear Plastic Bottle - Natural	----	24-Jun-2021	28-Jun-2021	✗	----
0960_SW209_210624	Clear Plastic Bottle - Natural	----	24-Jun-2021	28-Jun-2021	✗	----
0960_SW210_210624	Clear Plastic Bottle - Natural	----	24-Jun-2021	28-Jun-2021	✗	----
0960_SW302_210624	Clear Plastic Bottle - Natural	----	24-Jun-2021	28-Jun-2021	✗	----

CERTIFICATE OF ANALYSIS

Work Order : **EP2107274**
Client : **CARDNO (WA) PTY LTD**
Contact : **MAELLE BOURDAIS**
Address : **11 HARVEST TERRACE PO BOX 155**
WEST PERTH WA, AUSTRALIA 6006
Telephone : **----**
Project : **WA_0960_PFASOMP**
Order number : **DEF19009/0960**
C-O-C number : **24563**
Sampler : **MAELLE BOURDAIS, Shaun Chambers**
Site : **DEF19009/Learmonth**
Quote number : **SY/139/19**
No. of samples received : **4**
No. of samples analysed : **4**

Page : 1 of 6
Laboratory : Environmental Division Perth
Contact : Nick Courts
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 28-Jun-2021 13:25
Date Analysis Commenced : 30-Jun-2021
Issue Date : 08-Jul-2021 12:08



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)				Sample ID	0960_SW189_210624	0960_SW302_210624	0960_SW209_210624	0960_SW210_210624	----
Sampling date / time					24-Jun-2021 08:51	24-Jun-2021 12:44	24-Jun-2021 12:45	24-Jun-2021 13:24	----
Compound	CAS Number	LOR	Unit		EP2107274-001	EP2107274-002	EP2107274-003	EP2107274-004	-----
				Result	Result	Result	Result	Result	----
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		8.28	7.95	7.96	8.10	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		579	36500	42400	37800	----
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		36	21	52	60	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L		<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L		<1	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L		135	224	235	203	----
Total Alkalinity as CaCO ₃	----	1	mg/L		135	224	235	203	----
ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA									
Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L		33	2270	2490	2240	----
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		211	19300	20500	18800	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		8	450	478	453	----
Magnesium	7439-95-4	1	mg/L		8	1380	1490	1380	----
Sodium	7440-23-5	1	mg/L		160	10400	11400	10500	----
Potassium	7440-09-7	1	mg/L		21	533	582	544	----
EN055: Ionic Balance									
∅ Total Anions	----	0.01	meq/L		9.34	596	635	581	----
∅ Total Cations	----	0.01	meq/L		8.55	602	657	607	----
∅ Ionic Balance	----	0.01	%		4.37	0.49	1.74	2.17	----
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		5	3	4	4	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	----



Analytical Results

Sub-Matrix: SURFACE WATER
 (Matrix: WATER)

Sample ID

				0960_SW189_210624	0960_SW302_210624	0960_SW209_210624	0960_SW210_210624	----
Sampling date / time				24-Jun-2021 08:51	24-Jun-2021 12:44	24-Jun-2021 12:45	24-Jun-2021 13:24	----
Compound	CAS Number	LOR	Unit	EP2107274-001	EP2107274-002	EP2107274-003	EP2107274-004	-----
				Result	Result	Result	Result	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.45	<0.01	<0.01	0.01	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----



Analytical Results

Sub-Matrix: SURFACE WATER
 (Matrix: WATER)

Sample ID

				0960_SW189_210624	0960_SW302_210624	0960_SW209_210624	0960_SW210_210624	----
Sampling date / time				24-Jun-2021 08:51	24-Jun-2021 12:44	24-Jun-2021 12:45	24-Jun-2021 13:24	----
Compound	CAS Number	LOR	Unit	EP2107274-001	EP2107274-002	EP2107274-003	EP2107274-004	-----
				Result	Result	Result	Result	----
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	0.45	<0.01	<0.01	0.01	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	0.45	<0.01	<0.01	0.01	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	0.45	<0.01	<0.01	0.01	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	79.4	88.0	83.1	86.3	----
13C8-PFOA	----	0.02	%	83.1	84.7	83.6	84.7	----

Page : 6 of 6
Work Order : EP2107274
Client : CARDNO (WA) PTY LTD
Project : WA_0960_PFASOMP



Surrogate Control Limits

Sub-Matrix: SURFACE WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EP231A: Perfluoroalkyl Sulfonic Acids

(WATER) EP231B: Perfluoroalkyl Carboxylic Acids

(WATER) EP231C: Perfluoroalkyl Sulfonamides

(WATER) EP231D: (n:2) Fluorotelomer Sulfonic Acids

(WATER) EP231P: PFAS Sums

(WATER) EP231S: PFAS Surrogate

QUALITY CONTROL REPORT

Work Order	: EP2107274	Page	: 1 of 8
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 28-Jun-2021
Order number	: DEF19009/0960	Date Analysis Commenced	: 30-Jun-2021
C-O-C number	: 24563	Issue Date	: 08-Jul-2021
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: DEF19009/Learmonth		
Quote number	: SY/139/19		
No. of samples received	: 4		
No. of samples analysed	: 4		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
= Indicates failed QC

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA005P: pH by PC Titrator (QC Lot: 3776028)									
EP2107273-004	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.64	7.68	0.5	0% - 20%
EP2107276-003	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.60	7.62	0.3	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3767504)									
EP2107273-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	47400	46400	2.3	0% - 20%
EP2107276-003	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	52300	45200	14.4	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3767526)									
EP2107273-006	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	84300	85900	1.8	0% - 20%
EP2107276-007	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	63300	62600	1.1	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3767505)									
EP2107273-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	1140	1140	0.0	0% - 20%
EP2107277-002	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	110	123	10.5	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3767527)									
EP2107273-006	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	174	191	9.3	0% - 20%
EP2107277-005	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	82	99	18.8	0% - 50%
ED037P: Alkalinity by PC Titrator (QC Lot: 3776027)									
EP2107273-004	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	121	121	0.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	121	121	0.0	0% - 20%
EP2107276-003	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	198	217	9.4	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	198	217	9.4	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3761927)									



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3761927) - continued									
EP2107184-015	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	905	915	1.0	0% - 20%
EP2107274-002	0960_SW302_210624	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2270	2340	3.1	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3761926)									
EP2107184-015	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	6220	6270	0.7	0% - 20%
EP2107274-002	0960_SW302_210624	ED045G: Chloride	16887-00-6	1	mg/L	19300	19200	0.3	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3762880)									
EP2107188-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	341	326	4.4	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	730	703	3.7	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	5580	5420	3.0	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	304	296	2.5	0% - 20%
EP2107270-005	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	441	445	0.8	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	1340	1360	1.5	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	10300	10400	1.1	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	534	545	2.0	0% - 20%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3778890)									
EP2107272-005	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	2	2	0.0	No Limit
EP2107274-003	0960_SW209_210624	EP002: Dissolved Organic Carbon	----	1	mg/L	4	2	60.2	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3777895)									
EP2107273-001	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3777895)									
EP2107273-001	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3777895)									
EP2107273-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3777895) - continued									
EP2107273-001	Anonymous	EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3777895)									
EP2107273-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231P: PFAS Sums (QC Lot: 3777895)									
EP2107273-001	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.0	No Limit

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
	Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
----	4 pH Unit	100	98.5	102
----	7 pH Unit	100	98.5	102
<10	246 mg/L	102	88.1	114
<10	1000 mg/L	101	88.1	114
<10	246 mg/L	99.6	88.1	114
<10	1000 mg/L	102	88.1	114
<5	95 mg/L	112	89.1	120
<5	1000 mg/L	99.0	89.1	120
<5	95 mg/L	98.9	89.1	120
<5	1000 mg/L	101	89.1	120
<1	----	----	----	----
<1	----	----	----	----
<1	----	----	----	----
<1	20 mg/L	90.7	81.2	126
<1	200 mg/L	99.9	90.0	110
<1	25 mg/L	98.0	87.7	113
<1	500 mg/L	96.8	87.7	113
<1	10 mg/L	101	87.9	114
<1	1000 mg/L	104	87.9	114
<1	50 mg/L	97.8	85.9	113
<1	50 mg/L	99.6	88.0	110
<1	50 mg/L	104	87.3	118
<1	50 mg/L	92.4	89.7	108



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3778890) - continued								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	103	73.2	116
				<1	100 mg/L	102	73.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3777895)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	75.2	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	89.4	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	96.4	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	79.0	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	76.6	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	131	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3777895)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	77.8	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	90.0	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	86.8	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	87.0	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	88.0	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	95.4	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	81.0	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	81.4	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	80.0	72.0	134
EP231X: Perfluorotridecanoic acid (PFTriDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	74.4	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	90.0	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3777895)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	89.0	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	71.4	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	75.6	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	79.2	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	80.4	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	85.8	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	82.4	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3777895)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	101	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	93.6	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	93.0	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	75.8	71.4	144



Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3761927)							
EP2107184-015	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3761926)							
EP2107184-015	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	# Not Determined	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3778890)							
EP2107272-006	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	104	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3777895)							
EP2107274-003	0960_SW209_210624	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	81.6	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	94.2	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	96.6	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	82.4	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	89.6	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	117	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3777895)							
EP2107274-003	0960_SW209_210624	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	77.4	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	94.2	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	88.4	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	89.4	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	91.8	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	99.2	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	87.2	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	86.6	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	90.8	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	81.2	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	97.4	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3777895)							
EP2107274-003	0960_SW209_210624	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	101	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	84.2	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	78.6	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	82.3	66.0	145

Page : 8 of 8
 Work Order : EP2107274
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3777895) - continued							
EP2107274-003	0960_SW209_210624	EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	82.2	57.6	145
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	88.2	65.0	136
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	82.0	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3777895)							
EP2107274-003	0960_SW209_210624	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	106	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	111	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	106	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	110	71.4	144

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2107274	Page	: 1 of 7
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 28-Jun-2021
Site	: DEF19009/Learmonth	Issue Date	: 08-Jul-2021
Sampler	: MAELLE BOURDAIS, Shaun Chambers	No. of samples received	: 4
Order number	: DEF19009/0960	No. of samples analysed	: 4

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- Matrix Spike outliers exist - please see following pages for full details.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- Quality Control Sample Frequency Outliers exist - please see following pages for full details.



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA	EP2107184--015	Anonymous	Sulfate as SO4 - Turbidimetric	14808-79-8	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
ED045G: Chloride by Discrete Analyser	EP2107184--015	Anonymous	Chloride	16887-00-6	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method		<i>Extraction / Preparation</i>			<i>Analysis</i>		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural							
0960_SW189_210624,	0960_SW302_210624,	----	----	----	06-Jul-2021	24-Jun-2021	12
0960_SW209_210624,	0960_SW210_210624						

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	1	18	5.56	10.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for **VOC in soils** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator								
Clear Plastic Bottle - Natural (EA005-P)								
0960_SW189_210624,	0960_SW302_210624,	24-Jun-2021	----	----	----	06-Jul-2021	24-Jun-2021	✖
0960_SW209_210624,	0960_SW210_210624							



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Clear Plastic Bottle - Natural (EA015H)								
0960_SW189_210624,	0960_SW302_210624,	24-Jun-2021	----	----	----	01-Jul-2021	01-Jul-2021	✓
0960_SW209_210624,	0960_SW210_210624							
EA025: Total Suspended Solids dried at 104 ± 2°C								
Clear Plastic Bottle - Natural (EA025H)								
0960_SW189_210624,	0960_SW302_210624,	24-Jun-2021	----	----	----	01-Jul-2021	01-Jul-2021	✓
0960_SW209_210624,	0960_SW210_210624							
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P)								
0960_SW189_210624,	0960_SW302_210624,	24-Jun-2021	----	----	----	06-Jul-2021	08-Jul-2021	✓
0960_SW209_210624,	0960_SW210_210624							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G)								
0960_SW189_210624,	0960_SW302_210624,	24-Jun-2021	----	----	----	07-Jul-2021	22-Jul-2021	✓
0960_SW209_210624,	0960_SW210_210624							
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G)								
0960_SW189_210624,	0960_SW302_210624,	24-Jun-2021	----	----	----	07-Jul-2021	22-Jul-2021	✓
0960_SW209_210624,	0960_SW210_210624							
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F)								
0960_SW189_210624,	0960_SW302_210624,	24-Jun-2021	----	----	----	30-Jun-2021	01-Jul-2021	✓
0960_SW209_210624,	0960_SW210_210624							
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002)								
0960_SW189_210624,	0960_SW302_210624,	24-Jun-2021	----	----	----	07-Jul-2021	22-Jul-2021	✓
0960_SW209_210624,	0960_SW210_210624							
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X)								
0960_SW189_210624,	0960_SW302_210624,	24-Jun-2021	07-Jul-2021	21-Dec-2021	✓	07-Jul-2021	21-Dec-2021	✓
0960_SW209_210624,	0960_SW210_210624							
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X)								
0960_SW189_210624,	0960_SW302_210624,	24-Jun-2021	07-Jul-2021	21-Dec-2021	✓	07-Jul-2021	21-Dec-2021	✓
0960_SW209_210624,	0960_SW210_210624							
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X)								
0960_SW189_210624,	0960_SW302_210624,	24-Jun-2021	07-Jul-2021	21-Dec-2021	✓	07-Jul-2021	21-Dec-2021	✓
0960_SW209_210624,	0960_SW210_210624							



Matrix: WATER

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X)		24-Jun-2021	07-Jul-2021	21-Dec-2021	✔	07-Jul-2021	21-Dec-2021	✔
0960_SW189_210624,	0960_SW302_210624,							
0960_SW209_210624,	0960_SW210_210624							
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X)		24-Jun-2021	07-Jul-2021	21-Dec-2021	✔	07-Jul-2021	21-Dec-2021	✔
0960_SW189_210624,	0960_SW302_210624,							
0960_SW209_210624,	0960_SW210_210624							



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	5.56	10.00	✗	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	4	36	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	4	38	10.53	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	4	36	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	4	38	10.53	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	36	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	38	5.26	5.26	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of 'filterable' residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high temperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.



Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.



CHAIN OF CUSTODY

COC#: 24564

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: SC-DEF19009/Learmonth SED

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Sediments SEDIMENT	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0960_SS189		24/06/2021 08:38 AM	Soil	ALS: 2 Non ALS: 0	No	X		
002	0960_SS288		24/06/2021 09:26 AM	Soil	ALS: 2 Non ALS: 0	No	X		
003	0960_SD209		24/06/2021 12:26 PM	Soil	ALS: 2 Non ALS: 0	No	X		
004	0960_SD302		24/06/2021 12:32 PM	Soil	ALS: 2 Non ALS: 0	No	X		
005	0960_SS293		24/06/2021 01:05 PM	Soil	ALS: 2 Non ALS: 0	No	X		
006	0960_SD210		24/06/2021 01:17 PM	Soil	ALS: 2 Non ALS: 0	No	X		

**CHAIN OF CUSTODY****(ALS) COC#: 24564** ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: SC-DEF19009/Learmonth SED

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS: 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0960_SS189	HDPE Soil Jar	200 mL	00620719063129	Grey	No	
001	0960_SS189	Soil Glass Jar - Unpreserved	150 mL	00260321005759	Orange	No	
002	0960_SS288	HDPE Soil Jar	200 mL	00620719063162	Grey	No	
002	0960_SS288	Soil Glass Jar - Unpreserved	150 mL	00260321005741	Orange	No	
003	0960_SD209	HDPE Soil Jar	200 mL	00620719063101	Grey	No	
003	0960_SD209	Soil Glass Jar - Unpreserved	150 mL	00260321005748	Orange	No	
004	0960_SD302	Soil Glass Jar - Unpreserved	150 mL	00260321005684	Orange	No	
004	0960_SD302	HDPE Soil Jar	200 mL	00620719063094	Grey	No	
005	0960_SS293	HDPE Soil Jar	200 mL	00620719063220	Grey	No	
005	0960_SS293	Soil Glass Jar - Unpreserved	150 mL	00260321005742	Orange	No	
006	0960_SD210	Soil Glass Jar - Unpreserved	150 mL	00260321005508	Orange	No	
006	0960_SD210	HDPE Soil Jar	200 mL	00620719063190	Grey	No	

Total Bottle Count: ALS: 12, Non ALS: 0

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : EP2107275

Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: maelle.bourdais@cardno.com.au	E-mail	: nick.courts@alsglobal.com
Telephone	: ----	Telephone	: +61-8-9406 1301
Facsimile	: ----	Facsimile	: +61-8-9406 1399
Project	: WA_0960_PFASOMP	Page	: 1 of 2
Order number	: DEF19009/0960	Quote number	: ES2019CARBSD0002 (SY/139/19)
C-O-C number	: 24564	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: DEF19009/Learmonth		
Sampler	: MAELLE BOURDAIS, Shaun Chambers		

Dates

Date Samples Received	: 28-Jun-2021 13:25	Issue Date	: 28-Jun-2021
Client Requested Due Date	: 09-Jul-2021	Scheduled Reporting Date	: 09-Jul-2021

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Not Available
No. of coolers/boxes	: 3	Temperature	: 15.8 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 6 / 6

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepancies: extra samples, samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- ### Summary of Sample(s) and Requested Analysis

Laboratory sample ID	Sampling date / time	Sample ID	SOIL - Agriculture	SOIL - Ecosystem	SOIL - Moisture	SOIL - Ecosystem	Organic	SOIL - PFAS
EP2107275-001	24-Jun-2021 08:38	0960_SS189_210624	✓	✓	✓	✓	✓	✓
EP2107275-002	24-Jun-2021 09:26	0960_SS288_210624	✓	✓	✓	✓	✓	✓
EP2107275-003	24-Jun-2021 12:26	0960_SD209_210624	✓	✓	✓	✓	✓	✓
EP2107275-004	24-Jun-2021 12:32	0960_SD302_210624	✓	✓	✓	✓	✓	✓
EP2107275-005	24-Jun-2021 13:05	0960_SS293_210624	✓	✓	✓	✓	✓	✓
EP2107275-006	24-Jun-2021 13:17	0960_SD210_210624	✓	✓	✓	✓	✓	✓

Sample(s) have been received within the recommended holding times for the requested analysis.

Email maelle.bourdais@cardno.com.au

CERTIFICATE OF ANALYSIS

Work Order : **EP2107275**
Client : **CARDNO (WA) PTY LTD**
Contact : **MAELLE BOURDAIS**
Address : **11 HARVEST TERRACE PO BOX 155**
WEST PERTH WA, AUSTRALIA 6006
Telephone : **----**
Project : **WA_0960_PFASOMP**
Order number : **DEF19009/0960**
C-O-C number : **24564**
Sampler : **MAELLE BOURDAIS, Shaun Chambers**
Site : **DEF19009/Learmonth**
Quote number : **SY/139/19**
No. of samples received : **6**
No. of samples analysed : **6**

Page : 1 of 9
Laboratory : Environmental Division Perth
Contact : Nick Courts
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 28-Jun-2021 13:25
Date Analysis Commenced : 02-Jul-2021
Issue Date : 08-Jul-2021 11:54



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H⁺ + Al³⁺).
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SS189_210624	0960_SS288_210624	0960_SD209_210624	0960_SD302_210624	0960_SS293_210624
Sampling date / time					24-Jun-2021 08:38	24-Jun-2021 09:26	24-Jun-2021 12:26	24-Jun-2021 12:32	24-Jun-2021 13:05
Compound	CAS Number	LOR	Unit		EP2107275-001	EP2107275-002	EP2107275-003	EP2107275-004	EP2107275-005
				Result	Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		9.2	9.4	8.7	8.6	8.6
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		158	1000	5910	6570	132
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		21.5	24.6	22.7	26.4	23.1
ED007: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		18.8	----	----	----	24.0
Exchangeable Magnesium	----	0.1	meq/100g		3.8	----	----	----	7.3
Exchangeable Potassium	----	0.1	meq/100g		0.7	----	----	----	1.1
Exchangeable Sodium	----	0.1	meq/100g		1.0	----	----	----	0.2
Cation Exchange Capacity	----	0.1	meq/100g		24.3	----	----	----	32.6
Exchangeable Sodium Percent	----	0.1	%		4.2	----	----	----	0.5
ED008: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		----	16.9	15.1	17.3	----
Exchangeable Magnesium	----	0.1	meq/100g		----	2.2	3.6	4.3	----
Exchangeable Potassium	----	0.1	meq/100g		----	<0.1	0.4	0.5	----
Exchangeable Sodium	----	0.1	meq/100g		----	<0.1	0.3	0.3	----
Cation Exchange Capacity	----	0.1	meq/100g		----	19.3	19.3	22.4	----
Exchangeable Sodium Percent	----	0.1	%		----	0.5	1.4	1.2	----
EP004: Organic Matter									
Organic Matter	----	0.5	%		1.0	0.8	1.0	1.9	2.0
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		0.0017	<0.0002	<0.0002	<0.0002	0.0106
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		0.0002	<0.0002	<0.0002	<0.0002	0.0002



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				0960_SS189_210624	0960_SS288_210624	0960_SD209_210624	0960_SD302_210624	0960_SS293_210624
Sampling date / time				24-Jun-2021 08:38	24-Jun-2021 09:26	24-Jun-2021 12:26	24-Jun-2021 12:32	24-Jun-2021 13:05
Compound	CAS Number	LOR	Unit	EP2107275-001	EP2107275-002	EP2107275-003	EP2107275-004	EP2107275-005
				Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				0960_SS189_210624	0960_SS288_210624	0960_SD209_210624	0960_SD302_210624	0960_SS293_210624
Sampling date / time				24-Jun-2021 08:38	24-Jun-2021 09:26	24-Jun-2021 12:26	24-Jun-2021 12:32	24-Jun-2021 13:05
Compound	CAS Number	LOR	Unit	EP2107275-001	EP2107275-002	EP2107275-003	EP2107275-004	EP2107275-005
				Result	Result	Result	Result	Result
EP231D: (n:2) Fluorotelomer Sulfonic Acids - Continued								
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	0.0019	<0.0002	<0.0002	<0.0002	0.0108
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	0.0017	<0.0002	<0.0002	<0.0002	0.0106
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	0.0017	<0.0002	<0.0002	<0.0002	0.0106
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	101	90.0	102	92.0	108
13C8-PFOA	----	0.0002	%	97.5	95.5	95.5	98.0	92.5



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)		Sample ID		0960_SD210_210624	----	----	----	----
		Sampling date / time		24-Jun-2021 13:17	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2107275-006	-----	-----	-----	-----
Result				----	----	----	----	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	8.7	----	----	----	----
EA010: Conductivity (1:5)								
Electrical Conductivity @ 25°C	----	1	µS/cm	6210	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	30.6	----	----	----	----
ED008: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	15.1	----	----	----	----
Exchangeable Magnesium	----	0.1	meq/100g	6.6	----	----	----	----
Exchangeable Potassium	----	0.1	meq/100g	1.3	----	----	----	----
Exchangeable Sodium	----	0.1	meq/100g	0.6	----	----	----	----
Cation Exchange Capacity	----	0.1	meq/100g	23.6	----	----	----	----
Exchangeable Sodium Percent	----	0.1	%	2.5	----	----	----	----
EP004: Organic Matter								
Organic Matter	----	0.5	%	5.1	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0012	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	----	----	----	----



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

0960_SD210_210624

Sampling date / time				24-Jun-2021 13:17	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2107275-006	-----	-----	-----	-----
Result				----	----	----	----	----

EP231B: Perfluoroalkyl Carboxylic Acids - Continued

Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	----	----	----	----

EP231C: Perfluoroalkyl Sulfonamides

Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	----	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	----	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	----	----	----	----

EP231D: (n:2) Fluorotelomer Sulfonic Acids

4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	----	----	----	----

EP231P: PFAS Sums

Sum of PFAS	----	0.0002	mg/kg	0.0012	----	----	----	----
-------------	------	--------	-------	--------	------	------	------	------



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SD210_210624	----	----	----	----
				Sampling date / time	24-Jun-2021 13:17	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2107275-006	-----	-----	-----	-----
				Result	----	----	----	----	----
EP231P: PFAS Sums - Continued									
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg		0.0012	----	----	----	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg		0.0012	----	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%		94.0	----	----	----	----
13C8-PFOA	----	0.0002	%		97.0	----	----	----	----

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Work Order : EP2107275
Client : CARDNO (WA) PTY LTD
Project : WA_0960_PFASOMP



Surrogate Control Limits

Sub-Matrix: SEDIMENT		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(SOIL) EP231B: Perfluoroalkyl Carboxylic Acids

(SOIL) EP231D: (n:2) Fluorotelomer Sulfonic Acids

(SOIL) EP231C: Perfluoroalkyl Sulfonamides

(SOIL) EP231A: Perfluoroalkyl Sulfonic Acids

(SOIL) EP231P: PFAS Sums

(SOIL) EP231S: PFAS Surrogate

QUALITY CONTROL REPORT

Work Order	: EP2107275	Page	: 1 of 7
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 28-Jun-2021
Order number	: DEF19009/0960	Date Analysis Commenced	: 02-Jul-2021
C-O-C number	: 24564	Issue Date	: 08-Jul-2021
Sampler	: MAELLE BOURDAIS, Shaun Chambers		
Site	: DEF19009/Learmonth		
Quote number	: SY/139/19		
No. of samples received	: 6		
No. of samples analysed	: 6		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key :
 Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
 CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
 LOR = Limit of reporting
 RPD = Relative Percentage Difference
 # = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA002: pH 1:5 (Soils) (QC Lot: 3768217)									
EP2107304-007	Anonymous	EA002: pH Value	----	0.1	pH Unit	6.2	6.2	0.0	0% - 20%
EP2107275-001	0960_SS189_210624	EA002: pH Value	----	0.1	pH Unit	9.2	9.3	0.0	0% - 20%
EA010: Conductivity (1:5) (QC Lot: 3768216)									
EP2107275-001	0960_SS189_210624	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	158	160	1.6	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3770475)									
EP2107271-001	Anonymous	EA055: Moisture Content	----	0.1	%	30.4	30.7	1.0	0% - 20%
EP2107271-012	Anonymous	EA055: Moisture Content	----	0.1	%	26.7	27.5	2.9	0% - 20%
ED007: Exchangeable Cations (QC Lot: 3774488)									
EP2107198-008	Anonymous	ED007: Exchangeable Sodium Percent	----	0.1	%	1.8	1.7	0.0	0% - 50%
		ED007: Exchangeable Calcium	----	0.1	meq/100g	17.6	18.3	3.8	0% - 20%
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	2.8	2.8	0.0	0% - 20%
		ED007: Exchangeable Potassium	----	0.1	meq/100g	0.6	0.6	0.0	No Limit
		ED007: Exchangeable Sodium	----	0.1	meq/100g	0.4	0.4	0.0	No Limit
		ED007: Cation Exchange Capacity	----	0.1	meq/100g	21.4	22.0	3.2	0% - 20%
ED008: Exchangeable Cations (QC Lot: 3774236)									
EP2107275-002	0960_SS288_210624	ED008: Exchangeable Sodium Percent	----	0.1	%	0.5	0.5	0.0	No Limit
		ED008: Exchangeable Calcium	----	0.1	meq/100g	16.9	16.4	3.2	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	2.2	2.1	6.4	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	<0.1	<0.1	0.0	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	<0.1	<0.1	0.0	No Limit
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	19.3	18.7	3.5	0% - 20%
EP004: Organic Matter (QC Lot: 3770465)									
EP2107271-001	Anonymous	EP004: Organic Matter	----	0.5	%	1.6	1.6	0.0	No Limit
EP2107275-001	0960_SS189_210624	EP004: Organic Matter	----	0.5	%	1.0	1.0	0.0	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3776841)									
EP2107275-002	0960_SS288_210624	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EP2107280-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0152	0.0157	2.7	0% - 20%
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit		
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3776841)									
EP2107275-002	0960_SS288_210624	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.0	No Limit
EP2107280-001	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.0	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3776841)									
EP2107275-002	0960_SS288_210624	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3776841) - continued									
EP2107275-002	0960_SS288_210624	EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP2107280-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3776841)									
EP2107275-002	0960_SS288_210624	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP2107280-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit



Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

Sub-Matrix: SOIL				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EA002: pH 1:5 (Soils) (QCLot: 3768217)								
EA002: pH Value	----	----	pH Unit	----	4 pH Unit	100	70.0	130
				----	7 pH Unit	100	70.0	130
EA010: Conductivity (1:5) (QCLot: 3768216)								
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	147 µS/cm	105	93.6	106
ED007: Exchangeable Cations (QCLot: 3774488)								
ED007: Exchangeable Calcium	----	0.1	meq/100g	<0.1	21.6 meq/100g	100	82.9	117
ED007: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.76 meq/100g	96.6	78.4	119
ED007: Exchangeable Potassium	----	0.1	meq/100g	<0.1	1 meq/100g	109	87.9	129
ED007: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.9 meq/100g	106	92.9	132
ED007: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	25.3 meq/100g	100	84.7	117
ED007: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
ED008: Exchangeable Cations (QCLot: 3774236)								
ED008: Exchangeable Calcium	----	0.1	meq/100g	<0.1	22.1 meq/100g	93.2	78.7	111
ED008: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.56 meq/100g	88.3	77.6	111
ED008: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.91 meq/100g	100.0	86.9	116
ED008: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.38 meq/100g	101	72.3	129
ED008: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
ED008: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	24.95 meq/100g	93.3	79.9	110
EP004: Organic Matter (QCLot: 3770465)								
EP004: Organic Matter	----	0.5	%	<0.5	2.3 %	102	70.0	120
				<0.5	85 %	88.5	70.0	120
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3776841)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.0	72.0	128
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	81.6	73.0	123
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	79.6	67.0	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	80.8	70.0	132
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.8	68.0	136
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.0	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3776841)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	82.8	71.0	135
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.4	69.0	132
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	80.4	70.0	132
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	76.8	71.0	131
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	88.8	69.0	133



Sub-Matrix: SOIL				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3776841) - continued								
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	81.6	72.0	129
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	77.6	69.0	133
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.4	64.0	136
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	86.4	69.0	135
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	87.6	66.0	139
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	79.8	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3776841)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.4	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	88.8	71.6	129
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	80.6	69.8	131
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	77.2	68.7	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	77.4	65.1	134
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	86.4	63.0	144
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	86.8	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3776841)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	93.6	62.0	145
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	95.6	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	85.2	65.0	137
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	82.0	69.2	143

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: SOIL				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3776841)							
EP2107275-002	0960_SS288_210624	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	76.0	72.0	128
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	80.0	73.0	123
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	80.0	67.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	86.4	70.0	132
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	74.0	68.0	136
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	87.6	59.0	134



Sub-Matrix: **SOIL**

Sub-Matrix: SOIL				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3776841)							
EP2107275-002	0960_SS288_210624	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	87.2	71.0	135
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	76.8	69.0	132
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	82.8	70.0	132
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	76.4	71.0	131
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	87.6	69.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	82.0	72.0	129
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	80.0	69.0	133
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	76.8	64.0	136
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	90.4	69.0	135
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	90.4	66.0	139
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	80.4	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3776841)							
EP2107275-002	0960_SS288_210624	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	84.4	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	88.3	71.6	129
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	77.7	69.8	131
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	78.2	68.7	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	80.8	65.1	134
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	84.0	63.0	144
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	86.4	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3776841)							
EP2107275-002	0960_SS288_210624	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	98.4	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	106	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	93.2	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	84.4	69.2	143

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2107275	Page	: 1 of 5
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 28-Jun-2021
Site	: DEF19009/Learmonth	Issue Date	: 08-Jul-2021
Sampler	: MAELLE BOURDAIS, Shaun Chambers	No. of samples received	: 6
Order number	: DEF19009/0960	No. of samples analysed	: 6

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- **NO** Matrix Spike outliers occur.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- **NO** Quality Control Sample Frequency Outliers exist.

Matrix: SOIL

Method	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA002: pH 1:5 (Soils)						
Soil Glass Jar - Unpreserved						
0960_SS189_210624,	0960_SS288_210624,	02-Jul-2021	01-Jul-2021	1	----	----
0960_SD209_210624,	0960_SD302_210624,					
0960_SS293_210624,	0960_SD210_210624					
EA010: Conductivity (1:5)						
Soil Glass Jar - Unpreserved						
0960_SS189_210624,	0960_SS288_210624,	02-Jul-2021	01-Jul-2021	1	----	----
0960_SD209_210624,	0960_SD302_210624,					
0960_SS293_210624,	0960_SD210_210624					

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: SOIL

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA002: pH 1:5 (Soils)								
Soil Glass Jar - Unpreserved (EA002)		24-Jun-2021	02-Jul-2021	01-Jul-2021	✖	02-Jul-2021	02-Jul-2021	✔
0960_SS189_210624,	0960_SS288_210624,							
0960_SD209_210624,	0960_SD302_210624,							
0960_SS293_210624,	0960_SD210_210624							
EA010: Conductivity (1:5)								
Soil Glass Jar - Unpreserved (EA010)		24-Jun-2021	02-Jul-2021	01-Jul-2021	✖	02-Jul-2021	30-Jul-2021	✔
0960_SS189_210624,	0960_SS288_210624,							
0960_SD209_210624,	0960_SD302_210624,							
0960_SS293_210624,	0960_SD210_210624							
EA055: Moisture Content (Dried @ 105-110°C)								
Soil Glass Jar - Unpreserved (EA055)		24-Jun-2021	----	----	----	02-Jul-2021	08-Jul-2021	✔
0960_SS189_210624,	0960_SS288_210624,							
0960_SD209_210624,	0960_SD302_210624,							
0960_SS293_210624,	0960_SD210_210624							



Matrix: **SOIL**

Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED007: Exchangeable Cations							
Soil Glass Jar - Unpreserved (ED007) 0960_SS189_210624, 0960_SS293_210624	24-Jun-2021	06-Jul-2021	22-Jul-2021	✓	06-Jul-2021	22-Jul-2021	✓
ED008: Exchangeable Cations							
Soil Glass Jar - Unpreserved (ED008) 0960_SS288_210624, 0960_SD302_210624, 0960_SD210_210624	24-Jun-2021	05-Jul-2021	22-Jul-2021	✓	05-Jul-2021	22-Jul-2021	✓
EP004: Organic Matter							
Soil Glass Jar - Unpreserved (EP004) 0960_SS189_210624, 0960_SD209_210624, 0960_SS293_210624	24-Jun-2021	07-Jul-2021	22-Jul-2021	✓	07-Jul-2021	22-Jul-2021	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE Soil Jar (EP231X) 0960_SS189_210624, 0960_SD209_210624, 0960_SS293_210624	24-Jun-2021	07-Jul-2021	21-Dec-2021	✓	07-Jul-2021	16-Aug-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE Soil Jar (EP231X) 0960_SS189_210624, 0960_SD209_210624, 0960_SS293_210624	24-Jun-2021	07-Jul-2021	21-Dec-2021	✓	07-Jul-2021	16-Aug-2021	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE Soil Jar (EP231X) 0960_SS189_210624, 0960_SD209_210624, 0960_SS293_210624	24-Jun-2021	07-Jul-2021	21-Dec-2021	✓	07-Jul-2021	16-Aug-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE Soil Jar (EP231X) 0960_SS189_210624, 0960_SD209_210624, 0960_SS293_210624	24-Jun-2021	07-Jul-2021	21-Dec-2021	✓	07-Jul-2021	16-Aug-2021	✓
EP231P: PFAS Sums							
HDPE Soil Jar (EP231X) 0960_SS189_210624, 0960_SD209_210624, 0960_SS293_210624	24-Jun-2021	07-Jul-2021	21-Dec-2021	✓	07-Jul-2021	16-Aug-2021	✓



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)		Quality Control Specification	
Analytical Methods	Method	QC	Regular	Actual	Expected		Evaluation
Laboratory Duplicates (DUP)							
Electrical Conductivity (1:5)	EA010	1	8	12.50	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	10	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	9	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	12	16.67	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Electrical Conductivity (1:5)	EA010	1	8	12.50	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	10	10.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	12	16.67	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Electrical Conductivity (1:5)	EA010	1	8	12.50	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	10	10.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	9	11.11	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	In house: Referenced to Rayment and Lyons 4A1 and APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Electrical Conductivity (1:5)	EA010	SOIL	In house: Referenced to Rayment and Lyons 3A1 and APHA 2510. Conductivity is determined on soil samples using a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Exchangeable Cations	ED007	SOIL	In house: Referenced to Rayment & Lyons Method 15A1. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM Schedule B(3).
Exchangeable Cations with pre-treatment	ED008	SOIL	In house: Referenced to Rayment & Lyons Method 15A2. Soluble salts are removed from the sample prior to analysis. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM Schedule B(3).
Organic Matter	EP004	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3)
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	SOIL	In-house: Analysis of soils by solvent extraction followed by LC-Electrospray-MS-MS, Negative Mode using MRM using internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Exchangeable Cations Preparation Method	ED007PR	SOIL	In house: Referenced to Rayment & Lyons method 15A1. A 1M NH4Cl extraction by end over end tumbling at a ratio of 1:20. There is no pretreatment for soluble salts. Extracts can be run by ICP for cations.
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
Organic Matter	EP004-PR	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3).
QuEChERS Extraction of Solids	ORG71	SOIL	In house: Sequential extractions with Acetonitrile/Methanol by shaking. Extraction efficiency aided by the addition of salts under acidic conditions. Where relevant, interferences from co-extracted organics are removed with dispersive clean-up media (dSPE). The extract is either diluted or concentrated and exchanged into the analytical solvent.



CHAIN OF CUSTODY

COC#: 24568 ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: AH-DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0960_MW112		24/06/2021 08:43 AM	Water	ALS: 4 Non ALS: 0	No	X		
002	0960_MW115		24/06/2021 09:08 AM	Water	ALS: 4 Non ALS: 0	No	X		
003	0960_MW139		24/06/2021 10:55 AM	Water	ALS: 4 Non ALS: 0	No	X		
004	0960_MW122		24/06/2021 11:28 AM	Water	ALS: 4 Non ALS: 0	No	X		
005	0960_MW146		24/06/2021 11:50 AM	Water	ALS: 6 Non ALS: 0	No	X	extra for qc	
006	0960_MW138		24/06/2021 12:29 PM	Water	ALS: 5 Non ALS: 0	No	X		
007	0960_MW137		24/06/2021 01:27 PM	Water	ALS: 5 Non ALS: 0	No	X		



CHAIN OF CUSTODY

COC#: 24568 ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: AH-DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

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EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0960_MW112	HDPE (no PTFE)	20 mL	00352005016326	Grey	No	
001	0960_MW112	HDPE (no PTFE)	20 mL	00352005016154	Grey	No	
001	0960_MW112	Clear Plastic Bottle - Natural	250 mL	00070719042790	Green	No	
001	0960_MW112	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220056282	Purple	No	
002	0960_MW115	HDPE (no PTFE)	20 mL	00352005016316	Grey	No	
002	0960_MW115	HDPE (no PTFE)	20 mL	00352005016221	Grey	No	
002	0960_MW115	Clear Plastic Bottle - Natural	250 mL	00070719042805	Green	No	
002	0960_MW115	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220055946	Purple	No	
003	0960_MW139	Clear Plastic Bottle - Natural	250 mL	00071119012739	Green	No	
003	0960_MW139	HDPE (no PTFE)	20 mL	00350019112606	Grey	No	
003	0960_MW139	HDPE (no PTFE)	20 mL	00350019165625	Grey	No	
003	0960_MW139	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019065397	Purple	No	
004	0960_MW122	HDPE (no PTFE)	20 mL	00350019169304	Grey	No	
004	0960_MW122	HDPE (no PTFE)	20 mL	00350019169495	Grey	No	
004	0960_MW122	Clear Plastic Bottle - Natural	250 mL	00070719145314	Green	No	
004	0960_MW122	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181019023654	Purple	No	
005	0960_MW146	HDPE (no PTFE)	20 mL	00350019165800	Grey	No	
005	0960_MW146	HDPE (no PTFE)	20 mL	00352005006967	Grey	No	
005	0960_MW146	Clear Plastic Bottle - Natural	250 mL	00070719042717	Green	No	
005	0960_MW146	HDPE (no PTFE)	20 mL	00352005016046	Grey	No	
005	0960_MW146	HDPE (no PTFE)	20 mL	00352005016255	Grey	No	
005	0960_MW146	Amber DOC Filtered- Sulfuric Preserved	40 mL	00180220056204	Purple	No	
006	0960_MW138	Clear Plastic Bottle - Natural	250 mL	00070220142064	Green	No	
006	0960_MW138	Clear Plastic Bottle - Natural	250 mL	00070220142664	Green	No	
006	0960_MW138	HDPE (no PTFE)	20 mL	00352005019410	Grey	No	
006	0960_MW138	HDPE (no PTFE)	20 mL	00352010039921	Grey	No	



CHAIN OF CUSTODY

COC#: 24568

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: AH-DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

006	0960_MW138	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003930	Purple	No	
007	0960_MW137	Clear Plastic Bottle - Natural	250 mL	00070220142999	Green	No	
007	0960_MW137	Clear Plastic Bottle - Natural	250 mL	00070220143232	Green	No	
007	0960_MW137	HDPE (no PTFE)	20 mL	00352010040079	Grey	No	
007	0960_MW137	HDPE (no PTFE)	20 mL	00352010040042	Grey	No	
007	0960_MW137	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003894	Purple	No	

Total Bottle Count: ALS: 32, Non ALS: 0

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : EP2107276

<p>Client : CARDNO (WA) PTY LTD</p> <p>Contact : MAELLE BOURDAIS</p> <p>Address : 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006</p> <p>E-mail : maelle.bourdais@cardno.com.au</p> <p>Telephone : ----</p> <p>Facsimile : ----</p> <p>Project : WA_0960_PFASOMP</p> <p>Order number : DEF19009/0960</p> <p>C-O-C number : 24568</p> <p>Site : DEF19009/Learmonth</p> <p>Sampler : ASHLEY BROWN, MAELLE BOURDAIS</p>	<p>Laboratory : Environmental Division Perth</p> <p>Contact : Nick Courts</p> <p>Address : 26 Rigali Way Wangara WA Australia 6065</p> <p>E-mail : nick.courts@alsglobal.com</p> <p>Telephone : +61-8-9406 1301</p> <p>Facsimile : +61-8-9406 1399</p> <p>Page : 1 of 3</p> <p>Quote number : ES2019CARBSD0002 (SY/139/19)</p> <p>QC Level : NEPM 2013 B3 & ALS QC Standard</p>
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Dates

Date Samples Received : 28-Jun-2021 13:25	Issue Date : 28-Jun-2021
Client Requested Due : 09-Jul-2021	Scheduled Reporting Date : 09-Jul-2021
Date	

Delivery Details

Mode of Delivery : Carrier	Security Seal : Not Available
No. of coolers/boxes : 3	Temperature : 15.8 - Ice present
Receipt Detail :	No. of samples received / analysed : 7 / 7

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepancies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.



Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2107276-001	24-Jun-2021 08:43	0960_MW112_210624	✓	✓	✓	✓	✓	✓	✓
EP2107276-002	24-Jun-2021 09:08	0960_MW115_210624	✓	✓	✓	✓	✓	✓	✓
EP2107276-003	24-Jun-2021 10:55	0960_MW139_210624	✓	✓	✓	✓	✓	✓	✓
EP2107276-004	24-Jun-2021 11:28	0960_MW122_210624	✓	✓	✓	✓	✓	✓	✓
EP2107276-005	24-Jun-2021 11:50	0960_MW146_210624	✓	✓	✓	✓	✓	✓	✓
EP2107276-006	24-Jun-2021 12:29	0960_MW138_210624	✓	✓	✓	✓	✓	✓	✓
EP2107276-007	24-Jun-2021 13:27	0960_MW137_210624	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2107276-001	24-Jun-2021 08:43	0960_MW112_210624	✓
EP2107276-002	24-Jun-2021 09:08	0960_MW115_210624	✓
EP2107276-003	24-Jun-2021 10:55	0960_MW139_210624	✓
EP2107276-004	24-Jun-2021 11:28	0960_MW122_210624	✓
EP2107276-005	24-Jun-2021 11:50	0960_MW146_210624	✓
EP2107276-006	24-Jun-2021 12:29	0960_MW138_210624	✓
EP2107276-007	24-Jun-2021 13:27	0960_MW137_210624	✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **WATER**

Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method	Due for extraction	Due for analysis	Samples Received		Instructions Received	
Client Sample ID(s)	Container		Date	Evaluation	Date	Evaluation
EA005-P: pH by PC Titrator						
0960_MW112_210624	Clear Plastic Bottle - Natural	----	24-Jun-2021	28-Jun-2021	✗	----
0960_MW115_210624	Clear Plastic Bottle - Natural	----	24-Jun-2021	28-Jun-2021	✗	----
0960_MW122_210624	Clear Plastic Bottle - Natural	----	24-Jun-2021	28-Jun-2021	✗	----



0960_MW137_21062	Clear Plastic Bottle - Natural	----	24-Jun-2021	28-Jun-2021	✖	----	----
0960_MW138_21062	Clear Plastic Bottle - Natural	----	24-Jun-2021	28-Jun-2021	✖	----	----
0960_MW139_21062	Clear Plastic Bottle - Natural	----	24-Jun-2021	28-Jun-2021	✖	----	----
0960_MW146_21062	Clear Plastic Bottle - Natural	----	24-Jun-2021	28-Jun-2021	✖	----	----

Requested Deliverables

CLAIRE ARMSTRONG

- A4 - AU Tax Invoice (INV)

Email claire.armstrong@cardno.com.au

DERP LAB REPORTS

- EDI Format - ESDAT (ESDAT)

Email derp.labreports@esdat.com.au

Laura Beames

- A4 - AU Tax Invoice (INV)

Email laura.beames@cardno.com.au

MAELLE BOURDAIS

- *AU Certificate of Analysis - NATA (COA)
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)
- Chain of Custody (CoC) (COC)
- EDI Format - ESDAT (ESDAT)
- EDI Format - XTab (XTAB)

Email maelle.bourdais@cardno.com.au

Email maelle.bourdais@cardno.com.au

Email maelle.bourdais@cardno.com.au

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Email maelle.bourdais@cardno.com.au

Email maelle.bourdais@cardno.com.au

CERTIFICATE OF ANALYSIS

Work Order : **EP2107276**
Client : **CARDNO (WA) PTY LTD**
Contact : **MAELLE BOURDAIS**
Address : **11 HARVEST TERRACE PO BOX 155**
WEST PERTH WA, AUSTRALIA 6006
Telephone : **----**
Project : **WA_0960_PFASOMP**
Order number : **DEF19009/0960**
C-O-C number : **24568**
Sampler : **ASHLEY BROWN, MAELLE BOURDAIS**
Site : **DEF19009/Learmonth**
Quote number : **SY/139/19**
No. of samples received : **7**
No. of samples analysed : **7**

Page : 1 of 9
Laboratory : Environmental Division Perth
Contact : Nick Courts
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 28-Jun-2021 13:25
Date Analysis Commenced : 01-Jul-2021
Issue Date : 09-Jul-2021 15:17



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- TDS by method EA-015 may bias high due to the presence of fine particulate matter, which may pass through the prescribed GF/C paper.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW112_210624	0960_MW115_210624	0960_MW139_210624	0960_MW122_210624	0960_MW146_210624
Sampling date / time				24-Jun-2021 08:43	24-Jun-2021 09:08	24-Jun-2021 10:55	24-Jun-2021 11:28	24-Jun-2021 11:50
Compound	CAS Number	LOR	Unit	EP2107276-001	EP2107276-002	EP2107276-003	EP2107276-004	EP2107276-005
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.87	7.65	7.60	7.79	7.69
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	7890	25800	52300	26900	81500
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	54	146	388	216	49
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	726	328	198	394	128
Total Alkalinity as CaCO3	----	1	mg/L	726	328	198	394	128
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1050	1260	3620	1720	4900
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	3360	12900	24000	14100	38400
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	111	623	844	319	1080
Magnesium	7439-95-4	1	mg/L	169	903	2080	893	2750
Sodium	7440-23-5	1	mg/L	2730	7250	15400	9130	22200
Potassium	7440-09-7	1	mg/L	112	310	849	482	1290
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	131	397	756	441	1190
∅ Total Cations	----	0.01	meq/L	141	429	905	499	1280
∅ Ionic Balance	----	0.01	%	3.64	3.88	8.94	6.11	3.69
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	<1	3	2	2	2
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	0.02	0.10	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	0.03	0.13	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.40	0.91	0.03	<0.02	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW112_210624	0960_MW115_210624	0960_MW139_210624	0960_MW122_210624	0960_MW146_210624
Sampling date / time				24-Jun-2021 08:43	24-Jun-2021 09:08	24-Jun-2021 10:55	24-Jun-2021 11:28	24-Jun-2021 11:50
Compound	CAS Number	LOR	Unit	EP2107276-001	EP2107276-002	EP2107276-003	EP2107276-004	EP2107276-005
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.56	0.12	0.01	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.04	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	0.07	0.20	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	0.01	0.02	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW112_210624	0960_MW115_210624	0960_MW139_210624	0960_MW122_210624	0960_MW146_210624
Sampling date / time				24-Jun-2021 08:43	24-Jun-2021 09:08	24-Jun-2021 10:55	24-Jun-2021 11:28	24-Jun-2021 11:50
Compound	CAS Number	LOR	Unit	EP2107276-001	EP2107276-002	EP2107276-003	EP2107276-004	EP2107276-005
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	1.09	1.52	0.04	<0.01	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	0.96	1.03	0.04	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L	1.06	1.39	0.04	<0.01	<0.01
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	80.9	88.0	79.0	87.5	90.0
13C8-PFOA	----	0.02	%	85.3	84.4	83.8	84.7	86.3



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW138_210624	0960_MW137_210624	----	----	----
Sampling date / time				24-Jun-2021 12:29	24-Jun-2021 13:27	----	----	----
Compound	CAS Number	LOR	Unit	EP2107276-006	EP2107276-007	-----	-----	-----
Result				Result	Result	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.78	7.67	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	51200	63300	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	114	232	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	<1	----	----	----
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	<1	<1	----	----	----
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L	144	195	----	----	----
Total Alkalinity as CaCO ₃	----	1	mg/L	144	195	----	----	----
ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA								
Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L	3670	3730	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	29000	30500	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	905	720	----	----	----
Magnesium	7439-95-4	1	mg/L	2130	2240	----	----	----
Sodium	7440-23-5	1	mg/L	18900	17600	----	----	----
Potassium	7440-09-7	1	mg/L	997	1010	----	----	----
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	897	942	----	----	----
∅ Total Cations	----	0.01	meq/L	1070	1010	----	----	----
∅ Ionic Balance	----	0.01	%	8.69	3.57	----	----	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	6	3	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	0.03	<0.02	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	----	----	----



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW138_210624	0960_MW137_210624	----	----	----
Sampling date / time				24-Jun-2021 12:29	24-Jun-2021 13:27	----	----	----
Compound	CAS Number	LOR	Unit	EP2107276-006	EP2107276-007	-----	-----	-----
				Result	Result	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	0.09	<0.01	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	----	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	----	----	----



Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0960_MW138_210624	0960_MW137_210624	----	----	----
Sampling date / time					24-Jun-2021 12:29	24-Jun-2021 13:27	----	----	----
Compound	CAS Number	LOR	Unit		EP2107276-006	EP2107276-007	-----	-----	-----
				Result	Result		----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	<0.02	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	<0.05	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	<0.05	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	<0.05	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	<0.05	----	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		0.12	<0.01	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		0.12	<0.01	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		0.12	<0.01	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		86.7	86.2	----	----	----
13C8-PFOA	----	0.02	%		85.0	86.8	----	----	----

Page : 9 of 9
Work Order : EP2107276
Client : CARDNO (WA) PTY LTD
Project : WA_0960_PFASOMP



Surrogate Control Limits

Sub-Matrix: GROUNDWATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EP231A: Perfluoroalkyl Sulfonic Acids

(WATER) EP231B: Perfluoroalkyl Carboxylic Acids

(WATER) EP231C: Perfluoroalkyl Sulfonamides

(WATER) EP231D: (n:2) Fluorotelomer Sulfonic Acids

(WATER) EP231P: PFAS Sums

(WATER) EP231S: PFAS Surrogate

QUALITY CONTROL REPORT

Work Order	: EP2107276	Page	: 1 of 8
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 28-Jun-2021
Order number	: DEF19009/0960	Date Analysis Commenced	: 01-Jul-2021
C-O-C number	: 24568	Issue Date	: 09-Jul-2021
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		
Site	: DEF19009/Learmonth		
Quote number	: SY/139/19		
No. of samples received	: 7		
No. of samples analysed	: 7		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
= Indicates failed QC

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA005P: pH by PC Titrator (QC Lot: 3776028)									
EP2107273-004	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.64	7.68	0.5	0% - 20%
EP2107276-003	0960_MW139_210624	EA005-P: pH Value	----	0.01	pH Unit	7.60	7.62	0.3	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3767504)									
EP2107273-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	47400	46400	2.3	0% - 20%
EP2107276-003	0960_MW139_210624	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	52300	45200	14.4	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3767526)									
EP2107273-006	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	84300	85900	1.8	0% - 20%
EP2107276-007	0960_MW137_210624	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	63300	62600	1.1	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3767505)									
EP2107273-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	1140	1140	0.0	0% - 20%
EP2107277-002	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	110	123	10.5	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3767527)									
EP2107273-006	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	174	191	9.3	0% - 20%
EP2107277-005	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	82	99	18.8	0% - 50%
ED037P: Alkalinity by PC Titrator (QC Lot: 3776027)									
EP2107273-004	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	121	121	0.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	121	121	0.0	0% - 20%
EP2107276-003	0960_MW139_210624	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	198	217	9.4	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	198	217	9.4	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3761927)									



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3761927) - continued									
EP2107184-015	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	905	915	1.0	0% - 20%
EP2107274-002	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2270	2340	3.1	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3761926)									
EP2107184-015	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	6220	6270	0.7	0% - 20%
EP2107274-002	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	19300	19200	0.3	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3762892)									
EP2107276-001	0960_MW112_210624	ED093F: Calcium	7440-70-2	1	mg/L	111	113	1.3	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	169	169	0.0	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	2730	2730	0.0	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	112	113	0.0	0% - 20%
EP2107277-004	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	884	892	0.9	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	2810	2830	0.6	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	24200	24600	1.5	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	1090	1090	0.6	0% - 20%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3778890)									
EP2107272-005	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	2	2	0.0	No Limit
EP2107274-003	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	4	2	60.2	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3777895)									
EP2107273-001	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3777895)									
EP2107273-001	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3777895)									
EP2107273-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3777895) - continued									
EP2107273-001	Anonymous	EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3777895)									
EP2107273-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231P: PFAS Sums (QC Lot: 3777895)									
EP2107273-001	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.0	No Limit

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
	Spike Concentration	Spike Recovery (%)	Acceptable Limits (%)	
		LCS	Low	High
Result				
----	4 pH Unit	100	98.5	102
----	7 pH Unit	100	98.5	102
<10	246 mg/L	102	88.1	114
<10	1000 mg/L	101	88.1	114
<10	246 mg/L	99.6	88.1	114
<10	1000 mg/L	102	88.1	114
<5	95 mg/L	112	89.1	120
<5	1000 mg/L	99.0	89.1	120
<5	95 mg/L	98.9	89.1	120
<5	1000 mg/L	101	89.1	120
<1	----	----	----	----
<1	----	----	----	----
<1	----	----	----	----
<1	20 mg/L	90.7	81.2	126
<1	200 mg/L	99.9	90.0	110
<1	25 mg/L	98.0	87.7	113
<1	500 mg/L	96.8	87.7	113
<1	10 mg/L	101	87.9	114
<1	1000 mg/L	104	87.9	114
<1	50 mg/L	97.2	85.9	113
<1	50 mg/L	101	88.0	110
<1	50 mg/L	102	87.3	118
<1	50 mg/L	92.4	89.7	108



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3778890) - continued								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	103	73.2	116
				<1	100 mg/L	102	73.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3777895)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	75.2	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	89.4	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	96.4	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	79.0	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	76.6	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	131	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3777895)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	77.8	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	90.0	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	86.8	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	87.0	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	88.0	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	95.4	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	81.0	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	81.4	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	80.0	72.0	134
EP231X: Perfluorotridecanoic acid (PFTriDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	74.4	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	90.0	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3777895)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	89.0	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	71.4	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	75.6	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	79.2	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	80.4	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	85.8	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	82.4	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3777895)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	101	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	93.6	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	93.0	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	75.8	71.4	144



Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3761927)							
EP2107184-015	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3761926)							
EP2107184-015	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	# Not Determined	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3778890)							
EP2107272-006	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	104	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3777895)							
EP2107274-003	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	81.6	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	94.2	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	96.6	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	82.4	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	89.6	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	117	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3777895)							
EP2107274-003	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	77.4	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	94.2	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	88.4	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	89.4	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	91.8	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	99.2	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	87.2	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	86.6	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	90.8	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	81.2	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	97.4	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3777895)							
EP2107274-003	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	101	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	84.2	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	78.6	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	82.3	66.0	145

Page : 8 of 8
 Work Order : EP2107276
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3777895) - continued							
EP2107274-003	Anonymous	EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	82.2	57.6	145
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	88.2	65.0	136
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	82.0	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3777895)							
EP2107274-003	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	106	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	111	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	106	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	110	71.4	144

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2107276	Page	: 1 of 7
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 28-Jun-2021
Site	: DEF19009/Learmonth	Issue Date	: 09-Jul-2021
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS	No. of samples received	: 7
Order number	: DEF19009/0960	No. of samples analysed	: 7

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- Matrix Spike outliers exist - please see following pages for full details.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- Quality Control Sample Frequency Outliers exist - please see following pages for full details.



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO ₄ 2- by DA	EP2107184--015	Anonymous	Sulfate as SO₄ - Turbidimetric	14808-79-8	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
ED045G: Chloride by Discrete Analyser	EP2107184--015	Anonymous	Chloride	16887-00-6	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method		<i>Extraction / Preparation</i>			<i>Analysis</i>		
Container / Client Sample ID(s)		<i>Date extracted</i>	<i>Due for extraction</i>	<i>Days overdue</i>	<i>Date analysed</i>	<i>Due for analysis</i>	<i>Days overdue</i>
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural							
0960_MW112_210624,	0960_MW115_210624,	----	----	----	06-Jul-2021	24-Jun-2021	12
0960_MW139_210624,	0960_MW122_210624,						
0960_MW146_210624,	0960_MW138_210624,						
0960_MW137_210624							

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	1	18	5.56	10.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator								
Clear Plastic Bottle - Natural (EA005-P)								
0960_MW112_210624,	0960_MW115_210624,	24-Jun-2021	----	----	----	06-Jul-2021	24-Jun-2021	✗
0960_MW139_210624,	0960_MW122_210624,							
0960_MW146_210624,	0960_MW138_210624,							
0960_MW137_210624								
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Clear Plastic Bottle - Natural (EA015H)								
0960_MW112_210624,	0960_MW115_210624,	24-Jun-2021	----	----	----	01-Jul-2021	01-Jul-2021	✓
0960_MW139_210624,	0960_MW122_210624,							
0960_MW146_210624,	0960_MW138_210624,							
0960_MW137_210624								
EA025: Total Suspended Solids dried at 104 ± 2°C								
Clear Plastic Bottle - Natural (EA025H)								
0960_MW112_210624,	0960_MW115_210624,	24-Jun-2021	----	----	----	01-Jul-2021	01-Jul-2021	✓
0960_MW139_210624,	0960_MW122_210624,							
0960_MW146_210624,	0960_MW138_210624,							
0960_MW137_210624								
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P)								
0960_MW112_210624,	0960_MW115_210624,	24-Jun-2021	----	----	----	06-Jul-2021	08-Jul-2021	✓
0960_MW139_210624,	0960_MW122_210624,							
0960_MW146_210624,	0960_MW138_210624,							
0960_MW137_210624								
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G)								
0960_MW112_210624,	0960_MW115_210624,	24-Jun-2021	----	----	----	07-Jul-2021	22-Jul-2021	✓
0960_MW139_210624,	0960_MW122_210624,							
0960_MW146_210624,	0960_MW138_210624,							
0960_MW137_210624								
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G)								
0960_MW112_210624,	0960_MW115_210624,	24-Jun-2021	----	----	----	07-Jul-2021	22-Jul-2021	✓
0960_MW139_210624,	0960_MW122_210624,							
0960_MW146_210624,	0960_MW138_210624,							
0960_MW137_210624								
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F)								
0960_MW112_210624,	0960_MW115_210624,	24-Jun-2021	----	----	----	01-Jul-2021	01-Jul-2021	✓
0960_MW139_210624,	0960_MW122_210624,							
0960_MW146_210624,	0960_MW138_210624,							
0960_MW137_210624								



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002)		24-Jun-2021	----	----	----	07-Jul-2021	22-Jul-2021	✓
0960_MW112_210624,	0960_MW115_210624,							
0960_MW139_210624,	0960_MW122_210624,							
0960_MW146_210624,	0960_MW138_210624,							
0960_MW137_210624								
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X)		24-Jun-2021	07-Jul-2021	21-Dec-2021	✓	07-Jul-2021	21-Dec-2021	✓
0960_MW112_210624,	0960_MW115_210624,							
0960_MW139_210624,	0960_MW122_210624,							
0960_MW146_210624,	0960_MW138_210624,							
0960_MW137_210624								
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X)		24-Jun-2021	07-Jul-2021	21-Dec-2021	✓	07-Jul-2021	21-Dec-2021	✓
0960_MW112_210624,	0960_MW115_210624,							
0960_MW139_210624,	0960_MW122_210624,							
0960_MW146_210624,	0960_MW138_210624,							
0960_MW137_210624								
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X)		24-Jun-2021	07-Jul-2021	21-Dec-2021	✓	07-Jul-2021	21-Dec-2021	✓
0960_MW112_210624,	0960_MW115_210624,							
0960_MW139_210624,	0960_MW122_210624,							
0960_MW146_210624,	0960_MW138_210624,							
0960_MW137_210624								
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X)		24-Jun-2021	07-Jul-2021	21-Dec-2021	✓	07-Jul-2021	21-Dec-2021	✓
0960_MW112_210624,	0960_MW115_210624,							
0960_MW139_210624,	0960_MW122_210624,							
0960_MW146_210624,	0960_MW138_210624,							
0960_MW137_210624								
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X)		24-Jun-2021	07-Jul-2021	21-Dec-2021	✓	07-Jul-2021	21-Dec-2021	✓
0960_MW112_210624,	0960_MW115_210624,							
0960_MW139_210624,	0960_MW122_210624,							
0960_MW146_210624,	0960_MW138_210624,							
0960_MW137_210624								



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	5.56	10.00	✗	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	4	36	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	4	38	10.53	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	4	36	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	4	38	10.53	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	36	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	38	5.26	5.26	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of 'filterable' residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C. This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high temperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.



Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.



CHAIN OF CUSTODY

COC#: 24570

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFASOMP

SITE: MB DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.iabreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	Rinsate WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0960_OTH107		24/06/2021 09:13 AM	Water	ALS: 7 Non ALS: 0	No	X			extra PFAS bottles for lab QC
002	0960_OTH106		24/06/2021 09:30 AM	Water	ALS: 5 Non ALS: 0	No	X			
003	0960_MW141_7.0-7.5		24/06/2021 10:05 AM	Water	ALS: 5 Non ALS: 0	No	X			
004	0960_MW140_6.0-6.5		24/06/2021 11:18 AM	Water	ALS: 4 Non ALS: 0	No	Partial 7/8			
005	0960_MW147_4.0-4.5		24/06/2021 12:08 PM	Water	ALS: 7 Non ALS: 0	No	X			Extra PFAS bottles for lab QC
006	0960_MW181_5.5-6.0		24/06/2021 12:32 PM	Water	ALS: 5 Non ALS: 0	No	X			
007	0960_MW180_1.0-1.5		24/06/2021 12:52 PM	Water	ALS: 5 Non ALS: 0	No	X			
008	0960_QC301		24/06/2021 02:43 PM	Water	ALS: 2 Non ALS: 0	No		X		
009	0960_QC302		24/06/2021 02:43 PM	Water	ALS: 2 Non ALS: 0	No		X		

**CHAIN OF CUSTODY**

COC#: 24570

ALS Laboratory: EP Perth

RELINQUISHED BY:

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DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: MB DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

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EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS**ANALYSIS REQUIRED**

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Ground Waters Primary WATER	Rinsate WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
010	0960_QC303		24/06/2021 02:44 PM	Water	ALS: 2 Non ALS: 0	No		X		
011	0960_QC401		24/06/2021 02:45 PM	Water	ALS: 2 Non ALS: 0	No		X		
012	0960_QC402		24/06/2021 02:46 PM	Water	ALS: 2 Non ALS: 0	No		X		
013	0960_QC403		24/06/2021 02:48 PM	Water	ALS: 2 Non ALS: 0	No		X		

**CHAIN OF CUSTODY**

COC#: 24570

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: MB DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	PARTIAL ANALYSIS GROUP NAME	MATRIX	SELECTED ANALYSIS NAME
004	0960_MW140_6.0-6.5	Ground Waters Primary WATER	Water	<ul style="list-style-type: none">- EA005P pH (PCT)- NT-02 Major Anions (Chloride, Sulphate, Alkalinity)- NT-01 Major Cations (Ca, Mg, Na, K)- EA025H Suspended Solids - Standard Level- EA015H Total Dissolved Solids - Standard Level- EN055 - PG Ionic Balance by ED037P, ED041G, ED045G & ED093F- EP231X PFAS - Full Suite (28 analytes)

**CHAIN OF CUSTODY**

COC#: 24570

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFASOMP

SITE: MB DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

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EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0960_OTH107	Clear Plastic Bottle - Natural	250 mL	00070220142912	Green	No	
001	0960_OTH107	Clear Plastic Bottle - Natural	250 mL	00070220142773	Green	No	
001	0960_OTH107	HDPE (no PTFE)	20 mL	00352005019875	Grey	No	
001	0960_OTH107	HDPE (no PTFE)	20 mL	00352005019681	Grey	No	
001	0960_OTH107	HDPE (no PTFE)	20 mL	00352005005314	Grey	No	
001	0960_OTH107	HDPE (no PTFE)	20 mL	00350019164421	Grey	No	
001	0960_OTH107	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020004099	Purple	No	
002	0960_OTH106	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003785	Purple	No	
002	0960_OTH106	Clear Plastic Bottle - Natural	250 mL	00070220142747	Green	No	
002	0960_OTH106	Clear Plastic Bottle - Natural	250 mL	00070220142889	Green	No	
002	0960_OTH106	HDPE (no PTFE)	20 mL	00352005019704	Grey	No	
002	0960_OTH106	HDPE (no PTFE)	20 mL	00352010039937	Grey	No	
003	0960_MW141_7.0-7.5	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003931	Purple	No	
003	0960_MW141_7.0-7.5	Clear Plastic Bottle - Natural	250 mL	00070220142806	Green	No	
003	0960_MW141_7.0-7.5	Clear Plastic Bottle - Natural	250 mL	00070220142853	Green	No	
003	0960_MW141_7.0-7.5	HDPE (no PTFE)	20 mL	00352005019693	Grey	No	
003	0960_MW141_7.0-7.5	HDPE (no PTFE)	20 mL	00352010039954	Grey	No	
004	0960_MW140_6.0-6.5	Clear Plastic Bottle - Natural	250 mL	00070220142717	Green	No	
004	0960_MW140_6.0-6.5	Clear Plastic Bottle - Natural	250 mL	00070220142792	Green	No	
004	0960_MW140_6.0-6.5	HDPE (no PTFE)	20 mL	00352005019882	Grey	No	
004	0960_MW140_6.0-6.5	HDPE (no PTFE)	20 mL	00352005019847	Grey	No	
005	0960_MW147_4.0-4.5	Clear Plastic Bottle - Natural	250 mL	00070220142813	Green	No	
005	0960_MW147_4.0-4.5	Clear Plastic Bottle - Natural	250 mL	00070220142729	Green	No	
005	0960_MW147_4.0-4.5	HDPE (no PTFE)	20 mL	00352005019822	Grey	No	
005	0960_MW147_4.0-4.5	HDPE (no PTFE)	20 mL	00350019164335	Grey	No	
005	0960_MW147_4.0-4.5	HDPE (no PTFE)	20 mL	00352010040097	Grey	No	

**CHAIN OF CUSTODY**

ALS COC#: 24570

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFASOMP

SITE: MB DEF19009/Learmonth GW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

005	0960_MW147_4.0-4.5	HDPE (no PTFE)	20 mL	00352005005282	Grey	No	
005	0960_MW147_4.0-4.5	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003848	Purple	No	
006	0960_MW181_5.5-6.0	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003938	Purple	No	
006	0960_MW181_5.5-6.0	HDPE (no PTFE)	20 mL	00352010040005	Grey	No	
006	0960_MW181_5.5-6.0	HDPE (no PTFE)	20 mL	00352010040108	Grey	No	
006	0960_MW181_5.5-6.0	Clear Plastic Bottle - Natural	250 mL	00070220142776	Green	No	
006	0960_MW181_5.5-6.0	Clear Plastic Bottle - Natural	250 mL	00070220142817	Green	No	
007	0960_MW180_1.0-1.5	Clear Plastic Bottle - Natural	250 mL	00070220142778	Green	No	
007	0960_MW180_1.0-1.5	Clear Plastic Bottle - Natural	250 mL	00070220142829	Green	No	
007	0960_MW180_1.0-1.5	HDPE (no PTFE)	20 mL	00352010040306	Grey	No	
007	0960_MW180_1.0-1.5	HDPE (no PTFE)	20 mL	00352005019676	Grey	No	
007	0960_MW180_1.0-1.5	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003823	Purple	No	
008	0960_QC301	HDPE (no PTFE)	20 mL	00352010059059	Grey	No	
008	0960_QC301	HDPE (no PTFE)	20 mL	00352010058989	Grey	No	
009	0960_QC302	HDPE (no PTFE)	20 mL	00352010059071	Grey	No	
009	0960_QC302	HDPE (no PTFE)	20 mL	00352010059085	Grey	No	
010	0960_QC303	HDPE (no PTFE)	20 mL	00352010058953	Grey	No	
010	0960_QC303	HDPE (no PTFE)	20 mL	00352010059082	Grey	No	
011	0960_QC401	HDPE (no PTFE)	20 mL	00352010059010	Grey	No	
011	0960_QC401	HDPE (no PTFE)	20 mL	00352010058885	Grey	No	
012	0960_QC402	HDPE (no PTFE)	20 mL	00352010058883	Grey	No	
012	0960_QC402	HDPE (no PTFE)	20 mL	00352010059134	Grey	No	
013	0960_QC403	HDPE (no PTFE)	20 mL	00352010058935	Grey	No	
013	0960_QC403	HDPE (no PTFE)	20 mL	00352010058915	Grey	No	

Total Bottle Count: ALS: 50, Non ALS: 0

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : EP2107277

<p>Client : CARDNO (WA) PTY LTD</p> <p>Contact : MAELLE BOURDAIS</p> <p>Address : 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006</p> <p>E-mail : maelle.bourdais@cardno.com.au</p> <p>Telephone : ----</p> <p>Facsimile : ----</p> <p>Project : WA_0960_PFASOMP</p> <p>Order number : DEF19009/0960</p> <p>C-O-C number : 24570</p> <p>Site : DEF19009/Learmonth</p> <p>Sampler : MAELLE BOURDAIS</p>	<p>Laboratory : Environmental Division Perth</p> <p>Contact : Nick Courts</p> <p>Address : 26 Rigali Way Wangara WA Australia 6065</p> <p>E-mail : nick.courts@alsglobal.com</p> <p>Telephone : +61-8-9406 1301</p> <p>Facsimile : +61-8-9406 1399</p> <p>Page : 1 of 3</p> <p>Quote number : ES2019CARBSD0002 (SY/139/19)</p> <p>QC Level : NEPM 2013 B3 & ALS QC Standard</p>
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Dates

Date Samples Received : 28-Jun-2021 13:25	Issue Date : 28-Jun-2021
Client Requested Due : 09-Jul-2021	Scheduled Reporting Date : 09-Jul-2021
Date	

Delivery Details

Mode of Delivery : Carrier	Security Seal : Not Available
No. of coolers/boxes : 3	Temperature : 15.8 - Ice present
Receipt Detail :	No. of samples received / analysed : 13 / 13

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepancies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.



Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- No sample container / preservation non-compliance exists.

Any sample identifications that cannot be displayed entirely in the analysis summary table will be listed below.

EP2107277-003 : 24-Jun-2021 10:05 : 0960_MW141_7.0-7.5_210624
EP2107277-004 : 24-Jun-2021 11:18 : 0960_MW140_6.0-6.5_210624
EP2107277-005 : 24-Jun-2021 12:08 : 0960_MW147_4.0-4.5_210624
EP2107277-006 : 24-Jun-2021 12:32 : 0960_MW181_5.5-6.0_210624
EP2107277-007 : 24-Jun-2021 12:52 : 0960_MW180_1.0-1.5_210624

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2107277-001	24-Jun-2021 09:13	0960_OTH107_210624	✓	✓	✓	✓	✓	✓	✓
EP2107277-002	24-Jun-2021 09:30	0960_OTH106_210624	✓	✓	✓	✓	✓	✓	✓
EP2107277-003	24-Jun-2021 10:05	0960_MW141_7.0-7.5_2...	✓	✓	✓	✓	✓	✓	✓
EP2107277-004	24-Jun-2021 11:18	0960_MW140_6.0-6.5_2...	✓	✓	✓	✓	✓	✓	✓
EP2107277-005	24-Jun-2021 12:08	0960_MW147_4.0-4.5_2...	✓	✓	✓	✓	✓	✓	✓
EP2107277-006	24-Jun-2021 12:32	0960_MW181_5.5-6.0_2...	✓	✓	✓	✓	✓	✓	✓
EP2107277-007	24-Jun-2021 12:52	0960_MW180_1.0-1.5_2...	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2107277-001	24-Jun-2021 09:13	0960_OTH107_210624	✓
EP2107277-002	24-Jun-2021 09:30	0960_OTH106_210624	✓
EP2107277-003	24-Jun-2021 10:05	0960_MW141_7.0-7.5_2...	✓
EP2107277-004	24-Jun-2021 11:18	0960_MW140_6.0-6.5_2...	✓
EP2107277-005	24-Jun-2021 12:08	0960_MW147_4.0-4.5_2...	✓
EP2107277-006	24-Jun-2021 12:32	0960_MW181_5.5-6.0_2...	✓
EP2107277-007	24-Jun-2021 12:52	0960_MW180_1.0-1.5_2...	✓
EP2107277-008	24-Jun-2021 14:43	0960_QC301_210624	✓
EP2107277-009	24-Jun-2021 14:43	0960_QC302_210624	✓
EP2107277-010	24-Jun-2021 14:44	0960_QC303_210624	✓
EP2107277-011	24-Jun-2021 14:45	0960_QC401_210624	✓
EP2107277-012	24-Jun-2021 14:46	0960_QC402_210624	✓

Proactive Holding Time Report

Matrix: WATER

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Container	Due for extraction	Due for analysis	Samples Received		Instructions Received	
				Date	Evaluation	Date	Evaluation
EA005-P: pH by PC Titrator							
0960_MW140_6.0-6.5	Clear Plastic Bottle - Natural	----	24-Jun-2021	28-Jun-2021	✗	----	-----
0960_MW141_7.0-7.5	Clear Plastic Bottle - Natural	----	24-Jun-2021	28-Jun-2021	✗	----	-----
0960_MW147_4.0-4.5	Clear Plastic Bottle - Natural	----	24-Jun-2021	28-Jun-2021	✗	----	-----
0960_MW180_1.0-1.5	Clear Plastic Bottle - Natural	----	24-Jun-2021	28-Jun-2021	✗	----	-----
0960_MW181_5.5-6.0	Clear Plastic Bottle - Natural	----	24-Jun-2021	28-Jun-2021	✗	----	-----
0960_OTH106_21062	Clear Plastic Bottle - Natural	----	24-Jun-2021	28-Jun-2021	✗	----	-----
0960_OTH107_21062	Clear Plastic Bottle - Natural	----	24-Jun-2021	28-Jun-2021	✗	----	-----

Requested Deliverables

- A4 - AU Tax Invoice (INV)

Email claire.armstrong@cardno.com.au

- EDI Format - ESDAT (ESDAT)

Email derp.labreports@esdat.com.au

- A4 - AU Tax Invoice (INV)

Email laura.beames@cardno.com.au

- *AU Certificate of Analysis - NATA (COA)

Email maelle.bourdais@cardno.com.au

- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)

Email maelle.bourdais@cardno.com.au

- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)

Email maelle.bourdais@cardno.com.au

- A4 - AU Sample Receipt Notification - Environmental HT (SRN)

Email maelle.bourdais@cardno.com.au

- Chain of Custody (CoC) (COC)

Email maelle.bourdais@cardno.com.au

- EDI Format - ESDAT (ESDAT)

Email maelle.bourdais@cardno.com.au

- EDI Format - XTab (XTAB)

Email maelle.bourdais@cardno.com.au

CERTIFICATE OF ANALYSIS

Work Order : **EP2107277**
Client : **CARDNO (WA) PTY LTD**
Contact : **MAELLE BOURDAIS**
Address : **11 HARVEST TERRACE PO BOX 155**
WEST PERTH WA, AUSTRALIA 6006
Telephone : **----**
Project : **WA_0960_PFASOMP**
Order number : **DEF19009/0960**
C-O-C number : **24570**
Sampler : **MAELLE BOURDAIS**
Site : **DEF19009/Learmonth**
Quote number : **SY/139/19**
No. of samples received : **13**
No. of samples analysed : **13**

Page : 1 of 11
Laboratory : Environmental Division Perth
Contact : Nick Courts
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 28-Jun-2021 13:25
Date Analysis Commenced : 01-Jul-2021
Issue Date : 09-Jul-2021 15:27



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW141_7.0-7.5 _210624	0960_MW140_6.0-6.5 _210624	0960_MW147_4.0-4.5 _210624	0960_MW181_5.5-6.0 _210624	0960_MW180_1.0-1.5 _210624
Sampling date / time				24-Jun-2021 10:05	24-Jun-2021 11:18	24-Jun-2021 12:08	24-Jun-2021 12:32	24-Jun-2021 12:52
Compound	CAS Number	LOR	Unit	EP2107277-003	EP2107277-004	EP2107277-005	EP2107277-006	EP2107277-007
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.93	7.84	7.63	7.30	7.64
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	33400	81800	87100	79300	72000
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	622	238	82	401	54
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	191	216	154	316	139
Total Alkalinity as CaCO3	----	1	mg/L	191	216	154	316	139
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1870	4910	5620	5230	4420
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	15200	36600	39400	37900	32400
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	522	884	1200	1030	859
Magnesium	7439-95-4	1	mg/L	1150	2810	3090	2760	2390
Sodium	7440-23-5	1	mg/L	9420	24200	26600	23500	20700
Potassium	7440-09-7	1	mg/L	513	1090	1190	1080	979
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	472	1140	1230	1180	1010
∅ Total Cations	----	0.01	meq/L	544	1360	1500	1330	1160
∅ Ionic Balance	----	0.01	%	7.10	8.69	9.88	5.73	7.19
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	7	----	11	4	3
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW141_7.0-7.5 _210624	0960_MW140_6.0-6.5 _210624	0960_MW147_4.0-4.5 _210624	0960_MW181_5.5-6.0 _210624	0960_MW180_1.0-1.5 _210624
Sampling date / time				24-Jun-2021 10:05	24-Jun-2021 11:18	24-Jun-2021 12:08	24-Jun-2021 12:32	24-Jun-2021 12:52
Compound	CAS Number	LOR	Unit	EP2107277-003	EP2107277-004	EP2107277-005	EP2107277-006	EP2107277-007
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

				0960_MW141_7.0-7.5 _210624	0960_MW140_6.0-6.5 _210624	0960_MW147_4.0-4.5 _210624	0960_MW181_5.5-6.0 _210624	0960_MW180_1.0-1.5 _210624
Sampling date / time				24-Jun-2021 10:05	24-Jun-2021 11:18	24-Jun-2021 12:08	24-Jun-2021 12:32	24-Jun-2021 12:52
Compound	CAS Number	LOR	Unit	EP2107277-003	EP2107277-004	EP2107277-005	EP2107277-006	EP2107277-007
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	86.1	81.8	85.0	83.4	78.2
13C8-PFOA	----	0.02	%	84.8	84.9	84.2	84.3	85.1



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				0960_OTH107_21062 4	0960_OTH106_21062 4	0960_QC301_210624	0960_QC302_210624	0960_QC303_210624
Sampling date / time				24-Jun-2021 09:13	24-Jun-2021 09:30	24-Jun-2021 14:43	24-Jun-2021 14:43	24-Jun-2021 14:44
Compound	CAS Number	LOR	Unit	EP2107277-001	EP2107277-002	EP2107277-008	EP2107277-009	EP2107277-010
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	7.94	7.96	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	43100	40200	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	117	110	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	124	126	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	124	126	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2540	2560	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	19600	19500	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	506	502	----	----	----
Magnesium	7439-95-4	1	mg/L	1530	1530	----	----	----
Sodium	7440-23-5	1	mg/L	12200	12200	----	----	----
Potassium	7440-09-7	1	mg/L	659	669	----	----	----
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	608	606	----	----	----
∅ Total Cations	----	0.01	meq/L	699	699	----	----	----
∅ Ionic Balance	----	0.01	%	6.92	7.12	----	----	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	13	1	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				0960_OTH107_21062 4	0960_OTH106_21062 4	0960_QC301_210624	0960_QC302_210624	0960_QC303_210624
Sampling date / time				24-Jun-2021 09:13	24-Jun-2021 09:30	24-Jun-2021 14:43	24-Jun-2021 14:43	24-Jun-2021 14:44
Compound	CAS Number	LOR	Unit	EP2107277-001	EP2107277-002	EP2107277-008	EP2107277-009	EP2107277-010
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				0960_OTH107_21062 4	0960_OTH106_21062 4	0960_QC301_210624	0960_QC302_210624	0960_QC303_210624
Sampling date / time				24-Jun-2021 09:13	24-Jun-2021 09:30	24-Jun-2021 14:43	24-Jun-2021 14:43	24-Jun-2021 14:44
Compound	CAS Number	LOR	Unit	EP2107277-001	EP2107277-002	EP2107277-008	EP2107277-009	EP2107277-010
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	91.7	76.0	81.3	83.7	82.9
13C8-PFOA	----	0.02	%	88.2	83.2	86.2	84.9	86.5



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				0960_QC401_210624	0960_QC402_210624	0960_QC403_210624	----	----
Sampling date / time				24-Jun-2021 14:45	24-Jun-2021 14:46	24-Jun-2021 14:48	----	----
Compound	CAS Number	LOR	Unit	EP2107277-011	EP2107277-012	EP2107277-013	-----	-----
				Result	Result	Result	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	----	----



Analytical Results

Sub-Matrix: WATER
 (Matrix: WATER)

Sample ID

				0960_QC401_210624	0960_QC402_210624	0960_QC403_210624	----	----
Sampling date / time				24-Jun-2021 14:45	24-Jun-2021 14:46	24-Jun-2021 14:48	----	----
Compound	CAS Number	LOR	Unit	EP2107277-011	EP2107277-012	EP2107277-013	-----	-----
				Result	Result	Result	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	<0.01	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	<0.01	<0.01	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	79.6	77.9	81.3	----	----
13C8-PFOA	----	0.02	%	84.5	87.7	85.2	----	----



Surrogate Control Limits

Sub-Matrix: GROUNDWATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EP231A: Perfluoroalkyl Sulfonic Acids
(WATER) EP231B: Perfluoroalkyl Carboxylic Acids
(WATER) EP231C: Perfluoroalkyl Sulfonamides
(WATER) EP231D: (n:2) Fluorotelomer Sulfonic Acids
(WATER) EP231P: PFAS Sums
(WATER) EP231S: PFAS Surrogate

QUALITY CONTROL REPORT

Work Order	: EP2107277	Page	: 1 of 9
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 28-Jun-2021
Order number	: DEF19009/0960	Date Analysis Commenced	: 01-Jul-2021
C-O-C number	: 24570	Issue Date	: 09-Jul-2021
Sampler	: MAELLE BOURDAIS		
Site	: DEF19009/Learmonth		
Quote number	: SY/139/19		
No. of samples received	: 13		
No. of samples analysed	: 13		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
 CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
 LOR = Limit of reporting
 RPD = Relative Percentage Difference
 # = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA005P: pH by PC Titrator (QC Lot: 3776028)									
EP2107273-004	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.64	7.68	0.5	0% - 20%
EP2107276-003	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.60	7.62	0.3	0% - 20%
EA005P: pH by PC Titrator (QC Lot: 3776030)									
EP2107277-006	0960_MW181_5.5-6.0_210 624	EA005-P: pH Value	----	0.01	pH Unit	7.30	7.31	0.1	0% - 20%
EP2107363-001	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.66	7.66	0.0	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3767504)									
EP2107273-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	47400	46400	2.3	0% - 20%
EP2107276-003	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	52300	45200	14.4	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3767526)									
EP2107273-006	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	84300	85900	1.8	0% - 20%
EP2107276-007	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	63300	62600	1.1	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3767505)									
EP2107273-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	1140	1140	0.0	0% - 20%
EP2107277-002	0960_OTH106_210624	EA025H: Suspended Solids (SS)	----	5	mg/L	110	123	10.5	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3767527)									
EP2107273-006	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	174	191	9.3	0% - 20%
EP2107277-005	0960_MW147_4.0-4.5_210 624	EA025H: Suspended Solids (SS)	----	5	mg/L	82	99	18.8	0% - 50%
ED037P: Alkalinity by PC Titrator (QC Lot: 3776027)									
EP2107273-004	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	121	121	0.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	121	121	0.0	0% - 20%

Page : 3 of 9
 Work Order : EP2107277
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
ED037P: Alkalinity by PC Titrator (QC Lot: 3776027) - continued									
EP2107276-003	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	198	217	9.4	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	198	217	9.4	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3776029)									
EP2107277-006	0960_MW181_5.5-6.0_210 624	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	316	342	8.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	316	342	8.0	0% - 20%
EP2107363-001	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	182	178	2.2	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	182	178	2.2	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3764405)									
EP2107189-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	657	656	0.0	0% - 20%
EP2107189-011	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	3230	3230	0.1	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3764406)									
EP2107189-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	5060	5080	0.3	0% - 20%
EP2107189-011	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	27300	28000	2.7	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3762892)									
EP2107276-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	111	113	1.3	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	169	169	0.0	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	2730	2730	0.0	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	112	113	0.0	0% - 20%
EP2107277-004	0960_MW140_6.0-6.5_210 624	ED093F: Calcium	7440-70-2	1	mg/L	884	892	0.9	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	2810	2830	0.6	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	24200	24600	1.5	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	1090	1090	0.6	0% - 20%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3778890)									
EP2107272-005	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	2	2	0.0	No Limit
EP2107274-003	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	4	2	60.2	No Limit
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3778896)									
EP2107277-002	0960_OTH106_210624	EP002: Dissolved Organic Carbon	----	1	mg/L	1	2	0.0	No Limit
EP2107281-001	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	2	2	0.0	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3777900)									
EP2107277-001	0960_OTH107_210624	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.0	No Limit

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3777900) - continued									
EP2107277-001	0960_OTH107_210624	EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3777900)									
EP2107277-001	0960_OTH107_210624	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3777900)									
EP2107277-001	0960_OTH107_210624	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3777900)									
EP2107277-001	0960_OTH107_210624	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231P: PFAS Sums (QC Lot: 3777900)									



Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231P: PFAS Sums (QC Lot: 3777900) - continued									
EP2107277-001	0960_OTH107_210624	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.0	No Limit



Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EA005P: pH by PC Titrator (QCLot: 3776028)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.5	102
				----	7 pH Unit	100	98.5	102
EA005P: pH by PC Titrator (QCLot: 3776030)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	101	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3767504)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	246 mg/L	102	88.1	114
				<10	1000 mg/L	101	88.1	114
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3767526)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	246 mg/L	99.6	88.1	114
				<10	1000 mg/L	102	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3767505)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	95 mg/L	112	89.1	120
				<5	1000 mg/L	99.0	89.1	120
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3767527)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	95 mg/L	98.9	89.1	120
				<5	1000 mg/L	101	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3776027)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	90.7	81.2	126
				<1	200 mg/L	99.9	90.0	110
ED037P: Alkalinity by PC Titrator (QCLot: 3776029)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	107	81.2	126
				<1	200 mg/L	101	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3764405)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	101	87.7	113
				<1	500 mg/L	97.6	87.7	113



Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result			Low	High
ED045G: Chloride by Discrete Analyser (QCLot: 3764406)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	99.3	87.9	114
				<1	1000 mg/L	104	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3762892)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	97.2	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	101	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	102	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	92.4	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3778890)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	103	73.2	116
				<1	100 mg/L	102	73.2	116
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3778896)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	103	73.2	116
				<1	100 mg/L	103	73.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3777900)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	75.2	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	80.4	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	78.0	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	82.8	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	87.0	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	126	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3777900)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	78.2	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	88.0	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	83.8	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	84.8	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	93.4	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	92.4	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	84.8	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	79.0	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	86.2	72.0	134
EP231X: Perfluorotridecanoic acid (PFTriDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	79.8	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	86.5	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3777900)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	92.0	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	84.5	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	79.0	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	89.3	66.0	145

Matrix Spike (MS) Report

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3764405)							
EP2107189-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3764406)							
EP2107189-001	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	# Not Determined	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3778890)							
EP2107272-006	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	104	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3778896)							
EP2107277-003	0960_MW141_7.0-7.5_210624	EP002: Dissolved Organic Carbon	----	100 mg/L	105	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3777900)							
EP2107277-005	0960_MW147_4.0-4.5_210624	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	84.0	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	91.2	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	88.6	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	88.6	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	86.8	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	124	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3777900)							



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3777900) - continued							
EP2107277-005	0960_MW147_4.0-4.5_210624	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	78.9	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	94.2	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	87.0	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	91.2	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	92.8	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	97.2	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	91.8	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	82.2	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	89.8	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	85.8	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	90.4	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3777900)							
EP2107277-005	0960_MW147_4.0-4.5_210624	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	103	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	82.3	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	83.0	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	86.7	66.0	145
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	85.4	57.6	145
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	94.2	65.0	136
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	90.0	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3777900)							
EP2107277-005	0960_MW147_4.0-4.5_210624	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	107	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	113	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	87.2	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	91.4	71.4	144

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2107277	Page	: 1 of 8
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 28-Jun-2021
Site	: DEF19009/Learmonth	Issue Date	: 09-Jul-2021
Sampler	: MAELLE BOURDAIS	No. of samples received	: 13
Order number	: DEF19009/0960	No. of samples analysed	: 13

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- Matrix Spike outliers exist - please see following pages for full details.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- Quality Control Sample Frequency Outliers exist - please see following pages for full details.



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO ₄ 2- by DA	EP2107189--001	Anonymous	Sulfate as SO₄ - Turbidimetric	14808-79-8	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
ED045G: Chloride by Discrete Analyser	EP2107189--001	Anonymous	Chloride	16887-00-6	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method		<i>Extraction / Preparation</i>			<i>Analysis</i>		
Container / Client Sample ID(s)		<i>Date extracted</i>	<i>Due for extraction</i>	<i>Days overdue</i>	<i>Date analysed</i>	<i>Due for analysis</i>	<i>Days overdue</i>
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural							
0960_OTH107_210624,	0960_OTH106_210624,	----	----	----	06-Jul-2021	24-Jun-2021	12
0960_MW141_7.0-7.5_210624,	0960_MW140_6.0-6.5_210624,						
0960_MW147_4.0-4.5_210624,	0960_MW181_5.5-6.0_210624,						
0960_MW180_1.0-1.5_210624							

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	1	19	5.26	10.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA005P: pH by PC Titrator								
Clear Plastic Bottle - Natural (EA005-P) 0960_OTH107_210624, 0960_MW141_7.0-7.5_210624, 0960_MW147_4.0-4.5_210624, 0960_MW180_1.0-1.5_210624	0960_OTH106_210624, 0960_MW140_6.0-6.5_210624, 0960_MW181_5.5-6.0_210624,	24-Jun-2021	----	----	----	06-Jul-2021	24-Jun-2021	✖
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Clear Plastic Bottle - Natural (EA015H) 0960_OTH107_210624, 0960_MW141_7.0-7.5_210624, 0960_MW147_4.0-4.5_210624, 0960_MW180_1.0-1.5_210624	0960_OTH106_210624, 0960_MW140_6.0-6.5_210624, 0960_MW181_5.5-6.0_210624,	24-Jun-2021	----	----	----	01-Jul-2021	01-Jul-2021	✔
EA025: Total Suspended Solids dried at 104 ± 2°C								
Clear Plastic Bottle - Natural (EA025H) 0960_OTH107_210624, 0960_MW141_7.0-7.5_210624, 0960_MW147_4.0-4.5_210624, 0960_MW180_1.0-1.5_210624	0960_OTH106_210624, 0960_MW140_6.0-6.5_210624, 0960_MW181_5.5-6.0_210624,	24-Jun-2021	----	----	----	01-Jul-2021	01-Jul-2021	✔
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P) 0960_OTH107_210624, 0960_MW141_7.0-7.5_210624, 0960_MW147_4.0-4.5_210624, 0960_MW180_1.0-1.5_210624	0960_OTH106_210624, 0960_MW140_6.0-6.5_210624, 0960_MW181_5.5-6.0_210624,	24-Jun-2021	----	----	----	06-Jul-2021	08-Jul-2021	✔
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G) 0960_OTH107_210624, 0960_MW141_7.0-7.5_210624, 0960_MW147_4.0-4.5_210624, 0960_MW180_1.0-1.5_210624	0960_OTH106_210624, 0960_MW140_6.0-6.5_210624, 0960_MW181_5.5-6.0_210624,	24-Jun-2021	----	----	----	07-Jul-2021	22-Jul-2021	✔
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G) 0960_OTH107_210624, 0960_MW141_7.0-7.5_210624, 0960_MW147_4.0-4.5_210624, 0960_MW180_1.0-1.5_210624	0960_OTH106_210624, 0960_MW140_6.0-6.5_210624, 0960_MW181_5.5-6.0_210624,	24-Jun-2021	----	----	----	07-Jul-2021	22-Jul-2021	✔
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F) 0960_OTH107_210624, 0960_MW141_7.0-7.5_210624, 0960_MW147_4.0-4.5_210624, 0960_MW180_1.0-1.5_210624	0960_OTH106_210624, 0960_MW140_6.0-6.5_210624, 0960_MW181_5.5-6.0_210624,	24-Jun-2021	----	----	----	01-Jul-2021	01-Jul-2021	✔



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis			
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002) 0960_OTH107_210624, 0960_MW141_7.0-7.5_210624, 0960_MW181_5.5-6.0_210624,	0960_OTH106_210624, 0960_MW147_4.0-4.5_210624, 0960_MW180_1.0-1.5_210624	24-Jun-2021	----	----	----	07-Jul-2021	22-Jul-2021	✓
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X) 0960_OTH107_210624, 0960_MW141_7.0-7.5_210624, 0960_MW147_4.0-4.5_210624, 0960_MW180_1.0-1.5_210624, 0960_QC302_210624, 0960_QC401_210624, 0960_QC403_210624	0960_OTH106_210624, 0960_MW140_6.0-6.5_210624, 0960_MW181_5.5-6.0_210624, 0960_QC301_210624, 0960_QC303_210624, 0960_QC402_210624,	24-Jun-2021	07-Jul-2021	21-Dec-2021	✓	07-Jul-2021	21-Dec-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X) 0960_OTH107_210624, 0960_MW141_7.0-7.5_210624, 0960_MW147_4.0-4.5_210624, 0960_MW180_1.0-1.5_210624, 0960_QC302_210624, 0960_QC401_210624, 0960_QC403_210624	0960_OTH106_210624, 0960_MW140_6.0-6.5_210624, 0960_MW181_5.5-6.0_210624, 0960_QC301_210624, 0960_QC303_210624, 0960_QC402_210624,	24-Jun-2021	07-Jul-2021	21-Dec-2021	✓	07-Jul-2021	21-Dec-2021	✓
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X) 0960_OTH107_210624, 0960_MW141_7.0-7.5_210624, 0960_MW147_4.0-4.5_210624, 0960_MW180_1.0-1.5_210624, 0960_QC302_210624, 0960_QC401_210624, 0960_QC403_210624	0960_OTH106_210624, 0960_MW140_6.0-6.5_210624, 0960_MW181_5.5-6.0_210624, 0960_QC301_210624, 0960_QC303_210624, 0960_QC402_210624,	24-Jun-2021	07-Jul-2021	21-Dec-2021	✓	07-Jul-2021	21-Dec-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X) 0960_OTH107_210624, 0960_MW141_7.0-7.5_210624, 0960_MW147_4.0-4.5_210624, 0960_MW180_1.0-1.5_210624, 0960_QC302_210624, 0960_QC401_210624, 0960_QC403_210624	0960_OTH106_210624, 0960_MW140_6.0-6.5_210624, 0960_MW181_5.5-6.0_210624, 0960_QC301_210624, 0960_QC303_210624, 0960_QC402_210624,	24-Jun-2021	07-Jul-2021	21-Dec-2021	✓	07-Jul-2021	21-Dec-2021	✓



Matrix: WATER

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X)	24-Jun-2021	07-Jul-2021	21-Dec-2021	✔	07-Jul-2021	21-Dec-2021	✔	
0960_OTH107_210624,								0960_OTH106_210624,
0960_MW141_7.0-7.5_210624,								0960_MW140_6.0-6.5_210624,
0960_MW147_4.0-4.5_210624,								0960_MW181_5.5-6.0_210624,
0960_MW180_1.0-1.5_210624,								0960_QC301_210624,
0960_QC302_210624,								0960_QC303_210624,
0960_QC401_210624,								0960_QC402_210624,
0960_QC403_210624								



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	4	35	11.43	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	5.26	10.00	✗	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	4	36	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	4	38	10.53	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	4	35	11.43	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	4	36	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	4	38	10.53	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	2	40	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	35	5.71	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	36	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	38	5.26	5.26	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	35	5.71	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of 'filterable' residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C. This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high temperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.



Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

**CHAIN OF CUSTODY**

COC#: 24573

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: MB DEF19009/Learmonth SW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS**ANALYSIS REQUIRED**

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Surface Waters Primary WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0960_SW208		24/06/2021 09:42 AM	Water	ALS: 5 Non ALS: 0	No	X		
002	0960_SW205		24/06/2021 10:23 AM	Water	ALS: 5 Non ALS: 0	No	X		
003	0960_SS301		24/06/2021 10:52 AM	Water	ALS: 5 Non ALS: 0	No	X		
004	0960_SW298		24/06/2021 11:38 AM	Water	ALS: 5 Non ALS: 0	No	X		
005	0960_SW207		24/06/2021 01:05 PM	Water	ALS: 5 Non ALS: 0	No	X		

**CHAIN OF CUSTODY**

COC#: 24573

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: MB DEF19009/Learmonth SW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

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EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

°C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0960_SW208	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003837	Purple	No	
001	0960_SW208	Clear Plastic Bottle - Natural	250 mL	00070220142302	Green	No	
001	0960_SW208	Clear Plastic Bottle - Natural	250 mL	00070220142812	Green	No	
001	0960_SW208	HDPE (no PTFE)	20 mL	00352010039922	Grey	No	
001	0960_SW208	HDPE (no PTFE)	20 mL	00352010039913	Grey	No	
002	0960_SW205	HDPE (no PTFE)	20 mL	00352005019308	Grey	No	
002	0960_SW205	HDPE (no PTFE)	20 mL	00352005019879	Grey	No	
002	0960_SW205	Clear Plastic Bottle - Natural	250 mL	00070220142733	Green	No	
002	0960_SW205	Clear Plastic Bottle - Natural	250 mL	00070220142768	Green	No	
002	0960_SW205	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003841	Purple	No	
003	0960_SS301	Clear Plastic Bottle - Natural	250 mL	00070220142746	Green	No	
003	0960_SS301	Clear Plastic Bottle - Natural	250 mL	00070220142819	Green	No	
003	0960_SS301	HDPE (no PTFE)	20 mL	00352010039966	Grey	No	
003	0960_SS301	HDPE (no PTFE)	20 mL	00352005019804	Grey	No	
003	0960_SS301	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003984	Purple	No	
004	0960_SW298	Clear Plastic Bottle - Natural	250 mL	00070220142784	Green	No	
004	0960_SW298	Clear Plastic Bottle - Natural	250 mL	00070220142301	Green	No	
004	0960_SW298	HDPE (no PTFE)	20 mL	00352005019787	Grey	No	
004	0960_SW298	HDPE (no PTFE)	20 mL	00352010039936	Grey	No	
004	0960_SW298	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003898	Purple	No	
005	0960_SW207	Clear Plastic Bottle - Natural	250 mL	00070220142506	Green	No	
005	0960_SW207	Clear Plastic Bottle - Natural	250 mL	00070220142540	Green	No	
005	0960_SW207	HDPE (no PTFE)	20 mL	00352005019782	Grey	No	
005	0960_SW207	HDPE (no PTFE)	20 mL	00352010040261	Grey	No	
005	0960_SW207	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003906	Purple	No	



CHAIN OF CUSTODY

COC#: 24573

ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFASOMP

SITE: MB DEF19009/Learmonth SW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

Total Bottle Count: ALS: 25, Non ALS: 0

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : EP2107278

<p>Client : CARDNO (WA) PTY LTD</p> <p>Contact : MAELLE BOURDAIS</p> <p>Address : 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006</p> <p>E-mail : maelle.bourdais@cardno.com.au</p> <p>Telephone : ----</p> <p>Facsimile : ----</p> <p>Project : WA_0960_PFASOMP</p> <p>Order number : DEF19009/0960</p> <p>C-O-C number : 24573</p> <p>Site : DEF19009/Learmonth</p> <p>Sampler : MAELLE BOURDAIS</p>	<p>Laboratory : Environmental Division Perth</p> <p>Contact : Nick Courts</p> <p>Address : 26 Rigali Way Wangara WA Australia 6065</p> <p>E-mail : nick.courts@alsglobal.com</p> <p>Telephone : +61-8-9406 1301</p> <p>Facsimile : +61-8-9406 1399</p> <p>Page : 1 of 3</p> <p>Quote number : ES2019CARBSD0002 (SY/139/19)</p> <p>QC Level : NEPM 2013 B3 & ALS QC Standard</p>
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Dates

Date Samples Received : 28-Jun-2021 13:25	Issue Date : 29-Jun-2021
Client Requested Due : 09-Jul-2021	Scheduled Reporting Date : 09-Jul-2021
Date	

Delivery Details

Mode of Delivery : Carrier	Security Seal : Not Available
No. of coolers/boxes : 3	Temperature : 15.8 - Ice present
Receipt Detail :	No. of samples received / analysed : 5 / 5

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepancies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.



Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2107278-001	24-Jun-2021 09:42	0960_SW208_210624	✓	✓	✓	✓	✓	✓	✓
EP2107278-002	24-Jun-2021 10:23	0960_SW205_210624	✓	✓	✓	✓	✓	✓	✓
EP2107278-003	24-Jun-2021 10:52	0960_SW301_210624	✓	✓	✓	✓	✓	✓	✓
EP2107278-004	24-Jun-2021 11:38	0960_SW298_210624	✓	✓	✓	✓	✓	✓	✓
EP2107278-005	24-Jun-2021 13:05	0960_SW207_210624	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2107278-001	24-Jun-2021 09:42	0960_SW208_210624	✓
EP2107278-002	24-Jun-2021 10:23	0960_SW205_210624	✓
EP2107278-003	24-Jun-2021 10:52	0960_SW301_210624	✓
EP2107278-004	24-Jun-2021 11:38	0960_SW298_210624	✓
EP2107278-005	24-Jun-2021 13:05	0960_SW207_210624	✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **WATER**

Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method	Container	Due for extraction	Due for analysis	Samples Received		Instructions Received	
				Date	Evaluation	Date	Evaluation
Client Sample ID(s)							
EA005-P: pH by PC Titrator							
0960_SW205_210624	Clear Plastic Bottle - Natural	----	24-Jun-2021	28-Jun-2021	✗	----	----
0960_SW207_210624	Clear Plastic Bottle - Natural	----	24-Jun-2021	28-Jun-2021	✗	----	----
0960_SW208_210624	Clear Plastic Bottle - Natural	----	24-Jun-2021	28-Jun-2021	✗	----	----
0960_SW298_210624	Clear Plastic Bottle - Natural	----	24-Jun-2021	28-Jun-2021	✗	----	----
0960_SW301_210624	Clear Plastic Bottle - Natural	----	24-Jun-2021	28-Jun-2021	✗	----	----

CERTIFICATE OF ANALYSIS

Work Order : **EP2107278**
Client : **CARDNO (WA) PTY LTD**
Contact : **MAELLE BOURDAIS**
Address : **11 HARVEST TERRACE PO BOX 155**
WEST PERTH WA, AUSTRALIA 6006
Telephone : **----**
Project : **WA_0960_PFASOMP**
Order number : **DEF19009/0960**
C-O-C number : **24573**
Sampler : **MAELLE BOURDAIS**
Site : **DEF19009/Learmonth**
Quote number : **SY/139/19**
No. of samples received : **5**
No. of samples analysed : **5**

Page : 1 of 6
Laboratory : Environmental Division Perth
Contact : Nick Courts
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 28-Jun-2021 13:25
Date Analysis Commenced : 01-Jul-2021
Issue Date : 09-Jul-2021 17:13



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

Ø = ALS is not NATA accredited for these tests.

~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- Ionic Balance out of acceptable limits for sample #3 due to analytes not quantified in this report. Major cations (ED093F) and major anions (ED041G/ED045G) have been confirmed by re-analysis.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: SURFACE WATER (Matrix: WATER)				Sample ID	0960_SW208_210624	0960_SW205_210624	0960_SW301_210624	0960_SW298_210624	0960_SW207_210624
Sampling date / time					24-Jun-2021 09:42	24-Jun-2021 10:23	24-Jun-2021 10:52	24-Jun-2021 11:38	24-Jun-2021 13:05
Compound	CAS Number	LOR	Unit		EP2107278-001	EP2107278-002	EP2107278-003	EP2107278-004	EP2107278-005
				Result	Result	Result	Result	Result	Result
EA005P: pH by PC Titrator									
pH Value	----	0.01	pH Unit		8.06	7.93	7.97	8.00	8.08
EA015: Total Dissolved Solids dried at 180 ± 5 °C									
Total Dissolved Solids @180°C	----	10	mg/L		43500	48800	51700	5740	47900
EA025: Total Suspended Solids dried at 104 ± 2°C									
Suspended Solids (SS)	----	5	mg/L		24	29	27	63	83
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L		124	206	186	96	134
Total Alkalinity as CaCO ₃	----	1	mg/L		124	206	186	96	134
ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA									
Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L		2590	2940	3280	466	3040
ED045G: Chloride by Discrete Analyser									
Chloride	16887-00-6	1	mg/L		19800	22200	23100	2700	21500
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		475	600	686	144	585
Magnesium	7439-95-4	1	mg/L		1530	1890	1950	185	1780
Sodium	7440-23-5	1	mg/L		12100	14600	15400	1570	14000
Potassium	7440-09-7	1	mg/L		631	771	807	98	718
EN055: Ionic Balance									
∅ Total Anions	----	0.01	meq/L		615	692	724	87.8	672
∅ Total Cations	----	0.01	meq/L		692	840	885	93.2	803
∅ Ionic Balance	----	0.01	%		5.90	9.71	10.0	3.00	8.85
EP002: Dissolved Organic Carbon (DOC)									
Dissolved Organic Carbon	----	1	mg/L		1	3	2	4	2
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L		<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: SURFACE WATER
 (Matrix: WATER)

Sample ID

				0960_SW208_210624	0960_SW205_210624	0960_SW301_210624	0960_SW298_210624	0960_SW207_210624
Sampling date / time				24-Jun-2021 09:42	24-Jun-2021 10:23	24-Jun-2021 10:52	24-Jun-2021 11:38	24-Jun-2021 13:05
Compound	CAS Number	LOR	Unit	EP2107278-001	EP2107278-002	EP2107278-003	EP2107278-004	EP2107278-005
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	<0.1	<0.1	<0.1
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02



Analytical Results

Sub-Matrix: SURFACE WATER
 (Matrix: WATER)

Sample ID

				0960_SW208_210624	0960_SW205_210624	0960_SW301_210624	0960_SW298_210624	0960_SW207_210624
Sampling date / time				24-Jun-2021 09:42	24-Jun-2021 10:23	24-Jun-2021 10:52	24-Jun-2021 11:38	24-Jun-2021 13:05
Compound	CAS Number	LOR	Unit	EP2107278-001	EP2107278-002	EP2107278-003	EP2107278-004	EP2107278-005
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	<0.02	<0.02	<0.02
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	<0.05	<0.05	<0.05
EP231P: PFAS Sums								
Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Sum of PFAS (WA DER List)	----	0.01	µg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.02	%	79.9	79.6	83.3	78.2	81.5
13C8-PFOA	----	0.02	%	87.0	85.9	83.5	86.8	86.1

Page : 6 of 6
Work Order : EP2107278
Client : CARDNO (WA) PTY LTD
Project : WA_0960_PFASOMP



Surrogate Control Limits

Sub-Matrix: SURFACE WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EP231A: Perfluoroalkyl Sulfonic Acids

(WATER) EP231B: Perfluoroalkyl Carboxylic Acids

(WATER) EP231C: Perfluoroalkyl Sulfonamides

(WATER) EP231D: (n:2) Fluorotelomer Sulfonic Acids

(WATER) EP231P: PFAS Sums

(WATER) EP231S: PFAS Surrogate

QUALITY CONTROL REPORT

Work Order	: EP2107278	Page	: 1 of 8
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 28-Jun-2021
Order number	: DEF19009/0960	Date Analysis Commenced	: 01-Jul-2021
C-O-C number	: 24573	Issue Date	: 09-Jul-2021
Sampler	: MAELLE BOURDAIS		
Site	: DEF19009/Learmonth		
Quote number	: SY/139/19		
No. of samples received	: 5		
No. of samples analysed	: 5		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
= Indicates failed QC

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA005P: pH by PC Titrator (QC Lot: 3776030)									
EP2107277-006	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.30	7.31	0.1	0% - 20%
EP2107363-001	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.66	7.66	0.0	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3767504)									
EP2107273-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	47400	46400	2.3	0% - 20%
EP2107276-003	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	52300	45200	14.4	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3767526)									
EP2107273-006	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	84300	85900	1.8	0% - 20%
EP2107276-007	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	63300	62600	1.1	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3767505)									
EP2107273-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	1140	1140	0.0	0% - 20%
EP2107277-002	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	110	123	10.5	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3767527)									
EP2107273-006	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	174	191	9.3	0% - 20%
EP2107277-005	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	82	99	18.8	0% - 50%
ED037P: Alkalinity by PC Titrator (QC Lot: 3776029)									
EP2107277-006	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	316	342	8.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	316	342	8.0	0% - 20%
EP2107363-001	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	182	178	2.2	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	182	178	2.2	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3764408)									



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3764408) - continued									
EP2107188-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	1240	1240	0.0	0% - 20%
EP2107270-006	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2260	2310	2.4	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3764409)									
EP2107188-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	8770	8780	0.2	0% - 20%
EP2107270-006	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	17900	18300	2.0	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3762892)									
EP2107276-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	111	113	1.3	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	169	169	0.0	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	2730	2730	0.0	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	112	113	0.0	0% - 20%
EP2107277-004	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	884	892	0.9	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	2810	2830	0.6	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	24200	24600	1.5	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	1090	1090	0.6	0% - 20%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3778896)									
EP2107277-002	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	1	2	0.0	No Limit
EP2107281-001	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	2	2	0.0	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3777900)									
EP2107277-001	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3777900)									
EP2107277-001	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3777900)									
EP2107277-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3777900) - continued									
EP2107277-001	Anonymous	EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3777900)									
EP2107277-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231P: PFAS Sums (QC Lot: 3777900)									
EP2107277-001	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.0	No Limit

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
	Spike Concentration	Spike Recovery (%)	Acceptable Limits (%)	
		LCS	Low	High
----	4 pH Unit	101	98.5	102
----	7 pH Unit	100	98.5	102
<10	246 mg/L	102	88.1	114
<10	1000 mg/L	101	88.1	114
<10	246 mg/L	99.6	88.1	114
<10	1000 mg/L	102	88.1	114
<5	95 mg/L	112	89.1	120
<5	1000 mg/L	99.0	89.1	120
<5	95 mg/L	98.9	89.1	120
<5	1000 mg/L	101	89.1	120
<1	----	----	----	----
<1	----	----	----	----
<1	----	----	----	----
<1	20 mg/L	107	81.2	126
<1	200 mg/L	101	90.0	110
<1	25 mg/L	108	87.7	113
<1	500 mg/L	105	87.7	113
<1	10 mg/L	104	87.9	114
<1	1000 mg/L	106	87.9	114
<1	50 mg/L	97.2	85.9	113
<1	50 mg/L	101	88.0	110
<1	50 mg/L	102	87.3	118
<1	50 mg/L	92.4	89.7	108



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3778896) - continued								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	103	73.2	116
				<1	100 mg/L	103	73.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3777900)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	75.2	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	80.4	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	78.0	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	82.8	69.0	134
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	87.0	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	126	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3777900)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	78.2	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	88.0	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	83.8	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	84.8	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	93.4	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	92.4	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	84.8	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	79.0	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	86.2	72.0	134
EP231X: Perfluorotridecanoic acid (PFTriDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	79.8	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	86.5	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3777900)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	92.0	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	84.5	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	79.0	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	89.3	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	80.1	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	86.0	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	90.0	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3777900)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	99.0	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	96.8	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	82.6	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	99.0	71.4	144



Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3764408)							
EP2107188-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3764409)							
EP2107188-001	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	# Not Determined	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3778896)							
EP2107277-003	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	105	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3777900)							
EP2107277-005	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	84.0	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	91.2	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	88.6	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	88.6	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	86.8	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	124	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3777900)							
EP2107277-005	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	78.9	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	94.2	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	87.0	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	91.2	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	92.8	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	97.2	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	91.8	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	82.2	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	89.8	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	85.8	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	90.4	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3777900)							
EP2107277-005	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	103	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	82.3	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	83.0	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	86.7	66.0	145

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 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3777900) - continued							
EP2107277-005	Anonymous	EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	85.4	57.6	145
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	94.2	65.0	136
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	90.0	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3777900)							
EP2107277-005	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	107	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	113	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	87.2	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	91.4	71.4	144

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2107278	Page	: 1 of 7
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 28-Jun-2021
Site	: DEF19009/Learmonth	Issue Date	: 09-Jul-2021
Sampler	: MAELLE BOURDAIS	No. of samples received	: 5
Order number	: DEF19009/0960	No. of samples analysed	: 5

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- Matrix Spike outliers exist - please see following pages for full details.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- Quality Control Sample Frequency Outliers exist - please see following pages for full details.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA	EP2107188--001	Anonymous	Sulfate as SO4 - Turbidimetric	14808-79-8	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
ED045G: Chloride by Discrete Analyser	EP2107188--001	Anonymous	Chloride	16887-00-6	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

Method		Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural							
0960_SW208_210624,	0960_SW205_210624,	----	----	----	06-Jul-2021	24-Jun-2021	12
0960_SW301_210624,	0960_SW298_210624,						
0960_SW207_210624							

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	1	19	5.26	10.00	NEPM 2013 B3 & ALS QC Standard

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator								
Clear Plastic Bottle - Natural (EA005-P)								
0960_SW208_210624,	0960_SW205_210624,	24-Jun-2021	----	----	----	06-Jul-2021	24-Jun-2021	✖
0960_SW301_210624,	0960_SW298_210624,							
0960_SW207_210624								
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Clear Plastic Bottle - Natural (EA015H)								
0960_SW208_210624,	0960_SW205_210624,	24-Jun-2021	----	----	----	01-Jul-2021	01-Jul-2021	✔
0960_SW301_210624,	0960_SW298_210624,							
0960_SW207_210624								
EA025: Total Suspended Solids dried at 104 ± 2°C								
Clear Plastic Bottle - Natural (EA025H)								
0960_SW208_210624,	0960_SW205_210624,	24-Jun-2021	----	----	----	01-Jul-2021	01-Jul-2021	✔
0960_SW301_210624,	0960_SW298_210624,							
0960_SW207_210624								
ED037P: Alkalinity by PC Titrator								
Clear Plastic Bottle - Natural (ED037-P)								
0960_SW208_210624,	0960_SW205_210624,	24-Jun-2021	----	----	----	06-Jul-2021	08-Jul-2021	✔
0960_SW301_210624,	0960_SW298_210624,							
0960_SW207_210624								
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Clear Plastic Bottle - Natural (ED041G)								
0960_SW208_210624,	0960_SW205_210624,	24-Jun-2021	----	----	----	08-Jul-2021	22-Jul-2021	✔
0960_SW301_210624,	0960_SW298_210624,							
0960_SW207_210624								
ED045G: Chloride by Discrete Analyser								
Clear Plastic Bottle - Natural (ED045G)								
0960_SW208_210624,	0960_SW205_210624,	24-Jun-2021	----	----	----	08-Jul-2021	22-Jul-2021	✔
0960_SW301_210624,	0960_SW298_210624,							
0960_SW207_210624								
ED093F: Dissolved Major Cations								
Clear Plastic Bottle - Natural (ED093F)								
0960_SW208_210624,	0960_SW205_210624,	24-Jun-2021	----	----	----	01-Jul-2021	01-Jul-2021	✔
0960_SW301_210624,	0960_SW298_210624,							
0960_SW207_210624								
EP002: Dissolved Organic Carbon (DOC)								
Amber DOC Filtered- Sulfuric Preserved (EP002)								
0960_SW208_210624,	0960_SW205_210624,	24-Jun-2021	----	----	----	07-Jul-2021	22-Jul-2021	✔
0960_SW301_210624,	0960_SW298_210624,							
0960_SW207_210624								

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 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE (no PTFE) (EP231X) 0960_SW208_210624, 0960_SW301_210624, 0960_SW207_210624	0960_SW205_210624, 0960_SW298_210624,	24-Jun-2021	07-Jul-2021	21-Dec-2021	✔	07-Jul-2021	21-Dec-2021	✔
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X) 0960_SW208_210624, 0960_SW301_210624, 0960_SW207_210624	0960_SW205_210624, 0960_SW298_210624,	24-Jun-2021	07-Jul-2021	21-Dec-2021	✔	07-Jul-2021	21-Dec-2021	✔
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X) 0960_SW208_210624, 0960_SW301_210624, 0960_SW207_210624	0960_SW205_210624, 0960_SW298_210624,	24-Jun-2021	07-Jul-2021	21-Dec-2021	✔	07-Jul-2021	21-Dec-2021	✔
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X) 0960_SW208_210624, 0960_SW301_210624, 0960_SW207_210624	0960_SW205_210624, 0960_SW298_210624,	24-Jun-2021	07-Jul-2021	21-Dec-2021	✔	07-Jul-2021	21-Dec-2021	✔
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X) 0960_SW208_210624, 0960_SW301_210624, 0960_SW207_210624	0960_SW205_210624, 0960_SW298_210624,	24-Jun-2021	07-Jul-2021	21-Dec-2021	✔	07-Jul-2021	21-Dec-2021	✔



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	15	13.33	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	5.26	10.00	✗	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	4	36	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	4	38	10.53	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	15	13.33	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	4	36	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	4	38	10.53	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	15	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	36	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	38	5.26	5.26	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	15	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of 'filterable' residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high temperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.



Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.



CHAIN OF CUSTODY

COC#: 24574 ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFASOMP

SITE: MB DEF19009/Learmonth SED

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Sediments SEDIMENT	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0960_SD208		24/06/2021 09:46 AM	Soil	ALS: 2 Non ALS: 0	No	X		
002	0960_SD205		24/06/2021 10:22 AM	Soil	ALS: 2 Non ALS: 0	No	X		
003	0960_SS301		24/06/2021 10:51 AM	Soil	ALS: 2 Non ALS: 0	No	X		
004	0960_SS298		24/06/2021 11:39 AM	Soil	ALS: 2 Non ALS: 0	No	X		
005	0960_SD207		24/06/2021 01:06 PM	Soil	ALS: 2 Non ALS: 0	No	X		

**CHAIN OF CUSTODY**

COC#: 24574 ALS Laboratory: EP Perth

RELINQUISHED BY:

RECEIVED BY:

RELINQUISHED BY:

RECEIVED BY:

DATE TIME:

DATE TIME:

DATE TIME:

DATE TIME:

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: MB DEF19009/Learmonth SED

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0960_SD208	Soil Glass Jar - Unpreserved	150 mL	00260321005792	Orange	No	
001	0960_SD208	HDPE Soil Jar	200 mL	00620719063092	Grey	No	
002	0960_SD205	Soil Glass Jar - Unpreserved	150 mL	00260321005706	Orange	No	
002	0960_SD205	HDPE Soil Jar	200 mL	00620719063207	Grey	No	
003	0960_SS301	HDPE Soil Jar	200 mL	00620719063134	Grey	No	
003	0960_SS301	Soil Glass Jar - Unpreserved	150 mL	00260321005757	Orange	No	
004	0960_SS298	HDPE Soil Jar	200 mL	00620719063131	Grey	No	
004	0960_SS298	Soil Glass Jar - Unpreserved	150 mL	00260321005711	Orange	No	
005	0960_SD207	Soil Glass Jar - Unpreserved	150 mL	00260321005702	Orange	No	
005	0960_SD207	HDPE Soil Jar	200 mL	00620719063164	Grey	No	

Total Bottle Count: ALS: 10, Non ALS: 0

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : EP2107279

<p>Client : CARDNO (WA) PTY LTD</p> <p>Contact : MAELLE BOURDAIS</p> <p>Address : 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006</p> <p>E-mail : maelle.bourdais@cardno.com.au</p> <p>Telephone : ----</p> <p>Facsimile : ----</p> <p>Project : WA_0960_PFASOMP</p> <p>Order number : DEF19009/0960</p> <p>C-O-C number : 24574</p> <p>Site : DEF19009/Learmonth</p> <p>Sampler : MAELLE BOURDAIS</p>	<p>Laboratory : Environmental Division Perth</p> <p>Contact : Nick Courts</p> <p>Address : 26 Rigali Way Wangara WA Australia 6065</p> <p>E-mail : nick.courts@alsglobal.com</p> <p>Telephone : +61-8-9406 1301</p> <p>Facsimile : +61-8-9406 1399</p> <p>Page : 1 of 2</p> <p>Quote number : ES2019CARBSD0002 (SY/139/19)</p> <p>QC Level : NEPM 2013 B3 & ALS QC Standard</p>
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Dates

Date Samples Received : 28-Jun-2021 13:25	Issue Date : 28-Jun-2021
Client Requested Due : 09-Jul-2021	Scheduled Reporting Date : 09-Jul-2021
Date	

Delivery Details

Mode of Delivery : Carrier	Security Seal : Not Available
No. of coolers/boxes : 3	Temperature : 15.8 - Ice present
Receipt Detail :	No. of samples received / analysed : 5 / 5

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepancies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- ### Summary of Sample(s) and Requested Analysis

Laboratory sample ID	Sampling date / time	Sample ID
-------------------------	-------------------------	-----------

EP2107279-001	24-Jun-2021 09:46	0960_SD208_210624	✓	✓	✓	✓
EP2107279-002	24-Jun-2021 10:22	0960_SD205_210624	✓	✓	✓	✓
EP2107279-003	24-Jun-2021 10:51	0960_SS301_210624	✓	✓	✓	✓
EP2107279-004	24-Jun-2021 11:39	0960_SS298_210624	✓	✓	✓	✓
EP2107279-005	24-Jun-2021 13:06	0960_SD207_210624	✓	✓	✓	✓

Sample(s) have been received within the recommended holding times for the requested analysis.

Email claire.armstrong@cardno.com.au

Email derp.labreports@esdat.com.au

Email laura.beames@cardno.com.au

Email maelle.bourdais@cardno.com.au

Email maelle.bourdais@cardno.com.au

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Email maelle.bourdais@cardno.com.au

Email maelle.bourdais@cardno.com.au

Email maelle.bourdais@cardno.com.au

Email maelle.bourdais@cardno.com.au

CERTIFICATE OF ANALYSIS

Work Order : **EP2107279**
Client : **CARDNO (WA) PTY LTD**
Contact : **MAELLE BOURDAIS**
Address : **11 HARVEST TERRACE PO BOX 155**
WEST PERTH WA, AUSTRALIA 6006
Telephone : **----**
Project : **WA_0960_PFASOMP**
Order number : **DEF19009/0960**
C-O-C number : **24574**
Sampler : **MAELLE BOURDAIS**
Site : **DEF19009/Learmonth**
Quote number : **SY/139/19**
No. of samples received : **5**
No. of samples analysed : **5**

Page : 1 of 6
Laboratory : Environmental Division Perth
Contact : Nick Courts
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 28-Jun-2021 13:25
Date Analysis Commenced : 02-Jul-2021
Issue Date : 08-Jul-2021 12:15



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H⁺ + Al³⁺).
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SD208_210624	0960_SD205_210624	0960_SS301_210624	0960_SS298_210624	0960_SD207_210624
Sampling date / time					24-Jun-2021 09:46	24-Jun-2021 10:22	24-Jun-2021 10:51	24-Jun-2021 11:39	24-Jun-2021 13:06
Compound	CAS Number	LOR	Unit		EP2107279-001	EP2107279-002	EP2107279-003	EP2107279-004	EP2107279-005
				Result	Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit		9.2	8.6	8.6	9.3	8.8
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm		2080	12600	2590	567	9470
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%		21.7	16.1	27.9	18.8	24.6
ED008: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g		7.2	47.4	29.6	18.6	18.8
Exchangeable Magnesium	----	0.1	meq/100g		0.9	6.4	8.8	3.0	6.2
Exchangeable Potassium	----	0.1	meq/100g		<0.1	0.3	0.7	0.4	0.8
Exchangeable Sodium	----	0.1	meq/100g		0.2	0.3	0.6	0.1	0.5
Cation Exchange Capacity	----	0.1	meq/100g		8.5	54.4	39.7	22.1	26.2
Exchangeable Sodium Percent	----	0.1	%		2.8	0.5	1.6	0.5	1.8
EP004: Organic Matter									
Organic Matter	----	0.5	%		1.9	1.7	3.6	1.0	2.0
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg		<0.001	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				0960_SD208_210624	0960_SD205_210624	0960_SS301_210624	0960_SS298_210624	0960_SD207_210624
Sampling date / time				24-Jun-2021 09:46	24-Jun-2021 10:22	24-Jun-2021 10:51	24-Jun-2021 11:39	24-Jun-2021 13:06
Compound	CAS Number	LOR	Unit	EP2107279-001	EP2107279-002	EP2107279-003	EP2107279-004	EP2107279-005
				Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids - Continued								
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002



Analytical Results

Sub-Matrix: **SEDIMENT**
 (Matrix: **SOIL**)

Sample ID

				0960_SD208_210624	0960_SD205_210624	0960_SS301_210624	0960_SS298_210624	0960_SD207_210624
Sampling date / time				24-Jun-2021 09:46	24-Jun-2021 10:22	24-Jun-2021 10:51	24-Jun-2021 11:39	24-Jun-2021 13:06
Compound	CAS Number	LOR	Unit	EP2107279-001	EP2107279-002	EP2107279-003	EP2107279-004	EP2107279-005
				Result	Result	Result	Result	Result
EP231P: PFAS Sums - Continued								
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	93.0	92.5	93.0	96.0	98.0
13C8-PFOA	----	0.0002	%	94.0	100	93.5	98.5	93.5

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Work Order : EP2107279
Client : CARDNO (WA) PTY LTD
Project : WA_0960_PFASOMP



Surrogate Control Limits

Sub-Matrix: SEDIMENT		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(SOIL) EP231B: Perfluoroalkyl Carboxylic Acids

(SOIL) EP231D: (n:2) Fluorotelomer Sulfonic Acids

(SOIL) EP231C: Perfluoroalkyl Sulfonamides

(SOIL) EP231A: Perfluoroalkyl Sulfonic Acids

(SOIL) EP231P: PFAS Sums

(SOIL) EP231S: PFAS Surrogate

QUALITY CONTROL REPORT

Work Order	: EP2107279	Page	: 1 of 8
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 28-Jun-2021
Order number	: DEF19009/0960	Date Analysis Commenced	: 02-Jul-2021
C-O-C number	: 24574	Issue Date	: 08-Jul-2021
Sampler	: MAELLE BOURDAIS		
Site	: DEF19009/Learmonth		
Quote number	: SY/139/19		
No. of samples received	: 5		
No. of samples analysed	: 5		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key :
 Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
 CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
 LOR = Limit of reporting
 RPD = Relative Percentage Difference
 # = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA002: pH 1:5 (Soils) (QC Lot: 3768711)									
EP2107279-001	0960_SD208_210624	EA002: pH Value	----	0.1	pH Unit	9.2	9.2	0.0	0% - 20%
EA010: Conductivity (1:5) (QC Lot: 3768710)									
EP2107279-001	0960_SD208_210624	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	2080	2090	0.2	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3770475)									
EP2107271-001	Anonymous	EA055: Moisture Content	----	0.1	%	30.4	30.7	1.0	0% - 20%
EP2107271-012	Anonymous	EA055: Moisture Content	----	0.1	%	26.7	27.5	2.9	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3770476)									
EP2107279-005	0960_SD207_210624	EA055: Moisture Content	----	0.1	%	24.6	24.5	0.0	0% - 20%
ED008: Exchangeable Cations (QC Lot: 3774236)									
EP2107275-002	Anonymous	ED008: Exchangeable Sodium Percent	----	0.1	%	0.5	0.5	0.0	No Limit
		ED008: Exchangeable Calcium	----	0.1	meq/100g	16.9	16.4	3.2	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	2.2	2.1	6.4	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	<0.1	<0.1	0.0	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	<0.1	<0.1	0.0	No Limit
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	19.3	18.7	3.5	0% - 20%
ED008: Exchangeable Cations (QC Lot: 3774498)									
EP2107271-011	Anonymous	ED008: Exchangeable Sodium Percent	----	0.1	%	0.7	<0.1	153	No Limit
		ED008: Exchangeable Calcium	----	0.1	meq/100g	13.0	12.9	1.3	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	1.4	1.4	0.0	0% - 50%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	<0.1	<0.1	0.0	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	0.1	<0.1	0.0	No Limit
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	14.7	14.4	1.9	0% - 20%
EP004: Organic Matter (QC Lot: 3770465)									
EP2107271-001	Anonymous	EP004: Organic Matter	----	0.5	%	1.6	1.6	0.0	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP004: Organic Matter (QC Lot: 3770465) - continued									
EP2107275-001	Anonymous	EP004: Organic Matter	----	0.5	%	1.0	1.0	0.0	No Limit
EP004: Organic Matter (QC Lot: 3770466)									
EP2107279-005	0960_SD207_210624	EP004: Organic Matter	----	0.5	%	2.0	2.0	0.0	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3776841)									
EP2107275-002	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EP2107280-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0152	0.0157	2.7	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3776841)									
EP2107275-002	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.0	No Limit
		EP2107280-001	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4			0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9			0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1			0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EP231X: Perfluorononanoic acid (PFNA)	375-95-1			0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2			0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8			0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1			0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EP231X: Perfluorotridecanoic acid (PFTTrDA)	72629-94-8			0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7			0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4			0.001	mg/kg	<0.001	<0.001	0.0	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3776841)									
EP2107275-002	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP2107280-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3776841)									
EP2107275-002	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP2107280-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3776841) - continued									
EP2107280-001	Anonymous	EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit



Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

Sub-Matrix: SOIL				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EA002: pH 1:5 (Soils) (QCLot: 3768711)								
EA002: pH Value	----	----	pH Unit	----	4 pH Unit	100	70.0	130
				----	7 pH Unit	100	70.0	130
EA010: Conductivity (1:5) (QCLot: 3768710)								
EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	<1	1412 µS/cm	100	93.6	106
ED008: Exchangeable Cations (QCLot: 3774236)								
ED008: Exchangeable Calcium	----	0.1	meq/100g	<0.1	22.1 meq/100g	93.2	78.7	111
ED008: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.56 meq/100g	88.3	77.6	111
ED008: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.91 meq/100g	100.0	86.9	116
ED008: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.38 meq/100g	101	72.3	129
ED008: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
ED008: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	24.95 meq/100g	93.3	79.9	110
ED008: Exchangeable Cations (QCLot: 3774498)								
ED008: Exchangeable Calcium	----	0.1	meq/100g	<0.1	22.1 meq/100g	93.4	78.7	111
ED008: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.56 meq/100g	90.6	77.6	111
ED008: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.91 meq/100g	95.3	86.9	116
ED008: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.38 meq/100g	88.9	72.3	129
ED008: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
ED008: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	24.95 meq/100g	93.2	79.9	110
EP004: Organic Matter (QCLot: 3770465)								
EP004: Organic Matter	----	0.5	%	<0.5	2.3 %	102	70.0	120
				<0.5	85 %	88.5	70.0	120
EP004: Organic Matter (QCLot: 3770466)								
EP004: Organic Matter	----	0.5	%	<0.5	2.3 %	102	70.0	120
				<0.5	85 %	88.5	70.0	120
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3776841)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.0	72.0	128
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	81.6	73.0	123
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	79.6	67.0	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	80.8	70.0	132
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.8	68.0	136
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.0	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3776841)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	82.8	71.0	135
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.4	69.0	132



Sub-Matrix: **SOIL**

Sub-Matrix: SOIL				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3776841) - continued								
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	80.4	70.0	132
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	76.8	71.0	131
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	88.8	69.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	81.6	72.0	129
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	77.6	69.0	133
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	78.4	64.0	136
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	86.4	69.0	135
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	87.6	66.0	139
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	79.8	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3776841)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.4	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	88.8	71.6	129
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	80.6	69.8	131
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	77.2	68.7	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	77.4	65.1	134
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	86.4	63.0	144
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	86.8	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3776841)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	93.6	62.0	145
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	95.6	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	85.2	65.0	137
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	82.0	69.2	143

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	Spike Recovery (%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3776841)							
EP2107275-002	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	76.0	72.0	128
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	80.0	73.0	123
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	80.0	67.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	86.4	70.0	132



Sub-Matrix: SOIL

Sub-Matrix: SOIL				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3776841) - continued							
EP2107275-002	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	74.0	68.0	136
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	87.6	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3776841)							
EP2107275-002	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	87.2	71.0	135
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	76.8	69.0	132
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	82.8	70.0	132
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	76.4	71.0	131
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	87.6	69.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	82.0	72.0	129
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	80.0	69.0	133
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	76.8	64.0	136
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	90.4	69.0	135
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	90.4	66.0	139
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	80.4	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3776841)							
EP2107275-002	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	84.4	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	88.3	71.6	129
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	77.7	69.8	131
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	78.2	68.7	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	80.8	65.1	134
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	84.0	63.0	144
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	86.4	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3776841)							
EP2107275-002	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	98.4	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	106	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	93.2	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	84.4	69.2	143

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2107279	Page	: 1 of 5
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 28-Jun-2021
Site	: DEF19009/Learmonth	Issue Date	: 08-Jul-2021
Sampler	: MAELLE BOURDAIS	No. of samples received	: 5
Order number	: DEF19009/0960	No. of samples analysed	: 5

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- **NO** Matrix Spike outliers occur.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- **NO** Quality Control Sample Frequency Outliers exist.



Outliers : Analysis Holding Time Compliance

Matrix: **SOIL**

Method	Extraction / Preparation			Analysis		
	Container / Client Sample ID(s)	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis
EA002: pH 1:5 (Soils)						
Soil Glass Jar - Unpreserved						
0960_SD208_210624, 0960_SS301_210624, 0960_SD207_210624	0960_SD205_210624, 0960_SS298_210624,	02-Jul-2021	01-Jul-2021	1	----	----
EA010: Conductivity (1:5)						
Soil Glass Jar - Unpreserved						
0960_SD208_210624, 0960_SS301_210624, 0960_SD207_210624	0960_SD205_210624, 0960_SS298_210624,	02-Jul-2021	01-Jul-2021	1	----	----

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for **VOC in soils** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA002: pH 1:5 (Soils)								
Soil Glass Jar - Unpreserved (EA002)								
0960_SD208_210624, 0960_SS301_210624, 0960_SD207_210624	0960_SD205_210624, 0960_SS298_210624,	24-Jun-2021	02-Jul-2021	01-Jul-2021	✖	02-Jul-2021	02-Jul-2021	✔
EA010: Conductivity (1:5)								
Soil Glass Jar - Unpreserved (EA010)								
0960_SD208_210624, 0960_SS301_210624, 0960_SD207_210624	0960_SD205_210624, 0960_SS298_210624,	24-Jun-2021	02-Jul-2021	01-Jul-2021	✖	02-Jul-2021	30-Jul-2021	✔
EA055: Moisture Content (Dried @ 105-110°C)								
Soil Glass Jar - Unpreserved (EA055)								
0960_SD208_210624, 0960_SS301_210624, 0960_SD207_210624	0960_SD205_210624, 0960_SS298_210624,	24-Jun-2021	----	----	----	02-Jul-2021	08-Jul-2021	✔



Matrix: **SOIL**

Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
ED008: Exchangeable Cations								
Soil Glass Jar - Unpreserved (ED008)								
0960_SD208_210624, 0960_SS298_210624,	0960_SD205_210624, 0960_SD207_210624	24-Jun-2021	05-Jul-2021	22-Jul-2021	✓	05-Jul-2021	22-Jul-2021	✓
Soil Glass Jar - Unpreserved (ED008)								
0960_SS301_210624		24-Jun-2021	06-Jul-2021	22-Jul-2021	✓	06-Jul-2021	22-Jul-2021	✓
EP004: Organic Matter								
Soil Glass Jar - Unpreserved (EP004)								
0960_SD208_210624, 0960_SS301_210624, 0960_SD207_210624	0960_SD205_210624, 0960_SS298_210624,	24-Jun-2021	07-Jul-2021	22-Jul-2021	✓	07-Jul-2021	22-Jul-2021	✓
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE Soil Jar (EP231X)								
0960_SD208_210624, 0960_SS301_210624, 0960_SD207_210624	0960_SD205_210624, 0960_SS298_210624,	24-Jun-2021	07-Jul-2021	21-Dec-2021	✓	07-Jul-2021	16-Aug-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE Soil Jar (EP231X)								
0960_SD208_210624, 0960_SS301_210624, 0960_SD207_210624	0960_SD205_210624, 0960_SS298_210624,	24-Jun-2021	07-Jul-2021	21-Dec-2021	✓	07-Jul-2021	16-Aug-2021	✓
EP231C: Perfluoroalkyl Sulfonamides								
HDPE Soil Jar (EP231X)								
0960_SD208_210624, 0960_SS301_210624, 0960_SD207_210624	0960_SD205_210624, 0960_SS298_210624,	24-Jun-2021	07-Jul-2021	21-Dec-2021	✓	07-Jul-2021	16-Aug-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE Soil Jar (EP231X)								
0960_SD208_210624, 0960_SS301_210624, 0960_SD207_210624	0960_SD205_210624, 0960_SS298_210624,	24-Jun-2021	07-Jul-2021	21-Dec-2021	✓	07-Jul-2021	16-Aug-2021	✓
EP231P: PFAS Sums								
HDPE Soil Jar (EP231X)								
0960_SD208_210624, 0960_SS301_210624, 0960_SD207_210624	0960_SD205_210624, 0960_SS298_210624,	24-Jun-2021	07-Jul-2021	21-Dec-2021	✓	07-Jul-2021	16-Aug-2021	✓



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)		Quality Control Specification	
Analytical Methods	Method	QC	Regular	Actual	Expected		Evaluation
Laboratory Duplicates (DUP)							
Electrical Conductivity (1:5)	EA010	1	8	12.50	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	2	13	15.38	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	3	22	13.64	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	3	22	13.64	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	20	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	1	8	12.50	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Electrical Conductivity (1:5)	EA010	1	8	12.50	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	2	13	15.38	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	4	22	18.18	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	8	25.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Electrical Conductivity (1:5)	EA010	1	8	12.50	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	2	13	15.38	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	22	9.09	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	In house: Referenced to Rayment and Lyons 4A1 and APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Electrical Conductivity (1:5)	EA010	SOIL	In house: Referenced to Rayment and Lyons 3A1 and APHA 2510. Conductivity is determined on soil samples using a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Exchangeable Cations with pre-treatment	ED008	SOIL	In house: Referenced to Rayment & Lyons Method 15A2. Soluble salts are removed from the sample prior to analysis. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM Schedule B(3).
Organic Matter	EP004	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3)
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	SOIL	In-house: Analysis of soils by solvent extraction followed by LC-Electrospray-MS-MS, Negative Mode using MRM using internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
Preparation Methods	Method	Matrix	Method Descriptions
Exchangeable Cations Preparation Method	ED007PR	SOIL	In house: Referenced to Rayment & Lyons method 15A1. A 1M NH4Cl extraction by end over end tumbling at a ratio of 1:20. There is no pretreatment for soluble salts. Extracts can be run by ICP for cations.
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
Organic Matter	EP004-PR	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3).
QuEChERS Extraction of Solids	ORG71	SOIL	In house: Sequential extractions with Acetonitrile/Methanol by shaking. Extraction efficiency aided by the addition of salts under acidic conditions. Where relevant, interferences from co-extracted organics are removed with dispersive clean-up media (dSPE). The extract is either diluted or concentrated and exchanged into the analytical solvent.

**CHAIN OF CUSTODY**

ALS COC#: 24575 ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: ah DEF19009/Learmonth SED

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS**ANALYSIS REQUIRED**

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Sediments SEDIMENT	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0960_SS125		24/06/2021 10:05 AM	Soil	ALS: 1 Non ALS: 0	No	Partial 1/4		
002	0960_SS114		24/06/2021 10:05 AM	Soil	ALS: 2 Non ALS: 0	No	X		
003	0960_SD200		24/06/2021 10:29 AM	Soil	ALS: 1 Non ALS: 0	No	Partial 1/4		
004	0960_SD199		24/06/2021 11:19 AM	Soil	ALS: 1 Non ALS: 0	No	Partial 1/4		
005	0960_SS108		24/06/2021 12:15 PM	Soil	ALS: 1 Non ALS: 0	No	Partial 1/4		
006	0960_SS227		24/06/2021 12:17 PM	Soil	ALS: 1 Non ALS: 0	No	Partial 1/4		
007	0960_SS291		24/06/2021 12:41 PM	Soil	ALS: 1 Non ALS: 0	No	Partial 1/4		
008	0960_SS292		24/06/2021 01:03 PM	Soil	ALS: 1 Non ALS: 0	No	Partial 1/4		
009	0960_SS198		24/06/2021 01:09 PM	Soil	ALS: 1 Non ALS: 0	No	Partial 1/4		

**CHAIN OF CUSTODY**

COC#: 24575

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: ah DEF19009/Learmonth SED

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

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RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE	SAMPLE NAME	PARTIAL ANALYSIS GROUP NAME	MATRIX	SELECTED ANALYSIS NAME
001	0960_SS125	Sediments SEDIMENT	Soil	- EP231X (solids) PFAS - Full Suite (28 analytes)
003	0960_SD200	Sediments SEDIMENT	Soil	- EP231X (solids) PFAS - Full Suite (28 analytes)
004	0960_SD199	Sediments SEDIMENT	Soil	- EP231X (solids) PFAS - Full Suite (28 analytes)
005	0960_SS108	Sediments SEDIMENT	Soil	- EP231X (solids) PFAS - Full Suite (28 analytes)
006	0960_SS227	Sediments SEDIMENT	Soil	- EP231X (solids) PFAS - Full Suite (28 analytes)
007	0960_SS291	Sediments SEDIMENT	Soil	- EP231X (solids) PFAS - Full Suite (28 analytes)
008	0960_SS292	Sediments SEDIMENT	Soil	- EP231X (solids) PFAS - Full Suite (28 analytes)
009	0960_SS198	Sediments SEDIMENT	Soil	- EP231X (solids) PFAS - Full Suite (28 analytes)

**CHAIN OF CUSTODY****ALS** COC#: 24575

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: ah DEF19009/Learmonth SED

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

°C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0960_SS125	HDPE Soil Jar	200 mL	00620719063155	Grey	No	
002	0960_SS114	HDPE Soil Jar	200 mL	00620719063104	Grey	No	
002	0960_SS114	Soil Glass Jar - Unpreserved	150 mL	00260321005870	Orange	No	
003	0960_SD200	HDPE Soil Jar	200 mL	00620719063186	Grey	No	
004	0960_SD199	HDPE Soil Jar	200 mL	00620719063077	Grey	No	
005	0960_SS108	HDPE Soil Jar	200 mL	00620719063202	Grey	No	
006	0960_SS227	HDPE Soil Jar	200 mL	00620719063147	Grey	No	
007	0960_SS291	HDPE Soil Jar	200 mL	00620719063184	Grey	No	
008	0960_SS292	HDPE Soil Jar	200 mL	00620719063208	Grey	No	
009	0960_SS198	HDPE Soil Jar	200 mL	00620719063093	Grey	No	

Total Bottle Count: ALS: 10, Non ALS: 0

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : EP2107280

<p>Client : CARDNO (WA) PTY LTD</p> <p>Contact : MAELLE BOURDAIS</p> <p>Address : 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006</p> <p>E-mail : maelle.bourdais@cardno.com.au</p> <p>Telephone : ----</p> <p>Facsimile : ----</p> <p>Project : WA_0960_PFASOMP</p> <p>Order number : DEF19009/0960</p> <p>C-O-C number : 24575</p> <p>Site : DEF19009/Learmonth</p> <p>Sampler : ASHLEY BROWN, MAELLE BOURDAIS</p>	<p>Laboratory : Environmental Division Perth</p> <p>Contact : Nick Courts</p> <p>Address : 26 Rigali Way Wangara WA Australia 6065</p> <p>E-mail : nick.courts@alsglobal.com</p> <p>Telephone : +61-8-9406 1301</p> <p>Facsimile : +61-8-9406 1399</p> <p>Page : 1 of 2</p> <p>Quote number : ES2019CARBSD0002 (SY/139/19)</p> <p>QC Level : NEPM 2013 B3 & ALS QC Standard</p>
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Dates

Date Samples Received : 28-Jun-2021 13:25	Issue Date : 28-Jun-2021
Client Requested Due : 09-Jul-2021	Scheduled Reporting Date : 09-Jul-2021
Date	

Delivery Details

Mode of Delivery : Carrier	Security Seal : Not Available
No. of coolers/boxes : 3	Temperature : 15.8 - Ice present
Receipt Detail :	No. of samples received / analysed : 9 / 9

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepancies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- ### Summary of Sample(s) and Requested Analysis

Matrix: **SOIL**

Laboratory sample ID	Sampling date / time	Sample ID	SOIL - A - Agriculture	SOIL - E - Moisture	SOIL - E - Organic	SOIL - E - PFAS -
EP2107280-001	24-Jun-2021 10:05	0960_SS125_210624		✓		✓
EP2107280-002	24-Jun-2021 10:05	0960_SS114_210624	✓	✓	✓	✓
EP2107280-003	24-Jun-2021 10:29	0960_SD200_210624		✓		✓
EP2107280-004	24-Jun-2021 11:19	0960_SD199_210624		✓		✓
EP2107280-005	24-Jun-2021 12:15	0960_SS108_210624		✓		✓
EP2107280-006	24-Jun-2021 12:17	0960_SS227_210624		✓		✓
EP2107280-007	24-Jun-2021 12:41	0960_SS291_210624		✓		✓
EP2107280-008	24-Jun-2021 13:03	0960_SS292_210624		✓		✓
EP2107280-009	24-Jun-2021 13:09	0960_SS198_210624		✓		✓

[illegible]

CERTIFICATE OF ANALYSIS

Work Order : **EP2107280**
Client : **CARDNO (WA) PTY LTD**
Contact : **MAELLE BOURDAIS**
Address : **11 HARVEST TERRACE PO BOX 155**
WEST PERTH WA, AUSTRALIA 6006
Telephone : **----**
Project : **WA_0960_PFASOMP**
Order number : **DEF19009/0960**
C-O-C number : **24575**
Sampler : **ASHLEY BROWN, MAELLE BOURDAIS**
Site : **DEF19009/Learmonth**
Quote number : **SY/139/19**
No. of samples received : **9**
No. of samples analysed : **9**

Page : 1 of 8
Laboratory : Environmental Division Perth
Contact : Nick Courts
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 28-Jun-2021 13:25
Date Analysis Commenced : 01-Jul-2021
Issue Date : 08-Jul-2021 11:54



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Inorganics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H⁺ + Al³⁺).
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SS125_210624	0960_SS114_210624	0960_SD200_210624	0960_SD199_210624	0960_SS108_210624
Sampling date / time					24-Jun-2021 10:05	24-Jun-2021 10:05	24-Jun-2021 10:29	24-Jun-2021 11:19	24-Jun-2021 12:15
Compound	CAS Number	LOR	Unit		EP2107280-001	EP2107280-002	EP2107280-003	EP2107280-004	EP2107280-005
				Result	Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)									
pH Value	----	0.1	pH Unit	----	9.0	----	----	----	----
EA010: Conductivity (1:5)									
Electrical Conductivity @ 25°C	----	1	µS/cm	----	120	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	0.1	%	6.7	28.4	25.6	18.2	3.3	
ED007: Exchangeable Cations									
Exchangeable Calcium	----	0.1	meq/100g	----	20.8	----	----	----	----
Exchangeable Magnesium	----	0.1	meq/100g	----	3.6	----	----	----	----
Exchangeable Potassium	----	0.1	meq/100g	----	0.8	----	----	----	----
Exchangeable Sodium	----	0.1	meq/100g	----	0.9	----	----	----	----
Cation Exchange Capacity	----	0.1	meq/100g	----	26.0	----	----	----	----
Exchangeable Sodium Percent	----	0.1	%	----	3.5	----	----	----	----
EP004: Organic Matter									
Organic Matter	----	0.5	%	----	0.9	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids									
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0152	0.0066	<0.0002	<0.0002	0.0011	
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.0015	<0.0002	<0.0002	<0.0002	
EP231B: Perfluoroalkyl Carboxylic Acids									
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.0002	<0.0002	<0.0002	<0.0002	<0.0002



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				0960_SS125_210624	0960_SS114_210624	0960_SD200_210624	0960_SD199_210624	0960_SS108_210624
Sampling date / time				24-Jun-2021 10:05	24-Jun-2021 10:05	24-Jun-2021 10:29	24-Jun-2021 11:19	24-Jun-2021 12:15
Compound	CAS Number	LOR	Unit	EP2107280-001	EP2107280-002	EP2107280-003	EP2107280-004	EP2107280-005
				Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids - Continued								
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	0.0152	0.0083	<0.0002	<0.0002	0.0011



Analytical Results

Sub-Matrix: **SEDIMENT**
 (Matrix: **SOIL**)

Sample ID

				0960_SS125_210624	0960_SS114_210624	0960_SD200_210624	0960_SD199_210624	0960_SS108_210624
Sampling date / time				24-Jun-2021 10:05	24-Jun-2021 10:05	24-Jun-2021 10:29	24-Jun-2021 11:19	24-Jun-2021 12:15
Compound	CAS Number	LOR	Unit	EP2107280-001	EP2107280-002	EP2107280-003	EP2107280-004	EP2107280-005
				Result	Result	Result	Result	Result
EP231P: PFAS Sums - Continued								
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	0.0152	0.0066	<0.0002	<0.0002	0.0011
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	0.0152	0.0066	<0.0002	<0.0002	0.0011
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	96.0	96.0	93.5	100	104
13C8-PFOA	----	0.0002	%	98.5	93.5	97.0	95.5	95.5



Analytical Results

Sub-Matrix: SEDIMENT
 (Matrix: SOIL)

Sample ID

				0960_SS227_210624	0960_SS291_210624	0960_SS292_210624	0960_SS198_210624	----
Sampling date / time				24-Jun-2021 12:17	24-Jun-2021 12:41	24-Jun-2021 13:03	24-Jun-2021 13:09	----
Compound	CAS Number	LOR	Unit	EP2107280-006	EP2107280-007	EP2107280-008	EP2107280-009	-----
				Result	Result	Result	Result	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	12.2	24.2	23.2	16.2	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0508	0.0006	0.0006	<0.0002	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	0.0008	<0.0002	<0.0002	<0.0002	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	<0.001	<0.001	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	0.0003	<0.0002	<0.0002	<0.0002	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	----



Analytical Results

Sub-Matrix: SEDIMENT (Matrix: SOIL)				Sample ID	0960_SS227_210624	0960_SS291_210624	0960_SS292_210624	0960_SS198_210624	----
Sampling date / time					24-Jun-2021 12:17	24-Jun-2021 12:41	24-Jun-2021 13:03	24-Jun-2021 13:09	----
Compound	CAS Number	LOR	Unit		EP2107280-006	EP2107280-007	EP2107280-008	EP2107280-009	-----
				Result	Result	Result	Result	Result	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.0002	mg/kg	0.0521	0.0006	0.0006	0.0006	<0.0002	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	0.0508	0.0006	0.0006	0.0006	<0.0002	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	0.0508	0.0006	0.0006	0.0006	<0.0002	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.0002	%	101	97.0	98.5	104	----	----
13C8-PFOA	----	0.0002	%	97.5	92.0	96.0	99.0	----	----

Page : 8 of 8
Work Order : EP2107280
Client : CARDNO (WA) PTY LTD
Project : WA_0960_PFASOMP



Surrogate Control Limits

Sub-Matrix: SEDIMENT		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(SOIL) EP231D: (n:2) Fluorotelomer Sulfonic Acids

(SOIL) EP231A: Perfluoroalkyl Sulfonic Acids

(SOIL) EP231C: Perfluoroalkyl Sulfonamides

(SOIL) EP231B: Perfluoroalkyl Carboxylic Acids

(SOIL) EP231P: PFAS Sums

(SOIL) EP231S: PFAS Surrogate

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology). Only applies to samples EP2107280 (001, 003, 004, 005, 006, 007, 008, 009).

(SOIL) EA055: Moisture Content (Dried @ 105-110°C)

QUALITY CONTROL REPORT

Work Order	: EP2107280	Page	: 1 of 7
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 28-Jun-2021
Order number	: DEF19009/0960	Date Analysis Commenced	: 01-Jul-2021
C-O-C number	: 24575	Issue Date	: 08-Jul-2021
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		
Site	: DEF19009/Learmonth		
Quote number	: SY/139/19		
No. of samples received	: 9		
No. of samples analysed	: 9		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Inorganics, Smithfield, NSW
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW
Ivan Taylor	Analyst	Sydney Inorganics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key :
 Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
 CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
 LOR = Limit of reporting
 RPD = Relative Percentage Difference
 # = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **SOIL**

Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA002: pH 1:5 (Soils) (QC Lot: 3768711)									
EP2107279-001	Anonymous	EA002: pH Value	----	0.1	pH Unit	9.2	9.2	0.0	0% - 20%
EA010: Conductivity (1:5) (QC Lot: 3768710)									
EP2107279-001	Anonymous	EA010: Electrical Conductivity @ 25°C	----	1	µS/cm	2080	2090	0.2	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3767600)									
EP2107198-003	Anonymous	EA055: Moisture Content	----	0.1	%	21.0	19.6	6.8	0% - 20%
EP2107280-006	0960_SS227_210624	EA055: Moisture Content	----	0.1	%	12.2	11.5	5.9	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3770476)									
EP2107279-005	Anonymous	EA055: Moisture Content	----	0.1	%	24.6	24.5	0.0	0% - 20%
ED007: Exchangeable Cations (QC Lot: 3774488)									
EP2107198-008	Anonymous	ED007: Exchangeable Sodium Percent	----	0.1	%	1.8	1.7	0.0	0% - 50%
		ED007: Exchangeable Calcium	----	0.1	meq/100g	17.6	18.3	3.8	0% - 20%
		ED007: Exchangeable Magnesium	----	0.1	meq/100g	2.8	2.8	0.0	0% - 20%
		ED007: Exchangeable Potassium	----	0.1	meq/100g	0.6	0.6	0.0	No Limit
		ED007: Exchangeable Sodium	----	0.1	meq/100g	0.4	0.4	0.0	No Limit
		ED007: Cation Exchange Capacity	----	0.1	meq/100g	21.4	22.0	3.2	0% - 20%
EP004: Organic Matter (QC Lot: 3770466)									
EP2107279-005	Anonymous	EP004: Organic Matter	----	0.5	%	2.0	2.0	0.0	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3776841)									
EP2107275-002	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3776841) - continued									
EP2107280-001	0960_SS125_210624	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0152	0.0157	2.7	0% - 20%
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3776841)									
EP2107275-002	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.0	No Limit
EP2107280-001	0960_SS125_210624	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.0	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3776841)									
EP2107275-002	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit



Sub-Matrix: SOIL				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3776841) - continued									
EP2107275-002	Anonymous	EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP2107280-001	0960_SS125_210624	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3776841)							
EP2107275-002	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP2107280-001	0960_SS125_210624	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
	Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%)	
			Low	High
----	4 pH Unit	100	70.0	130
----	7 pH Unit	100	70.0	130
<1	1412 µS/cm	100	93.6	106
<0.1	21.6 meq/100g	100	82.9	117
<0.1	1.76 meq/100g	96.6	78.4	119
<0.1	1 meq/100g	109	87.9	129
<0.1	0.9 meq/100g	106	92.9	132
<0.1	25.3 meq/100g	100	84.7	117
<0.1	----	----	----	----
<0.5	2.3 %	102	70.0	120
<0.5	85 %	88.5	70.0	120
<0.0002	0.00125 mg/kg	78.0	72.0	128
<0.0002	0.00125 mg/kg	81.6	73.0	123
<0.0002	0.00125 mg/kg	79.6	67.0	130
<0.0002	0.00125 mg/kg	80.8	70.0	132
<0.0002	0.00125 mg/kg	78.8	68.0	136
<0.0002	0.00125 mg/kg	84.0	59.0	134
<0.001	0.00625 mg/kg	82.8	71.0	135
<0.0002	0.00125 mg/kg	78.4	69.0	132
<0.0002	0.00125 mg/kg	80.4	70.0	132
<0.0002	0.00125 mg/kg	76.8	71.0	131
<0.0002	0.00125 mg/kg	88.8	69.0	133
<0.0002	0.00125 mg/kg	81.6	72.0	129
<0.0002	0.00125 mg/kg	77.6	69.0	133
<0.0002	0.00125 mg/kg	78.4	64.0	136
<0.0002	0.00125 mg/kg	86.4	69.0	135
<0.0002	0.00125 mg/kg	87.6	66.0	139
<0.0005	0.00312 mg/kg	79.8	69.0	133



Sub-Matrix: SOIL				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3776841) - continued								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	84.4	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	88.8	71.6	129
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	80.6	69.8	131
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	77.2	68.7	130
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	77.4	65.1	134
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	86.4	63.0	144
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	86.8	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3776841)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	93.6	62.0	145
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00125 mg/kg	95.6	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.00125 mg/kg	85.2	65.0	137
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.00125 mg/kg	82.0	69.2	143

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: SOIL				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3776841)							
EP2107275-002	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00125 mg/kg	76.0	72.0	128
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00125 mg/kg	80.0	73.0	123
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00125 mg/kg	80.0	67.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00125 mg/kg	86.4	70.0	132
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00125 mg/kg	74.0	68.0	136
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00125 mg/kg	87.6	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3776841)							
EP2107275-002	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	87.2	71.0	135
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	76.8	69.0	132
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	82.8	70.0	132
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	76.4	71.0	131
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	87.6	69.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	82.0	72.0	129
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	80.0	69.0	133



Sub-Matrix: **SOIL**

Sub-Matrix: SOIL				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3776841) - continued							
EP2107275-002	Anonymous	EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	76.8	64.0	136
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	90.4	69.0	135
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	90.4	66.0	139
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00312 mg/kg	80.4	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3776841)							
EP2107275-002	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	84.4	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	88.3	71.6	129
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	77.7	69.8	131
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	78.2	68.7	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	80.8	65.1	134
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	84.0	63.0	144
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	86.4	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3776841)							
EP2107275-002	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00125 mg/kg	98.4	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00125 mg/kg	106	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00125 mg/kg	93.2	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00125 mg/kg	84.4	69.2	143

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2107280	Page	: 1 of 5
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 28-Jun-2021
Site	: DEF19009/Learmonth	Issue Date	: 08-Jul-2021
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS	No. of samples received	: 9
Order number	: DEF19009/0960	No. of samples analysed	: 9

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO** Method Blank value outliers occur.
- **NO** Duplicate outliers occur.
- **NO** Laboratory Control outliers occur.
- **NO** Matrix Spike outliers occur.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- **NO** Quality Control Sample Frequency Outliers exist.



Outliers : Analysis Holding Time Compliance

Matrix: **SOIL**

Method Container / Client Sample ID(s)	Extraction / Preparation			Analysis		
	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA002: pH 1:5 (Soils)						
Soil Glass Jar - Unpreserved 0960_SS114_210624	02-Jul-2021	01-Jul-2021	1	----	----	----
EA010: Conductivity (1:5)						
Soil Glass Jar - Unpreserved 0960_SS114_210624	02-Jul-2021	01-Jul-2021	1	----	----	----

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA002: pH 1:5 (Soils)							
Soil Glass Jar - Unpreserved (EA002) 0960_SS114_210624	24-Jun-2021	02-Jul-2021	01-Jul-2021	✖	02-Jul-2021	02-Jul-2021	✓
EA010: Conductivity (1:5)							
Soil Glass Jar - Unpreserved (EA010) 0960_SS114_210624	24-Jun-2021	02-Jul-2021	01-Jul-2021	✖	02-Jul-2021	30-Jul-2021	✓
EA055: Moisture Content (Dried @ 105-110°C)							
HDPE Soil Jar (EA055) 0960_SS125_210624, 0960_SS108_210624, 0960_SS227_210624, 0960_SS292_210624, 0960_SS198_210624	24-Jun-2021	----	----	----	01-Jul-2021	08-Jul-2021	✓
Soil Glass Jar - Unpreserved (EA055) 0960_SS114_210624	24-Jun-2021	----	----	----	02-Jul-2021	08-Jul-2021	✓
ED007: Exchangeable Cations							
Soil Glass Jar - Unpreserved (ED007) 0960_SS114_210624	24-Jun-2021	06-Jul-2021	22-Jul-2021	✓	06-Jul-2021	22-Jul-2021	✓
EP004: Organic Matter							
Soil Glass Jar - Unpreserved (EP004) 0960_SS114_210624	24-Jun-2021	07-Jul-2021	22-Jul-2021	✓	07-Jul-2021	22-Jul-2021	✓



Matrix: **SOIL**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP231A: Perfluoroalkyl Sulfonic Acids								
HDPE Soil Jar (EP231X) 0960_SS125_210624, 0960_SS114_210624, 0960_SD200_210624, 0960_SS108_210624, 0960_SS291_210624, 0960_SS198_210624,	0960_SS114_210624, 0960_SD199_210624, 0960_SS227_210624, 0960_SS292_210624,	24-Jun-2021	07-Jul-2021	21-Dec-2021	✔	07-Jul-2021	16-Aug-2021	✔
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE Soil Jar (EP231X) 0960_SS125_210624, 0960_SS114_210624, 0960_SD200_210624, 0960_SS108_210624, 0960_SS291_210624, 0960_SS198_210624,	0960_SS114_210624, 0960_SD199_210624, 0960_SS227_210624, 0960_SS292_210624,	24-Jun-2021	07-Jul-2021	21-Dec-2021	✔	07-Jul-2021	16-Aug-2021	✔
EP231C: Perfluoroalkyl Sulfonamides								
HDPE Soil Jar (EP231X) 0960_SS125_210624, 0960_SS114_210624, 0960_SD200_210624, 0960_SS108_210624, 0960_SS291_210624, 0960_SS198_210624,	0960_SS114_210624, 0960_SD199_210624, 0960_SS227_210624, 0960_SS292_210624,	24-Jun-2021	07-Jul-2021	21-Dec-2021	✔	07-Jul-2021	16-Aug-2021	✔
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE Soil Jar (EP231X) 0960_SS125_210624, 0960_SS114_210624, 0960_SD200_210624, 0960_SS108_210624, 0960_SS291_210624, 0960_SS198_210624,	0960_SS114_210624, 0960_SD199_210624, 0960_SS227_210624, 0960_SS292_210624,	24-Jun-2021	07-Jul-2021	21-Dec-2021	✔	07-Jul-2021	16-Aug-2021	✔
EP231P: PFAS Sums								
HDPE Soil Jar (EP231X) 0960_SS125_210624, 0960_SS114_210624, 0960_SD200_210624, 0960_SS108_210624, 0960_SS291_210624, 0960_SS198_210624,	0960_SS114_210624, 0960_SD199_210624, 0960_SS227_210624, 0960_SS292_210624,	24-Jun-2021	07-Jul-2021	21-Dec-2021	✔	07-Jul-2021	16-Aug-2021	✔



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)		Quality Control Specification	
Analytical Methods	Method	QC	Regular	Actual	Expected		Evaluation
Laboratory Duplicates (DUP)							
Electrical Conductivity (1:5)	EA010	1	8	12.50	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	10	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	1	2	50.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	2	50.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	20	10.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	1	8	12.50	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Electrical Conductivity (1:5)	EA010	1	8	12.50	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	10	10.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	2	2	100.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	2	8	25.00	10.00	✔	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Electrical Conductivity (1:5)	EA010	1	8	12.50	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations	ED007	1	10	10.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Organic Matter	EP004	1	2	50.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	20	5.00	5.00	✔	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH (1:5)	EA002	SOIL	In house: Referenced to Rayment and Lyons 4A1 and APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Electrical Conductivity (1:5)	EA010	SOIL	In house: Referenced to Rayment and Lyons 3A1 and APHA 2510. Conductivity is determined on soil samples using a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Exchangeable Cations	ED007	SOIL	In house: Referenced to Rayment & Lyons Method 15A1. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM Schedule B(3).
Organic Matter	EP004	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3)
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	SOIL	In-house: Analysis of soils by solvent extraction followed by LC-Electrospray-MS-MS, Negative Mode using MRM using internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.

Preparation Methods	Method	Matrix	Method Descriptions
Exchangeable Cations Preparation Method	ED007PR	SOIL	In house: Referenced to Rayment & Lyons method 15A1. A 1M NH4Cl extraction by end over end tumbling at a ratio of 1:20. There is no pretreatment for soluble salts. Extracts can be run by ICP for cations.
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
Organic Matter	EP004-PR	SOIL	In house: Referenced to AS1289.4.1.1. Dichromate oxidation method after Walkley and Black. This method is compliant with NEPM Schedule B(3).
QuEChERS Extraction of Solids	ORG71	SOIL	In house: Sequential extractions with Acetonitrile/Methanol by shaking. Extraction efficiency aided by the addition of salts under acidic conditions. Where relevant, interferences from co-extracted organics are removed with dispersive clean-up media (dSPE). The extract is either diluted or concentrated and exchanged into the analytical solvent.



CHAIN OF CUSTODY

ALS COC#: 24577 ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFASOMP

SITE: ah DEF19009/Learmonth SW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

LABORATORY USE ONLY (Circle)

Custody Seal intact? Yes No N/A

Free ice / frozen ice bricks present upon receipt? Yes No N/A

Random Sample Temperature on Receipt: °C

Other comments:

SAMPLE DETAILS

ANALYSIS REQUIRED

SAMPLE	NAME	DESCRIPTION	DATE / TIME	MATRIX	TOTAL BOTTLES	ON HOLD	Surface Waters Primary WATER	ALTERNATIVE ANALYSIS	ADDITIONAL INFORMATION
001	0960_SW200		24/06/2021 10:34 AM	Water	ALS: 5 Non ALS: 0	No	X		



CHAIN OF CUSTODY

COC#: 24577

ALS Laboratory: EP Perth

CLIENT: CARBSD - CARDNO (WA) PTY LTD

PROJECT: WA_0960_PFSOMP

SITE: ah DEF19009/Learmonth SW

ORDER NO: DEF19009/0960

PROJECT MANAGER: Maelle Bourdais

PRIMARY SAMPLER: Maelle Bourdais

EMAIL REPORTS TO: maelle.bourdais@cardno.com.au, derp.labreports@esdat.com.au

EMAIL INVOICES TO: claire.armstrong@cardno.com.au, laura.beames@cardno.com.au

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

RELINQUISHED BY:

DATE TIME:

RECEIVED BY:

DATE TIME:

TURNAROUND REQUIREMENTS : 5 Days

Biohazard info:

CONTACT PH:

QUOTE NO: SY/139/19

SAMPLER MOBILE:

/ ES2019CARBSD0002

LABORATORY USE ONLY (Circle)

Custody Seal intact?

Yes No N/A

Free ice / frozen ice bricks present upon receipt?

Yes No N/A

Random Sample Temperature on Receipt:

°C

Other comments:

SAMPLE	SAMPLE NAME	BOTTLE NAME	VOLUME	BARCODE	TYPE	FILTERED	REASON
001	0960_SW200	Clear Plastic Bottle - Natural	250 mL	00070220143074	Green	No	
001	0960_SW200	HDPE (no PTFE)	20 mL	00352010040118	Grey	No	
001	0960_SW200	Clear Plastic Bottle - Natural	250 mL	00070220143028	Green	No	
001	0960_SW200	HDPE (no PTFE)	20 mL	00352010040506	Grey	No	
001	0960_SW200	Amber DOC Filtered- Sulfuric Preserved	40 mL	00181020003974	Purple	No	

Total Bottle Count: ALS: 5, Non ALS: 0

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : EP2107281

<p>Client : CARDNO (WA) PTY LTD</p> <p>Contact : MAELLE BOURDAIS</p> <p>Address : 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006</p> <p>E-mail : maelle.bourdais@cardno.com.au</p> <p>Telephone : ----</p> <p>Facsimile : ----</p> <p>Project : WA_0960_PFASOMP</p> <p>Order number : DEF19009/0960</p> <p>C-O-C number : 24577</p> <p>Site : DEF19009/Learmonth</p> <p>Sampler : ASHLEY BROWN, MAELLE BOURDAIS</p>	<p>Laboratory : Environmental Division Perth</p> <p>Contact : Nick Courts</p> <p>Address : 26 Rigali Way Wangara WA Australia 6065</p> <p>E-mail : nick.courts@alsglobal.com</p> <p>Telephone : +61-8-9406 1301</p> <p>Facsimile : +61-8-9406 1399</p> <p>Page : 1 of 3</p> <p>Quote number : ES2019CARBSD0002 (SY/139/19)</p> <p>QC Level : NEPM 2013 B3 & ALS QC Standard</p>
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Dates

Date Samples Received : 28-Jun-2021 13:25	Issue Date : 28-Jun-2021
Client Requested Due : 09-Jul-2021	Scheduled Reporting Date : 09-Jul-2021
Date	

Delivery Details

Mode of Delivery : Carrier	Security Seal : Not Available
No. of coolers/boxes : 3	Temperature : 15.8 - Ice present
Receipt Detail :	No. of samples received / analysed : 1 / 1

General Comments

- This report contains the following information:
 - Sample Container(s)/Preservation Non-Compliances
 - Summary of Sample(s) and Requested Analysis
 - Proactive Holding Time Report
 - Requested Deliverables
- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- Please see scanned COC for sample discrepancies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **PFAS analysis will be conducted by ALS Environmental, Sydney, NATA accreditation no. 825, Site No. 10911.**
- **pH analysis should be conducted within 6 hours of sampling.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.



Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- No sample container / preservation non-compliance exists.

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EA005P pH (PCT)	WATER - EA015H Total Dissolved Solids - Standard Level	WATER - EA025H Suspended Solids - Standard Level	WATER - EN055 - PG Ionic Balance by ED037P, ED041G, ED045G &	WATER - EP002 Dissolved Organic Carbon (DOC)	WATER - NT-01 Major Cations (Ca, Mg, Na, K)	WATER - NT-02 Major Anions (Chloride, Sulphate, Alkalinity)
EP2107281-001	24-Jun-2021 10:34	0960_SW200_210624	✓	✓	✓	✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	Sampling date / time	Sample ID	WATER - EP231X PFAS - Full Suite (28 analytes)
EP2107281-001	24-Jun-2021 10:34	0960_SW200_210624	✓

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **WATER**

Evaluation: ✗ = Holding time breach ; ✓ = Within holding time.

Method	Container	Due for extraction	Due for analysis	Samples Received		Instructions Received	
Client Sample ID(s)				Date	Evaluation	Date	Evaluation
EA005-P: pH by PC Titrator							
0960_SW200_210624	Clear Plastic Bottle - Natural	----	24-Jun-2021	28-Jun-2021	✗	----	----

CERTIFICATE OF ANALYSIS

Work Order : **EP2107281**
Client : **CARDNO (WA) PTY LTD**
Contact : **MAELLE BOURDAIS**
Address : **11 HARVEST TERRACE PO BOX 155**
WEST PERTH WA, AUSTRALIA 6006
Telephone : **----**
Project : **WA_0960_PFASOMP**
Order number : **DEF19009/0960**
C-O-C number : **24577**
Sampler : **ASHLEY BROWN, MAELLE BOURDAIS**
Site : **DEF19009/Learmonth**
Quote number : **SY/139/19**
No. of samples received : **1**
No. of samples analysed : **1**

Page : 1 of 6
Laboratory : Environmental Division Perth
Contact : Nick Courts
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 28-Jun-2021 13:25
Date Analysis Commenced : 30-Jun-2021
Issue Date : 08-Jul-2021 12:11



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW



General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- PFAS conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.
- EP231X - Per- and Polyfluoroalkyl Substances (PFAS): Samples received in 20ml or 125ml bottles have been tested in accordance with the QSM5.3 compliant, NATA accredited method. 60mL or 250mL bottles have been tested to the legacy QSM 5.1 aligned, NATA accredited method.
- Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.



Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)			Sample ID	0960_SW200_210624	----	----	----	----
Sampling date / time				24-Jun-2021 10:34	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2107281-001	-----	-----	-----	-----
Result				----	----	----	----	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	8.21	----	----	----	----
EA015: Total Dissolved Solids dried at 180 ± 5 °C								
Total Dissolved Solids @180°C	----	10	mg/L	217	----	----	----	----
EA025: Total Suspended Solids dried at 104 ± 2°C								
Suspended Solids (SS)	----	5	mg/L	48	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO ₃	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO ₃	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO ₃	71-52-3	1	mg/L	81	----	----	----	----
Total Alkalinity as CaCO ₃	----	1	mg/L	81	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO₄ 2- by DA								
Sulfate as SO ₄ - Turbidimetric	14808-79-8	1	mg/L	5	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	65	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	20	----	----	----	----
Magnesium	7439-95-4	1	mg/L	5	----	----	----	----
Sodium	7440-23-5	1	mg/L	55	----	----	----	----
Potassium	7440-09-7	1	mg/L	6	----	----	----	----
EN055: Ionic Balance								
∅ Total Anions	----	0.01	meq/L	3.56	----	----	----	----
∅ Total Cations	----	0.01	meq/L	3.96	----	----	----	----
∅ Ionic Balance	----	0.01	%	5.32	----	----	----	----
EP002: Dissolved Organic Carbon (DOC)								
Dissolved Organic Carbon	----	1	mg/L	2	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	----	----	----	----



Analytical Results

Sub-Matrix: GROUNDWATER
 (Matrix: WATER)

Sample ID

0960_SW200_210624

Sampling date / time				24-Jun-2021 10:34	----	----	----	----
Compound	CAS Number	LOR	Unit	EP2107281-001	-----	-----	-----	-----
Result				----	----	----	----	----

EP231A: Perfluoroalkyl Sulfonic Acids - Continued

Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	----	----	----	----

EP231B: Perfluoroalkyl Carboxylic Acids

Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	----	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	----	----	----	----
Perfluorotridecanoic acid (PFTTrDA)	72629-94-8	0.02	µg/L	<0.02	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	----	----	----	----

EP231C: Perfluoroalkyl Sulfonamides

Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	----	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	----	----	----	----



Analytical Results

Sub-Matrix: GROUNDWATER (Matrix: WATER)				Sample ID	0960_SW200_210624	----	----	----	----
				Sampling date / time	24-Jun-2021 10:34	----	----	----	----
Compound	CAS Number	LOR	Unit		EP2107281-001	-----	-----	-----	-----
				Result		----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued									
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L		<0.02	----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids									
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L		<0.05	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L		<0.05	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L		<0.05	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L		<0.05	----	----	----	----
EP231P: PFAS Sums									
Sum of PFAS	----	0.01	µg/L		<0.01	----	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.01	µg/L		<0.01	----	----	----	----
Sum of PFAS (WA DER List)	----	0.01	µg/L		<0.01	----	----	----	----
EP231S: PFAS Surrogate									
13C4-PFOS	----	0.02	%		80.1	----	----	----	----
13C8-PFOA	----	0.02	%		90.1	----	----	----	----

Page : 6 of 6
Work Order : EP2107281
Client : CARDNO (WA) PTY LTD
Project : WA_0960_PFASOMP



Surrogate Control Limits

Sub-Matrix: GROUNDWATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP231S: PFAS Surrogate			
13C4-PFOS	----	60	120
13C8-PFOA	----	60	120

Inter-Laboratory Testing

Analysis conducted by ALS Sydney, NATA accreditation no. 825, site no. 10911 (Chemistry) 14913 (Biology).

(WATER) EP231A: Perfluoroalkyl Sulfonic Acids

(WATER) EP231B: Perfluoroalkyl Carboxylic Acids

(WATER) EP231C: Perfluoroalkyl Sulfonamides

(WATER) EP231D: (n:2) Fluorotelomer Sulfonic Acids

(WATER) EP231P: PFAS Sums

(WATER) EP231S: PFAS Surrogate

QUALITY CONTROL REPORT

Work Order	: EP2107281	Page	: 1 of 8
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Contact	: Nick Courts
Address	: 11 HARVEST TERRACE PO BOX 155 WEST PERTH WA, AUSTRALIA 6006	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: ----	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 28-Jun-2021
Order number	: DEF19009/0960	Date Analysis Commenced	: 30-Jun-2021
C-O-C number	: 24577	Issue Date	: 08-Jul-2021
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS		
Site	: DEF19009/Learmonth		
Quote number	: SY/139/19		
No. of samples received	: 1		
No. of samples analysed	: 1		



This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

<i>Signatories</i>	<i>Position</i>	<i>Accreditation Category</i>
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Franco Lentini	LCMS Coordinator	Sydney Organics, Smithfield, NSW

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
= Indicates failed QC

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: WATER					Laboratory Duplicate (DUP) Report				
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EA005P: pH by PC Titrator (QC Lot: 3776030)									
EP2107277-006	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.30	7.31	0.1	0% - 20%
EP2107363-001	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	7.66	7.66	0.0	0% - 20%
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QC Lot: 3767504)									
EP2107273-001	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	47400	46400	2.3	0% - 20%
EP2107276-003	Anonymous	EA015H: Total Dissolved Solids @180°C	----	10	mg/L	52300	45200	14.4	0% - 20%
EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 3767505)									
EP2107273-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	1140	1140	0.0	0% - 20%
EP2107277-002	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	110	123	10.5	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 3776029)									
EP2107277-006	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	316	342	8.0	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	316	342	8.0	0% - 20%
EP2107363-001	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	182	178	2.2	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	182	178	2.2	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 3761880)									
EP2107185-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2720	2720	0.0	0% - 20%
EP2107185-011	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	2670	2680	0.4	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 3761881)									
EP2107185-001	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	19200	19100	0.7	0% - 20%
EP2107185-011	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	18900	19100	1.3	0% - 20%
ED093F: Dissolved Major Cations (QC Lot: 3762890)									



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
ED093F: Dissolved Major Cations (QC Lot: 3762890) - continued									
EP2107272-007	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	575	574	0.2	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	1310	1300	0.4	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	9960	9920	0.4	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	580	586	1.0	0% - 20%
EP002: Dissolved Organic Carbon (DOC) (QC Lot: 3778896)									
EP2107277-002	Anonymous	EP002: Dissolved Organic Carbon	----	1	mg/L	1	2	0.0	No Limit
EP2107281-001	0960_SW200_210624	EP002: Dissolved Organic Carbon	----	1	mg/L	2	2	0.0	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 3777900)									
EP2107277-001	Anonymous	EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 3777900)									
EP2107277-001	Anonymous	EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	<0.01	0.0	No Limit
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	<0.1	0.0	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 3777900)									
EP2107277-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	<0.02	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit

Page : 4 of 8
 Work Order : EP2107281
 Client : CARDNO (WA) PTY LTD
 Project : WA_0960_PFASOMP



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 3777900)									
EP2107277-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	<0.05	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	<0.05	0.0	No Limit
EP231P: PFAS Sums (QC Lot: 3777900)									
EP2107277-001	Anonymous	EP231X: Sum of PFAS	----	0.01	µg/L	<0.01	<0.01	0.0	No Limit



Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result		LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 3776030)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	101	98.5	102
				----	7 pH Unit	100	98.5	102
EA015: Total Dissolved Solids dried at 180 ± 5 °C (QCLot: 3767504)								
EA015H: Total Dissolved Solids @180°C	----	10	mg/L	<10	246 mg/L	102	88.1	114
				<10	1000 mg/L	101	88.1	114
EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 3767505)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	95 mg/L	112	89.1	120
				<5	1000 mg/L	99.0	89.1	120
ED037P: Alkalinity by PC Titrator (QCLot: 3776029)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-00 1	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	107	81.2	126
				<1	200 mg/L	101	90.0	110
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3761880)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	101	87.7	113
				<1	500 mg/L	102	87.7	113
ED045G: Chloride by Discrete Analyser (QCLot: 3761881)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	94.5	87.9	114
				<1	1000 mg/L	95.0	87.9	114
ED093F: Dissolved Major Cations (QCLot: 3762890)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	99.0	85.9	113
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	98.9	88.0	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	105	87.3	118
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	92.9	89.7	108
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3778896)								
EP002: Dissolved Organic Carbon	----	1	mg/L	<1	10 mg/L	103	73.2	116
				<1	100 mg/L	103	73.2	116
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3777900)								
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.02	µg/L	<0.02	0.25 µg/L	75.2	72.0	130
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.02	µg/L	<0.02	0.25 µg/L	80.4	71.0	127
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.02	µg/L	<0.02	0.25 µg/L	78.0	68.0	131
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.02	µg/L	<0.02	0.25 µg/L	82.8	69.0	134



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Acceptable Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3777900) - continued								
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.01	µg/L	<0.01	0.25 µg/L	87.0	65.0	140
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.02	µg/L	<0.02	0.25 µg/L	126	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3777900)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.1	µg/L	<0.1	1.25 µg/L	78.2	73.0	129
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.02	µg/L	<0.02	0.25 µg/L	88.0	72.0	129
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.02	µg/L	<0.02	0.25 µg/L	83.8	72.0	129
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.02	µg/L	<0.02	0.25 µg/L	84.8	72.0	130
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.01	µg/L	<0.01	0.25 µg/L	93.4	71.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.02	µg/L	<0.02	0.25 µg/L	92.4	69.0	130
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.02	µg/L	<0.02	0.25 µg/L	84.8	71.0	129
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.02	µg/L	<0.02	0.25 µg/L	79.0	69.0	133
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.02	µg/L	<0.02	0.25 µg/L	86.2	72.0	134
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.02	µg/L	<0.02	0.25 µg/L	79.8	65.0	144
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.05	µg/L	<0.05	0.625 µg/L	86.5	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3777900)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.02	µg/L	<0.02	0.25 µg/L	92.0	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.05	µg/L	<0.05	0.625 µg/L	84.5	68.0	141
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.05	µg/L	<0.05	0.625 µg/L	79.0	62.6	147
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.05	µg/L	<0.05	0.625 µg/L	89.3	66.0	145
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.05	µg/L	<0.05	0.625 µg/L	80.1	57.6	145
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.02	µg/L	<0.02	0.25 µg/L	86.0	65.0	136
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.02	µg/L	<0.02	0.25 µg/L	90.0	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3777900)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.05	µg/L	<0.05	0.25 µg/L	99.0	63.0	143
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.05	µg/L	<0.05	0.25 µg/L	96.8	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.05	µg/L	<0.05	0.25 µg/L	82.6	67.0	138
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.05	µg/L	<0.05	0.25 µg/L	99.0	71.4	144

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 3761880)							
EP2107185-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	# Not Determined	70.0	130
ED045G: Chloride by Discrete Analyser (QCLot: 3761881)							
EP2107185-001	Anonymous	ED045G: Chloride	16887-00-6	1000 mg/L	# Not Determined	70.0	130
EP002: Dissolved Organic Carbon (DOC) (QCLot: 3778896)							
EP2107277-003	Anonymous	EP002: Dissolved Organic Carbon	----	100 mg/L	105	70.0	130
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 3777900)							
EP2107277-005	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.25 µg/L	84.0	72.0	130
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.25 µg/L	91.2	71.0	127
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.25 µg/L	88.6	68.0	131
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.25 µg/L	88.6	69.0	134
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.25 µg/L	86.8	65.0	140
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.25 µg/L	124	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 3777900)							
EP2107277-005	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	1.25 µg/L	78.9	73.0	129
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.25 µg/L	94.2	72.0	129
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.25 µg/L	87.0	72.0	129
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.25 µg/L	91.2	72.0	130
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.25 µg/L	92.8	71.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.25 µg/L	97.2	69.0	130
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.25 µg/L	91.8	71.0	129
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.25 µg/L	82.2	69.0	133
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.25 µg/L	89.8	72.0	134
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.25 µg/L	85.8	65.0	144
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.625 µg/L	90.4	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3777900)							
EP2107277-005	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.25 µg/L	103	67.0	137
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.625 µg/L	82.3	68.0	141
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.625 µg/L	83.0	62.6	147
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.625 µg/L	86.7	66.0	145
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.625 µg/L	85.4	57.6	145
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.25 µg/L	94.2	65.0	136



Sub-Matrix: WATER

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 3777900) - continued							
EP2107277-005	Anonymous	EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.25 µg/L	90.0	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 3777900)							
EP2107277-005	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.25 µg/L	107	63.0	143
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.25 µg/L	113	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.25 µg/L	87.2	67.0	138
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.25 µg/L	91.4	71.4	144

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EP2107281	Page	: 1 of 6
Client	: CARDNO (WA) PTY LTD	Laboratory	: Environmental Division Perth
Contact	: MAELLE BOURDAIS	Telephone	: +61-8-9406 1301
Project	: WA_0960_PFASOMP	Date Samples Received	: 28-Jun-2021
Site	: DEF19009/Learmonth	Issue Date	: 08-Jul-2021
Sampler	: ASHLEY BROWN, MAELLE BOURDAIS	No. of samples received	: 1
Order number	: DEF19009/0960	No. of samples analysed	: 1

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- Matrix Spike outliers exist - please see following pages for full details.
- For all regular sample matrices, **NO** surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

- Analysis Holding Time Outliers exist - please see following pages for full details.

Outliers : Frequency of Quality Control Samples

- Quality Control Sample Frequency Outliers exist - please see following pages for full details.



Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	Analyte	CAS Number	Data	Limits	Comment
Matrix Spike (MS) Recoveries							
ED041G: Sulfate (Turbidimetric) as SO ₄ 2- by DA	EP2107185--001	Anonymous	Sulfate as SO ₄ - Turbidimetric	14808-79-8	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.
ED045G: Chloride by Discrete Analyser	EP2107185--001	Anonymous	Chloride	16887-00-6	Not Determined	----	MS recovery not determined, background level greater than or equal to 4x spike level.

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EA005P: pH by PC Titrator						
Clear Plastic Bottle - Natural 0960_SW200_210624	----	----	----	06-Jul-2021	24-Jun-2021	12

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	1	19	5.26	10.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural (EA005-P) 0960_SW200_210624	24-Jun-2021	----	----	----	06-Jul-2021	24-Jun-2021	✖
EA015: Total Dissolved Solids dried at 180 ± 5 °C							
Clear Plastic Bottle - Natural (EA015H) 0960_SW200_210624	24-Jun-2021	----	----	----	01-Jul-2021	01-Jul-2021	✔



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA025: Total Suspended Solids dried at 104 ± 2°C							
Clear Plastic Bottle - Natural (EA025H) 0960_SW200_210624	24-Jun-2021	----	----	----	01-Jul-2021	01-Jul-2021	✓
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P) 0960_SW200_210624	24-Jun-2021	----	----	----	06-Jul-2021	08-Jul-2021	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G) 0960_SW200_210624	24-Jun-2021	----	----	----	07-Jul-2021	22-Jul-2021	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G) 0960_SW200_210624	24-Jun-2021	----	----	----	07-Jul-2021	22-Jul-2021	✓
ED093F: Dissolved Major Cations							
Clear Plastic Bottle - Natural (ED093F) 0960_SW200_210624	24-Jun-2021	----	----	----	30-Jun-2021	01-Jul-2021	✓
EP002: Dissolved Organic Carbon (DOC)							
Amber DOC Filtered- Sulfuric Preserved (EP002) 0960_SW200_210624	24-Jun-2021	----	----	----	07-Jul-2021	22-Jul-2021	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X) 0960_SW200_210624	24-Jun-2021	07-Jul-2021	21-Dec-2021	✓	07-Jul-2021	21-Dec-2021	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X) 0960_SW200_210624	24-Jun-2021	07-Jul-2021	21-Dec-2021	✓	07-Jul-2021	21-Dec-2021	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X) 0960_SW200_210624	24-Jun-2021	07-Jul-2021	21-Dec-2021	✓	07-Jul-2021	21-Dec-2021	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X) 0960_SW200_210624	24-Jun-2021	07-Jul-2021	21-Dec-2021	✓	07-Jul-2021	21-Dec-2021	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X) 0960_SW200_210624	24-Jun-2021	07-Jul-2021	21-Dec-2021	✓	07-Jul-2021	21-Dec-2021	✓



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	15	13.33	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	10	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	5.26	10.00	✗	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	19	10.53	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Alkalinity by PC Titrator	ED037-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	2	15	13.33	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	10	10.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
pH by PC Titrator	EA005-P	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	2	19	10.53	10.53	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Alkalinity by PC Titrator	ED037-P	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	15	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	10	10.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Suspended Solids (High Level)	EA025H	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Dissolved Solids (High Level)	EA015H	1	19	5.26	5.26	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Chloride by Discrete Analyser	ED045G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Organic Carbon	EP002	1	15	6.67	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	1	19	5.26	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH by PC Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Total Dissolved Solids (High Level)	EA015H	WATER	In house: Referenced to APHA 2540C. A gravimetric procedure that determines the amount of 'filterable' residue in an aqueous sample. A well-mixed sample is filtered through a glass fibre filter (1.2um). The filtrate is evaporated to dryness and dried to constant weight at 180+/-5C. This method is compliant with NEPM Schedule B(3)
Suspended Solids (High Level)	EA025H	WATER	In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C. This method is compliant with NEPM Schedule B(3)
Alkalinity by PC Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G. The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocyanate forms highly-coloured ferric thiocyanate which is measured at 480 nm APHA seal method 2 017-1-L
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
Dissolved Organic Carbon	EP002	WATER	In house: Referenced to APHA 5310 B. This method is compliant with NEPM Schedule B(3). Samples are combusted at high temperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector.



Analytical Methods	Method	Matrix	Method Descriptions
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.3, table B-15 requirements.
Preparation Methods	Method	Matrix	Method Descriptions
Solid Phase Extraction (SPE) for PFAS in water	ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.



CHAIN OF CUSTODY RECORD

Eurofins | Environment Testing ABN 50 005 085 521

☐ Sydney Laboratory
Unit F3 Bld F 16 Mars Road Lane Cove West NSW 2068
02 9900 8400 EnviroSampleNSW@eurofins.com

☐ Brisbane Laboratory
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07 3902 4600 EnviroSampleQLD@eurofins.com

☐ Perth Laboratory
Unit 2 91 Leach Highway Kewdale WA 6105
08 9251 9600 EnviroSampleWA@eurofins.com

☐ Melbourne Laboratory
6 Monterey Road Dandenong South VIC 3175
03 8564 5000 EnviroSampleVic@eurofins.com

Company		CARDNO		Project No		WA_0960_PFASOMP		Project Manager		David James		Sampler(s)		MB, AH, SC																					
Address		11 harvest Tce WEST PERTH		Project Name		Learmonth		EDD Format ESdat, EQuIS etc		ESdat		Handed over by		ALS																					
Contact Name		Maele Bourdais		Analyses Where metals are requested, please specify "Total" or "Filtered" SUITE code must be used to attract SUITE pricing.		Full PFAS suite		(water) Major anions & cations		(water) DOC TSS, TDS, pH		(sediment) TOC, CEC, pH		Email for Invoice		claire.armstrong@cardno.com.au																			
Phone No		0448 308 372												Email for Results		maele.bourdais@cardno.com.au derp.labreports@esdat.com.au																			
Special Directions		Please send ESdat report to derp.labreports@esdat.com.au with the project No in the header file.												Containers		Required Turnaround Time (TAT)																			
														Change container type & size if necessary.		Default will be 5 days if not ticked.																			
Purchase Order		DEF19009/430												500mL Plastic		250mL Plastic		125mL Plastic		200mL Amber Glass		40mL VOA vial		500mL PFAS Bottle		Jar (Glass or HDPE)		Other (Asbestos AS4684, WA Guidelines)		Required Turnaround Time (TAT)					
Quote ID No																																			
No		Client Sample ID		Sampled Date/Time dd/mm/yy hh:mm		Matrix Solid (S) Water (W)																													
1		0960_QC201_210623		23/6/21		W		X		X		X																							
2		0960_QC202_210623				S		X						X																					
3		0960_QC203_210623				W		X		X		X																							
4		0960_QC204_210623				W		X		X		X																							
5		0960_QC205_210623				W		X		X		X																							
6		0960_QC206_210623				S		X																											
7		0960_QC207_210623				W		X		X		X																							
8		0960_QC208_210623				W		X		X		X																							
9		0960_QC209_210623				W		X		X		X																							
10		0960_QC210_210623		v		S		X																											
Total Counts																																			
Method of Shipment		<input type="checkbox"/> Courier (#) <input type="checkbox"/> Hand Delivered <input type="checkbox"/> Postal		Name				Signature				Date				Time																			
Laboratory Use Only		Received By		Caitlyn Gibson		SYD BNE MEL PER ADL NTL DRW		Signature		Caitlyn Gibson		Date		28/6/21		Time		9:30		Temperature		16.6													
		Received By				SYD BNE MEL PER ADL NTL DRW		Signature				Date				Time				Report No		806235													



CHAIN OF CUSTODY RECORD

Eurofins | Environment Testing ABN 50 005 085 521

☐ Sydney Laboratory
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☐ Perth Laboratory
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☐ Melbourne Laboratory
6 Monterey Road Dandenong South VIC 3175
03 8564 5000 EnviroSampleVic@eurofins.com

Company		CARDNO		Project No		WA_0960_PFASOMP		Project Manager		David James		Sampler(s)			
Address		11 harvest Tce WEST PERTH		Project Name		Learmonth		EDD Format ESdat, EQUIS etc		ESdat		Handed over by		ALS	
Contact Name		Maelle Bourdais		Analyses Where results are requested, please specify "Total" or "Filtered" SUITE code must be used to attach SUITE pricing		Full PFAS suite (water) Major anions & cations (water) DOC, TSS, pH (sediment) TOC, CEC, pH						Email for Invoice		claire.armstrong@cardno.com.au	
Phone No		0448 308 372										Email for Results		maelle.bourdais@cardno.com.au derp.labreports@esdat.com.au	
Special Directions		Please send ESdat report to derp.labreports@esdat.com.au with the project No in the header file.													
Purchase Order		DEF19009/430													
Quote ID No															
No	Client Sample ID	Sampled Date/Time dd/mm/yy hh:mm	Matrix Solid (S) Water (W)												
1	0960_QC201_														
11	0960_QC211_210623	23-6-21	S	X			X								
12	0960_QC212_210623	"	W	X	X	X									
13	0960_QC213_210623	"	S	X											
5															
6															
7															
8															
9															
10															
Total Counts															
Method of Shipment		<input type="checkbox"/> Courier (#) <input type="checkbox"/> Hand Delivered <input type="checkbox"/> Postal		Name		Signature		Date		Time		Temperature		Report No	
Laboratory Use Only		Received By		SYD BNE MEL PER ADL NTL DRW		Signature		Date		Time		Temperature		Report No	
		Received By		SYD BNE MEL PER ADL NTL DRW		Signature		Date		Time		Temperature		Report No	

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Penrose, Auckland 1061
Phone : +64 9 526 45 51
IANZ # 1327

Christchurch

43 Detroit Drive
Rolleston, Christchurch 7675
Phone : 0800 856 450
IANZ # 1290

Sample Receipt Advice

Company name: Cardno (WA)
Contact name: David James
Project name: LEARMONTH
Project ID: WA_0960_PFASOMP
Turnaround time: 5 Day
Date/Time received: Jun 28, 2021 9:30 AM
Eurofins reference: 806235

Sample Information

- ✓ A detailed list of analytes logged into our LIMS, is included in the attached summary table.
- ✓ All samples have been received as described on the above COC.
- ✓ COC has been completed correctly.
- ✓ Attempt to chill was evident.
- ✓ Appropriately preserved sample containers have been used.
- ✓ All samples were received in good condition.
- ✓ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
- ✓ Appropriate sample containers have been used.
- ✓ Sample containers for volatile analysis received with zero headspace.
- ✗ Split sample sent to requested external lab.
- ✗ Some samples have been subcontracted.
- N/A Custody Seals intact (if used).

Notes

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Rhys Thomas on phone : (+61) 8 9251 9602 or by email: RhysThomas@eurofins.com

Results will be delivered electronically via email to David James - David.James@cardno.com.au.

Note: A copy of these results will also be delivered to the general Cardno (WA) email address.

Australia

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Company Name: Cardno (WA)
Address: 11 Harvest Terrace
West Perth
WA 6005

Project Name: LEARMONTH
Project ID: WA_0960_PFASOMP

Order No.: DEF19009/430
Report #: 806235
Phone: 08 9273 3888
Fax: 08 9388 3831

Received: Jun 28, 2021 9:30 AM
Due: Jul 5, 2021
Priority: 5 Day
Contact Name: David James

Eurofins Analytical Services Manager : Rhys Thomas

Sample Detail						pH (1:5 Aqueous extract at 25°C as rec.)	pH (at 25 °C)	Total Organic Carbon	Total Suspended Solids Dried at 103–105°C	Moisture Set	Moisture Set	Cation Exchange Capacity	Eurofins Suite B11E: Cl/SO ₄ /Alkalinity	Per- and Polyfluoroalkyl Substances (PFASs)	Eurofins Suite B11C: Na/K/Ca/Mg	Total Dissolved Solids Dried at 180°C ± 2°C
Melbourne Laboratory - NATA Site # 1254						X	X	X	X	X	X	X	X		X	X
Sydney Laboratory - NATA Site # 18217																
Brisbane Laboratory - NATA Site # 20794										X	X	X		X		X
Perth Laboratory - NATA Site # 23736																
Mayfield Laboratory - NATA Site # 25079																
External Laboratory																
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID											
1	0960_QC201_210623	Jun 23, 2021		Water	P21-Jn54705		X		X				X	X	X	X
2	0960_QC202_210623	Jun 23, 2021		Soil	P21-Jn54706	X		X		X		X		X		
3	0960_QC203_210623	Jun 23, 2021		Water	P21-Jn54707		X		X				X	X	X	X
4	0960_QC204_210623	Jun 23, 2021		Water	P21-Jn54708		X		X				X	X	X	X
5	0960_QC205_210623	Jun 23, 2021		Water	P21-Jn54709		X		X				X	X	X	X
6	0960_QC206_	Jun 23, 2021		Soil	P21-Jn54710						X			X		

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Phone : 0800 856 450
IANZ # 1290

Company Name: Cardno (WA)
Address: 11 Harvest Terrace
West Perth
WA 6005

Project Name: LEARMONTH
Project ID: WA_0960_PFASOMP

Order No.: DEF19009/430
Report #: 806235
Phone: 08 9273 3888
Fax: 08 9388 3831

Received: Jun 28, 2021 9:30 AM
Due: Jul 5, 2021
Priority: 5 Day
Contact Name: David James

Eurofins Analytical Services Manager : Rhys Thomas

Sample Detail						pH (1:5 Aqueous extract at 25°C as rec.)	pH (at 25 °C)	Total Organic Carbon	Total Suspended Solids Dried at 103–105°C	Moisture Set	Moisture Set	Cation Exchange Capacity	Eurofins Suite B11E: Cl/SO4/Alkalinity	Per- and Polyfluoroalkyl Substances (PFASs)	Eurofins Suite B11C: Na/K/Ca/Mg	Total Dissolved Solids Dried at 180°C ± 2°C
Melbourne Laboratory - NATA Site # 1254						X	X	X	X	X	X	X	X		X	X
Sydney Laboratory - NATA Site # 18217																
Brisbane Laboratory - NATA Site # 20794										X	X	X		X		X
Perth Laboratory - NATA Site # 23736																
Mayfield Laboratory - NATA Site # 25079																
External Laboratory																
	210623															
7	0960_QC207_210623	Jun 23, 2021		Water	P21-Jn54711		X		X				X	X	X	X
8	0960_QC208_210623	Jun 23, 2021		Water	P21-Jn54712		X		X				X	X	X	X
9	0960_QC209_210623	Jun 23, 2021		Water	P21-Jn54713		X		X				X	X	X	X
10	0960_QC210_210623	Jun 23, 2021		Soil	P21-Jn54714						X			X		
11	0960_QC211_210623	Jun 23, 2021		Soil	P21-Jn54715	X		X		X		X		X		
12	0960_QC212_210623	Jun 23, 2021		Water	P21-Jn54716		X		X				X	X	X	X

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Phone : 0800 856 450
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ABN: 50 005 085 521 web: www.eurofins.com.au email: EnviroSales@eurofins.com

Company Name: Cardno (WA)
Address: 11 Harvest Terrace
West Perth
WA 6005

Project Name: LEARMONTH
Project ID: WA_0960_PFASOMP

Order No.: DEF19009/430
Report #: 806235
Phone: 08 9273 3888
Fax: 08 9388 3831

Received: Jun 28, 2021 9:30 AM
Due: Jul 5, 2021
Priority: 5 Day
Contact Name: David James

Eurofins Analytical Services Manager : Rhys Thomas

Sample Detail						pH (1:5 Aqueous extract at 25°C as rec.)	pH (at 25 °C)	Total Organic Carbon	Total Suspended Solids Dried at 103–105°C	Moisture Set	Moisture Set	Cation Exchange Capacity	Eurofins Suite B11E: Cl/SO ₄ /Alkalinity	Per- and Polyfluoroalkyl Substances (PFASs)	Eurofins Suite B11C: Na/K/Ca/Mg	Total Dissolved Solids Dried at 180°C ± 2°C
Melbourne Laboratory - NATA Site # 1254						X	X	X	X	X	X	X	X		X	X
Sydney Laboratory - NATA Site # 18217																
Brisbane Laboratory - NATA Site # 20794										X	X	X		X		X
Perth Laboratory - NATA Site # 23736																
Mayfield Laboratory - NATA Site # 25079																
External Laboratory																
13	0960_QC213_210623	Jun 23, 2021		Soil	P21-Jn54717						X			X		
Test Counts						2	8	2	8	5	5	2	8	13	8	8

Cardno Consulting WA
11 Harvest Terrace
West Perth
WA 6005



NATA Accredited
Accreditation Number 1261
Site Number 23736

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition
Arrangement for the mutual recognition of the
equivalence of testing, medical testing, calibration,
inspection, proficiency testing scheme providers and
reference materials producers reports and certificates.

Attention: David James

Report 806235-S
Project name LEARMONTH
Project ID WA_0960_PFASOMP
Received Date Jun 28, 2021

Client Sample ID			0960_QC202_2 10623	0960_QC206_2 10623	0960_QC210_2 10623	0960_QC211_2 10623
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			P21-Jn54706	P21-Jn54710	P21-Jn54714	P21-Jn54715
Date Sampled			Jun 23, 2021	Jun 23, 2021	Jun 23, 2021	Jun 23, 2021
Test/Reference	LOR	Unit				
Conductivity (1:5 aqueous extract at 25°C as rec.)	10	uS/cm	72	-	-	310
pH (1:5 Aqueous extract at 25°C as rec.)	0.1	pH Units	9.1	-	-	9.7
Total Organic Carbon	0.1	%	0.4	-	-	< 0.1
% Moisture	1	%	8.4	20	20	13
Cation Exchange Capacity						
Cation Exchange Capacity	0.05	meq/100g	31	-	-	38
Perfluoroalkyl carboxylic acids (PFCAs)						
Perfluorobutanoic acid (PFBA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoropentanoic acid (PFPeA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorohexanoic acid (PFHxA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoroheptanoic acid (PFHpA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorooctanoic acid (PFOA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorononanoic acid (PFNA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorodecanoic acid (PFDA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoroundecanoic acid (PFUnDA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorododecanoic acid (PFDoDA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotridecanoic acid (PFTeDA) ^{N15}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorotetradecanoic acid (PFTeDA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
13C4-PFBA (surr.)	1	%	93	34	42	86
13C5-PFPeA (surr.)	1	%	114	74	87	117
13C5-PFHxA (surr.)	1	%	89	59	70	81
13C4-PFHpA (surr.)	1	%	109	75	88	98
13C8-PFOA (surr.)	1	%	116	87	103	112
13C5-PFNA (surr.)	1	%	113	89	100	103
13C6-PFDA (surr.)	1	%	140	116	129	134
13C2-PFUnDA (surr.)	1	%	112	90	88	106
13C2-PFDoDA (surr.)	1	%	147	131	136	138
13C2-PFTeDA (surr.)	1	%	130	114	129	113
Perfluoroalkyl sulfonamido substances						
Perfluorooctane sulfonamide (FOSA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5

Client Sample ID			0960_QC202_2 10623	0960_QC206_2 10623	0960_QC210_2 10623	0960_QC211_2 10623
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			P21-Jn54706	P21-Jn54710	P21-Jn54714	P21-Jn54715
Date Sampled			Jun 23, 2021	Jun 23, 2021	Jun 23, 2021	Jun 23, 2021
Test/Reference	LOR	Unit				
Perfluoroalkyl sulfonamido substances						
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA) ^{N11}	10	ug/kg	< 10	< 10	< 10	< 10
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA) ^{N11}	10	ug/kg	< 10	< 10	< 10	< 10
13C8-FOSA (surr.)	1	%	128	112	123	121
D3-N-MeFOSA (surr.)	1	%	103	86	90	96
D5-N-EtFOSA (surr.)	1	%	93	81	84	90
D7-N-MeFOSE (surr.)	1	%	95	85	85	92
D9-N-EtFOSE (surr.)	1	%	93	75	83	84
D5-N-EtFOSAA (surr.)	1	%	101	81	93	99
D3-N-MeFOSAA (surr.)	1	%	95	78	88	94
Perfluoroalkyl sulfonic acids (PFASs)						
Perfluorobutanesulfonic acid (PFBS) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorononanesulfonic acid (PFNS) ^{N15}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoropropanesulfonic acid (PFPrS) ^{N15}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoropentanesulfonic acid (PFPeS) ^{N15}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorohexanesulfonic acid (PFHxS) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluoroheptanesulfonic acid (PFHpS) ^{N15}	5	ug/kg	< 5	< 5	< 5	< 5
Perfluorooctanesulfonic acid (PFOS) ^{N11}	5	ug/kg	^{N09} 66	< 5	< 5	^{N09} 6.6
Perfluorodecanesulfonic acid (PFDS) ^{N15}	5	ug/kg	< 5	< 5	< 5	< 5
13C3-PFBS (surr.)	1	%	69	72	78	86
18O2-PFHxS (surr.)	1	%	92	85	90	76
13C8-PFOS (surr.)	1	%	81	86	92	88
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)						
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA) ^{N11}	10	ug/kg	< 10	< 10	< 10	< 10
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA) ^{N11}	5	ug/kg	< 5	< 5	< 5	< 5
13C2-4:2 FTS (surr.)	1	%	71	38	40	62
13C2-6:2 FTSA (surr.)	1	%	83	47	54	57
13C2-8:2 FTSA (surr.)	1	%	95	51	52	77
13C2-10:2 FTSA (surr.)	1	%	96	101	92	95
PFASs Summations						
Sum (PFHxS + PFOS)*	5	ug/kg	66	< 5	< 5	6.6
Sum of US EPA PFAS (PFOS + PFOA)*	5	ug/kg	66	< 5	< 5	6.6
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	5	ug/kg	66	< 5	< 5	6.6
Sum of WA DWER PFAS (n=10)*	10	ug/kg	66	< 10	< 10	< 10
Sum of PFASs (n=30)*	50	ug/kg	66	< 50	< 50	< 50

Client Sample ID			0960_QC213_2 10623
Sample Matrix			Soil
Eurofins Sample No.			P21-Jn54717
Date Sampled			Jun 23, 2021
Test/Reference	LOR	Unit	
% Moisture	1	%	35
Perfluoroalkyl carboxylic acids (PFCAs)			
Perfluorobutanoic acid (PFBA) ^{N11}	5	ug/kg	< 5
Perfluoropentanoic acid (PFPeA) ^{N11}	5	ug/kg	< 5
Perfluorohexanoic acid (PFHxA) ^{N11}	5	ug/kg	< 5
Perfluoroheptanoic acid (PFHpA) ^{N11}	5	ug/kg	< 5
Perfluorooctanoic acid (PFOA) ^{N11}	5	ug/kg	< 5
Perfluorononanoic acid (PFNA) ^{N11}	5	ug/kg	< 5
Perfluorodecanoic acid (PFDA) ^{N11}	5	ug/kg	< 5
Perfluoroundecanoic acid (PFUnDA) ^{N11}	5	ug/kg	< 5
Perfluorododecanoic acid (PFDoDA) ^{N11}	5	ug/kg	< 5
Perfluorotridecanoic acid (PFTeDA) ^{N15}	5	ug/kg	< 5
Perfluorotetradecanoic acid (PFTeDA) ^{N11}	5	ug/kg	< 5
13C4-PFBA (surr.)	1	%	40
13C5-PFPeA (surr.)	1	%	92
13C5-PFHxA (surr.)	1	%	60
13C4-PFHpA (surr.)	1	%	71
13C8-PFOA (surr.)	1	%	90
13C5-PFNA (surr.)	1	%	92
13C6-PFDA (surr.)	1	%	121
13C2-PFUnDA (surr.)	1	%	97
13C2-PFDoDA (surr.)	1	%	124
13C2-PFTeDA (surr.)	1	%	107
Perfluoroalkyl sulfonamido substances			
Perfluorooctane sulfonamide (FOSA) ^{N11}	5	ug/kg	< 5
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA) ^{N11}	5	ug/kg	< 5
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA) ^{N11}	5	ug/kg	< 5
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE) ^{N11}	5	ug/kg	< 5
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE) ^{N11}	5	ug/kg	< 5
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA) ^{N11}	10	ug/kg	< 10
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA) ^{N11}	10	ug/kg	< 10
13C8-FOSA (surr.)	1	%	117
D3-N-MeFOSA (surr.)	1	%	85
D5-N-EtFOSA (surr.)	1	%	79
D7-N-MeFOSE (surr.)	1	%	82
D9-N-EtFOSE (surr.)	1	%	79
D5-N-EtFOSAA (surr.)	1	%	80
D3-N-MeFOSAA (surr.)	1	%	76
Perfluoroalkyl sulfonic acids (PFSA)			
Perfluorobutanesulfonic acid (PFBS) ^{N11}	5	ug/kg	< 5
Perfluorononanesulfonic acid (PFNS) ^{N15}	5	ug/kg	< 5
Perfluoropropanesulfonic acid (PFPrS) ^{N15}	5	ug/kg	< 5
Perfluoropentanesulfonic acid (PFPeS) ^{N15}	5	ug/kg	< 5
Perfluorohexanesulfonic acid (PFHxS) ^{N11}	5	ug/kg	< 5
Perfluoroheptanesulfonic acid (PFHpS) ^{N15}	5	ug/kg	< 5

Client Sample ID			0960_QC213_2
Sample Matrix			Soil
Eurofins Sample No.			P21-Jn54717
Date Sampled			Jun 23, 2021
Test/Reference	LOR	Unit	
Perfluoroalkyl sulfonic acids (PFASs)			
Perfluorooctanesulfonic acid (PFOS) ^{N11}	5	ug/kg	< 5
Perfluorodecanesulfonic acid (PFDS) ^{N15}	5	ug/kg	< 5
13C3-PFBS (surr.)	1	%	74
18O2-PFHxS (surr.)	1	%	85
13C8-PFOS (surr.)	1	%	84
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA) ^{N11}	5	ug/kg	< 5
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA) ^{N11}	10	ug/kg	< 10
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA) ^{N11}	5	ug/kg	< 5
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA) ^{N11}	5	ug/kg	< 5
13C2-4:2 FTS (surr.)	1	%	32
13C2-6:2 FTSA (surr.)	1	%	32
13C2-8:2 FTSA (surr.)	1	%	48
13C2-10:2 FTSA (surr.)	1	%	82
PFASs Summations			
Sum (PFHxS + PFOS)*	5	ug/kg	< 5
Sum of US EPA PFAS (PFOS + PFOA)*	5	ug/kg	< 5
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	5	ug/kg	< 5
Sum of WA DWER PFAS (n=10)*	10	ug/kg	< 10
Sum of PFASs (n=30)*	50	ug/kg	< 50

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Conductivity (1:5 aqueous extract at 25°C as rec.) - Method: LTM-INO-4030 Conductivity	Melbourne	Jul 02, 2021	7 Days
Cation Exchange Capacity - Method: LTM-MET-3060 Cation Exchange Capacity by bases & Exchangeable Sodium Percentage	Melbourne	Jul 02, 2021	180 Days
pH (1:5 Aqueous extract at 25°C as rec.) - Method: LTM-GEN-7090 pH in soil by ISE	Melbourne	Jul 02, 2021	7 Days
Total Organic Carbon - Method: LTM-INO-4060 Total Organic Carbon in water and soil	Melbourne	Jul 02, 2021	28 Days
% Moisture - Method: LTM-GEN-7080 Moisture	Brisbane	Jun 28, 2021	14 Days
Per- and Polyfluoroalkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs) - Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)	Brisbane	Jul 02, 2021	28 Days
Perfluoroalkyl sulfonamido substances - Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)	Brisbane	Jul 02, 2021	28 Days
Perfluoroalkyl sulfonic acids (PFASs) - Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)	Brisbane	Jul 02, 2021	28 Days
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs) - Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)	Brisbane	Jul 02, 2021	28 Days

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Site # 1254

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Brisbane
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NATA # 1261 Site # 20794

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Phone : +61 8 9251 9600
NATA # 1261
Site # 23736

Newcastle
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NATA # 1261 Site # 25079

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Company Name: Cardno (WA)
Address: 11 Harvest Terrace
West Perth
WA 6005

Project Name: LEARMONTH
Project ID: WA_0960_PFASOMP

Order No.: DEF19009/430
Report #: 806235
Phone: 08 9273 3888
Fax: 08 9388 3831

Received: Jun 28, 2021 9:30 AM
Due: Jul 5, 2021
Priority: 5 Day
Contact Name: David James

Eurofins Analytical Services Manager : Rhys Thomas

Sample Detail						pH (1:5 Aqueous extract at 25°C as rec.)	pH (at 25 °C)	Total Organic Carbon	Total Suspended Solids Dried at 103–105°C	Moisture Set	Moisture Set	Cation Exchange Capacity	Eurofins Suite B11E: Cl/SO4/Alkalinity	Per- and Polyfluoroalkyl Substances (PFASs)	Eurofins Suite B11C: Na/K/Ca/Mg	Total Dissolved Solids Dried at 180°C ± 2°C
Melbourne Laboratory - NATA Site # 1254						X	X	X	X	X	X	X	X		X	X
Sydney Laboratory - NATA Site # 18217																
Brisbane Laboratory - NATA Site # 20794										X	X	X		X		X
Perth Laboratory - NATA Site # 23736																
Mayfield Laboratory - NATA Site # 25079																
External Laboratory																
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID											
1	0960_QC201_210623	Jun 23, 2021		Water	P21-Jn54705		X		X				X	X	X	X
2	0960_QC202_210623	Jun 23, 2021		Soil	P21-Jn54706	X		X		X		X		X		
3	0960_QC203_210623	Jun 23, 2021		Water	P21-Jn54707		X		X				X	X	X	X
4	0960_QC204_210623	Jun 23, 2021		Water	P21-Jn54708		X		X				X	X	X	X
5	0960_QC205_210623	Jun 23, 2021		Water	P21-Jn54709		X		X				X	X	X	X
6	0960_QC206_	Jun 23, 2021		Soil	P21-Jn54710						X			X		

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Melbourne Laboratory - NATA Site # 1254						X	X	X	X	X	X	X	X		X	X
Sydney Laboratory - NATA Site # 18217																
Brisbane Laboratory - NATA Site # 20794										X	X	X		X		X
Perth Laboratory - NATA Site # 23736																
Mayfield Laboratory - NATA Site # 25079																
External Laboratory																
	210623															
7	0960_QC207_210623	Jun 23, 2021		Water	P21-Jn54711		X		X				X	X	X	X
8	0960_QC208_210623	Jun 23, 2021		Water	P21-Jn54712		X		X				X	X	X	X
9	0960_QC209_210623	Jun 23, 2021		Water	P21-Jn54713		X		X				X	X	X	X
10	0960_QC210_210623	Jun 23, 2021		Soil	P21-Jn54714						X			X		
11	0960_QC211_210623	Jun 23, 2021		Soil	P21-Jn54715	X		X		X		X		X		
12	0960_QC212_210623	Jun 23, 2021		Water	P21-Jn54716		X		X				X	X	X	X

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Sample Detail						pH (1:5 Aqueous extract at 25°C as rec.)	pH (at 25 °C)	Total Organic Carbon	Total Suspended Solids Dried at 103–105°C	Moisture Set	Moisture Set	Cation Exchange Capacity	Eurofins Suite B11E: Cl/SO4/Alkalinity	Per- and Polyfluoroalkyl Substances (PFASs)	Eurofins Suite B11C: Na/K/Ca/Mg	Total Dissolved Solids Dried at 180°C ± 2°C
Melbourne Laboratory - NATA Site # 1254						X	X	X	X	X	X	X	X		X	X
Sydney Laboratory - NATA Site # 18217																
Brisbane Laboratory - NATA Site # 20794										X	X	X		X		X
Perth Laboratory - NATA Site # 23736																
Mayfield Laboratory - NATA Site # 25079																
External Laboratory																
13	0960_QC213_210623	Jun 23, 2021		Soil	P21-Jn54717						X			X		
Test Counts						2	8	2	8	5	5	2	8	13	8	8

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram

mg/L: milligrams per litre

ug/L: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100mL: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NC	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 20-130% Phenols & 50-150% PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " - " in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Conductivity (1:5 aqueous extract at 25°C as rec.)	uS/cm	< 10			10	Pass	
Total Organic Carbon	%	< 0.1			0.1	Pass	
Method Blank							
Cation Exchange Capacity							
Cation Exchange Capacity	meq/100g	< 0.05			0.05	Pass	
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	ug/kg	< 5			5	Pass	
Perfluoropentanoic acid (PFPeA)	ug/kg	< 5			5	Pass	
Perfluorohexanoic acid (PFHxA)	ug/kg	< 5			5	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/kg	< 5			5	Pass	
Perfluorooctanoic acid (PFOA)	ug/kg	< 5			5	Pass	
Perfluorononanoic acid (PFNA)	ug/kg	< 5			5	Pass	
Perfluorodecanoic acid (PFDA)	ug/kg	< 5			5	Pass	
Perfluoroundecanoic acid (PFUnDA)	ug/kg	< 5			5	Pass	
Perfluorododecanoic acid (PFDoDA)	ug/kg	< 5			5	Pass	
Perfluorotridecanoic acid (PFTTrDA)	ug/kg	< 5			5	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/kg	< 5			5	Pass	
Method Blank							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	ug/kg	< 5			5	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/kg	< 5			5	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/kg	< 5			5	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	ug/kg	< 5			5	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	ug/kg	< 5			5	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/kg	< 10			10	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/kg	< 10			10	Pass	
Method Blank							
Perfluoroalkyl sulfonic acids (PFSA's)							
Perfluorobutanesulfonic acid (PFBS)	ug/kg	< 5			5	Pass	
Perfluorononanesulfonic acid (PFNS)	ug/kg	< 5			5	Pass	
Perfluoropropanesulfonic acid (PFPrS)	ug/kg	< 5			5	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/kg	< 5			5	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/kg	< 5			5	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/kg	< 5			5	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/kg	< 5			5	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/kg	< 5			5	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids (n:2 FTSA's)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	ug/kg	< 5			5	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	ug/kg	< 10			10	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	ug/kg	< 5			5	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	ug/kg	< 5			5	Pass	
LCS - % Recovery							
Total Organic Carbon	%	99			70-130	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	85			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	70			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	87			50-150	Pass	

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Perfluoroheptanoic acid (PFHpA)			%	88			50-150	Pass	
Perfluorooctanoic acid (PFOA)			%	81			50-150	Pass	
Perfluorononanoic acid (PFNA)			%	93			50-150	Pass	
Perfluorodecanoic acid (PFDA)			%	84			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)			%	86			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)			%	80			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)			%	68			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)			%	80			50-150	Pass	
LCS - % Recovery									
Perfluoroalkyl sulfonamido substances									
Perfluorooctane sulfonamide (FOSA)			%	85			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)			%	106			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)			%	74			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)			%	89			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)			%	91			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)			%	79			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)			%	64			50-150	Pass	
LCS - % Recovery									
Perfluoroalkyl sulfonic acids (PFSA's)									
Perfluorobutanesulfonic acid (PFBS)			%	74			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)			%	83			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)			%	76			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)			%	84			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)			%	84			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)			%	78			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)			%	84			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)			%	82			50-150	Pass	
LCS - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSA's)									
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)			%	74			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)			%	98			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)			%	88			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)			%	71			50-150	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs)									
				Result 1					
Perfluorobutanoic acid (PFBA)	S21-Jn60024	NCP	%	85			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	S21-Jn60024	NCP	%	76			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	S21-Jn60024	NCP	%	89			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	S21-Jn60024	NCP	%	92			50-150	Pass	
Perfluorooctanoic acid (PFOA)	S21-Jn60024	NCP	%	85			50-150	Pass	
Perfluorononanoic acid (PFNA)	S21-Jn60024	NCP	%	92			50-150	Pass	
Perfluorodecanoic acid (PFDA)	S21-Jn60024	NCP	%	88			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	S21-Jn60024	NCP	%	92			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	S21-Jn60024	NCP	%	81			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	S21-Jn60024	NCP	%	86			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	S21-Jn60024	NCP	%	86			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances									
				Result 1					
Perfluorooctane sulfonamide (FOSA)	S21-Jn60024	NCP	%	85			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	S21-Jn60024	NCP	%	100			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	S21-Jn60024	NCP	%	87			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	S21-Jn60024	NCP	%	88			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	S21-Jn60024	NCP	%	101			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	S21-Jn60024	NCP	%	89			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	S21-Jn60024	NCP	%	82			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSA's)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	S21-Jn60024	NCP	%	83			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	S21-Jn60024	NCP	%	78			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	S21-Jn60024	NCP	%	83			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	S21-Jn60024	NCP	%	94			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	S21-Jn60024	NCP	%	89			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	S21-Jn60024	NCP	%	85			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	S21-Jn60024	NCP	%	80			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	S21-Jn60024	NCP	%	86			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSA's)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	S21-Jn60024	NCP	%	79			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	S21-Jn60024	NCP	%	101			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	S21-Jn60024	NCP	%	83			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	S21-Jn60024	NCP	%	78			50-150	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
				Result 1	Result 2	RPD			
Conductivity (1:5 aqueous extract at 25°C as rec.)	B21-Jn55031	NCP	uS/cm	< 10	11	7.8	30%	Pass	
pH (1:5 Aqueous extract at 25°C as rec.)	B21-Jn55031	NCP	pH Units	5.8	5.7	pass	30%	Pass	
Total Organic Carbon	M21-Jn61439	NCP	%	2.5	2.9	16	30%	Pass	
Duplicate									
Cation Exchange Capacity				Result 1	Result 2	RPD			
Cation Exchange Capacity	B21-JI03613	NCP	meq/100g	24	27	8.0	30%	Pass	

Duplicate								
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD		
Perfluorobutanoic acid (PFBA)	S21-Jn59948	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluoropentanoic acid (PFPeA)	S21-Jn59948	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorohexanoic acid (PFHxA)	S21-Jn59948	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluoroheptanoic acid (PFHpA)	S21-Jn59948	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorooctanoic acid (PFOA)	S21-Jn59948	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorononanoic acid (PFNA)	S21-Jn59948	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorodecanoic acid (PFDA)	S21-Jn59948	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluoroundecanoic acid (PFUnDA)	S21-Jn59948	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorododecanoic acid (PFDoDA)	S21-Jn59948	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorotridecanoic acid (PFTTrDA)	S21-Jn59948	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorotetradecanoic acid (PFTeDA)	S21-Jn59948	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Duplicate								
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD		
Perfluorooctane sulfonamide (FOSA)	S21-Jn59948	NCP	ug/kg	< 5	< 5	<1	30%	Pass
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	S21-Jn59948	NCP	ug/kg	< 5	< 5	<1	30%	Pass
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	S21-Jn59948	NCP	ug/kg	< 5	< 5	<1	30%	Pass
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	S21-Jn59948	NCP	ug/kg	< 5	< 5	<1	30%	Pass
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	S21-Jn59948	NCP	ug/kg	< 5	< 5	<1	30%	Pass
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	S21-Jn59948	NCP	ug/kg	< 10	< 10	<1	30%	Pass
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	S21-Jn59948	NCP	ug/kg	< 10	< 10	<1	30%	Pass
Duplicate								
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD		
Perfluorobutanesulfonic acid (PFBS)	S21-Jn59948	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorononanesulfonic acid (PFNS)	S21-Jn59948	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluoropropanesulfonic acid (PFPrS)	S21-Jn59948	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluoropentanesulfonic acid (PFPeS)	S21-Jn59948	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorohexanesulfonic acid (PFHxS)	S21-Jn59948	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluoroheptanesulfonic acid (PFHpS)	S21-Jn59948	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorooctanesulfonic acid (PFOS)	S21-Jn59948	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Perfluorodecanesulfonic acid (PFDS)	S21-Jn59948	NCP	ug/kg	< 5	< 5	<1	30%	Pass
Duplicate								
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)				Result 1	Result 2	RPD		
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	S21-Jn59948	NCP	ug/kg	< 5	< 5	<1	30%	Pass
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	S21-Jn59948	NCP	ug/kg	< 10	< 10	<1	30%	Pass
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	S21-Jn59948	NCP	ug/kg	< 5	< 5	<1	30%	Pass
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	S21-Jn59948	NCP	ug/kg	< 5	< 5	<1	30%	Pass

Duplicate									
					Result 1	Result 2	RPD		
% Moisture	S21-Jn53001	NCP	%		2.7	2.3	14	30%	Pass

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N09	Quantification of linear and branched isomers has been conducted as a single total response using the relative response factor for the corresponding linear/branched standard.
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.
N15	Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).

Authorised by:

Rhys Thomas	Analytical Services Manager
Emily Rosenberg	Senior Analyst-Metal (VIC)
Sarah McCallion	Senior Analyst-PFAS (QLD)
Scott Beddoes	Senior Analyst-Inorganic (VIC)



Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please [click here](#).

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Arrangement for the mutual recognition of the
equivalence of testing, medical testing, calibration,
inspection, proficiency testing scheme providers and
reference materials producers reports and certificates.

Attention: David James

Report 806235-W
Project name LEARMONTH
Project ID WA_0960_PFASOMP
Received Date Jun 28, 2021

Client Sample ID			0960_QC201_2 10623	0960_QC203_2 10623	0960_QC204_2 10623	0960_QC205_2 10623
Sample Matrix			Water	Water	Water	Water
Eurofins Sample No.			P21-Jn54705	P21-Jn54707	P21-Jn54708	P21-Jn54709
Date Sampled			Jun 23, 2021	Jun 23, 2021	Jun 23, 2021	Jun 23, 2021
Test/Reference	LOR	Unit				
Chloride	1	mg/L	3400	3000	1300	21000
pH (at 25 °C)	0.1	pH Units	8.5	8.9	9.1	8.3
Sulphate (as SO ₄)	5	mg/L	520	430	350	3200
Total Dissolved Solids Dried at 180°C ± 2°C	10	mg/L	6200	5200	3800	18000
Total Suspended Solids Dried at 103–105°C	1	mg/L	200	9.0	250	86
Alkalinity (speciated)						
Bicarbonate Alkalinity (as CaCO ₃)	20	mg/L	1100	97	910	140
Carbonate Alkalinity (as CaCO ₃)	10	mg/L	23	14	87	< 10
Hydroxide Alkalinity (as CaCO ₃)	20	mg/L	< 20	< 20	< 20	< 20
Total Alkalinity (as CaCO ₃)	20	mg/L	1100	110	1000	150
Eurofins Suite B11C: Na/K/Ca/Mg						
Calcium	0.5	mg/L	140	79	32	450
Magnesium	0.5	mg/L	170	180	61	1300
Potassium	0.5	mg/L	76	78	37	420
Sodium	0.5	mg/L	2000	1700	1300	11000
Perfluoroalkyl carboxylic acids (PFCA's)						
Perfluorobutanoic acid (PFBA) ^{N11}	0.05	ug/L	0.24	< 0.05	< 0.05	< 0.05
Perfluoropentanoic acid (PFPeA) ^{N11}	0.01	ug/L	0.29	< 0.01	0.07	< 0.01
Perfluorohexanoic acid (PFHxA) ^{N11}	0.01	ug/L	^{NO9} 1.4	< 0.01	^{NO9} 0.26	< 0.01
Perfluoroheptanoic acid (PFHpA) ^{N11}	0.01	ug/L	^{NO9} 0.14	< 0.01	^{NO9} 0.03	< 0.01
Perfluorooctanoic acid (PFOA) ^{N11}	0.01	ug/L	^{NO9} 0.22	< 0.01	^{NO9} 0.04	< 0.01
Perfluorononanoic acid (PFNA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorodecanoic acid (PFDA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluoroundecanoic acid (PFUnDA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorododecanoic acid (PFDoDA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorotridecanoic acid (PFTeDA) ^{N15}	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorotetradecanoic acid (PFTeDA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
13C4-PFBA (surr.)	1	%	76	78	91	81
13C5-PFPeA (surr.)	1	%	89	109	110	109
13C5-PFHxA (surr.)	1	%	72	117	108	112
13C4-PFHpA (surr.)	1	%	90	106	105	104
13C8-PFOA (surr.)	1	%	81	107	100	102
13C5-PFNA (surr.)	1	%	86	96	92	93
13C6-PFDA (surr.)	1	%	55	84	65	73
13C2-PFUnDA (surr.)	1	%	57	67	51	63

Client Sample ID			0960_QC201_2 10623	0960_QC203_2 10623	0960_QC204_2 10623	0960_QC205_2 10623
Sample Matrix			Water	Water	Water	Water
Eurofins Sample No.			P21-Jn54705	P21-Jn54707	P21-Jn54708	P21-Jn54709
Date Sampled			Jun 23, 2021	Jun 23, 2021	Jun 23, 2021	Jun 23, 2021
Test/Reference	LOR	Unit				
Perfluoroalkyl carboxylic acids (PFCAs)						
13C2-PFDoDA (surr.)	1	%	32	37	26	39
13C2-PFTeDA (surr.)	1	%	INT	INT	INT	INT
Perfluoroalkyl sulfonamido substances						
Perfluorooctane sulfonamide (FOSA) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
13C8-FOSA (surr.)	1	%	80	82	76	79
D3-N-MeFOSA (surr.)	1	%	50	75	43	74
D5-N-EtFOSA (surr.)	1	%	45	65	35	67
D7-N-MeFOSE (surr.)	1	%	25	22	20	30
D9-N-EtFOSE (surr.)	1	%	19	19	16	24
D5-N-EtFOSAA (surr.)	1	%	21	22	12	50
D3-N-MeFOSAA (surr.)	1	%	27	27	16	61
Perfluoroalkyl sulfonic acids (PFASs)						
Perfluorobutanesulfonic acid (PFBS) ^{N11}	0.01	ug/L	0.43	< 0.01	0.09	< 0.01
Perfluorononanesulfonic acid (PFNS) ^{N15}	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluoropropanesulfonic acid (PFPrS) ^{N15}	0.01	ug/L	0.20	< 0.01	0.04	< 0.01
Perfluoropentanesulfonic acid (PFPeS) ^{N15}	0.01	ug/L	^{N09} 0.47	< 0.01	^{N09} 0.11	< 0.01
Perfluorohexanesulfonic acid (PFHxS) ^{N11}	0.01	ug/L	^{N09} 7.6	< 0.01	^{N09} 1.1	< 0.01
Perfluoroheptanesulfonic acid (PFHpS) ^{N15}	0.01	ug/L	^{N09} 0.30	< 0.01	^{N09} 0.05	< 0.01
Perfluorooctanesulfonic acid (PFOS) ^{N11}	0.01	ug/L	^{N09} 2.9	^{N09} 0.02	^{N09} 1.5	< 0.01
Perfluorodecanesulfonic acid (PFDS) ^{N15}	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
13C3-PFBS (surr.)	1	%	83	110	103	102
18O2-PFHxS (surr.)	1	%	60	98	72	93
13C8-PFOS (surr.)	1	%	75	91	65	86
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)						
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA) ^{N11}	0.05	ug/L	0.11	< 0.05	0.18	< 0.05
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
13C2-4:2 FTS (surr.)	1	%	63	82	76	39
13C2-6:2 FTSA (surr.)	1	%	61	81	65	38
13C2-8:2 FTSA (surr.)	1	%	69	84	68	68
13C2-10:2 FTSA (surr.)	1	%	29	36	21	33

Client Sample ID			0960_QC201_2 10623	0960_QC203_2 10623	0960_QC204_2 10623	0960_QC205_2 10623
Sample Matrix			Water	Water	Water	Water
Eurofins Sample No.			P21-Jn54705	P21-Jn54707	P21-Jn54708	P21-Jn54709
Date Sampled			Jun 23, 2021	Jun 23, 2021	Jun 23, 2021	Jun 23, 2021
Test/Reference	LOR	Unit				
PFASs Summations						
Sum (PFHxS + PFOS)*	0.01	ug/L	10.5	0.02	2.6	< 0.01
Sum of US EPA PFAS (PFOS + PFOA)*	0.01	ug/L	3.12	0.02	1.54	< 0.01
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	0.01	ug/L	10.72	0.02	2.64	< 0.01
Sum of WA DWER PFAS (n=10)*	0.05	ug/L	13.33	< 0.05	3.27	< 0.05
Sum of PFASs (n=30)*	0.1	ug/L	14.3	< 0.1	3.47	< 0.1

Client Sample ID			0960_QC207_2 10623	0960_QC208_2 10623	0960_QC209_2 10623	0960_QC212_2 10623
Sample Matrix			Water	Water	Water	Water
Eurofins Sample No.			P21-Jn54711	P21-Jn54712	P21-Jn54713	P21-Jn54716
Date Sampled			Jun 23, 2021	Jun 23, 2021	Jun 23, 2021	Jun 23, 2021
Test/Reference	LOR	Unit				
Chloride	1	mg/L	27000	1800	19000	16000
pH (at 25 °C)	0.1	pH Units	8.2	8.9	8.6	8.5
Sulphate (as SO4)	5	mg/L	3000	500	2800	1800
Total Dissolved Solids Dried at 180°C ± 2°C	10	mg/L	66000	3800	34000	16000
Total Suspended Solids Dried at 103–105°C	1	mg/L	690	270	71	450
Alkalinity (speciated)						
Bicarbonate Alkalinity (as CaCO3)	20	mg/L	210	820	180	550
Carbonate Alkalinity (as CaCO3)	10	mg/L	< 10	57	19	13
Hydroxide Alkalinity (as CaCO3)	20	mg/L	< 20	< 20	< 20	< 20
Total Alkalinity (as CaCO3)	20	mg/L	210	880	200	570
Eurofins Suite B11C: Na/K/Ca/Mg						
Calcium	0.5	mg/L	1000	48	430	550
Magnesium	0.5	mg/L	1500	70	1200	990
Potassium	0.5	mg/L	360	44	400	320
Sodium	0.5	mg/L	16000	1500	10000	8400
Perfluoroalkyl carboxylic acids (PFCAs)						
Perfluorobutanoic acid (PFBA) ^{N11}	0.05	ug/L	< 0.05	0.18	< 0.05	< 0.05
Perfluoropentanoic acid (PFPeA) ^{N11}	0.01	ug/L	< 0.01	0.08	< 0.01	0.02
Perfluorohexanoic acid (PFHxA) ^{N11}	0.01	ug/L	< 0.01	^{N09} 0.20	< 0.01	^{N09} 0.12
Perfluoroheptanoic acid (PFHpA) ^{N11}	0.01	ug/L	< 0.01	^{N09} 0.07	< 0.01	< 0.01
Perfluorooctanoic acid (PFOA) ^{N11}	0.01	ug/L	< 0.01	^{N09} 0.11	< 0.01	< 0.01
Perfluorononanoic acid (PFNA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorodecanoic acid (PFDA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluoroundecanoic acid (PFUnDA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorododecanoic acid (PFDoDA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorotridecanoic acid (PFTeDA) ^{N15}	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluorotetradecanoic acid (PFTeDA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
13C4-PFBA (surr.)	1	%	80	67	87	87
13C5-PFPeA (surr.)	1	%	100	81	110	106
13C5-PFHxA (surr.)	1	%	106	84	109	99
13C4-PFHpA (surr.)	1	%	94	81	94	89
13C8-PFOA (surr.)	1	%	95	85	96	97
13C5-PFNA (surr.)	1	%	86	84	91	88
13C6-PFDA (surr.)	1	%	80	73	84	80
13C2-PFUnDA (surr.)	1	%	73	67	68	69

Client Sample ID			0960_QC207_2 10623	0960_QC208_2 10623	0960_QC209_2 10623	0960_QC212_2 10623
Sample Matrix			Water	Water	Water	Water
Eurofins Sample No.			P21-Jn54711	P21-Jn54712	P21-Jn54713	P21-Jn54716
Date Sampled			Jun 23, 2021	Jun 23, 2021	Jun 23, 2021	Jun 23, 2021
Test/Reference	LOR	Unit				
Perfluoroalkyl carboxylic acids (PFCAs)						
13C2-PFDoDA (surr.)	1	%	50	33	46	46
13C2-PFTeDA (surr.)	1	%	10	INT	INT	INT
Perfluoroalkyl sulfonamido substances						
Perfluorooctane sulfonamide (FOSA) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
13C8-FOSA (surr.)	1	%	80	81	79	74
D3-N-MeFOSA (surr.)	1	%	75	96	81	68
D5-N-EtFOSA (surr.)	1	%	69	79	67	59
D7-N-MeFOSE (surr.)	1	%	35	42	31	30
D9-N-EtFOSE (surr.)	1	%	29	33	26	25
D5-N-EtFOSAA (surr.)	1	%	52	13	25	32
D3-N-MeFOSAA (surr.)	1	%	55	15	30	37
Perfluoroalkyl sulfonic acids (PFSA's)						
Perfluorobutanesulfonic acid (PFBS) ^{N11}	0.01	ug/L	< 0.01	0.03	< 0.01	0.11
Perfluorononanesulfonic acid (PFNS) ^{N15}	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
Perfluoropropanesulfonic acid (PFPrS) ^{N15}	0.01	ug/L	< 0.01	0.01	< 0.01	0.04
Perfluoropentanesulfonic acid (PFPeS) ^{N15}	0.01	ug/L	< 0.01	N090.05	< 0.01	N090.14
Perfluorohexanesulfonic acid (PFHxS) ^{N11}	0.01	ug/L	< 0.01	N091.0	< 0.01	N090.72
Perfluoroheptanesulfonic acid (PFHpS) ^{N15}	0.01	ug/L	< 0.01	N090.06	< 0.01	< 0.01
Perfluorooctanesulfonic acid (PFOS) ^{N11}	0.01	ug/L	< 0.01	N090.92	< 0.01	N090.03
Perfluorodecanesulfonic acid (PFDS) ^{N15}	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
13C3-PFBS (surr.)	1	%	103	105	98	98
18O2-PFHxS (surr.)	1	%	91	77	93	82
13C8-PFOS (surr.)	1	%	89	80	83	91
n:2 Fluorotelomer sulfonic acids (n:2 FTSA's)						
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA) ^{N11}	0.05	ug/L	< 0.05	< 0.05	< 0.05	< 0.05
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA) ^{N11}	0.01	ug/L	< 0.01	< 0.01	< 0.01	< 0.01
13C2-4:2 FTS (surr.)	1	%	28	39	37	32
13C2-6:2 FTSA (surr.)	1	%	22	59	37	28
13C2-8:2 FTSA (surr.)	1	%	43	79	60	54
13C2-10:2 FTSA (surr.)	1	%	33	30	35	36

Client Sample ID			0960_QC207_2 10623	0960_QC208_2 10623	0960_QC209_2 10623	0960_QC212_2 10623
Sample Matrix			Water	Water	Water	Water
Eurofins Sample No.			P21-Jn54711	P21-Jn54712	P21-Jn54713	P21-Jn54716
Date Sampled			Jun 23, 2021	Jun 23, 2021	Jun 23, 2021	Jun 23, 2021
Test/Reference	LOR	Unit				
PFASs Summations						
Sum (PFHxS + PFOS)*	0.01	ug/L	< 0.01	1.92	< 0.01	0.75
Sum of US EPA PFAS (PFOS + PFOA)*	0.01	ug/L	< 0.01	1.03	< 0.01	0.03
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	0.01	ug/L	< 0.01	2.03	< 0.01	0.75
Sum of WA DWER PFAS (n=10)*	0.05	ug/L	< 0.05	2.59	< 0.05	1
Sum of PFASs (n=30)*	0.1	ug/L	< 0.1	2.71	< 0.1	1.18

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Eurofins Suite B11E: Cl/SO₄/Alkalinity			
Chloride	Melbourne	Jun 29, 2021	28 Days
- Method: LTM-INO-4090 Chloride by Discrete Analyser			
Sulphate (as SO ₄)	Melbourne	Jun 29, 2021	28 Days
- Method: LTM-INO-4110 Sulfate by Discrete Analyser			
Alkalinity (speciated)	Melbourne	Jun 29, 2021	14 Days
- Method: LTM-INO-4250 Alkalinity by Electrometric Titration			
pH (at 25 °C)	Melbourne	Jun 29, 2021	0 Hours
- Method: LTM-GEN-7090 pH in water by ISE			
Total Suspended Solids Dried at 103–105°C	Melbourne	Jun 29, 2021	7 Days
- Method: LTM-INO-4070 Analysis of Suspended Solids in Water by Gravimetry			
Eurofins Suite B11C: Na/K/Ca/Mg	Melbourne	Jun 29, 2021	180 Days
- Method: LTM-MET-3010 Alkali Metals by ICP-AES			
Total Dissolved Solids Dried at 180°C ± 2°C	Melbourne	Jun 29, 2021	7 Days
- Method: LTM-INO-4170 Total Dissolved Solids in Water			
Per- and Polyfluoroalkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs)	Brisbane	Jun 30, 2021	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonamido substances	Brisbane	Jun 30, 2021	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonic acids (PFSAAs)	Brisbane	Jun 30, 2021	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)	Brisbane	Jun 30, 2021	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			

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Company Name: Cardno (WA)
Address: 11 Harvest Terrace
West Perth
WA 6005

Project Name: LEARMONTH
Project ID: WA_0960_PFASOMP

Order No.: DEF19009/430
Report #: 806235
Phone: 08 9273 3888
Fax: 08 9388 3831

Received: Jun 28, 2021 9:30 AM
Due: Jul 5, 2021
Priority: 5 Day
Contact Name: David James

Eurofins Analytical Services Manager : Rhys Thomas

Sample Detail						pH (1:5 Aqueous extract at 25°C as rec.)	pH (at 25 °C)	Total Organic Carbon	Total Suspended Solids Dried at 103–105°C	Moisture Set	Moisture Set	Cation Exchange Capacity	Eurofins Suite B11E: Cl/SO4/Alkalinity	Per- and Polyfluoroalkyl Substances (PFASs)	Eurofins Suite B11C: Na/K/Ca/Mg	Total Dissolved Solids Dried at 180°C ± 2°C
Melbourne Laboratory - NATA Site # 1254						X	X	X	X	X	X	X	X		X	X
Sydney Laboratory - NATA Site # 18217																
Brisbane Laboratory - NATA Site # 20794										X	X	X		X		X
Perth Laboratory - NATA Site # 23736																
Mayfield Laboratory - NATA Site # 25079																
External Laboratory																
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID											
1	0960_QC201_210623	Jun 23, 2021		Water	P21-Jn54705		X		X				X	X	X	X
2	0960_QC202_210623	Jun 23, 2021		Soil	P21-Jn54706	X		X		X		X		X		
3	0960_QC203_210623	Jun 23, 2021		Water	P21-Jn54707		X		X				X	X	X	X
4	0960_QC204_210623	Jun 23, 2021		Water	P21-Jn54708		X		X				X	X	X	X
5	0960_QC205_210623	Jun 23, 2021		Water	P21-Jn54709		X		X				X	X	X	X
6	0960_QC206_	Jun 23, 2021		Soil	P21-Jn54710						X			X		

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Project ID: WA_0960_PFASOMP

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Sample Detail						pH (1:5 Aqueous extract at 25°C as rec.)	pH (at 25 °C)	Total Organic Carbon	Total Suspended Solids Dried at 103–105°C	Moisture Set	Moisture Set	Cation Exchange Capacity	Eurofins Suite B11E: Cl/SO4/Alkalinity	Per- and Polyfluoroalkyl Substances (PFASs)	Eurofins Suite B11C: Na/K/Ca/Mg	Total Dissolved Solids Dried at 180°C ± 2°C
Melbourne Laboratory - NATA Site # 1254						X	X	X	X	X	X	X	X		X	X
Sydney Laboratory - NATA Site # 18217																
Brisbane Laboratory - NATA Site # 20794										X	X	X		X		X
Perth Laboratory - NATA Site # 23736																
Mayfield Laboratory - NATA Site # 25079																
External Laboratory																
	210623															
7	0960_QC207_210623	Jun 23, 2021		Water	P21-Jn54711		X		X				X	X	X	X
8	0960_QC208_210623	Jun 23, 2021		Water	P21-Jn54712		X		X				X	X	X	X
9	0960_QC209_210623	Jun 23, 2021		Water	P21-Jn54713		X		X				X	X	X	X
10	0960_QC210_210623	Jun 23, 2021		Soil	P21-Jn54714						X			X		
11	0960_QC211_210623	Jun 23, 2021		Soil	P21-Jn54715	X		X		X		X		X		
12	0960_QC212_210623	Jun 23, 2021		Water	P21-Jn54716		X		X				X	X	X	X

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Sample Detail						pH (1:5 Aqueous extract at 25°C as rec.)	pH (at 25 °C)	Total Organic Carbon	Total Suspended Solids Dried at 103–105°C	Moisture Set	Moisture Set	Cation Exchange Capacity	Eurofins Suite B11E: Cl/SO4/Alkalinity	Per- and Polyfluoroalkyl Substances (PFASs)	Eurofins Suite B11C: Na/K/Ca/Mg	Total Dissolved Solids Dried at 180°C ± 2°C
Melbourne Laboratory - NATA Site # 1254						X	X	X	X	X	X	X	X		X	X
Sydney Laboratory - NATA Site # 18217																
Brisbane Laboratory - NATA Site # 20794										X	X	X		X		X
Perth Laboratory - NATA Site # 23736																
Mayfield Laboratory - NATA Site # 25079																
External Laboratory																
13	0960_QC213_210623	Jun 23, 2021		Soil	P21-Jn54717						X			X		
Test Counts						2	8	2	8	5	5	2	8	13	8	8

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram

mg/L: milligrams per litre

ug/L: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100mL: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NC	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 20-130% Phenols & 50-150% PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " - " in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Chloride	mg/L	< 1			1	Pass	
Sulphate (as SO ₄)	mg/L	< 5			5	Pass	
Total Dissolved Solids Dried at 180°C ± 2°C	mg/L	< 10			10	Pass	
Total Suspended Solids Dried at 103–105°C	mg/L	1.0			1	Pass	
Method Blank							
Alkalinity (speciated)							
Bicarbonate Alkalinity (as CaCO ₃)	mg/L	< 20			20	Pass	
Carbonate Alkalinity (as CaCO ₃)	mg/L	< 10			10	Pass	
Hydroxide Alkalinity (as CaCO ₃)	mg/L	< 20			20	Pass	
Total Alkalinity (as CaCO ₃)	mg/L	< 20			20	Pass	
Method Blank							
Eurofins Suite B11C: Na/K/Ca/Mg							
Calcium	mg/L	< 0.5			0.5	Pass	
Magnesium	mg/L	< 0.5			0.5	Pass	
Potassium	mg/L	< 0.5			0.5	Pass	
Sodium	mg/L	< 0.5			0.5	Pass	
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	ug/L	< 0.05			0.05	Pass	
Perfluoropentanoic acid (PFPeA)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanoic acid (PFHxA)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanoic acid (PFOA)	ug/L	< 0.01			0.01	Pass	
Perfluorononanoic acid (PFNA)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanoic acid (PFDA)	ug/L	< 0.01			0.01	Pass	
Perfluoroundecanoic acid (PFUnDA)	ug/L	< 0.01			0.01	Pass	
Perfluorododecanoic acid (PFDoDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotridecanoic acid (PFTTrDA)	ug/L	< 0.01			0.01	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/L	< 0.01			0.01	Pass	
Method Blank							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	ug/L	< 0.05			0.05	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/L	< 0.05			0.05	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/L	< 0.05			0.05	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	ug/L	< 0.05			0.05	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	ug/L	< 0.05			0.05	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/L	< 0.05			0.05	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/L	< 0.05			0.05	Pass	
Method Blank							
Perfluoroalkyl sulfonic acids (PFSA's)							
Perfluorobutanesulfonic acid (PFBS)	ug/L	< 0.01			0.01	Pass	
Perfluorononanesulfonic acid (PFNS)	ug/L	< 0.01			0.01	Pass	
Perfluoropropanesulfonic acid (PFPrS)	ug/L	< 0.01			0.01	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/L	< 0.01			0.01	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/L	< 0.01			0.01	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/L	< 0.01			0.01	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/L	< 0.01			0.01	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/L	< 0.01			0.01	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	ug/L	< 0.05			0.05	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	ug/L	< 0.01			0.01	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	ug/L	< 0.01			0.01	Pass	
LCS - % Recovery							
Chloride	%	102			70-130	Pass	
Sulphate (as SO ₄)	%	106			70-130	Pass	
Total Dissolved Solids Dried at 180°C ± 2°C	%	98			70-130	Pass	
Total Suspended Solids Dried at 103–105°C	%	95			70-130	Pass	
LCS - % Recovery							
Alkalinity (speciated)							
Carbonate Alkalinity (as CaCO ₃)	%	103			70-130	Pass	
Total Alkalinity (as CaCO ₃)	%	106			70-130	Pass	
LCS - % Recovery							
Eurofins Suite B11C: Na/K/Ca/Mg							
Calcium	%	89			80-120	Pass	
Magnesium	%	118			80-120	Pass	
Potassium	%	101			80-120	Pass	
Sodium	%	117			80-120	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	99			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	109			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	114			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	109			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	114			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	114			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	129			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	%	110			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	%	114			50-150	Pass	
Perfluorotridecanoic acid (PFTriDA)	%	62			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	124			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	%	110			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	%	112			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	%	110			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	%	114			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	%	117			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	%	115			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	%	110			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	%	101			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	%	93			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	%	102			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	%	102			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	%	103			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	%	115			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	%	110			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	%	61			50-150	Pass	
LCS - % Recovery							
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	%	106			50-150	Pass	

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)			%	112			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)			%	98			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)			%	110			50-150	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
				Result 1					
Chloride	P21-Jn52426	NCP	%	96			70-130	Pass	
Sulphate (as SO ₄)	M21-Jn60519	NCP	%	115			70-130	Pass	
Total Suspended Solids Dried at 103–105°C	N21-Jn51430	NCP	%	83			70-130	Pass	
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1					
Perfluorobutanoic acid (PFBA)	P21-Jn48731	NCP	%	105			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	P21-Jn48731	NCP	%	106			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	P21-Jn48731	NCP	%	111			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	P21-Jn48731	NCP	%	108			50-150	Pass	
Perfluorooctanoic acid (PFOA)	P21-Jn48731	NCP	%	110			50-150	Pass	
Perfluorononanoic acid (PFNA)	P21-Jn48731	NCP	%	115			50-150	Pass	
Perfluorodecanoic acid (PFDA)	P21-Jn48731	NCP	%	120			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	P21-Jn48731	NCP	%	112			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	P21-Jn48731	NCP	%	111			50-150	Pass	
Perfluorotridecanoic acid (PFTTrDA)	P21-Jn48731	NCP	%	75			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	P21-Jn48731	NCP	%	122			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances				Result 1					
Perfluorooctane sulfonamide (FOSA)	P21-Jn48731	NCP	%	112			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	P21-Jn48731	NCP	%	121			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	P21-Jn48731	NCP	%	114			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	P21-Jn48731	NCP	%	120			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	P21-Jn48731	NCP	%	123			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	P21-Jn48731	NCP	%	116			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	P21-Jn48731	NCP	%	120			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	P21-Jn48731	NCP	%	100			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	P21-Jn48731	NCP	%	97			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	P21-Jn48731	NCP	%	106			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	B21-Jn54390	NCP	%	98			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	B21-Jn54390	NCP	%	103			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	B21-Jn54390	NCP	%	108			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	B21-Jn54390	NCP	%	110			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Perfluorodecanesulfonic acid (PFDS)	P21-Jn48731	NCP	%	68			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSA)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	P21-Jn48731	NCP	%	104			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	P21-Jn48731	NCP	%	127			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	P21-Jn48731	NCP	%	87			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	P21-Jn48731	NCP	%	115			50-150	Pass	
Spike - % Recovery									
Alkalinity (speciated)				Result 1					
Carbonate Alkalinity (as CaCO ₃)	K21-Jn41616	NCP	%	85			70-130	Pass	
Total Alkalinity (as CaCO ₃)	K21-Jn41616	NCP	%	77			70-130	Pass	
Spike - % Recovery									
Eurofins Suite B11C: Na/K/Ca/Mg				Result 1					
Calcium	P21-Jn54712	CP	%	106			75-125	Pass	
Magnesium	P21-Jn54712	CP	%	97			75-125	Pass	
Potassium	P21-Jn54712	CP	%	95			75-125	Pass	
Sodium	P21-Jn54712	CP	%	101			75-125	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
				Result 1	Result 2	RPD			
Total Dissolved Solids Dried at 180°C ± 2°C	P21-Jn54705	CP	mg/L	6200	6100	2.3	30%	Pass	
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	P21-Jn48660	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	P21-Jn48660	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	P21-Jn48660	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	P21-Jn48660	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	P21-Jn48660	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	P21-Jn48660	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	P21-Jn48660	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	P21-Jn48660	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorododecanoic acid (PFDoDA)	P21-Jn48660	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotridecanoic acid (PFTrDA)	P21-Jn48660	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	P21-Jn48660	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	P21-Jn48660	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	P21-Jn48660	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	P21-Jn48660	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol (N-MeFOSE)	P21-Jn48660	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass	

Duplicate								
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD		
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol (N-EtFOSE)	P21-Jn48660	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	P21-Jn48660	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	P21-Jn48660	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
Duplicate								
Perfluoroalkyl sulfonic acids (PFSA's)				Result 1	Result 2	RPD		
Perfluorobutanesulfonic acid (PFBS)	P21-Jn48660	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorononanesulfonic acid (PFNS)	P21-Jn48660	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluoropropanesulfonic acid (PFPrS)	P21-Jn48660	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluoropentanesulfonic acid (PFPeS)	S21-Jn54174	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorohexanesulfonic acid (PFHxS)	S21-Jn54174	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluoroheptanesulfonic acid (PFHpS)	S21-Jn54174	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorooctanesulfonic acid (PFOS)	S21-Jn54174	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Perfluorodecanesulfonic acid (PFDS)	P21-Jn48660	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Duplicate								
n:2 Fluorotelomer sulfonic acids (n:2 FTSA's)				Result 1	Result 2	RPD		
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	P21-Jn48660	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
1H.1H.2H.2H-perfluorooctanesulfonic acid (6:2 FTSA)	P21-Jn48660	NCP	ug/L	< 0.05	< 0.05	<1	30%	Pass
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	P21-Jn48660	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	P21-Jn48660	NCP	ug/L	< 0.01	< 0.01	<1	30%	Pass
Duplicate								
				Result 1	Result 2	RPD		
pH (at 25 °C)	K21-Jn41612	NCP	pH Units	8.4	8.4	pass	30%	Pass
Duplicate								
Alkalinity (speciated)				Result 1	Result 2	RPD		
Bicarbonate Alkalinity (as CaCO ₃)	K21-Jn41612	NCP	mg/L	420	440	5.0	30%	Pass
Carbonate Alkalinity (as CaCO ₃)	K21-Jn41615	NCP	mg/L	< 10	< 10	<1	30%	Pass
Hydroxide Alkalinity (as CaCO ₃)	K21-Jn41612	NCP	mg/L	< 20	< 20	<1	30%	Pass
Total Alkalinity (as CaCO ₃)	K21-Jn41612	NCP	mg/L	430	440	3.0	30%	Pass
Duplicate								
				Result 1	Result 2	RPD		
Total Dissolved Solids Dried at 180°C ± 2°C	P21-Jn54712	CP	mg/L	3800	3300	15	30%	Pass
Total Suspended Solids Dried at 103–105°C	P21-Jn54712	CP	mg/L	270	250	7.0	30%	Pass
Duplicate								
Eurofins Suite B11C: Na/K/Ca/Mg				Result 1	Result 2	RPD		
Calcium	P21-Jn54712	CP	mg/L	48	58	19	30%	Pass
Magnesium	P21-Jn54712	CP	mg/L	70	72	2.0	30%	Pass
Potassium	P21-Jn54712	CP	mg/L	44	44	1.0	30%	Pass
Sodium	P21-Jn54712	CP	mg/L	1500	1600	1.0	30%	Pass

Duplicate								
				Result 1	Result 2	RPD		
Chloride	P21-Jn54713	CP	mg/L	19000	19000	<1	30%	Pass
Sulphate (as SO ₄)	P21-Jn54713	CP	mg/L	2800	2900	2.0	30%	Pass

Comments
Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N09	Quantification of linear and branched isomers has been conducted as a single total response using the relative response factor for the corresponding linear/branched standard.
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.
N15	Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).

Authorised by:

Rhys Thomas	Analytical Services Manager
Emily Rosenberg	Senior Analyst-Metal (VIC)
Sarah McCallion	Senior Analyst-PFAS (QLD)
Scott Beddoes	Senior Analyst-Inorganic (VIC)



Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please [click here](#).

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APPENDIX

D

FIELD RECORDS & CALIBRATION CERTIFICATES



Table D1 Groundwater Field Records

PFAS OMP biannual monitoring event
RAAF Learmonth

Monitoring		Sample_ID	Bore Type	TOC (mAHD)	Well Depth (m)	Screen Interval (mbgl)	Gauging Time	SWL (mbTOC)	RWL (mAHD)	Other Observations on		Sampling Method	Temp (°C)	DO (mg/L)	EC (us/Cm)	TDS (mg/L)	pH	Eh (mV)	QC Dup	Sample #	Odour Comments	Colour
Monitoring Date	Location									Bore/Site												
23/06/2021	MW016	0960_MW016_210623	Single Level	4.022	6.1	3.1-6.1_	10:47	3.335	0.687	mislabelled MW106 on CoC	HydraSleeve	25.1	1.26	10117	6589	7.33	4.1				Brown	
23/06/2021	MW018	0960_MW018_210623	Single Level	6.403	8.5	5.5-8.5_	11:48	5.2	1.203		HydraSleeve	26.5	3.25	3065	1995.5	7.88	136.5				Cloudy,Brown	
Bore cover concealed by dirt/rocks.																						
23/06/2021	MW021	0960_MW021_210623	Single Level	6.745	7.21	5.6-8.6_	08:55	5.521	1.224	HydraSleeve	23.1	2.5	6746	4381	7.32	190.1				Clear,Brown		
23/06/2021	MW102	0960_MW102_210623	Single Level	4.6266	8.5	2.5-8.5_	09:53	4.163	0.464	HydraSleeve	25.4	16.2	90727	59060	6.95	72.4				Brown		
23/06/2021	MW103	0960_MW103_210623	Single Level	2.2785	5.8	1-5.8_	14:49	1.605	0.674	HydraSleeve	26	0.78	77824	50590	6.87	-76.6				Brown		
23/06/2021	MW104	0960_MW104_210623	Single Level	2.7256	6.5	1-6.5_	10:38	2.133	0.593	HydraSleeve	24.1	2.77	42018	27337	7.225	105.4				Clear		
23/06/2021	MW105	0960_MW105_210623	Single Level	3.7272	4.59		15:24	3.05	0.677	HydraSleeve	22.9	2.31	44390	28853.5	7	1.5	QC112, QC212			Clear,Brown		
24/06/2021	MW112	0960_MW112_210624	Single Level	5.1191	8	3-8_	08:48	4.054	1.065	HydraSleeve	23.6	3.36	12943	8414	7.26	50.6				Clear		
23/06/2021	MW113	0960_MW113_210623	Single Level	7.3165	10.46	4-10_	12:28	6.1	1.217	HydraSleeve	26.2	2.6	10527	38405	7.06	125.1				Brown		
23/06/2021	MW114	0960_MW114_210623	Single Level	7.7467	10.02	4-40_	09:15	6.53	1.217	HydraSleeve	24	2.61	8998	5850	7.2	142.6				Clear,Brown		
24/06/2021	MW115	0960_MW115_210624	Single Level	4.9133	8	3-8_	09:20	3.997	0.916	HydraSleeve	23.7	2.69	35391	23005	7.09	59.1				Clear		
24/06/2021	MW122	0960_MW122_210624	Single Level	3.9702	7.7	1.7-7.7_	11:27	3.35	0.62	HydraSleeve	25.1	0.89	46016	29906	7.08	55.6				Clear		
23/06/2021	MW124	0960_MW124_210623	Single Level	2.9183	6	1-6_	16:03	2.444	0.474	HydraSleeve	24.7	3.51	52600	34173	7.45	13.4				Cloudy		
23/06/2021	MW126	0960_MW126_210623	Single Level	4.5088	8	2-8_	14:09	3.95	0.559	HydraSleeve	25.8	2.8	61001	39662	7.06	103.4				Clear		
23/06/2021	MW127	0960_MW127_210623	Single Level	5.6238	8.5	2.5-8.5_	14:03	4.85	0.774	HydraSleeve	25.3	2.2	37527	24336	7.2	122.7	QC107/207			Brown		
24/06/2021	MW134	0960_MW134_210624	Single Level	2.5155	4.64	1-5.7_	08:18	1.76	0.755	HydraSleeve	22.8	2.97	61680	40105	5.85	8.1				Cloudy,Clear,Brown		
24/06/2021	MW135	0960_MW135_210624	Multi level	2.7781	3.345	2.5-3_	09:45	1.945	0.833	Peristaltic Pump	25.7	2.48	33920	22054	6.64	-13.9				Cloudy,Brown		
24/06/2021	MW137	0960_MW137_2.5-3_210624	Multi level	2.1691	3	2.5-3_	13:13	1.257	0.912	Peristaltic Pump	25.6	2.77	73157	50805	7.68	13.1				Clear		
24/06/2021	MW138	0960_MW138_210624	Multi level	3.3074	3.5	3.0-3.5_	12:28	2.865	0.442	Peristaltic Pump	27.4	0.85	41420	26919	7.31	-177.2				Clear		
24/06/2021	MW139	0960_MW139_210624	Single Level	4.1386	7	2-7_	10:55	3.46	0.679	HydraSleeve	25.8	0.45	69146	45471	6.99	126				Clear		
24/06/2021	MW140	0960_MW140_6-6.5_210624	Multi level	2.5081	6.5	6-6.5_	11:17	1.7	0.808	Peristaltic Pump	23.5	2.67	98966	64350	7.62	123.2				Cloudy		
24/06/2021	MW141	0960_MW141_7-7.5_210624	Multi level	2.8224	7.5	7-7.5_	09:58	2.05	0.772	Peristaltic Pump	24.8	1.51	19068	12395	7.26	-80.6				Cloudy		
24/06/2021	MW143	0960_MW143_210624	Multi level	2.8174	3.8	3-3.5_	10:44	1.11	1.707	Peristaltic Pump	28.1	4.19	49386	32240	6.76	132.4				Cloudy,Brown		
24/06/2021	MW144	0960_MW144_210624	Multi level	3.0481	3.83	3-3.5_	09:07	2.44	0.608	Peristaltic Pump	25.3	3.78	18402	11966.5	6.4	-87.7				Cloudy,Brown		
24/06/2021	MW145	0960_MW145_210624	Multi level	3.1481	5.83	5-5.5_	11:30	2.53	0.618	Peristaltic Pump	23.6	2.78	54865	65640	7.15	1.1				Cloudy,Brown		
24/06/2021	MW146	0960_MW146_5-5.5_210624	Multi level	2.8009	5.5	5-5.5_	11:47	2.2	0.601	Peristaltic Pump	25.8	2.5	50435	32799	7.58	28				Clear		
24/06/2021	MW147	0960_MW147_5-5.5_210624	Multi level	2.9152	5.5	5-5.5_	11:53	2.33	0.585	Peristaltic Pump	25.4	1.8	102851	66950	7.25	156.8				Cloudy		
23/06/2021	MW148D	0960_MW148D_210623	Single Level	3.5778	20	14-20_	15:23	2.899	0.679	HydraSleeve	26.1	2.21	77031	50104	7.6	-4.3				Clear		
23/06/2021	MW148S	0960_MW148S_210623	Single Level	3.6851	8	2-8_	15:44	2.899	0.786	HydraSleeve	27.8	1.04	43357	28220	6.91	36.8				Brown		
23/06/2021	MW151	0960_MW151_210623	Single Level	4.0631	8	2-8_	11:07	3.307	0.756	HydraSleeve	25.1	1.78	12800	8327	7.17	105			Hydrocarbon	Brown		
23/06/2021	MW159	0960_MW159_210623	Single Level	4.1895	8.73	3-9_	15:01	3.365	0.824	HydraSleeve	27	2.35	29611	19240	7.16	77.5				Clear,Brown		
23/06/2021	MW162	0960_MW162_210623	Single Level	6.856	18.6	17-20_	12:44	5.64	1.216	HydraSleeve	25.3	0.84	13319	8658	6.96	165.1				Clear		
23/06/2021	MW163	0960_MW163_210623	Single Level	6.7808	18.59	17-20_	10:13	5.55	1.231	HydraSleeve	23.7	2.43	12160	7904	7.4	91.6	QC101, QC201			Clear,Brown		
23/06/2021	MW164	0960_MW164_210623	Single Level	6.7893	17.68	17-20_	10:37	5.55	1.239	HydraSleeve	25.2	1.81	7078	4602	7.8	108	QC104, QC204			Clear		
23/06/2021	MW165	0960_MW165_210623	Single Level	3.1043	8.77	3-9_	11:08	4.85	1.254	HydraSleeve	23.6	2.02	3801	2470	7.94	117.6				Clear		
23/06/2021	MW166	0960_MW166_210623	Single Level	5.7441	7.22	2.5-8.5_	13:31	4.55	1.194	HydraSleeve	28.6	1.83	3332	2164.5	7.77	117.4				Clear,Brown		
23/06/2021	MW167	0960_MW167_210623	Single Level	6.2094	8.86	2.5-8.5_	13:49	5.06	1.149	HydraSleeve	25	2.16	7066	4589	7.37	151.6	QC108, QC208			Clear,Brown		
23/06/2021	MW168	0960_MW168_210623	Single Level	6.1713	7.75	2.5-8.5_	16:03	5.08	1.091	HydraSleeve	26.1	1.18	13890	9028.5	6.99	73.1				Cloudy,Brown		
23/06/2021	MW170	0960_MW170_210623	Single Level	5.639	8.5	2.5-8.5_	09:21	4.764	0.875	HydraSleeve	23.2	2.39	48493	31535	6.95	81.8				Brown		
23/06/2021	MW172	0960_MW172_210623	Single Level	5.6193	8.5	2.5-8.5_	09:06	4.714	0.905	HydraSleeve	24.7	4.09	18584	12107	7.17	48.1						
23/06/2021	MW175	0960_MW175_7-7.5_210623	Multi level	4.7995	7.5	7-7.5_	11:39	4.13	0.67	Peristaltic Pump	25.6	1.57	2580	1670.5	7.77	-254.9				Cloudy		
23/06/2021	MW176	0960_MW176_3.5-4_210623	Multi level	2.1279	4	3.5-4_	14:53	1.24	0.888	Peristaltic Pump	24.6	4.09	31.808	20676	8	71.3				Brown		
23/06/2021	MW177	0960_MW177_3.5-4_210623	Multi level	2.2517	4	3.5-4_	13:00	0.9	1.352	Peristaltic Pump	24.2	2.97	71736	46605	7.42	51.5				Brown		
24/06/2021	MW178	0960_MW178_210624	Multi level	2.1614	4.66	4-4.5_	10:26	1.75	0.411	Peristaltic Pump	22.6	4.29	85879	55835.5	6.9	0.5				Clear		
24/06/2021	MW179	0960_MW179_210624	Multi level	2.2371	3.9	3.2-3.7_	11:50	2.46	-0.223	Peristaltic Pump	18.2	10.85	1260	808	6.28	34.5				Cloudy		
24/06/2021	MW180	0960_MW180_1-1.5_210624	Multi level	1.9179	1.5	1-1.5_	12:40	1.16	0.758	Peristaltic Pump	22.5	3.54	62058	40300	7.59	103.4				Brown,Cloudy		
24/06/2021	MW181	0960_MW181_5.5-6_210624	Multi level	2.2789	6	5.5-6_	12:21	1.52	0.759	Peristaltic Pump	23.7	1.35	101852	66235	6.81	-3				Cloudy,Brown		
23/06/2021	MW211	0960_MW211_210623	Single Level	3.3409	5.8	NA	11:54	5.08	1.261	HydraSleeve	24.4	3.45	2160	1404.5	8.25	124.7				Clear		
23/06/2021	MW233	0960_MW233_210623	Single Level	6.262	6.84	4-7_	09:50	5	1.262	HydraSleeve	25.2	2.59	1973	1280.5	8.27	129.6				Clear,Brown		

Monitoring Location	Date	Sample ID	Sampling Method	Sample Depth (m)	Water Body Depth (m)	Flow Rate	Comments	Temp (°C)	DO (mg/L)	EC (us/Cm)	TDS (mg/L)	pH	Eh (mV)	Water Colour	Turbidity
SW265	23/06/2021	0960_SW265_210623	Direct into Bottle	0.1	0.15	Slow		17.3	7.35	4580	2977	8.35	87.8	Orange	High
SW301	24/06/2021	0960_SW301_210624	Direct into Bottle	0	0.1	Slow	Sample taken ~300m to the west. Area flooded	18.6	4.92	67552	43940	7.78	115.3	Clear	Low
SW189	24/06/2021	0960_SW189_210624	Direct into Bottle	0.1	0.3	Slow		15.3	7.4	1451	942.5	7.25	154.6	brown	Low
SW190	23/06/2021	0960_SW190_210623	Direct into Bottle	0.05	0.1	Slow	QC103/203	15.8	9.86	5535	3594.5	8.83	25.6	Clear	Low
SW193	23/06/2021	0960_SW193_210623	Direct into Bottle	0.1	0.5	Slow		19.9	4.93	50328	32714.5	8.27	65.4	Clear	Low
SW199	24/06/2021						Dry								
SW200	24/06/2021	0960_SW200_210624	Direct into Bottle	0.1	0.2	Slow		17.1	7.47	1357	879	8.64	58.2	Clear/cloudy	Medium
SW205	24/06/2021	0960_SW205_210624	Direct into Bottle	0.1	0.2	Slow		16.1	6.06	34521	22418	7.6	99.1	Clear	Low
SW207	24/06/2021	0960_SW207_210624	Direct into Bottle	0.1	0.2	Slow		22.2	5.27	62965	40885	7.97	111.5	Clear	Low
SW208	24/06/2021	0960_SW208_210624	Direct into Bottle	0.1	0.5	Medium		15.1	5.32	57188	37173	7.86	131.9	Clear	Low
SW209	24/06/2021	0960_SW209_210624	Direct into Bottle	0.15	0.3	Slow		21.1	5.53	29416	19111	7.89	34.7	Clear	Medium
SW210	24/06/2021	0960_SW210_210624	Direct into Bottle	0.1	0.3	Slow		21.2	6.5	62295	33993	8.1	32.5		Low
SW211	23/06/2021	0960_SW211_210623	Direct into Bottle	0.1	0.15	Slow		22	6.81	27328	17764.5	8.29	76	Clear	Low
SW219	23/06/2021						DRY								
SW288	24/06/2021						DRY								
SW298	24/06/2021	0960_SW298_210624	Direct into Bottle	0.1	0.2	Slow		20.3	7.9	5372	3484	8.47	89.2	Orange	Medium
SW300	23/06/2021	0960_SW300_210623	Direct into Bottle	0.1	0.15	Slow		19	7.19	27647	17972.5	8.26	80.5	Clear	Low
SW001	23/06/2021	0960_SW001_210623	Direct into Bottle	0.1	0.2	Slow	QC109/209	20.3	6.03	27761	18044	8.05	66.9	Clear	Low
SW302	24/06/2021	0960_SW302_210624	Direct into Bottle	0.15	0.3	Slow		20.4	4.85	52230	33952	7.92	47.8	Clear	Low
SW303	23/06/2021	0960_SW303_210623	Direct into Bottle	0.1	0.4	Slow		17.1	5.46	53079	34489	7.8	25.1	Clear	Low
SW304	23/06/2021	0960_SW304_210623	Direct into Bottle	0.1	0.3	Slow		16.7	5.34	28204	18317	7.84	15.9	Clear	Low
SW305	23/06/2021	0960_SW305_210623	Direct into Bottle	0.1	0.2	Slow		19	5.25	58390	37960	7.93	24.4	Clear	Low
OTH103	23/06/2021	0960_OTH103_210623	Direct into Bottle	0.3				17.2	6.06	36172	23491	7.92	-35.9	Clear	
OTH106	24/06/2021	0960_OTH106_210624	Direct into Bottle	0.5				15.1	6.29	57455	37342	7.66	131.7	Cloudy	
OTH107	24/06/2021	0960_OTH107_210624	Direct into Bottle	0.5				16	6.21	57722	37524	6.77	144.1	Cloudy	
OTH129	23/06/2021	0960_OTH129_210623	Direct into Bottle	0.2				21.3	5.89	58193	37830	8.19	79.4	Clear	
OTH132	23/06/2021	0960_OTH132_210623	Direct into Bottle	0.3			QC105/205	16.9	5.34	56614	36796.5	8.06	68.4	Clear	
OTH134	23/06/2021	0960_OTH134_210623	Direct into Bottle	0.2				17.8	7.14	30756	20007	8.06	57.4	Clear	

Location ID	Date	Sample ID	Sample Type	Sampling Depth (m)	Sampling Method	Sample Condition	Sample Description	Comments
SD199	24/06/2021	0960_SD199_210624	Sediment	0.1	Direct into Bottle	Dry	Red clayey silt	
SD200	24/06/2021	0960_SD200_210624	Sediment	0.1	Direct into Bottle	Wet	Red clay	
SD205	24/06/2021	0960_SD205_210624	Sediment	0.1	Shovel Trowel	Wet	Brown red sandy clay	
SD207	24/06/2021	0960_SD207_210623	Sediment	0.1	Shovel Trowel	Wet	Red clay	
SD208	24/06/2021	0960_SD208_210624	Sediment	0.1	Shovel Trowel	Wet	Beige coarse sand	
SD209	24/06/2021	0960_SD209_210624	Sediment	0.1	Direct into Bottle	Wet	Grey clay/mud	
SD210	24/06/2021	0960_SD210_210624	Sediment	0.1	Direct into Bottle	Wet	brown/grey muddy clay	
SD211	23/06/2021	0960_SD211_210623	Sediment	0.1	Shovel Trowel	Wet	Brown clay	
SD219	23/06/2021	0960_SD219_210623	Sediment	0.1	Shovel Trowel	Dry	Red, clayey sand	
SD300	23/06/2021	0960_SD300_210623	Sediment	0.1	Shovel Trowel	Wet	Brown clay	
SD301	23/06/2021	0960_SD301_210623	Sediment	0.1	Shovel Trowel	Wet	Brown clay	QC110/210
SD302	24/06/2021	0960_SD302_210624	Sediment	0.1	Direct into Bottle	Wet	Brown/grey sandy clay	
SD303	23/06/2021	0960_SD303_210623	Sediment	0.1	Shovel Trowel	Wet	Brown sandy slay	
SD304	23/06/2021	0960_SD304_210623	Sediment	0.1	Shovel Trowel	Wet	Brown/black sandy clay	
SD305	23/06/2021	0960_SD305_210623	Sediment	0.1	Shovel Trowel	Wet	Brown black sandy clay	QC106/206
SS108	24/06/2021	0960_SS108_210624	Sediment	0.1	Direct into Bottle	Dry	Red clay	
SS113	23/06/2021	0960_SS113_210623	Sediment	0.1	Direct into Bottle	Dry	Red clay	
SS114	24/06/2021	0960_SS114_210624	Sediment	0.1	Direct into Bottle	Dry	Red clay	
SS121	23/06/2021	0960_SS121_210623	Sediment	0.15	Shovel Trowel	Dry	Red, sandy CLAY	
SS122	23/06/2021	0960_SS122_210623	Sediment	0.1	Shovel Trowel	Dry	Red, sandy CLAY	QC111, QC211
SS123	23/06/2021	0960_SS123_210623	Sediment	0.15	Shovel Trowel	Dry	Red sandy CLAY	QC102/202
SS124	23/06/2021	0960_SS124_210623	Sediment	0.1	Direct into Bottle	Dry	Red clay	
SS125	24/06/2021	0960_SS125_210624	Sediment	0.1	Direct into Bottle	Dry	Red clay	
SS157	23/06/2021	0960_SS157_210623	Sediment	0.1	Direct into Bottle	Dry	Red clay	
SS166	23/06/2021	0960_SS166_210623	Sediment	0.1	Direct into Bottle	Dry	Red clay	
SS168	23/06/2021	0960_SS168_210623	Sediment	0.1	Direct into Bottle	Dry	Moist sandy clay red	
SS170	23/06/2021	0960_SS170_210623	Sediment	0.1	Direct into Bottle	Dry	Moist sandy clay red	
SS174	23/06/2021	0960_SS174_210623	Sediment	0.1	Direct into Bottle	Dry	Red clay	
SS176	23/06/2021	0960_SS176_210623	Sediment	0.1	Direct into Bottle	Wet	Moist sandy clay red	
SS189	24/06/2021	0960_SS189_210624	Sediment	0.1	Shovel Trowel	Wet	Red clay	
SS190	23/06/2021	0960_SS190_210623	Sediment	0.1	Shovel Trowel	Wet	Red clay	
SS192	23/06/2021	0960_SS192_210623	Sediment	0.1	Shovel Trowel	Dry	Beige sand	
SS193	23/06/2021	0960_SS193_210623	Sediment	0.1	Shovel Trowel	Wet	Dark brown sand	QC113/213
SS198	24/06/2021	0960_SS198_210624	Sediment	0.1	Direct into Bottle	Dry	Red clay	
SS227	24/06/2021	0960_SS227_210624	Sediment	0.1	Direct into Bottle	Dry	Red clay	
SS231	23/06/2021	0960_SS231_210623	Sediment	0.1	Direct into Bottle	Dry	Clay red	
SS234	23/06/2021	0960_SS234_210623	Sediment	0.1	Direct into Bottle	Dry	Red clay	
SS235	23/06/2021	0960_SS235_210623	Sediment	0.1	Direct into Bottle	Dry	Red clay	
SS243	23/06/2021	0960_SS243_210623	Sediment	0.1	Direct into Bottle	Dry	Red clay	
SS277	23/06/2021	0960_SS277_210623	Sediment	0.1	Direct into Bottle	Dry	Red clay	
SS278	23/06/2021	0960_SS278_210623	Sediment	0.1	Direct into Bottle	Dry	Red clay	
SS279	23/06/2021	0960_SS279_210623	Sediment	0.1	Direct into Bottle	Dry	Moist sandy clay red	
SS288	24/06/2021	0960_SS288_210624	Sediment	0.12	Direct into Bottle	Dry	Yellow/red, clayey SAND	
SS291	24/06/2021	0960_SS291_210624	Sediment	0.1	Direct into Bottle	Dry	Red clay	
SS292	24/06/2021	0960_SS292_210624	Sediment	0.1	Direct into Bottle	Dry	Red clay	
SS293	24/06/2021	0960_SS293_210624	Sediment	0.15	Shovel Trowel	Dry	red CLAY	
SS298	24/06/2021	0960_SS298_210624	Sediment	0.1	Shovel Trowel	Wet	Red clay	
SS301	24/06/2021	0960_SS301_210624	Sediment	0.1	Shovel Trowel	Wet	Red clay	Sample taken ~300m to the west. Area flooded
SS265	23/06/2021	0960_SS265_210623	Sediment	0.1	Direct into Bottle	Wet	Wet clay red	mis-labeled SS625 on CoC

Calibration Report

Multi-Parameter Water Quality Instrument

Customer: Cardno

Contact: Maelle

Manufacturer: YSI

Instrument: Professional Plus with Quatro cable

Serial #: 21D101799

Cable length: 1m

Item	Test	Pass	Comments
Battery	2 x Alkaline C-cells	✓	Voltage reading above 2.9V
	Battery Saver	✓	Automatically turns off after 30 minutes if not used
Connections	Condition	✓	Good, clean
Cable	Condition	✓	Clean, no tears
Display	Operation	✓	
Firmware	Version	✓	4.0.0
Keypad	Operational	✓	
Display	Screen	✓	
Unit	Condition, seals and O-rings	✓	
Monitor housing	Condition	✓	
pH			
	Condition	✓	Good, clean
	pH millivolts for pH7 calibration range 0 mV ± 50 mV	✓	
	pH 4 mV range + 165 to + 180 from 7 buffer mV value	✓	174.10 mV
	pH slope	✓	55 to 60 mV/pH, ideal 59mV 58.77
	Response time < 90 seconds	✓	
	Calibrated and conforms to manufacturer's specifications	✓	
ORP			
	Condition	✓	Good, clean
	Response time < 90 seconds	✓	
	within ± 80mv of reference Zobell Reading	✓	
	Calibrated and conforms to manufacturer's specifications	✓	variance range ± 20mV 11 mV
Conductivity			
	Condition	✓	Good, clean
	Temperature	✓	°C
	Conductivity cell constant 5.0 ± 1.0 in GLP file	✓	
	Clean sensor reads less than 3 uS/cm in dry air	✓	
	Calibrated and conforms to manufacturer's specifications	✓	µs/cm
Dissolved Oxygen			
	Condition	✓	Good, clean
	DO sensor in use	✓	Galvanic
	1.25 mil PE membrane (yellow membrane):	✓	
	DO Sensor Value	✓	(min 4.31 uA - max 8.00 uA) Avg 6.15 uA
	Calibrated and conforms to manufacturer's specifications	✓	ppm

This is to certify that the above instrument has been calibrated to the following specifications:

Instrument Readings

Parameter	Standards	Reference	Calibration Point	Span	Units	Before	After	Units
Temperature	Check Temp NATA	Room Temp	18.3	0	°C	NA	18.3	°C
pH	pH 7.00	356684	7.01	-5.90	mV	7.1	7.01	pH
pH	pH 4.00	355385	4.00	168.20	mV	4.06	4.00	pH
Conductivity	2764 µs/cm at 25°C	20/1007	2764	GLP	5.09	2770	2764	µs/cm
ORP (Reference check only)	Zobell A & B	21/0502	244	244	mV	225.8	232.9	mV
Zero Dissolved Oxygen	NaSO3 in distilled water	10175	0.0	NA	NA	-0.9	0.0	%
100% Dissolved Oxygen	100% Air Saturation	Air	100.0	4.7	uA	93.2	100.0	%

Calibrated by: Gaurav Kanwar

Calibration Date: 12-Jun-21

Next Due: 09-Dec-21

Calibration Report

Multi-Parameter Water Quality Instrument

Customer: Cardno

Contact: Maelle

Manufacturer: YSI

Instrument: Professional Plus with Quatro cable

Serial #: 20B120527

Cable length: 1m

Item	Test	Pass	Comments
Battery	2 x Alkaline C-cells	✓	Voltage reading above 2.9V
	Battery Saver	✓	Automatically turns off after 30 minutes if not used
Connections	Condition	✓	Good, clean
Cable	Condition	✓	Clean, no tears
Display	Operation	✓	
Firmware	Version	✓	4.0.0
Keypad	Operational	✓	
Display	Screen	✓	
Unit	Condition, seals and O-rings	✓	
Monitor housing	Condition	✓	
pH			
	Condition	✓	Good, clean
	pH millivolts for pH7 calibration range 0 mV ± 50 mV	✓	
	pH 4 mV range + 165 to + 180 from 7 buffer mV value	✓	171.20 mV
	pH slope	✓	55 to 60 mV/pH, ideal 59mV 58.01
	Response time < 90 seconds	✓	
	Calibrated and conforms to manufacturer's specifications	✓	
ORP			
	Condition	✓	Good, clean
	Response time < 90 seconds	✓	
	within ± 80mv of reference Zobell Reading	✓	
	Calibrated and conforms to manufacturer's specifications	✓	variance range ± 20mV 5 mV
Conductivity			
	Condition	✓	Good, clean
	Temperature	✓	°C
	Conductivity cell constant 5.0 ± 1.0 in GLP file	✓	
	Clean sensor reads less than 3 uS/cm in dry air	✓	
	Calibrated and conforms to manufacturer's specifications	✓	µs/cm
Dissolved Oxygen			
	Condition	✓	Good, clean
	DO sensor in use	✓	Galvanic
	1.25 mil PE membrane (yellow membrane):	✓	
	DO Sensor Value	✓	(min 4.31 uA - max 8.00 uA) Avg 6.15 uA
	Calibrated and conforms to manufacturer's specifications	✓	ppm

This is to certify that the above instrument has been calibrated to the following specifications:

Instrument Readings

Parameter	Standards	Reference	Calibration Point	Span	Units	Before	After	Units
Temperature	Check Temp NATA	Room Temp	16.6	-0.1	°C	NA	16.5	°C
pH	pH 7.00	356684	7.01	-36.00	mV	7.04	7.01	pH
pH	pH 4.00	355385	4.00	135.20	mV	4	4.00	pH
Conductivity	2764 µs/cm at 25°C	20/1007	2764	GLP	5.06	2742	2764	µs/cm
ORP (Reference check only)	Zobell A & B	21/0502	248	248	mV	243.4	243.1	mV
Zero Dissolved Oxygen	NaSO3 in distilled water	10175	0.0	NA	NA	-0.1	0.0	%
100% Dissolved Oxygen	100% Air Saturation	Air	100.0	4.09	uA	102	100.0	%

Calibrated by: Gaurav Kanwar

Calibration Date: 17-Jun-21

Next Due: 14-Dec-21

Calibration Report

Multi-Parameter Water Quality Instrument

Customer: Cardno

Contact: Maelle

Manufacturer: YSI

Instrument: Professional Plus with Quatro cable

Serial #: 19K102536

Cable length: 1m

Item	Test	Pass	Comments
Battery	2 x Alkaline C-cells	✓	Voltage reading above 2.9V
	Battery Saver	✓	Automatically turns off after 30 minutes if not used
Connections	Condition	✓	Good, clean
Cable	Condition	✓	Clean, no tears
Display	Operation	✓	
Firmware	Version	✓	4.0.0
Keypad	Operational	✓	
Display	Screen	✓	
Unit	Condition, seals and O-rings	✓	
Monitor housing	Condition	✓	
pH			
	Condition	✓	Good, clean
	pH millivolts for pH7 calibration range 0 mV ± 50 mV	✓	
	pH 4 mV range + 165 to + 180 from 7 buffer mV value	✓	173.10 mV
	pH slope	✓	55 to 60 mV/pH, ideal 59mV 58.56
	Response time < 90 seconds	✓	
	Calibrated and conforms to manufacturer's specifications	✓	
ORP			
	Condition	✓	Good, clean
	Response time < 90 seconds	✓	
	within ± 80mv of reference Zobell Reading	✓	
	Calibrated and conforms to manufacturer's specifications	✓	variance range ± 20mV 4 mV
Conductivity			
	Condition	✓	Good, clean
	Temperature	✓	°C
	Conductivity cell constant 5.0 ± 1.0 in GLP file	✓	
	Clean sensor reads less than 3 uS/cm in dry air	✓	
	Calibrated and conforms to manufacturer's specifications	✓	µs/cm
Dissolved Oxygen			
	Condition	✓	Good, clean
	DO sensor in use	✓	Galvanic
	1.25 mil PE membrane (yellow membrane):	✓	
	DO Sensor Value	✓	(min 4.31 uA - max 8.00 uA) Avg 6.15 uA
	Calibrated and conforms to manufacturer's specifications	✓	ppm

This is to certify that the above instrument has been calibrated to the following specifications:





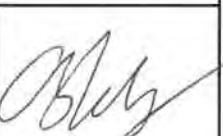

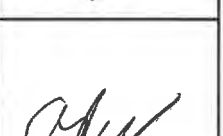
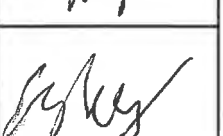
Instrument Readings

Parameter	Standards	Reference	Calibration Point	Span	Units	Before	After	Units
Temperature	Check Temp NATA	Room Temp	17.8	-0.1	°C	NA	17.7	°C
pH	pH 7.00	356684	7.01	-27.90	mV	7	7.01	pH
pH	pH 4.00	355385	4.00	145.20	mV	3.97	4.00	pH
Conductivity	2764 µs/cm at 25°C	20/1007	2764	GLP	5.06	2765	2764	µs/cm
ORP (Reference check only)	Zobell A & B	21/0502	245	245	mV	253	241.5	mV
Zero Dissolved Oxygen	NaSO3 in distilled water	10175	0.0	NA	NA	-0.2	0.0	%
100% Dissolved Oxygen	100% Air Saturation	Air	100.0	4.49	uA	93.8	100.0	%

Calibrated by: Gaurav Kanwar

Calibration Date: 14-Jun-21

Next Due: 11-Dec-21

Date of Bump Test	Project ID	Unit Brand/Model	Ambient Air Oxygen Calibration	Zero Oxygen Solution Calibration	Standard Concentrations	Ambient Temperature (°C)	Bump Test Reading	Bump Test Readings within ±5%?	Comment	Test by (Name)	(Signature)
20/6 22/6	DEF	YSI #20B	100% Saturation? <input checked="" type="radio"/> N	0% Calibration? <input checked="" type="radio"/> N NA	pH 4.00 <input checked="" type="radio"/> Y / N pH 7.00 <input checked="" type="radio"/> Y / N EC: 2,760µS/cm <input checked="" type="radio"/> Y / N	18° 20	pH 4.00: 4.30 pH 7.00: 7.17 Temp: 19.5 EC: 2768	pH 4.00: (± pH 0.2) <input checked="" type="radio"/> Y / N pH 7.00: (± pH 0.2) <input checked="" type="radio"/> Y / N Temp: (± 2°C) <input checked="" type="radio"/> Y / N EC: (± 150µS/cm) <input checked="" type="radio"/> Y / N		Ashley Harris	
19/6 22/6	DEF	YSI #19K	100% Saturation? <input checked="" type="radio"/> N	0% Calibration? <input checked="" type="radio"/> N NA	pH 4.00 <input checked="" type="radio"/> Y / N pH 7.00 <input checked="" type="radio"/> Y / N EC: 2,760µS/cm <input checked="" type="radio"/> Y / N	18° 20	pH 4.00: 4.25 pH 7.00: 7.04 Temp: 19.2 EC: 2780	pH 4.00: (± pH 0.2) <input checked="" type="radio"/> Y / N pH 7.00: (± pH 0.2) <input checked="" type="radio"/> Y / N Temp: (± 2°C) <input checked="" type="radio"/> Y / N EC: (± 150µS/cm) <input checked="" type="radio"/> Y / N		"	
22/6	DEF	YSI #21D	100% Saturation? <input checked="" type="radio"/> N	0% Calibration? <input checked="" type="radio"/> N NA	pH 4.00 <input checked="" type="radio"/> Y / N pH 7.00 <input checked="" type="radio"/> Y / N EC: 2,760µS/cm <input checked="" type="radio"/> Y / N	18° 20	pH 4.00: 4.2 pH 7.00: 7.07 Temp: 19.5 EC: 2747	pH 4.00: (± pH 0.2) <input checked="" type="radio"/> Y / N pH 7.00: (± pH 0.2) <input checked="" type="radio"/> Y / N Temp: (± 2°C) <input checked="" type="radio"/> Y / N EC: (± 150µS/cm) <input checked="" type="radio"/> Y / N		"	
23/6	DEF	YSI #20B	100% Saturation? <input checked="" type="radio"/> N	0% Calibration? <input checked="" type="radio"/> N NA	pH 4.00 <input checked="" type="radio"/> Y / N pH 7.00 <input checked="" type="radio"/> Y / N EC: 2,760µS/cm <input checked="" type="radio"/> Y / N	19	pH 4.00: 4.30 pH 7.00: 7.17 Temp: 18.8 EC: 2760	pH 4.00: (± pH 0.2) <input checked="" type="radio"/> Y / N pH 7.00: (± pH 0.2) <input checked="" type="radio"/> Y / N Temp: (± 2°C) <input checked="" type="radio"/> Y / N EC: (± 150µS/cm) <input checked="" type="radio"/> Y / N		"	
23/6	DEF	YSI #19K	100% Saturation? <input checked="" type="radio"/> N	0% Calibration? <input checked="" type="radio"/> N NA	pH 4.00 <input checked="" type="radio"/> Y / N pH 7.00 <input checked="" type="radio"/> Y / N EC: 2,760µS/cm <input checked="" type="radio"/> Y / N	19	pH 4.00: 4.37 pH 7.00: 7.08 Temp: 18.8 EC: 2871	pH 4.00: (± pH 0.2) <input checked="" type="radio"/> Y / N pH 7.00: (± pH 0.2) <input checked="" type="radio"/> Y / N Temp: (± 2°C) <input checked="" type="radio"/> Y / N EC: (± 150µS/cm) <input checked="" type="radio"/> Y / N		"	
2/6	DEF	YSI #21D	100% Saturation? <input checked="" type="radio"/> N	0% Calibration? <input checked="" type="radio"/> N NA	pH 4.00 <input checked="" type="radio"/> Y / N pH 7.00 <input checked="" type="radio"/> Y / N EC: 2,760µS/cm <input checked="" type="radio"/> Y / N	19	pH 4.00: 4.34 pH 7.00: 7.19 Temp: 18.8 EC: 2749	pH 4.00: (± pH 0.2) <input checked="" type="radio"/> Y / N pH 7.00: (± pH 0.2) <input checked="" type="radio"/> Y / N Temp: (± 2°C) <input checked="" type="radio"/> Y / N EC: (± 150µS/cm) <input checked="" type="radio"/> Y / N		"	
	DEF	YSI #19K	100% Saturation? <input checked="" type="radio"/> N	0% Calibration? <input checked="" type="radio"/> N NA	pH 4.00 <input checked="" type="radio"/> Y / N pH 7.00 <input checked="" type="radio"/> Y / N EC: 2,760µS/cm <input checked="" type="radio"/> Y / N	21	pH 4.00: 4.20.2 pH 7.00: 7.08 Temp: 20 EC: 2820	pH 4.00: (± pH 0.2) <input checked="" type="radio"/> Y / N pH 7.00: (± pH 0.2) <input checked="" type="radio"/> Y / N Temp: (± 2°C) <input checked="" type="radio"/> Y / N EC: (± 150µS/cm) <input checked="" type="radio"/> Y / N		"	
	"	YSI #20B	100% Saturation? <input checked="" type="radio"/> N	0% Calibration? <input checked="" type="radio"/> N NA	pH 4.00 <input checked="" type="radio"/> Y / N pH 7.00 <input checked="" type="radio"/> Y / N EC: 2,760µS/cm <input checked="" type="radio"/> Y / N	21	pH 4.00: 4.19 pH 7.00: 7.16 Temp: 20.2 EC: 2860	pH 4.00: (± pH 0.2) <input checked="" type="radio"/> Y / N pH 7.00: (± pH 0.2) <input checked="" type="radio"/> Y / N Temp: (± 2°C) <input checked="" type="radio"/> Y / N EC: (± 150µS/cm) <input checked="" type="radio"/> Y / N		"	

4 21D Y Y Y Y 21
pH 4.00: 4.05
pH 7.00: 7.1
Temp: 20.2
EC: 2790



APPENDIX

E

DATA QUALITY REVIEW

Data Quality Review

PFAS OMP biannual monitoring event

This appendix reviews the Quality Assurance (QA) and Quality Control (QC) documentation. Quality assurance encompasses the actions, procedures, checks and decisions undertaken to ensure sample integrity and representativeness, and the reliability and accuracy of analysis results. The QA documentation should also include an indication of the Data Quality Objectives sought in relation to each significant action, test or process involved in the assessment.

QC activities measure the effectiveness of the QA procedures by undertaking testing, and then comparing results to previously established objectives. QC work will include the internal laboratory testing as well as results of QC samples submitted such as field blanks and duplicates. The quality of the information and/or data is deemed satisfactory when the QC results demonstrate that agreed objectives have been met.

QA/QC Aspects	Evidence & Evaluation
QA Documentation	
Project Quality Plan/Work Plan and Data Quality Objectives	<p>The field investigation was carried out between the 23 June 2021 and 24 June 2021 and is in accordance with the proposed scope of work, as documented in the SAQP (ref DEF19009_RAAF Learmonth_SAQP_Rev5) issued to the client and in general compliance with the Australian standards AS 4482.1- 2005 "Guide to Sampling and Investigation of Potentially Contaminated Soil, Part 1: Non-volatile and Semi-volatile Compounds", Standards Australia 1998. AS/NZ 5667:1998 <i>Water quality – sampling</i> and NEPM "National Environment Protection (Assessment of Site Contamination) Measure".</p> <p>A quality control program was implemented during the Investigation and the quality assurance procedures used have been reiterated in the report (DEF19009_June 2021 OMP Factual Report_RAAF Learmonth). In addition, a Health, Safety and Environment Work Method Statement (HSEWMS) was also prepared.</p> <p>The Data Quality Objectives were expressed in terms of the purpose of the assessment and the relevant assessment criteria.</p>
Data Representativeness	
Use of Composites	No Composites were used during the investigation
Holding Times	<p>Chain of custody and laboratory reports provide evidence of holding times. Holding times were generally compliant with required timeframes. with the exception of the following:</p> <p>Water:</p> <ul style="list-style-type: none"> pH – generally 12 to 13 days overdue <p>Sediment:</p> <ul style="list-style-type: none"> pH – generally 1 day overdue Conductivity – generally 1 day overdue <p>The holding time exceedances for pH and some analytes are due to the Site's remoteness and are not considered to have adversely impacted the reliability of the results obtained, or the conclusions drawn from this assessment.</p>
Background samples	No background samples were collected as part of this investigation.
Verification of field procedures	<p>The methodology conducted during this investigation is documented in the body of the report, and was in general conformance with the SAQP.</p> <p>Non-disposable equipment was decontaminated between sample locations.</p>

QA/QC Aspects

Evidence & Evaluation

Data Precision & Accuracy

QC sample Frequency

QC sample type	SAQP required frequency	Sample Collected
Blind duplicate	1 in 10 primary water samples (10%) >1 in 20 primary sediment samples (>5%)	8 for 74 primary water samples (10.8%) 5 for 49 primary sediment samples (10.2%)
Split duplicate	1 in 10 primary water samples (10%) >1 in 20 primary sediment samples (>5%)	8 for 74 primary water samples (10.8%) 5 for 49 primary sediment samples (10.2%)
Rinsate	1 per day / equipment used	6 (3x equipment for 2 days) (100%)
Field Blank	1 per day / field team (esky)	6 (3x field teams for 2 days) (100%)

QC sample frequency was compliant with the SAQP for water and sediment duplicates, rinsates and field blanks.

**QC Testing –
Blind Replicates
(Primary Lab)**

- Relative Percentage Difference (RPD) Acceptance Criteria:

Magnitude of Results	Acceptable RPD range
< 10 x LOR	No limits
10 – 20 LOR	0% - 50%
> 20 x LOR	0% - 20%

Groundwater, Seepage water & Surface water

- Number of primary samples analysed: 74
- Duplicate samples analysed: 8

The level of RPD was acceptable for all field duplicates for PFAS. The RPD exceedances for some inorganics were generally minor and are not considered to compromise the validity of the dataset.

Sediment

- Number of primary samples analysed: 49
- Duplicate samples analysed: 5

The level of RPD is generally minor and probably related to the low analyte concentrations of analyte pairs. All RPDs were of acceptable level for PFAS.

**QC Testing –
Field Splits
(Secondary Lab)**

- Relative Percentage Difference (RPD) Acceptance Criteria:

Magnitude of Results	Acceptable RPD range
< 10 x LOR	No limits
10 – 20 LOR	0% - 50%
> 20 x LOR	0% - 20%

Groundwater, Seepage water & Surface water

- Number of primary samples Analysed: 74
- Field Split Samples Analysed: 8

The RPD exceedances (one groundwater sample only reported RPD exceedances for PFAS) were generally minor and probably related to the low analyte concentrations of analyte pairs and/or difference of methodologies between the primary and secondary laboratories.

Sediment

- Number of primary samples analysed: 49
- Field Split Samples Analysed: 5

The RPD exceedances were generally minor and probably related to the low analyte concentrations of analyte pairs and/or difference of methodologies between the primary and secondary laboratories.

QA/QC Aspects	Evidence & Evaluation
Field Blanks	<p>Field Blanks were collected at a rate of one per field team (esky) per fieldwork day. All field blank samples tested reported analytes below the laboratory limit of reporting.</p>
Laboratory Internal QC	<p>Evidence of the laboratories internal QC testing is present and complete in the reports. ALS (Primary) performed internal QC with adequate testing and satisfactory results for method blank, laboratory control samples and laboratory duplicates.</p> <p>All Method Blank results were within acceptable range.</p> <p>All Matrix Spikes generally reported recoveries within the acceptance range of 70% to 130% with the exception of the following:</p> <ul style="list-style-type: none"> ▪ EP2107273, EP2107274, EP2107276, EP2107277, EP2107278, EP2107281 <ul style="list-style-type: none"> - Sample ID anonymous: Sulfate and chloride matrix spike recovery not determined due to the background concentrations exceeding 4x spike level. ▪ EP2107189, EP2107270 <ul style="list-style-type: none"> - Multiple Sample ID: Sulfate, chloride, PFBS, PFPeS, PFHxS, PFOS, PFHxA, PFOA matrix spike recovery not determined due to the background concentrations exceeding 4x spike level. ▪ EP2107190 <ul style="list-style-type: none"> - Sample ID anonymous: PFHxS, PFOS, PFHxA, PFOA matrix spike recovery not determined due to the background concentrations exceeding 4x spike level. ▪ EP2107193 <ul style="list-style-type: none"> - Sample ID MW167: PFHxS and PFOS matrix spike recovery not determined due to the background concentrations exceeding 4x spike level. ▪ EP2107194 <ul style="list-style-type: none"> - Sample ID SS123: PFOS matrix spike recovery not determined due to the background concentrations exceeding 4x spike level. ▪ EP2107198 <ul style="list-style-type: none"> - Sample ID SS170: PFPeS matrix spike recovery not determined due to the background concentrations exceeding 4x spike level - Sample ID SS279: PFOS matrix spike recovery not determined due to the background concentrations exceeding 4x spike level. ▪ EP2107271 <ul style="list-style-type: none"> - Sample ID SD300 & anonymous: PFPeS matrix spike recovery not determined due to the background concentrations exceeding 4x spike level. <p>All laboratory duplicates generally reported RPDs within acceptable range with the exception of the following:</p> <ul style="list-style-type: none"> ▪ EP2107271 <ul style="list-style-type: none"> - Sample ID SD304: Exchangeable Calcium and CEC RPD exceeds LOR based limits (0% - 20%). <p>All Quality Control sample frequencies were of an acceptable rate with exception of the following:</p> <ul style="list-style-type: none"> ▪ EP2107274, EP2107276, EP2107277, EP2107278, EP2107281 <ul style="list-style-type: none"> - Lab duplicates for PFAS were undertaken less than the target rate of 10%.
Laboratory Method Detection Limit	<p>Laboratory reports indicate the method detection limits were generally lower than the respective assessment criteria.</p>
NATA endorsement of laboratory reports	<p>Laboratory reports were stamped with the NATA endorsement stamp and signature.</p> <p>ALS Accreditation No. 825</p> <p>Eurofins Accreditation No. 1261</p>

QA/QC Aspects	Evidence & Evaluation
Calibration of Field Equipment	<p>All equipment used during the investigation was calibrated by the supplier prior to use.</p> <p>The equipment calibration certificates are provided in Appendix D.</p> <p>Cardno undertook in-field calibration checks (bump tests) for each YSI water quality meters per day of sampling. The bump tests found all parameters to be within the acceptable range. As such, Cardno is satisfied that the equipment calibrations were acceptable for this assessment.</p>
Decontamination and Equipment Blanks	<p>Rinsate blanks were collected at a rate of one per day when reusable equipment is used (i.e. YSI, dipper, trowels/shovels...). All rinsate samples tested reported analytes concentrations below the laboratory LORs.</p>
Data Comparability	
Standard Procedures	<p>Fieldwork procedures are detailed in the SAQP and reports and are comparable for each phase of Investigation.</p>
Qualified Personnel	<p>Staff involved in managing and reviewing the project and those involved in fieldwork are qualified personnel.</p>
Sample Integrity	<p>Field Chain of Custody/Laboratory request forms can be found in Appendix C.</p>
Data Completeness	
Completeness of test program	<p>The scope of work undertaken was generally consistent with the SAQP.</p>
Validity of Data Set	<p>The data quality review indicates no significant systematic errors in the data collection process for groundwater and therefore, the data set used as the basis for the investigation is considered valid and complete.</p>

APPENDIX

F

INFORMATION ABOUT ENVIRONMENTAL REPORTS

About Site Environmental Assessment Reports

1. Introduction

This document explains the Environmental Site Assessment (ESA) process and the context that applies to the use of Environmental Reports issued by Cardno.

2. What is an ESA?

Environmental Site Assessments (ESA) are undertaken for a range of purposes, specific to the brief issued by the client in each case. The scope may include one or a combination of any of the following:

- ☐ A factual report of the condition of a portion of the site or one aspect of an entire site.
- ☐ Assessment of the contamination levels in soil to be removed from a site – a waste classification assessment.
- ☐ Validation of the success of remediation of a site or a portion of a site.
- ☐ Provision of a professional opinion about the suitability of a site for one or more uses, in terms of its contamination status.

The scope of any ESA needs to be defined at the outset.

An ESA is not an Environmental Audit. Such audits are undertaken in accordance with the provisions of regulations enacted in various states of Australia, and are referred to as Site Audits in some jurisdictions. Statutory audits provide certification by EPA accredited auditors that a site is suitable for one or more uses. An ESA may provide similar advice but cannot be used in place of an audit if the latter is required by regulation in any instance. However in some circumstances and jurisdictions an ESA is sufficient to provide “environmental sign-off” of a site.

An ESA may be undertaken for due diligence purposes, to establish whether the site has been impacted to the extent that some beneficial uses of the site may be precluded. Due diligence audits in many cases may be completed as non-statutory Audits, although in some jurisdictions they can also be statutory audits, if defined as such at the outset.

3. The ESA Process

The Client generally initiates the ESA process by specifying a brief which identifies the specific objectives of the assessment. If not, it is the consultants’ duty to so specify the ESA

In the case of an ESA to provide an opinion about the suitability of the site for use, it would be conducted in accordance with NEPM (Site Assessment). Such ESA would not commence until a thorough site history assessment (Phase 1 Assessment: to identify the potential for significant contamination at a site) is conducted. However, where the history is unclear, a broad screening of chemical parameters can be used to test environmental media. This normally includes a broad range of organic and inorganic compounds and elements, often referred to as an Environmental Screen.

(In the case of an ESA for a purpose other than to provide an opinion about the suitability of the site for use, it is not always necessary to undertake a Phase 1 assessment.)

The ESA requires sampling of soil at representative locations across the site. A NATA accredited laboratory performs the analysis of soil. It is impractical for all of the soil to be assessed. The ESA is often based on a statistical method of grid or random sampling, augmented by targeted sampling at locations known or suspected to be contaminated. Guidance on sampling strategy and density is provided in Australian Standard AS4482.1–2005. However, some considerable degree of judgement is still required in the application of any sampling and testing strategy. For example the blanket application of the “hot spot” method presented in this standard is often inappropriate given its limitations.

The field program also investigates the likelihood of contamination below the site surface. Field investigations must sample and test fill as well as the natural soils. If contamination is found then it is common for further work to be undertaken to characterise, to the extent practical, its vertical and horizontal extent. However, where fill is encountered and testing shows it to be uncontaminated, it must be realised that the heterogeneous nature of the material might mean that not all pockets of contaminated material can be detected using normal sampling regimes.

EPA guidelines for auditors, that may be relevant for an ESA, indicate the need in all cases to consider the potential for groundwater contamination in any site. This does not mean all sites need to be drilled to sample groundwater, but it is most often the case. Most hydrogeological settings and groundwater conditions are complex and vary in space and time. The condition of groundwater is investigated to identify if any beneficial use or environmental value of groundwater is precluded due to contamination.

As previously stated for soil, all groundwater at the site cannot be tested. The environmental investigations are conducted in accordance with industry standards and guidelines (e.g. EPA Vic Pub 668). This provides a level of confidence that a sufficiently comprehensive assessment of the groundwater at the site is achieved.

Where an investigation shows that groundwater is polluted, consideration should be given to assessing the risks and the need for and practicality of any clean up.

4. Environmental Assessment Report

The ESA Report details the findings of the ESA. It provides summary information on the site definition, the reasons for the assessment and other relevant facts. It reviews the scope and quality of the site investigations, laboratory testing and data analyses undertaken. These reports also present a review of the contamination status of the site, the need for any further clean up, and an opinion on the suitability of the site for a range of beneficial uses and land uses such as “residential – low density”, “commercial” etc, as appropriate.

However, as noted above, some ESA have a narrow scope such as for classification of waste soil for removal from site, and do not make conclusions on suitability of site for use.

The ESA Report generally includes copies of other documents and reports, necessary to support the assessment findings, presented as appendices. These can contain more detailed information than the body of the ESA Report. Care should be taken to also read the appended documents and the ESA report in full.

Cardno generally issues reports in electronic form (e-Report) on CD ROM. ESA Reports are issued in this format as Adobe Acrobat™ PDF files. However, a paper copy of the executive summary of the ESA Report is generally issued to the client, and others as required by the brief or by regulation.

5. Limitations of Environmental Assessment Report

The ESA Report is prepared in a manner that can be easily read by a lay person with a legitimate interest in the contamination status of the site, such as the site owner or occupier, EPA and Local Planning Authority. The ESA report is not intended for use by other parties or for other purposes. Anyone who uses the assessment report for purposes other than specified in the report, does so at their own risk.

The site should only be used for one or more of the beneficial uses and land uses identified in the ESA as suitable.

The conditions and qualifications may apply to the suitability of the site for use, and it is the responsibility of the Client to be cognizant of and accept these in accepting the report. Cardno are only responsible for the issuing of the ESA report but accepts no liability for the costs incurred in the implementation of ESA findings.

The ESA provides a “snapshot” of the site conditions at the time of the site investigation. Consequently, the report may not be valid at a later time if there has been any change to the contamination status of the site in that time. Verification of the status of the site may be required in cases where a significant time has elapsed, or site conditions have changed since the assessment and audit.

The ESA is necessarily limited by constraints such as time, cost and available information; although normal professional practice at the time has been applied with all due care to prepare the report. A necessary requirement of this process is the horizontal and vertical interpolation of data from discrete locations. However, site conditions are generally not homogenous and some discrepancies will occur between the actual and predicted results at locations not directly sampled. There is a risk that contamination may occur at the site and not be identified by a competent investigation and assessment. The approach adopted in sampling (a combination of statistically based grid and judgmental sampling) seeks to reduce, but cannot eliminate, this risk.

Where unexpected occurrences of contamination arise, subsequent to the issue of the ESA Report, Cardno should be permitted to make an interpretation of these facts in relation to the ESA Report findings. Consequently, the Client should inform Cardno and seek their opinion. Cardno accepts no liability for costs incurred due to such

unexpected occurrences, given the inherent uncertainties in the assessment process.

Cardno uses information provided by other parties as the basis for the ESA, and reliance on this information is at the discretion of Cardno. However, however Cardno cannot guarantee any of the facts, findings or conclusions presented by other parties. Cardno will not be liable for the use of information, provided by others that is subsequently found to be intentionally misleading.

The ESA Report is not and does not purport to be anything other than a contaminated land ESA. It is not a geotechnical report and bore logs reproduced are for interpretation of the likely distribution of contamination. They are not intended for geotechnical interpretations and may not be adequate for this purpose.

The ESA Report is not intended to be a comprehensive analysis of the presence and associated risk of asbestos in buildings and services. Where asbestos in buildings and services is known or likely, the report may only caution that an appropriately qualified person be engaged to undertake demolition to avoid contamination of the site.

Cardno

13 August 2015

APPENDIX

D

DATA ASSESSMENT



now



		Perfluoroalkyl Sulfonic Acids						Perfluoroalkyl Carboxylic Acids										(n:2) Fluorotelomer Sulfonic Acids				Perfluoroalkyl Sulfonamides										
		Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluorohexanoic acid (PFHxA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDDA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDDA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDDA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-methyl perfluorooctane sulfonamide (MeFOSA)	N-methyl perfluorooctane sulfonamide (MeFOSA)	N-Ethyl perfluorooctane sulfonamide (EFOSA)	N-Ethyl perfluorooctane sulfonamide (EFOSA)	
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	
LOR - Limit of Reporting		0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.001	0.002	0.001	0.002	0.005	0.001			0.05	0.01	0.002		0.001	0.001	0.001	0.001	0.01	0.005	0.002	0.005	0.01	0.002		
PFAS NEMP 2020 Interim Marine 99%						0.00023*																										
PFAS NEMP 2020 Recreational Water																																
Lab Report Number	Field ID	Location Code		Date																												
ES1019112	MW16	MW016		20/09/2010					0.84					0.18																		
EP1101571	MW016			10/03/2011											0.26								<0.1									
EP1308516	WA0160_MW016			5/11/2013											0.85								<0.1									
EP1402141	WA0160_MW016-190314			19/03/2014											0.87								<0.1									
207229	0960_MW016_180221			21/02/2018	6.3	5.8	34	2.0	12	<0.002	2.2	18	3.1	1.3	1.4	<0.002	<0.005	0.010	<0.05	<0.01	<0.002	<0.001	0.017	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	
212372	0960_MW016_180614			14/06/2018	7.4	6.6	36	3.7	17	<0.02	2.0	16	3.5	1.4	1.5	<0.020	<0.050	<0.010	<0.50	<0.10	<0.020	<0.010	<0.010	<0.010	<0.010	<0.10	<0.050	<0.040	<0.050	<0.10	<0.040	
EP2006515	0960_MW016_200624			24/06/2020	10.0	16.1	80.6	4.85	29.8	<0.02	3.0	34.2	6.50	1.73	2.53	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	
EP2107189	0960_MW016_210623			23/06/2021	9.12	10.5	56.9	3.80	25.3	<0.02	2.4	30.4	6.06	1.76	2.30	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	
ES1019112	MW18	MW018		18/09/2010					1.17					0.08																		
EP1101571	MW018			11/03/2011					0.22						<0.02								<0.1									
EP1308516	WA0043_MW018			6/11/2013					0.07						<0.02								<0.1									
EP1402252	WA0043-MW018-230314			23/03/2014					0.05						<0.02								<0.1									
EP1511012	WA0043-MW18			9/06/2015					0.18						0.03								<0.1	<0.1								
EP1514597	WA0043-MW018			6/10/2015					0.29						<0.02								<0.1	<0.1								
EP1602318	WA0043_MW18_150316			15/03/2016					1.16						0.04								<0.1	<0.1								
527022	MW018			3/12/2016					2.5						0.07								<0.05									
207817	0960_MW018_180306			6/03/2018	0.46	0.40	1.6	0.10	0.84	<0.002	0.19	0.83	0.21	0.079	0.068	<0.002	<0.005	0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	
211878	0960_MW018_180610			10/06/2018	0.57	0.4	2.1	0.08	0.83	<0.002	0.19	1.3	0.32	0.1	0.08	<0.002	<0.005	0.003	<0.05	<0.01	<0.002	<0.001	0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	
EP1912481	0960_MW018_191126			26/11/2019	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	
EP2006512	0960_MW018_200624			24/06/2020	0.14	0.19	1.24	0.04	0.66	<0.02	<0.1	0.39	0.12	0.04	0.05	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	
EP2012892	0960_MW018_201119			19/11/2020	0.15	0.17	1.32	0.05	0.78	<0.02	<0.1	0.42	0.10	0.06	0.07	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	
EP2107193	0960_MW018_210623			23/06/2021	0.06	0.10	1.02	0.03	0.33	<0.02	<0.1	0.29	0.12	0.06	0.06	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	
ES1019112	MW21	MW021		18/09/2010					<0.02					<0.02																		
EP1101571	MW021			11/03/2011					<0.02						<0.02								<0.1									
EP1308516	WA0043_MW021			8/11/2013					0.08						<0.02								<0.1									
EP1402252	WA0043_MW021_230314			23/03/2014					0.19						0.02								<0.1									
EP1511012	WA0043-MW021			9/06/2015					0.14						<0.02								<0.1	<0.1								
EP1514597	WA043-MW021			6/10/2015					0.05						<0.02								<0.1	<0.1								
EP1602318	WA0043_MW021_150316			15/03/2016					<0.01						<0.01								<0.1	<0.1								
527022	MW021			3/12/2016					0.04						<0.01								<0.05									
207817	0960_MW021_180306			6/03/2018	0.061	0.060	0.26	0.005	0.050	<0.002	0.020	0.057	0.01	0.006	0.004	<0.002	<0.005	<0.001	<													

		Perfluoroalkyl Sulfonic Acids						Perfluoroalkyl Carboxylic Acids										(n:2) Fluorotelomer Sulfonic Acids				Perfluoroalkyl Sulfonamides								
		Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluorohexanoic acid (PFHxA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDDA)	Perfluorononanoic acid (PFNA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTTrDA)	Perfluoroundecanoic acid (PFUnDA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamideethanol (MeFOSE)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Ethyl perfluorooctane sulfonamideethanol (EtFOSEAA)					
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L					
LOR - Limit of Reporting		0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.001	0.002	0.001	0.002	0.001	0.05	0.01	0.002	0.001	0.001	0.001	0.001	0.01	0.005	0.002	0.005	0.002					
PFAS NEMP 2020 Interim Marine 99%						0.00023*					19																			
PFAS NEMP 2020 Recreational Water										10																				
Lab Report Number	Field ID	Location Code		Date																										
EP1912676	0960_MW115_191129	MW115		29/11/2019	0.07	0.07	0.43	<0.02	0.06	<0.02	<0.1	0.11	0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02	
EP2006591	0960_MW115_200625			25/06/2020	0.09	0.12	0.73	<0.02	0.06	<0.02	<0.1	0.18	0.04	<0.02	0.01	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02	
EP2012917	0960_MW115_201119			19/11/2020	0.04	0.05	0.33	<0.02	0.06	<0.02	<0.1	0.09	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02	
EP2107276	0960_MW115_210624			24/06/2021	0.10	0.13	0.91	<0.02	0.12	<0.02	<0.1	0.20	0.04	<0.02	0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02	
212372	0960_MW122_180615	MW122		15/06/2018	<0.001	<0.001	0.001	<0.001	0.001	<0.002	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	0.009	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	
EP1912680	0960_MW122_191130			30/11/2019	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02		
EP2006590	0960_MW122_200625			25/06/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02		
EP2012956	0960_MW122_201121			21/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02		
EP2107276	0960_MW122_210624	MW124		24/06/2021	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02		
207857	0960_MW124_180307			7/03/2018	0.003	<0.001	0.004	<0.001	0.003	<0.002	0.01	0.003	<0.002	<0.001	0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002
211878	0960_MW124_180609			9/06/2018	0.002	<0.001	0.002	<0.001	0.005	<0.002	0.004	0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002
EP1912744	0960_MW124_191202			2/12/2019	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02
EP2006749	0960_MW124_200629	MW126		29/06/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	
EP2012894	0960_MW124_201119			19/11/2020	<0.02	<0.02	<0.02	<0.02	0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	
EP2107189	0960_MW124_210623			23/06/2021	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	
207857	0960_MW126_180307			7/03/2018	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002
211878	0960_MW126_180608	MW127		8/06/2018	<0.001	<0.001	<0.001	<0.001	0.009	<0.002	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	
EP1912676	0960_MW126_191129			29/11/2019	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	
EP2006524	0960_MW126_200624			24/06/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	
EP2107189	0960_MW126_210623			23/06/2021	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	
208042	0960_MW134_180310	MW134		10/03/2018	0.002	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.01	<0.002	<0.002	<0.005	<0.01	<0.002
211878	0960_MW134_180610			10/06/2018	0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002																			

		Perfluoroalkyl Sulfonic Acids						Perfluoroalkyl Carboxylic Acids										(n:2) Fluorotelomer Sulfonic Acids				Perfluoroalkyl Sulfonamides								
		Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluorohexanoic acid (PFHxA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDDA)	Perfluorotetradecanoic acid (PFTrDA)	Perfluorohexadecanoic acid (PFHxDA)	Perfluorooctadecanoic acid (PFODa)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamideethanol (MeFOSE)	N-Ethyl perfluorooctane sulfonamide (EFOSA)	N-Ethyl perfluorooctane sulfonamide (EFOSAA)						
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L						
LOR - Limit of Reporting		0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.001	0.002	0.001	0.002	0.005	0.001	0.05	0.01	0.002	0.001	0.001	0.001	0.01	0.005	0.002	0.01	0.002					
PFAS NEMP 2020 Interim Marine 99%						0.00023*																								
PFAS NEMP 2020 Recreational Water																														
Lab Report Number	Field ID	Location Code		Date																										
208042	0960_MW141_5.0-5.5_180308	MW141	8/03/2018	<0.001	<0.001	<0.001	<0.001	0.002	<0.002	0.009	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	0.005	<0.001	<0.001	<0.01	<0.02	<0.002	<0.005	<0.05	<0.002
208042	0960_MW141_7.0-7.5_180308		8/03/2018	<0.001	<0.001	<0.001	<0.001	0.001	<0.002	0.004	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	0.002	<0.001	<0.001	<0.01	<0.02	<0.002	<0.005	<0.05	<0.002
212372	0960_MW141_2.0_180616		16/06/2018	<0.001	<0.001	0.001	<0.001	0.001	<0.002	0.004	<0.001	0.002	0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002
212372	0960_MW141_3.5_180616		16/06/2018	<0.001	<0.001	0.001	<0.001	0.007	<0.002	0.006	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002
212372	0960_MW141_5.5_180616		16/06/2018	<0.001	<0.001	0.001	<0.001	0.006	<0.002	0.009	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	0.009	<0.01	<0.002
212372	0960_MW141_7.5_180616		16/06/2018	0.001	<0.001	<0.001	<0.001	0.003	<0.002	0.006	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002
EP1912678	0960_MW141_3.0-3.5_191129		29/11/2019	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02
EP2006523	0960_MW141_200624		24/06/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02
EP2012957	0960_MW141_3.5_201120		20/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02
EP2107277	0960_MW141_7.0-7.5_210624	24/06/2021	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	
208042	0960_MW143_3.0-3.5_180310	MW143	10/03/2018	0.001	<0.001	<0.001	<0.001	0.001	<0.002	0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	0.002	<0.001	<0.001	<0.01	<0.02	<0.002	<0.005	<0.05	<0.002
208042	0960_MW143_5.0-5.5_180310		10/03/2018	0.005	<0.001	<0.001	<0.001	0.005	<0.002	0.02	<0.01	<0.01	<0.01	0.002	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	0.005	<0.001	<0.001	<0.1	<0.02	<0.002	<0.005	<0.05	<0.002
208042	0960_MW143_7.0-7.5_180310		10/03/2018	0.002	<0.001	<0.001	<0.001	0.004	<0.002	0.02	<0.01	<0.002	<0.01	0.002	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	0.003	<0.001	<0.001	<0.1	<0.02	<0.002	<0.005	<0.05	<0.002
208042	0960_MW143_9.0-9.5_180310		10/03/2018	<0.002	<0.002	0.004	<0.002	0.017	<0.004	<0.004	<0.002	<0.004	0.003	<0.004	<0.01	<0.002	<0.004	<0.002	<0.002	0.02	<0.002	<0.002	<0.002	<0.002	<0.02	<0.02	<0.004	<0.01	<0.05	<0.004
212372	0960_MW143_3.5_180616		16/06/2018	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002
212372	0960_MW143_5.5_180616		16/06/2018	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002
212372	0960_MW143_7.5_180616		16/06/2018	<0.001	<0.001	0.002	<0.001	0.006	<0.002	0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002
212372	0960_MW143_9.5_180616		16/06/2018	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002
EP1912673	0960_MW143_3.0-3.5_191129		29/11/2019	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	0.05	<0.01	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	

		Perfluoroalkyl Sulfonic Acids						Perfluoroalkyl Carboxylic Acids										(n:2) Fluorotelomer Sulfonic Acids				Perfluoroalkyl Sulfonamides										
		Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluorohexanoic acid (PFHxA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDDA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDDA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDDA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-methyl perfluorooctane sulfonamide (MeFOSA)	N-methyl perfluorooctane sulfonamide (MeFOSA)	N-Ethyl perfluorooctane sulfonamide (EFOSA)	N-Ethyl perfluorooctane sulfonamide (EFOSA)	
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	
LOR - Limit of Reporting		0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.001	0.002	0.001	0.005	0.001	0.001	0.002	0.005	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.01	0.005	0.002	0.005	0.01	0.002		
PFAS NEMP 2020 Interim Marine 99%						0.00023*								19																		
PFAS NEMP 2020 Recreational Water														10																		
Lab Report Number	Field ID	Location Code		Date																												
EP2107189	0960_MW1485_210623	MW151		23/06/2021	9.03	6.80	25.5	3.06	20.8	<0.02	1.5	9.77	1.95	1.10	1.63	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	
212372	0960_MW151_180618			18/06/2018	8.6	9.6	92	6.9	40	<0.020	3.1	30	5.1	2.2	6.0	<0.020	<0.050	0.024	<0.50	<0.10	<0.020	<0.010	0.034	0.047	<0.010	<0.10	<0.050	<0.020	<0.050	<0.10	<0.020	
EP2002956	MW151_200316			16/03/2020	12.4	16.7	103	5.48	39.1	<0.02	3.2	45.8	8.25	2.44	2.56	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02
EP2006515	0960_MW151_200624			24/06/2020	6.12	11.5	85.6	10.9	72.6	<0.02	2.3	28.2	4.54	1.64	6.60	<0.02	<0.02	0.03	<0.05	<0.02	<0.02	<0.05	<0.05	0.10	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02
EP2012894	0960_MW151_201119			19/11/2020	2.59	5.18	40.9	3.98	41.9	<0.02	0.9	13.6	1.71	0.74	2.05	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02
EP2107189	0960_MW151_210623	MW159		23/06/2021	2.48	3.35	13.2	3.03	13.9	<0.02	0.8	4.91	1.18	0.64	1.59	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02
212372	0960_MW159_180615			15/06/2018	0.001	<0.001	0.008	<0.001	0.017	<0.002	<0.002	0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	
EP1912673	0960_MW159_191129			29/11/2019	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	0.06	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02
EP2002956	MW159_200316			16/03/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02
EP2006515	0960_MW159_200624			24/06/2020	<0.02	<0.02	0.12	<0.02	0.15	<0.02	<0.1	0.03	<0.02	<0.02	0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02
EP2012957	0960_MW159_201120	MW162		20/11/2020	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02	
EP2107193	0960_MW159_210623			23/06/2021	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02	
212372	0960_MW162_180615			15/06/2018	0.42	0.48	2.7	0.051	0.13	<0.002	0.18	1.0	0.20	0.071	0.060	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	
EP1912551	0960_MW162_191126			26/11/2019	0.84	0.98	6.68	0.07	0.29	<0.02	0.2	2.31	0.42	0.14	0.11	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02
EP2006512	0960_MW162_200624			24/06/2020	0.72	0.88	5.04	0.06	0.31	<0.02	0.2	1.70	0.42	0.14	0.12	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02
EP2012892	0960_MW162_201119	MW163		19/11/2020	0.44	0.52	3.48	0.05	0.37	<0.02	0.1	1.07	0.19	0.09	0.08	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02	
EP2107193	0960_MW162_210623			23/06/2021	0.32	0.34	2.02	0.02	0.15	<0.02	0.1	0.68	0.17	0.05	0.05	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02	
212372	0960_MW163_180615			15/06/2018	0.65	0.84	6.9	0.64	5.0	<0.002	0.19	2.0	0.43	0.25	0.30	<0.002	<0.005	0.010	<0.05	<0.01	<0.002	<0.001	0.090	0.003	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	
EP1912480	0960_MW163_191126			26/11/2019	<0.05	<0.05	0.26	<0.05	0.10	<0.05	<0.2	0.08	<0.05	<0.05	<0.05	<0.05	<0.05	<0.12	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.12	<0.05	<0.05	<0.12	<0.05	<0.05
EP2006512	0960_MW163_200624			24/06/2020	0.50	0.75	6.18	0.37	2.59	<0.02	0.2	1.50	0.36	0.18	0.27	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	0.09	<0.05	<0.05	<0.02	<0.05	<0.02</				

		Perfluoroalkyl Sulfonic Acids						Perfluoroalkyl Carboxylic Acids										(n:2) Fluorotelomer Sulfonic Acids				Perfluoroalkyl Sulfonamides										
		Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluorohexanoic acid (PFHxA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDDA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorohexadecanoic acid (PFHxDA)	Perfluorooctadecanoic acid (PFODa)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamideethanol (MeFOSE)	N-Ethyl perfluorooctane sulfonamide (EFOSA)	N-Ethyl perfluorooctane sulfonamide (EFOSAA)								
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L								
LOR - Limit of Reporting		0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.001	0.002	0.001	0.002	0.005	0.001		0.05	0.01	0.002		0.01	0.005	0.002	0.005	0.01	0.002							
PFAS NEMP 2020 Interim Marine 99%						0.00023*					19																					
PFAS NEMP 2020 Recreational Water											10																					
Lab Report Number	Field ID	Location Code		Date																												
EP2006524	0960_MW177_200624	MW178		24/06/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02	
EP2012946	0960_MW177_201120			20/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02
EP2107272	0960_MW177_3.5-4.0_210623			23/06/2021	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02
212372	0960_MW178_2.5_180617			17/06/2018	<0.001	<0.001	0.004	<0.001	0.004	<0.002	<0.002	0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.002	<0.005	<0.001	<0.002	<0.001	0.005	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	
212372	0960_MW178_4.5_180617			17/06/2018	<0.001	<0.001	0.002	<0.001	0.011	<0.002	<0.01	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.001	0.004	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	
212372	0960_MW178_7.5_180617			17/06/2018	<0.001	<0.001	0.002	<0.001	0.003	<0.002	<0.01	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.005	<0.001	0.002	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	
212372	0960_MW178_9.5_180617			17/06/2018	<0.001	<0.001	0.002	<0.001	0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.002	<0.001	<0.002	<0.005	<0.001	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	
EP1912673	0960_MW178_4.0-4.5_191129			29/11/2019	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	0.22	<0.05	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.02	
EP2006524	0960_MW178_200624			24/06/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.05	<0.02
EP2012943	0960_MW178_201120			20/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.05	<0.02
EP2107273	0960_MW178_210624			24/06/2021	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.05	<0.02
212372	0960_MW179_1.5_180616	MW179		16/06/2018	<0.001	<0.001	0.009	<0.001	0.010	<0.002	0.009	0.002	<0.002	<0.001	0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	0.003	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	
212372	0960_MW179_3.7_180616			16/06/2018	<0.001	<0.001	0.002	<0.001	0.005	<0.002	0.005	0.003	<0.002	<0.001	0.002	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	0.004	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	
212372	0960_MW179_6.4_180616			16/06/2018	<0.001	<0.001	0.003	<0.001	0.003	<0.002	0.004	0.003	<0.002	<0.001	0.003	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	0.004	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	
212372	0960_MW179_9.0_180616			16/06/2018	<0.001	<0.001	0.002	<0.001	0.002	<0.002	<0.002	0.001	<0.002	<0.001	0.002	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	0.002	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002	
EP1912678	0960_MW179_3.2-3.7_191129			29/11/2019	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.05	<0.02
EP2006523	0960_MW179_200624			24/06/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.05	<0.02
EP2012943	0960_MW179_201120			20/11/2020	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.05	<0.02
EP2107273	0960_MW179_210624			24/06/2021	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.05	<0.02	<0.05	<0.05	<0.02
212372	0960_MW180_1.5_180617	MW180		17/06/2018	<0.001	<0.001	0.001	<0.001	0.001	<0.002	0.020	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	0.004	<								

		Perfluoroalkyl Sulfonic Acids						Perfluoroalkyl Carboxylic Acids										(n:2) Fluorotelomer Sulfonic Acids				Perfluoroalkyl Sulfonamides													
		Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluorohexanoic acid (PFHxA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDoA)	Perfluorododecanoic acid (PFDDA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDDA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDDA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDDA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorodecanoic sulfonamide (MeFDDA)	N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	N-Ethyl perfluorooctane sulfonamide (EFOSA)	N-Ethyl perfluorodecanoic sulfonamide (EFDDA)	
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	
LOR - Limit of Reporting		0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.001	0.002	0.001	0.002	0.001	0.001	0.002	0.005	0.001	0.05	0.01	0.002		0.001	0.001	0.001	0.001	0.01	0.005	0.002	0.005	0.01	0.002				
PFAS NEMP 2020 Interim Marine 99%							0.00023*							19																					
PFAS NEMP 2020 Recreational Water														10																					
Lab Report Number	Field ID	Location Code		Date																															
EP2012946	0960_OTH132_201120	OTH134		20/11/2020	23/06/2021	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02		
EP2107272	0960_OTH132_210623			23/06/2021		<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.01	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02		
211878	0960_OTH134_180610_A			10/06/2018		<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002			
211878	0960_OTH134_180610_B			10/06/2018		<0.001	<0.001	<0.001	<0.001	0.003	<0.002	<0.002	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002			
EP1912685	0960_OTH134_191201			1/12/2019		<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02		
EP2006595	0960_OTH134_200625			25/06/2020		<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.05	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02			
EP2012946	0960_OTH134_201120			20/11/2020		<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.05	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02			
EP2107272	0960_OTH134_210623			23/06/2021		<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.05	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02			
EP1912686	0960_SW301_191202			2/12/2019		<0.02	1	<0.02	<0.02	0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02			
EP2005399	0960_SW301_200525			25/05/2020		<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02			
EP2006550	0960_SW301_200624			24/06/2020		<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02			
EP2012947	0960_SW301_201120	20/11/2020		<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02					
EP2102258	0960_SW301_210304	4/03/2021		<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02					
EP2107270	0960_SW001_210623	23/06/2021		<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02					
212572	0960_SW114_180619	SW114		19/06/2018		<0.001	<0.001	<0.001	<0.001	0.081	<0.002	<0.002	<0.001	<0.002	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002				
212572	0960_SW121_186019	SW121		19/06/2018		0.009	0.008	0.056	0.004	0.18	<0.002	0.006	0.030	0.007	0.002	0.004	<0.002	<0.005	0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002			
212572	0960_SW122_180619	SW122		19/06/2018		0.003	0.003	0.054	0.012	1.3	0.01	0.027	0.19	0.073	0.37	1.1	0.24	<0.02	0.02	0.75	<0.05	<0.01	0.050	<0.001	0.039	0.42	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002		
212572	0960_SW123_180619	SW123		19/06/2018		0.008	0.006	0.049	0.007	0.43	0.006	0.009	0.028	0.01	0.003	0.004	0.003	<0.005	0.003	<0.05	<0.01	<0.002	<0.001	0.002	0.002	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002			
EP2005558	0960_SW189_200528	SW189		28/05/2020		<0.02	<0.02	<0.02	<0.02	0.04	<0.02	<0.1	<0.02	<0.02	<0																				



Table 1 - Summary of Groundwater, Surface Water and Seepage Water Analytical Results

		Perfluoroalkyl Sulfonic Acids						Perfluoroalkyl Carboxylic Acids										(n:2) Fluorotelomer Sulfonic Acids				Perfluoroalkyl Sulfonamides													
		Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluorohexanoic acid (PFHxA)	Perfluoropentanoic acid (PFPeA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoA)	Perfluorononanoic acid (PFNA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTriDA)	Perfluoroundecanoic acid (PFUnDA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)							
		µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L							
LOR - Limit of Reporting		0.001	0.001	0.001	0.001	0.001	0.002	0.002	0.001	0.002	0.001	0.001	0.002	0.005	0.001	0.05	0.01	0.002	0.001	0.001	0.001	0.001	0.01	0.005	0.002	0.005	0.01	0.002							
PFAS NEMP 2020 Interim Marine 99%						0.00023*						19																							
PFAS NEMP 2020 Recreational Water												10																							
Lab Report Number	Field ID	Location Code		Date																															
EP2005487	0960_SW265_200527	SW265		27/05/2020	<0.02	<0.02	<0.02	<0.02	0.22	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02							
EP2107190	0960_SW625_210623			23/06/2021	<0.02	<0.02	<0.02	<0.02	0.18	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02							
212572	0960_SW288_180620	SW288		20/06/2018	<0.001	<0.001	0.002	<0.001	0.11	<0.002	<0.002	<0.001	<0.002	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002						
EP2102258	0960_SW288_210304			4/03/2021	<0.02	<0.02	<0.02	<0.02	0.10	<0.02	<0.1	<0.02	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.05	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02						
212572	0960_SW291_180620	SW291		20/06/2018	<0.001	<0.001	0.002	<0.001	0.038	<0.002	<0.002	<0.001	<0.002	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002						
212572	0960_SW293_180620	SW293		20/06/2018	<0.001	<0.001	<0.001	<0.001	0.050	<0.002	<0.002	<0.001	<0.002	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002						
212372	0960_SW298_180614	SW298		14/06/2018	<0.001	<0.001	<0.001	<0.001	0.005	<0.002	0.076	<0.001	<0.002	<0.001	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	0.002	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002					
EP2107278	0960_SW298_210624			24/06/2021	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.05	<0.02					
212151	0960_SW300_180613	SW300		13/06/2018	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.002	<0.001	<0.002	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	0.003	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002				
EP1912748	0960_SW300_191202			2/12/2019	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02					
EP2005408	0960_SW300_200526			26/05/2020	<0.02	<0.02	<0.02	<0.02	<0.02	0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02					
EP2006550	0960_SW300_200624			24/06/2020	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02					
EP2012947	0960_SW300_201120			20/11/2020	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02					
EP2102258	0960_SW300_210304			4/03/2021	<0.02	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02					
EP2107270	0960_SW300_210623			23/06/2021	<0.02	<0.02	<0.02	<0.02	<0.02	0.02	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02					
212572	0960_SW301_180620	SW301		20/06/2018	<0.001	<0.001	<0.001	<0.001	0.034	<0.002	<0.002	<0.001	<0.002	<0.001	<0.002	<0.005	<0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002					
EP2107278	0960_SW301_210624			24/06/2021	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02					
212572	0960_SW302_180620	SW302		20/06/2018	<0.001	<0.001	0.002	<0.001	0.22	0.003	<0.002	<0.001	0.002	<0.001	<0.001	<0.002	<0.005	0.001	<0.05	<0.01	<0.002	<0.001	<0.001	<0.001	<0.001	<0.01	<0.005	<0.002	<0.005	<0.01	<0.002				
EP1912743	0960_SW302_191202			2/12/2019	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02					
EP2005408	0960_SW302_200526			26/05/2020	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05	<0.02					
EP2006531	0960_SW302_200624			24/06/2020	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01	<0.02	<0.1	<0.02	<0.02	<0.02	<0.01	<0.02	<0.02	<0.02	<0.05	<0.02	<0.02	<0.05	<0.02	<0.05	<0.02	<0.05								

Table 1 - Summary of Groundwater, Surface Water and Seepage Water Analytical Results

				N-Ethyl perfluorooctane sulfonamidoethanol (EFOS-E)	PFAS				Inorganics											Metals				Organic		
				µg/L	Sum of PFAS (WA DER List)	Sum of PFAS and PFOS	Sum of PFAS	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3	Anions Total	Cations Total	Chloride	Ionic Balance	pH (Lab)	Sodium (filtered)	Sulphate as SO4 - Turbidimetric (filtered)	TDS	Total Suspended Solids	Calcium (filtered)	Magnesium (filtered)	Potassium (filtered)	Dissolved Organic Carbon		
				0.05	0.01	0.001	0.01	1	1	1	1	0.01	0.01	1	0.01	0.01	0.5	1	5	5	0.5	0.5	0.5	1		
					2																					
Lab Report Number	Field ID	Location Code	Date																							
ES1019112	MW16	MW016	20/09/2010																							
EP1101571	MW016		10/03/2011																							
EP1308516	WA0160_MW016		5/11/2013																							
EP1402141	WA0160_MW016-190314		19/03/2014																							
207229	0960_MW016_180221		21/02/2018	<0.05		46				773		169	154	4,570	4.66		3,020	1,180		5,600		71	185	149		
212372	0960_MW016_180614		14/06/2018	<0.50		53				820				1,900	3.4		1,900		7,600		39	74	74			
EP2006515	0960_MW016_200624		24/06/2020	<0.05	168	110	189		1,180	<1	1,180	80.4	76.2	1,600	2.70	7.81	1,530	564	5,200	2,260	59	110	95		6	
EP2107189	0960_MW016_210623		23/06/2021	<0.05	134	82.2	148		1,160	<1	1,160	78.4	72.8	1,540	3.66	7.92	1,500	565	4,820	1,990	33	62	114			
ES1019112	MW18	MW018	18/09/2010																							
EP1101571	MW018		11/03/2011																							
EP1308516	WA0043_MW018		6/11/2013																							
EP1402252	WA0043-MW018-230314		23/03/2014																							
EP1511012	WA0043-MW18		9/06/2015																							
EP1514597	WA0043-MW018		6/10/2015																							
EP1602318	WA0043_MW18_150316		15/03/2016																							
527022	MW018		3/12/2016																							
207817	0960_MW018_180306		6/03/2018	<0.05						730				960	-5.9		940		3,100		31	35	23			
211878	0960_MW018_180610		10/06/2018	<0.05						770				970	4.2		1,200		3,400		41	47	27			
EP1912481	0960_MW018_191126		26/11/2019	<0.05	<0.01	<0.01	<0.01			323	<1	323	10.3	128	1.41	7.89	96	12	600	<5	110	9	8		5	
EP2006512	0960_MW018_200624		24/06/2020	<0.05	2.64	1.90	2.87			968	<1	968	42.1	571	7.99	8.04	751	320	2,400	126	16	20	30		5	
EP2012892	0960_MW018_201119		19/11/2020	<0.05	2.90	2.10	3.12			857	<1	857	36.6	475	2.09	8.24	748	294	2,260	1,150	12	16	27		3	
EP2107193	0960_MW018_210623		23/06/2021	<0.05	1.94	1.35	2.07			933	<1	956	31.4	307	3.49	8.38	636	174	2,070	4,530	6	9	22			
ES1019112	MW21	MW021	18/09/2010																							
EP1101571	MW021		11/03/2011																							
EP1308516	WA0043_MW021		8/11/2013																							
EP1402252	WA0043_MW021_230314		23/03/2014																							
EP1511012	WA0043-MW021		9/06/2015																							
EP1514597	WA043-MW021		6/10/2015																							
EP1602318	WA0043_MW021_150316		15/03/2016																							
527022	MW021		3/12/2016																							
207817	0960_MW021_180306		6/03/2018	<0.05						520				2,900	0.49		1,900		6,600		160	170	51			
211878	0960_MW021_180610		10/06/2018	<0.05						670				2,400	3.6		1,800		5,300		120	130	42			
EP1912480	0960_MW021_191126		26/11/2019	<0.05	1.75	1.26	1.92			1,130	<1	1,140	46.7	46.0	0.74	8.30	966	173	2,620	97	19	27	32		17	
EP2006512	0960_MW021_200624		24/06/2020	<0.05	1.64	1.24	1.77			1,100	<1	1,100	42.0	34.8	597	9.46	8.12	742	155	2,350	71	10	16	27		5
EP2107193	0960_MW021_210623		23/06/2021	<0.05	0.88	0.68	0.96			702	<1	702	82.0	73.8	2,180	5.25	7.98	1,400	312	4,660	514	82	91	53		4
207857	0960_MW102_180307	MW102	7/03/2018	<0.05					150					39,000	-1.3		21,000		69,000		1,300	2,100	430			
211878	0960_MW102_180609		9/06/2018	<0.05						140				37,000	0.87		21,000		71,000		1,200	2,000	390			
EP1912744	0960_MW102_191202		2/12/2019	<0.05	<0.01	<0.01	<0.01			125	<1	125	1,050	1,360	34,400	12.6	7.48	24,000	3,790	70,400	17,800	1,470	2,660	798		
EP2006532	0960_MW102_200624		24/06/2020	<0.05	<0.01	<0.01	<0.01			167	<1	167	889	1,020	28,300	6.85	7.34	18,400	4,190	65,000	1,150	1,020	1,870	566		9
EP2012894	0960_MW102_201119		19/11/2020	<0.05	0.02	0.02	0.02			160	<1	160	1,030	1,100	33,200	3.57	7.47	19,200	4,220	76,100	299	1,310	2,250	702		2
EP2107189	0960_MW102_210623		23/06/2021	<0.05	<0.01	<0.01	<0.01			137	<1	137	1,070	1,240	35,000	7.32	7.34	21,800	3,820	78,700	691	1,450	2,410	765		
207857	0960_MW103_180307	MW103	7/03/2018	<0.05					180					29,000	1.5		16,000		52,000		1,200	1,800	470			
212372	0960_MW103_180615		15/06/2018	<0.05		0.24				190				27,000	1.7		15,000		57,000		1,100	1,700	430			
EP1912682	0960_MW103_191130		30/11/2019	<0.05	0.51	0.31	0.58			185	<1	185	786	984	26,000	11.2	7.38	16,200	2,350	55,600	3,120	1,430	2,300	740		3
EP2006515	0960_MW103_200624																									

Table 1 - Summary of Groundwater, Surface Water and Seepage Water Analytical Results

				N-Ethyl perfluorooctane sulfonamidoethanol (PFOSF)	Sum of PFAS (WA DER List)	Sum of PFAS and PFOS	Sum of PFAS	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3	Anions Total	Cations Total	Inorganics	Chloride	Ionic Balance	pH (Lab)	Sodium (filtered)	Sulphate as SO4 - Turbidimetric (filtered)	TDS	Total Suspended Solids	Calcium (filtered)	Magnesium (filtered)	Potassium (filtered)	Organic
				µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	mg/L	%	pH Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LOR - Limit of Reporting				0.05	0.01	0.001	0.01	1	1	1	1	0.01	0.01	1	0.01	0.01	0.5	1	5	5	0.5	0.5	0.5	1	
PFAS NEMP 2020 Interim Marine 99%																									
PFAS NEMP 2020 Recreational Water						2																			
Lab Report Number	Field ID	Location Code	Date																						
EP1912676	0960_MW115_191129	MW115	29/11/2019	<0.05	0.69	0.49	0.76		391	<1	391	392	471	12,600	9.18	7.57	7,940	1,390	26,900	144	699	1,000	347	<1	
EP2006591	0960_MW115_200625		25/06/2020	<0.05	1.11	0.79	1.23		330	<1	330	408	411	13,100	0.40	7.49	7,020	1,530	23,500	122	607	821	316	1	
EP2012917	0960_MW115_201119		19/11/2020	<0.05	0.52	0.39	0.57		340	<1	340	399	427	12,800	3.37	7.77	7,200	1,490	27,400	67	637	886	345	<1	
EP2107276	0960_MW115_210624		24/06/2021	<0.05	1.39	1.03	1.52		328	<1	328	397	429	12,900	3.88	7.65	7,250	1,260	25,800	146	623	903	310	3	
212372	0960_MW122_180615	MW122	15/06/2018	<0.05		0.002			420					14,000	3.5		9,100		30,000		300	760	310		
EP1912680	0960_MW122_191130		30/11/2019	<0.05	<0.01	<0.01	<0.01		478	<1	478	326	341	9,790	2.35	7.75	6,450	1,920	18,800	1,040	175	520	362	1	
EP2006590	0960_MW122_200625		25/06/2020	<0.05	<0.01	<0.01	<0.01		433	<1	433	408	412	12,600	0.53	7.78	7,680	2,100	24,000	56	253	659	440	2	
EP2012956	0960_MW122_201121		21/11/2020	<0.05	<0.01	<0.01	<0.01		376	<1	376	435	461	13,700	2.91	7.81	8,410	1,980	25,400	398	309	827	469	2	
EP2107276	0960_MW122_210624		24/06/2021	<0.05	<0.01	<0.01	<0.01		394	<1	394	441	499	14,100	6.11	7.79	9,130	1,720	26,900	216	319	893	482	2	
207857	0960_MW124_180307	MW124	7/03/2018	<0.05					160					35,000	-1.4		19,000		65,000		900	2,100	680		
211878	0960_MW124_180609		9/06/2018	<0.05					260					34,000	2.1		20,000		67,000		870	2,100	680		
EP1912744	0960_MW124_191202		2/12/2019	<0.05	<0.01	<0.01	<0.01		164	<1	164	1,010	1,320	32,300	13.2	7.51	23,200	4,720	67,200	1,470	1,040	2,820	1,040	4	
EP2006749	0960_MW124_200629		29/06/2020	<0.05	<0.01	<0.01	<0.01		175	<1	175	973	1,130	30,900	7.44	7.63	19,700	4,690	68,600	229	962	2,420	978	3	
EP2012894	0960_MW124_201119		19/11/2020	<0.05	0.01	0.01	0.01		162	<1	162	966	1,180	30,600	10.2	7.55	20,400	4,810	67,500	401	1,020	2,650	1,150	<1	
EP2107189	0960_MW124_210623		23/06/2021	<0.05	<0.01	<0.01	<0.01		144	<1	144	1,020	1,180	32,900	6.93	7.54	20,700	4,530	71,000	26	962	2,480	998	2	
207857	0960_MW126_180307	MW126	7/03/2018	<0.05					170					26,000	-0.38		14,000		49,000		1,100	1,600	420		
211878	0960_MW126_180608		8/06/2018	<0.05					230					26,000	3.8		15,000		51,000		1,000	1,700	440		
EP1912676	0960_MW126_191129		29/11/2019	<0.05	<0.01	<0.01	<0.01		199	<1	199	701	868	22,900	10.7	7.50	14,700	2,440	51,300	1,140	1,150	1,860	711	3	
EP2006524	0960_MW126_200624		24/06/2020	<0.05	<0.01	<0.01	<0.01		468	<1	468	777	804	25,500	1.70	7.64	13,800	2,330	60,100	2,700	954	1,710	606		
EP2107189	0960_MW126_210623		23/06/2021	<0.05	<0.01	<0.01	<0.01		121	<1	121	624	686	20,800	4.68	7.50	11,300	1,690	47,800	109	1,150	1,490	555	4	
207857	0960_MW127_180307	MW127	7/03/2018	<0.05					150					28,000	0.11		15,000		51,000		1,000	1,600	360		
211878	0960_MW127_180608		8/06/2018	<0.05					1,500					27,000	1		15,000		51,000		1,000	1,600	340		
EP1912676	0960_MW127_191129		29/11/2019	<0.05	<0.01	<0.01	<0.01		160	<1	160	788	866	25,900	4.71	7.42	14,800	2,620	55,100	2,140	1,200	1,800	567	3	
EP2006591	0960_MW127_200625		25/06/2020	<0.05	<0.01	<0.01	<0.01		146	<1	146	764	895	25,000	7.90	7.42	15,700	2,680	51,400	132	1,130	1,730	519	2	
EP2012917	0960_MW127_201119		19/11/2020	<0.05	<0.01	<0.01	<0.01		145	<1	145	830	898	26,900	3.94	7.64	15,500	3,270	57,000	21	1,140	1,840	599	2	
EP2107189	0960_MW127_210623		23/06/2021	<0.05	<0.01	<0.01	<0.01		152	<1	152	772	842	25,500	4.33	7.33	14,600	2,400	56,400	860	1,080	1,690	553	2	
208042	0960_MW134_180310	MW134	10/03/2018	<0.05		<0.001			200					22,000	3.7		14,000		44,000		600	1,400	520		
211878	0960_MW134_180610		10/06/2018	<0.05					250					21,000	1.8		12,000		44,000		550	1,300	450		
EP1912673	0960_MW134_191129		29/11/2019	<0.05	0.13	<0.01	0.13		208	<1	208	658	795	20,700	9.48	7.59	14,000	3,340	42,200	748	669	1,610	804	6	
EP2006688	0960_MW134_200626		26/06/2020	<0.05	<0.01	<0.01	<0.01		202	<1	202	654	689	20,600	2.56	7.65	12,200	3,330	43,100	811	598	1,370	609	3	
EP2012957	0960_MW134_201120		20/11/2020	<0.05	0.02	0.02	0.02		179	<1	179	619	668	19,600	3.83	7.66	11,800	2,990	35,800	2,640	563	1,360	574	2	
EP2107273	0960_MW134_210624		24/06/2021	<0.05	<0.01	<0.01	<0.01		174	<1	174	711	831	22,800	7.79	7.73	14,700	3,090	47,400	1,140	697	1,640	860	4	
208042	0960_MW135_2.5-3.0_180308	MW135	8/03/2018	<0.05		<0.001			250					11,000	-0.82		6,100		22,000		400	680	230		
208042	0960_MW135_4.5-5.0_180308		8/03/2018	<0.05		<0.001			220					14,000	0.99		7,800		28,000		500	870	270		
208042	0960_MW135_6.5-7.0_180308		8/03/2018	<0.05		<0.001			210					15,000	2.6		8,700		30,000		500	960	310		
208042	0960_MW135_9.0-9.5_180308		8/03/2018	<0.05		<0.001			210					14,000	2.4		8,300</								

Table 1 - Summary of Groundwater, Surface Water and Seepage Water Analytical Results

				N-Ethyl perfluorooctane sulfonamidoethanol (EFOSF)	Sum of PFAS (WA DER List)	Sum of PFHxS and PFOS	Sum of PFAS	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3	Anions Total	Cations Total	Inorganics	Chloride	Ionic Balance	pH (Lab)	Sodium (filtered)	Sulphate as SO4 - Turbidimetric (filtered)	TDS	Total Suspended Solids	Calcium (filtered)	Magnesium (filtered)	Potassium (filtered)	Organic	
				µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	mg/L	%	pH Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
LOR - Limit of Reporting				0.05	0.01	0.001	0.01	1	1	1	1	0.01	0.01	1	0.01	0.01	0.01	0.5	1	5	5	0.5	0.5	0.5	1	
PFAS NEMP 2020 Interim Marine 99%																										
PFAS NEMP 2020 Recreational Water						2																				
Lab Report Number	Field ID	Location Code	Date																							
208042	0960_MW141_5.0-5.5_180308	MW141	8/03/2018	<0.05		<0.001			280						13,000	1.5			7,500		26,000		460	840	250	
208042	0960_MW141_7.0-7.5_180308		8/03/2018	<0.05		<0.001			240						13,000	0.67			7,600		27,000		400	900	290	
212372	0960_MW141_2.0_180616		16/06/2018	<0.05			0.002		260						11,000	5.0			7,200		23,000		390	750	220	
212372	0960_MW141_3.5_180616		16/06/2018	<0.05			0.008		360						12,000	-0.98			6,600		24,000		420	730	200	
212372	0960_MW141_5.5_180616		16/06/2018	<0.05			0.007		340						14,000	0.26			7,900		27,000		480	780	230	
212372	0960_MW141_7.5_180616		16/06/2018	<0.05			0.003		200						17,000	-0.82			9,400		34,000		450	1,000	320	
EP1912678	0960_MW141_3.0-3.5_191129		29/11/2019	<0.05		<0.01	<0.01	<0.01	288	<1	288	388	448	448	12,300	7.11	7.79	7.79	7,570	1,700	25,600	3,120	446	1,040	406	
EP2006523	0960_MW141_200624		24/06/2020	<0.05		<0.01	<0.01	<0.01	295	<1	295	383	404	404	12,100	2.73	7.55	7.55	6,830	1,700	26,900	5,110	417	919	414	19
EP2012957	0960_MW141_3.5_201120		20/11/2020	<0.05		<0.01	<0.01	<0.01	306	<1	306	398	409	409	12,600	1.36	7.68	7.68	6,900	1,760	22,100	16,000	413	950	401	
EP2107277	0960_MW141_7.0-7.5_210624		24/06/2021	<0.05		<0.01	<0.01	<0.01	191	<1	191	472	544	544	15,200	7.10	7.93	7.93	9,420	1,870	33,400	622	522	1,150	513	7
208042	0960_MW143_3.0-3.5_180310	MW143	10/03/2018	<0.05		<0.001			160						34,000	3.7			21,000		70,000		1,000	2,300	740	
208042	0960_MW143_5.0-5.5_180310		10/03/2018	<0.05		<0.001			170						33,000	2.7			20,000		70,000		1,100	2,200	660	
208042	0960_MW143_7.0-7.5_180310		10/03/2018	<0.05		<0.001			170						34,000	4.7			21,000		71,000		1,200	2,200	690	
208042	0960_MW143_9.0-9.5_180310		10/03/2018	<0.1		<0.001			150						35,000	3			21,000		73,000		1,000	2,300	730	
212372	0960_MW143_3.5_180616		16/06/2018	<0.05		<0.001			160						35,000	0.33			20,000		66,000		860	2,100	690	
212372	0960_MW143_5.5_180616		16/06/2018	<0.05		<0.001			210						36,000	8.4			24,000		70,000		1,100	2,500	820	
212372	0960_MW143_7.5_180616		16/06/2018	<0.05			0.008		250						36,000	-6.0			18,000		70,000		1,000	2,000	610	
212372	0960_MW143_9.5_180616		16/06/2018	<0.05			<0.001		160						37,000	5.4			23,000		71,000		1,000	2,400	790	
EP1912673	0960_MW143_3.0-3.5_191129		29/11/2019	<0.05		0.05	<0.01	0.05	151	<1	151	997	1,140	1,140	31,600	6.65	7.53	7.53	19,500	4,910	64,800	15,200	1,130	2,500	1,110	
EP2006590	0960_MW143_200625		25/06/2020	<0.05		<0.01	<0.01	<0.01	215	<1	215	958	1,140	1,140	30,200	8.64	7.53	7.53	20,000	4,910	67,400	1,500	1,040	2,370	892	39
EP2012943	0960_MW143_201120	20/11/2020	<0.05		0.06	<0.01	0.06	134	<1	134	1,090	1,310	1,310	34,200	9.16	7.51	7.51	22,700	5,760	68,200	2,230	1,250	2,790	1,060		
EP2107273	0960_MW143_210624	24/06/2021	<0.05		<0.01	<0.01	<0.01	174	<1	174	1,020	1,180	1,180	32,500	7.31	7.56	7.56	20,600	4,830	72,100	2,280	1,080	2,510	992		
208042	0960_MW144_3.0-3.5_180308	MW144	8/03/2018	<0.05		<0.001			170						13,000	3.2			8,100		30,000		730	940	330	
208042	0960_MW144_5.0-5.5_180308		8/03/2018	<0.05		<0.001			220						15,000	1.3			9,000		32,000		850	940	330	
208042	0960_MW144_7.0-7.5_180308		8/03/2018	<0.05		<0.001			180						20,000	1.4			11,000		40,000		800	1,300	410	
208042	0960_MW144_9.0-9.5_180308		8/03/2018	<0.05		<0.001			200						21,000	-5			11,000		43,000		440	1,200	380	
212372	0960_MW144_3.5_180616		16/06/2018	<0.05			0.001		180						12,000	12			8,700		27,000		740	960	340	
212372	0960_MW144_5.5_180616		16/06/2018	<0.05			<0.001		200						14,000	11			10,000		31,000		970	1,100	370	
212372	0960_MW144_7.5_180616		16/06/2018	<0.05			<0.001		230						21,000	10			15,000		42,000		820	1,600	510	
212372	0960_MW144_9.5_180616		16/06/2018	<0.05			<0.001		210						26,000	10			18,000		52,000		820	1,900	610	
EP1912673	0960_MW144_3.0-3.5_191129		29/11/2019	<0.05		<0.01	<0.01	<0.01	182	<1	182	416	464	464	12,300	5.38	7.65	7.65	7,570	3,160	23,700	32,900	768	1,020	478	
EP2006590	0960_MW144_200625		25/06/2020	<0.05		<0.01	<0.01	<0.01	188	<1	188	427	424	424	12,700	0.38	7.62	7.62	6,990	3,130	25,500	11,900	731	871	458	28
EP2012943	0960_MW144_201120	20/11/2020	<0.05		<0.01	<0.01	<0.01	181	<1	181	452	422	422	13,300	3.35	7.54	7.54	6,860	3,500	25,000	6,040	739	916	459		
EP2107273	0960_MW144_210624	24/06/2021	<0.05		<0.01	<0.01	<0.01	184	<1	184	430	440	440	13,000	1.17	7.65	7.65	7,090	2,850	26,600	13,700	813	959	470		
208042	0960_MW145_3.0-3.5_180312	MW145	12/03/2018	<0.05		<0.001			140						38,000	3.9			23,000		75,000		990	2,400	810	
208042	0960_MW145_5.0-5.5_180312		12/03/2018	<0.05		<0.001			140						41,000	-0.75			23,000		83,000		1,200	2,500	820	
208042	0960_MW145_7.0-7.5_180312		12/03/2018	<0.05		<0.001			150						41,000	1.3			24,000		83,000		1,200	2,500	840	
208042	0960_MW145_9.0																									

Table 1 - Summary of Groundwater, Surface Water and Seepage Water Analytical Results

				N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	Sum of PFAS (WA DER List)	Sum of PFAS and PFOS	Sum of PFAS	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3	Anions Total	Cations Total	Inorganics	Chloride	Ionic Balance	pH (Lab)	Sodium (filtered)	Sulphate as SO4 - Turbidimetric (filtered)	TDS	Total Suspended Solids	Calcium (filtered)	Magnesium (filtered)	Potassium (filtered)	Organic
				µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	mg/L	%	pH Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LOR - Limit of Reporting				0.05	0.01	0.001	0.01	1	1	1	1	0.01	0.01	1	0.01	0.01	0.5	1	5	5	0.5	0.5	0.5	1	
PFAS NEMP 2020 Interim Marine 99%																									
PFAS NEMP 2020 Recreational Water						2																			
Lab Report Number	Field ID	Location Code	Date																						
EP2107189	0960_MW1485_210623	MW151	23/06/2021	<0.05	71.3	46.3	81.1		378	<1	378	475	517	15,400	4.20	7.52	8,990	1,590	31,000	1,790	591	1,050	383	5	
212372	0960_MW151_180618		18/06/2018	<0.50		130		880						2,900	-1.1		2,100		6,200		70	120	83		
EP2002956	MW151_200316		16/03/2020	<0.05	217	142	239																		
EP2006515	0960_MW151_200624		24/06/2020	<0.05	208	158	230		1,060	<1	1,060	72.6	76.4	1,500	2.54	7.88	1,520	437	4,600	346	42	69	97	9	
EP2012894	0960_MW151_201119		19/11/2020	<0.05	104	82.8	114		671	<1	671	158	162	4,650	0.94	7.92	2,940	669	9,380	2,990	151	275	136	4	
EP2107189	0960_MW151_210623	MW159	23/06/2021	<0.05	38.7	27.1	45.1		720	<1	720	171	155	5,060	4.89	7.67	2,840	657	9,770	2,500	141	254	133		
212372	0960_MW159_180615		15/06/2018	<0.05		0.020		380						8,200	7.1		5,400		17,000		390	500	180		
EP1912673	0960_MW159_191129		29/11/2019	<0.05	0.06	<0.01	0.06	390	<1	390	245	235	7,530	2.10	7.67	4,130	1,200	14,800	483	308	425	200	8		
EP2002956	MW159_200316		16/03/2020	<0.05	<0.01	<0.01	<0.01																		
EP2006515	0960_MW159_200624		24/06/2020	<0.05	0.31	0.27	0.31	413	<1	413	266	242	8,350	4.60	7.69	4,250	1,050	16,100	169	320	431	234	3		
EP2012957	0960_MW159_201120	MW162	20/11/2020	<0.05	0.02	0.02	0.02	457	<1	457	314	298	9,920	2.58	7.62	5,200	1,200	17,100	7,490	397	551	265	5		
EP2107193	0960_MW159_210623		23/06/2021	<0.05	<0.01	<0.01	<0.01	447	<1	447	335	355	10,700	2.91	7.54	6,170	1,160	21,800	1,820	453	683	306			
212372	0960_MW162_180615		15/06/2018	<0.05		2.8		520						4,000	3.6		2,600		8,200		200	220	100		
EP1912551	0960_MW162_191126		26/11/2019	<0.05	11.0	6.97	12.0	583	<1	583	128	132	3,810	1.79	7.80	2,280	414	7,710	150	204	242	122	10		
EP2006512	0960_MW162_200624		24/06/2020	<0.05	8.65	5.35	9.59	513	<1	513	140	126	4,340	5.62	7.66	2,140	376	8,190	72	199	235	125	4		
EP2012892	0960_MW162_201119	MW163	19/11/2020	<0.05	5.82	3.85	6.39	511	<1	511	127	133	3,840	1.99	7.77	2,320	428	7,710	627	187	234	122	7		
EP2107193	0960_MW162_210623		23/06/2021	<0.05	3.54	2.17	3.90	487	<1	487	127	131	3,880	1.32	7.80	2,270	398	8,150	149	195	234	123	7		
212372	0960_MW163_180615		15/06/2018	<0.05		12		440						3,500	4.6		2,600		8,300		190	160	76		
EP1912480	0960_MW163_191126		26/11/2019	<0.12	0.44	0.36	0.44	543	<1	543	118	124	3,420	2.28	7.76	2,210	534	6,930	77	172	201	106	10		
EP2006512	0960_MW163_200624		24/06/2020	<0.05	11.9	8.77	13.0	472	<1	472	124	113	3,660	4.70	7.83	2,000	538	7,070	38	161	183	104	10		
EP2012892	0960_MW163_201119	MW164	19/11/2020	<0.05	9.01	6.64	9.83	442	<1	442	121	127	3,550	2.47	7.89	2,250	585	7,350	104	183	213	108	8		
EP2107193	0960_MW163_210623		23/06/2021	<0.05	13.5	9.90	14.7	428	<1	428	119	123	3,520	1.49	7.80	2,220	557	7,000	130	157	194	105	11		
212372	0960_MW164_180615		15/06/2018	<0.05		1.7		620						3,800	4.1		2,800		8,600		180	200	83		
EP1912479	0960_MW164_191126		26/11/2019	<0.12	4.12	2.77	4.54	640	<1	640	134	146	3,670	4.56	7.61	2,650	840	8,300	1,300	191	230	112	3		
EP2006512	0960_MW164_200624		24/06/2020	<0.05	5.80	4.09	6.45	640	<1	640	144	129	4,040	5.39	7.68	2,330	810	7,980	193	176	196	104	5		
EP2012892	0960_MW164_201119	MW165	19/11/2020	<0.05	4.92	3.70	5.22	766	<1	766	75.6	80.4	1,820	3.06	8.25	1,580	432	4,650	174	44	93	72	5		
EP2107193	0960_MW164_210623		23/06/2021	<0.05	2.90	2.27	3.06	978	<1	978	67.4	66.6	1,480	0.62	8.28	1,370	293	3,930	123	23	53	57	4		
211878	0960_MW165_180610		10/06/2018	<0.05				950						210	-2		540		1,500		9.3	9	15		
EP1912483	0960_MW165_191126		26/11/2019	<0.05	0.13	<0.01	0.13	838	<1	864	24.1	23.6	219	0.99	8.42	515	33	1,480	770	5	6	20	3		
EP2006512	0960_MW165_200624		24/06/2020	<0.05	0.01	0.01	0.01	833	<1	842	27.0	22.3	327	9.52	8.30	488	47	1,420	115	3	5	21	2		
EP2012917	0960_MW165_201119	MW166	19/11/2020	<0.05	0.02	0.02	0.02	668	<1	791	24.3	22.8	275	3.21	8.80	498	34	1,370	284	3	5	21	3		
EP2107193	0960_MW165_210623		23/06/2021	<0.05	0.08	0.08	0.08	745	<1	745	35.5	33.1	641	3.43	8.26	714	120	2,010	162	7	12	28	<2		
211878	0960_MW166_180610		10/06/2018	<0.05				1,000						350	0.18		740		2,000		15	15	22		
EP1912481	0960_MW166_191126		26/11/2019	<0.05	1.65	0.68	1.69	996	<1	1,010	31.9	32.1	319	0.30	8.33	694	130	2,080	1,070	7	10	28	6		
EP2006512	0960_MW166_200624		24/06/2020	<0.05	1.80	0.79	1.86	1,080	<1	1,080	34.6	30.0	357	7.22	8.23	652	144	2,040	1,760	6	8	26			
EP2012917	0960_MW166_201119	MW167	19/11/2020	<0.05	0.49	0.29	0.49	920	<1	970	31.8	28.1	344	6.19	8.49	612	130	1,900	910	4	7	27	<1		
EP2107193	0960_MW166_210623		23/06/2021	<0.05	1.18	0.69	1.23	911	<1	938	31.5	28.5	376	4.98	8.40	625	105	1,900	623	4	6	26	55		
211878	0960_MW167_180610		10/06/2018	<0.05				870						1,400	2.4		1,400		4,000		26				

Table 1 - Summary of Groundwater, Surface Water and Seepage Water Analytical Results

				N-Ethyl perfluorooctane sulfonamidoethanol (EFOSF)	Sum of PFAS (WA DER List)	Sum of PFAS and PFOS	Sum of PFAS	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3	Anions Total	Cations Total	Inorganics	Chloride	Ionic Balance	pH (Lab)	Sodium (filtered)	Sulphate as SO4 - Turbidimetric (filtered)	TDS	Total Suspended Solids	Calcium (filtered)	Magnesium (filtered)	Potassium (filtered)	Organic
				µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	mg/L	%	pH Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
LOR - Limit of Reporting				0.05	0.01	0.001	0.01	1	1	1	1	0.01	0.01	1	0.01	0.01	0.5	1	5	5	0.5	0.5	0.5	1	
PFAS NEMP 2020 Interim Marine 99%																									
PFAS NEMP 2020 Recreational Water						2																			
Lab Report Number	Field ID	Location Code	Date																						
EP2006524	0960_MW177_200624	MW178	24/06/2020	<0.05	<0.01	<0.01	<0.01			270	<1	270	893	932	28,700	2.16	7.45	16,100	3,740	64,400	7,050	761	2,110	795	16
EP2012946	0960_MW177_201120		20/11/2020	<0.05	<0.01	<0.01	<0.01			204	<1	204	1,050	1,120	34,200	3.30	7.50	19,500	4,010	59,000	4,660	890	2,460	1,140	3
EP2107272	0960_MW177_3.5-4.0_210623		23/06/2021	<0.05	<0.01	<0.01	<0.01			193	<1	193	938	1,100	30,200	8.11	7.53	19,200	3,930	70,600	5,050	872	2,440	925	6
212372	0960_MW178_2.5_180617		17/06/2018	<0.05			0.008			160					38,000	4.5		23,000		74,000		1,100	2,400	780	
212372	0960_MW178_4.5_180617		17/06/2018	<0.05			0.013			170					37,000	3.7		23,000		71,000		1,200	2,300	680	
212372	0960_MW178_7.5_180617		17/06/2018	<0.05			0.005			150					37,000	0.16		21,000		73,000		1,100	2,100	670	
212372	0960_MW178_9.5_180617		17/06/2018	<0.05			0.003			170					38,000	3.5		23,000		74,000		1,000	2,400	780	
EP1912673	0960_MW178_4.0-4.5_191129		29/11/2019	<0.05	0.22	<0.01		0.22		149	<1	149	1,010	1,140	32,000	5.98	7.55	19,600	5,220	67,800	23,700	1,140	2,500	1,100	8
EP2006524	0960_MW178_200624		24/06/2020	<0.05	<0.01	<0.01	<0.01	<0.01		157	<1	157	1,030	1,090	32,500	2.98	7.51	18,700	5,120	74,800	157	1,040	2,440	920	8
EP2012943	0960_MW178_201120		20/11/2020	<0.05	<0.01	<0.01	<0.01	<0.01		128	<1	128	1,050	1,300	33,000	10.6	7.57	22,600	5,730	67,700	42	1,230	2,800	1,060	2
EP2107273	0960_MW178_210624		24/06/2021	<0.05	<0.01	<0.01	<0.01	<0.01		121	<1	121	1,050	1,260	33,400	9.10	7.64	21,900	4,960	73,000	60	1,160	2,680	1,040	4
212372	0960_MW179_1.5_180616	MW179	16/06/2018	<0.05		0.019			170					31,000	6.7		20,000		63,000		890	2,100	630		
212372	0960_MW179_3.7_180616		16/06/2018	<0.05		0.007			200					30,000	3.2		18,000		61,000		630	1,900	620		
212372	0960_MW179_6.4_180616		16/06/2018	<0.05		0.006			210					30,000	5.4		19,000		61,000		650	2,000	650		
212372	0960_MW179_9.0_180616		16/06/2018	<0.05		0.004			280					19,000			19,000		61,000		690	2,000	650		
EP1912678	0960_MW179_3.2-3.7_191129		29/11/2019	<0.05	<0.01	<0.01	<0.01	<0.01	144	<1	144	877	1,010	27,900	6.95	7.83	17,300	4,170	61,600	1,200	826	2,300	965	7	
EP2006523	0960_MW179_200624		24/06/2020	<0.05	<0.01	<0.01	<0.01	<0.01	200	<1	200	918	969	29,600	2.72	7.54	16,800	3,780	65,300	14,100	674	2,240	789	5	
EP2012943	0960_MW179_201120		20/11/2020	<0.05	<0.01	<0.01	<0.01	<0.01	169	<1	169	940	1,070	29,900	6.64	7.59	18,700	4,500	57,600	18,400	745	2,390	1,060		
EP2107273	0960_MW179_210624		24/06/2021	<0.05	<0.01	<0.01	<0.01	<0.01	171	<1	171	891	1,040	28,800	7.59	7.87	18,200	3,600	62,300	186	695	2,290	871	3	
212372	0960_MW180_1.5_180617	MW180	17/06/2018	<0.05		0.002			180					36,000	-1.9		19,000		69,000		760	2,100	640		
212372	0960_MW180_4.0_180617		17/06/2018	<0.05		0.002			220					36,000	-1.8		19,000		71,000		760	2,100	640		
212372	0960_MW180_6.5_180617		17/06/2018	<0.05		0.003			230					36,000	-0.14		21,000		73,000		790	2,100	640		
212372	0960_MW180_9.0_180617		17/06/2018	<0.05		0.001			260					37,000	4.1		23,000		77,000		780	2,400	760		
EP1912678	0960_MW180_6.0-6.5_191129		29/11/2019	<0.05	<0.01	<0.01	<0.01	<0.01	221	<1	221	1,050	1,240	33,500	8.43	7.72	21,600	4,720	73,900	650	1,060	2,660	1,140	28	
EP2006523	0960_MW180_200624		24/06/2020	<0.05	0.12	0.12	0.12	0.12	247	<1	247	1,050	1,120	33,900	2.92	7.66	19,400	4,480	71,500	703	791	2,550	966	4	
EP2013115	0960_MW180_4.0_201121		21/11/2020	<0.05	<0.01	<0.01	<0.01	<0.01	202	<1	202	1,090	1,300	34,600	8.78	7.76	22,700	5,160	67,600	159	886	2,880	1,100	25	
EP2107277	0960_MW180_1.0-1.5_210624		24/06/2021	<0.05	<0.01	<0.01	<0.01	<0.01	139	<1	139	1,010	1,160	32,400	7.19	7.64									

Table 1 - Summary of Groundwater, Surface Water and Seepage Water Analytical Results

				N-Ethyl perfluorooctane sulfonamidoethanol (EFOSF)	Sum of PFAS (WA DER List)	Sum of PFAS and PFOS	Sum of PFAS	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3	Anions Total	Cations Total	Inorganics	Chloride	Ionic Balance	pH (Lab)	Sodium (filtered)	Sulphate as SO4 - Turbidimetric (filtered)	TDS	Total Suspended Solids	Calcium (filtered)	Magnesium (filtered)	Potassium (filtered)	Organic	
				µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	mg/L	%	pH Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
LOR - Limit of Reporting				0.05	0.01	0.001	0.01	1	1	1	1	0.01	0.01	1	0.01	0.01	0.01	0.5	1	5	5	0.5	0.5	0.5	1	
PFAS NEMP 2020 Interim Marine 99%																										
PFAS NEMP 2020 Recreational Water						2																				
Lab Report Number	Field ID	Location Code	Date																							
EP2012946	0960_OTH132_201120	OTH134	20/11/2020	<0.05	<0.01	<0.01	<0.01			142	<1	142	740	726	24,000	0.94	7.70	12,600	2,890	41,200	370	515	1,670	588	2	
EP2107272	0960_OTH132_210623		23/06/2021	<0.05	<0.01	<0.01	<0.01			124	<1	124	631	718	20,400	6.42	7.98	12,500	2,560	43,900	86	506	1,600	674	1	
211878	0960_OTH134_180610_A		10/06/2018	<0.05						160						20,000	0.72		11,000		41,000		430	1,300	380	
211878	0960_OTH134_180610_B		10/06/2018	<0.05						150						20,000	-1.2		11,000		41,000		400	1,300	370	
EP1912685	0960_OTH134_191201		1/12/2019	<0.05	<0.01	<0.01	<0.01	<0.01			124	<1	124	599	784	19,200	13.4	7.99	13,600	2,620	40,800	56	523	1,790	737	2
EP2006595	0960_OTH134_200625		25/06/2020	<0.05	<0.01	<0.01	<0.01	<0.01			126	<1	126	617	647	19,800	2.32	8.14	11,300	2,710	39,100	29	448	1,450	534	1
EP2012946	0960_OTH134_201120		20/11/2020	<0.05	<0.01	<0.01	<0.01	<0.01			202	<1	202	751	733	24,300	1.25	7.62	12,700	2,970	42,200	14,300	539	1,680	594	
EP2107272	0960_OTH134_210623		23/06/2021	<0.05	<0.01	<0.01	<0.01	<0.01			125	<1	125	631	702	20,400	5.35	8.04	12,200	2,550	44,000	31	493	1,580	666	2
EP1912686	0960_SW301_191202	SW001	2/12/2019	<0.05	0.01	0.01	0.01	<1		150	<1	150	808	1,040	26,000	12.6	7.88	18,100	3,440	55,500	98	728	2,320	1,030	6	
EP2005399	0960_SW301_200525		25/05/2020	<0.05	<0.01	<0.01	<0.01	2		52	<1	54	278	282	8,960	0.74	8.37	4,900	1,160	17,500	<5	248	599	285	5	
EP2006550	0960_SW301_200624		24/06/2020	<0.05	<0.01	<0.01	<0.01	<1		258	<1	258	692	745	22,200	3.70	7.94	13,200	2,890	49,400	6	510	1,590	557	3	
EP2012947	0960_SW301_201120		20/11/2020	<0.05	<0.01	<0.01	<0.01	<1		171	<1	171	759	802	24,100	2.78	8.03	13,800	3,630	46,800	76	583	1,850	806	3	
EP2102258	0960_SW301_210304		4/03/2021	<0.05	<0.01	<0.01	<0.01	<1		94	<1	94	401	429	12,700	3.36	8.10	7,380	1,950	26,300	7	404	923	450	8	
EP2107270	0960_SW001_210623		23/06/2021	<0.05	<0.01	<0.01	<0.01	<1		209	<1	209	556	578	17,900	1.91	8.07	10,000	2,260	38,100	129	424	1,320	512	5	
212572	0960_SW114_180619		SW114	19/06/2018	<0.05		0.081			93						7	-7.0		8.4		110		22	2.9	6.0	
212572	0960_SW121_186019		SW121	19/06/2018	<0.05		0.24			43						5	-5.3		3.6		61		13	0.9	1.9	
212572	0960_SW122_180619	SW122	19/06/2018	<0.05		1.4			57						46	-4.1		26		170		19	2.9	2.8		
212572	0960_SW123_180619	SW123	19/06/2018	<0.05		0.48			75						8	-2.3		6.0		100		23	2.1	4.2		
EP2005558	0960_SW189_200528	SW189	28/05/2020	<0.05	0.04	0.04	0.04	<1		67	<1	67	17.2	14.4	519	9.06	7.93	234	60	986	<5	28	28	19	7	
EP2102258	0960_SW189_210304		4/03/2021	<0.05	0.06	0.06	0.06	<1		44	<1	44	1.06	1.19	5	5.88	7.92	7	2	80	31	13	2	3	4	
EP2107274	0960_SW189_210624		24/06/2021	<0.05	0.45	0.45	0.45	<1		135	<1	135	9.34	8.55	211	4.37	8.28	160	33	579	36	8	8	21	5	
EP2102258	0960_SW190_210304		SW190	4/03/2021	<0.05	0.06	0.06	0.06	<1		62	<1	62	2.32	2.43	23	2.14	7.81	29	21	147	18	18	2	4	6
EP2107270	0960_SW190_210623	23/06/2021		<0.05	0.04	0.04	0.04	22		88	<1	110	99.3	103	3,150	1.69	8.71	1,820	395	6,480	<5	70	205	124	6	
EP2005558	0960_SW193_200528	SW193	28/05/2020	<0.05	0.03	0.03	0.03	<1		85	<1	85	360	370	11,600	1.32	7.66	6,390	1,520	23,800	<5	287	836	357	9	
EP2006596	0960_SW193_200625		25/06/2020	<0.05	0.03	0.03	0.03	<1		168	<1	168	724	798	23,100	4.81	7.99	13,800	3,330	47,700	38	603	1,840	616	8	
EP2102258	0960_SW193_210304		4/03/2021	<0.05	0.26	0.26	0.26	<1		63	<1	63	2.38	2.68	25	5.88	7.79	30	20	148	34	20	3	5	10	
EP2107270	0960_SW193_210623		23/06/2021	<0.05	<0.01	<0.01	<0.01	<1		163																



Table 1 - Summary of Groundwater, Surface Water and Seepage Water Analytical Results

				N-Ethyl perfluorooctane sulfonamidoethanol (EtPSE)	PFAS				Inorganics												Metals			Organic
					Sum of PFAS (WA DER List)	Sum of PFHxS and PFOS	Sum of PFAS	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Bicarbonate as CaCO3)	Alkalinity (Hydroxide) as CaCO3	Alkalinity (total) as CaCO3	Anions Total	Cations Total	Chloride	Ionic Balance	pH (Lab)	Sodium (filtered)	Sulphate as SO4 - Turbidimetric (filtered)	TDS	Total Suspended Solids	Calcium (filtered)	Magnesium (filtered)	Potassium (filtered)	
					µg/L	µg/L	µg/L	µg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	mg/L	%	pH Units	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
LOR - Limit of Reporting				0.05	0.01	0.001	0.01	1	1	1	1	0.01	0.01	1	0.01	0.01	0.5	1	5	5	0.5	0.5	0.5	1
PFAS NEMP 2020 Interim Marine 99%																								
PFAS NEMP 2020 Recreational Water						2																		
Lab Report Number	Field ID	Location Code	Date																					
EP2005487	0960_SW265_200527	SW265	27/05/2020	<0.05	0.22	0.22	0.22	<1	74	<1	74	22.4	19.7	684	6.38	7.93	329	78	1,330	41	36	36	25	7
EP2107190	0960_SW625_210623		23/06/2021	<0.05	0.18	0.18	0.18	<1	214	<1	214	27.1	23.0	752	8.21	7.90	383	79	1,650	1,380	38	43	36	
212572	0960_SW288_180620	SW288	20/06/2018	<0.05		0.11			69					17	-5.9		13		120		17	3.9	3.6	
EP2102258	0960_SW288_210304		4/03/2021	<0.05	0.10	0.10	0.10	<1	65	<1	65	2.39	2.78	24	7.45	7.89	30	20	146	50	22	3	5	8
212572	0960_SW291_180620	SW291	20/06/2018	<0.05		0.040			64				4	-10			4.1		80		17	2.0	3.2	
212572	0960_SW293_180620		20/06/2018	<0.05		0.050			82					4	-5.8			4.6		90		21	3.3	3.9
212372	0960_SW298_180614	SW298	14/06/2018	<0.05		0.005			98					49,000	2.9		31,000		93,000		1,000	1,800	530	
EP2107278	0960_SW298_210624		24/06/2021	<0.05	<0.01	<0.01	<0.01	<1	96	<1	96	87.8	93.2	2,700	3.00	8.00	1,570	466	5,740	63	144	185	98	4
212151	0960_SW300_180613	SW300	13/06/2018	<0.05					250					29,000	6.7		18,000		55,000		810	2,100	600	
EP1912748	0960_SW300_191202		2/12/2019	<0.05	<0.01	<0.01	<0.01	10	108	<1	119	1,210	1,640	38,600	15.0	8.36	28,600	5,820	81,500	700	1,290	3,620	1,330	15
EP2005408	0960_SW300_200526		26/05/2020	<0.05	0.01	0.01	0.01	<1	107	<1	107	250	248	8,000	0.34	8.03	4,280	1,060	15,300	117	222	543	245	6
EP2006550	0960_SW300_200624		24/06/2020	<0.05	<0.01	<0.01	<0.01	<1	241	<1	241	726	791	23,200	4.31	8.10	14,000	3,190	51,500	<5	542	1,700	589	6
EP2012947	0960_SW300_201120		20/11/2020	<0.05	<0.01	<0.01	<0.01	33	70	<1	103	1,080	1,260	34,100	7.57	8.55	21,500	5,700	70,900	11	1,100	2,890	1,250	9
EP2102258	0960_SW300_210304		4/03/2021	<0.05	0.02	0.02	0.02	<1	85	<1	85	328	334	10,400	0.96	8.06	5,710	1,580	21,200	5	386	706	337	12
EP2107270	0960_SW300_210623		23/06/2021	<0.05	0.02	0.02	0.02	<1	236	<1	236	581	599	18,600	1.56	8.21	10,400	2,460	38,600	196	430	1,360	519	6
212572	0960_SW301_180620	SW301	20/06/2018	<0.05		0.034			190				19,000	0.35		11,000		37,000		500	1,200	330		
EP2107278	0960_SW301_210624		24/06/2021	<0.05	<0.01	<0.01	<0.01	<1	186	<1	186	724	885	23,100	10.0	7.97	15,400	3,280	51,700	27	686	1,950	807	2
212572	0960_SW302_180620	SW302	20/06/2018	<0.05		0.22			280				24,000	-0.41		14,000		7		470	1,500	450		
EP1912743	0960_SW302_191202		2/12/2019	<0.05	<0.01	<0.01	<0.01	<1	178	<1	178	796	966	25,600	9.67	7.72	16,900	3,360	52,900	296	669	2,120	901	7
EP2005408	0960_SW302_200526		26/05/2020	<0.05	<0.01	<0.01	<0.01	<1	119	<1	119	495	539	15,900	4.25	7.80	9,340	2,120	32,200	<5	414	1,200	519	4
EP2006531	0960_SW302_200624		24/06/2020	<0.05	<0.01	<0.01	<0.01	<1	183	<1	183	678	745	21,700	4.69	7.86	13,200	2,990	49,400	9	508	1,590	561	3
EP2012942	0960_SW302_201120		20/11/2020	<0.05	<0.01	<0.01	<0.01	<1	154	<1	154	720	796	22,900	4.99	7.96	13,800	3,410	46,600	110	567	1,830	644	2
EP2102262	0960_SW302_210304		4/03/2021	<0.05	0.09	0.09	0.09	<1	127	<1	127	424	438	13,600	1.63	7.71	7,580	1,840	26,900	618	347	970	458	
EP2107274	0960_SW302_210624		24/06/2021	<0.05	<0.01	<0.01	<0.01	<1	224	<1	224	596	602	19,300	0.49	7.95	10,400	2,270	36,500	21	450	1,380	533	3
212572	0960_SW303_180620	SW303	20/06/2018	<0.05		0.12			48				140	-2.2		80		380		17	11	6.0		
EP1912743	0960_SW303_191202		2/12/2019	<0.05	<0.01	<0.01	<0.01	<1	208	<1	208	751	914	23,800	9.74	7.84	15,900	3,640	49,300	9	630	2,050	850	5
EP2005408	0960_SW303_200526		26/05/2020	<0.05	<0.01	<0.01	<0.01	<1	112	<1	112	479	514	15,400	3.58	7.63	8,900	2,020	31,200	26	398	1,150	492	4
EP2006531	0960_SW303_200624		24/06/2020	<0.05	<0.01	<0.01	<0.01	<1	133	<1	133	639	713	20,500	5.46	8.04	12,600	2,780	45,500	<5	477	1,540	550	2
EP2012947	0960_SW303_201120		20/11/2020	<0.05	<0.01	<0.01	<0.01	<1	172	<1	172	659	693	21,000	2.51	7.87	12,000	3,030	39,300	6	493	1,600	568	2
EP2102258	0960_SW303_210304		4/03/2021	<0.05	<0.01	<0.01	<0.01	<1	109	<1	109	578	669	18,400	7.29	8.08	11,600	2,740	41,000	7	485	1,500	665	2
EP2107270	0960_SW303_210623		23/06/2021	<0.05	<0.01	<0.01	<0.01	<1	215	<1	215	571	594	18,400	1.97	7.85	10,300	2,290	38,900	164	441	1,340	534	4
212572	0960_SW304_180620	SW304	20/06/2018	<0.05		0.18			52				150	-3.4		81		390		18	10	6.2		
EP2005408	0960_SW304_200526		26/05/2020	<0.05	<0.01	<0.01	<0.01	<1	136	<1	136	585	680	18,800	7.51	7.84	11,800	2,490	40,000	<5	509	1,510	660	4
EP2006551	0960_SW304_200624		24/06/2020	<0.05	<0.01	<0.01	<0.01	<1	226	<1	226	676	735	21,600	4.16	7.82	13,000	3,000	47,000	<5	516	1,570	568	5
EP2012947	0960_SW30																							

Environmental Standards
HEPA, January 2020, PFAS NEMP 2020 Interim Marine 99%
HEPA, January 2020, PFAS NEMP 2020 Recreational Water

Note:
First Time detect of PFOA or PFHxS+PFOS
New exceedance of guideline value

Env Stds Comments
*Practical screening guideline of 0.01 µg/L adopted based on typical

				Perfluoroalkyl Sulfonic Acids						Perfluoroalkyl Carboxylic Acids										Fluorotelomer Sulfonic Acids				
				Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOs)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluorohexanoic acid (PFHxA)	Perfluoropentanoic acid (PFPeA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorononanoic acid (PFNA)	Perfluorotetradecanoic acid (PFTrDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnDA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)
				mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL				0.0001	0.0001	0.0001	0.0002		0.0002	0.0002	0.0001	0.0002	0.0001	0.0001	0.0002	0.0002	0.0001	0.0005	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001
PFAS NEMP 2020 Ecological direct exposure								1						10										
PFAS NEMP 2020 Ecological indirect exposure								0.01																
PFAS NEMP 2020 Industrial/ commercial (HIL D)														50										
Lab Report Number	Field ID	Location Code	Date																					
207115	0960_SD199_0.0_180219	SD199	19/02/2018	<0.0001	<0.0001	<0.0001	<0.0001	0.0011	<0.0002	<0.0002	<0.0001	<0.0002	<0.0001	<0.0001	<0.0005	<0.0005	<0.0001	<0.005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001
EP1912675	0960_SD199_191129		29/11/2019	<0.0002	<0.0002	<0.0002	<0.0002	0.0013	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
EP2005407	0960_SD199_200526		26/05/2020	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
EP2006525	0960_SS199_200624		24/06/2020	<0.0002	<0.0002	<0.0002	<0.0002	0.0009	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
EP2012955	0960_SD199_201120		20/11/2020	<0.0002	<0.0002	<0.0002	<0.0002	0.0005	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
EP2102261	0960_SD199_210304		4/03/2021	<0.0002	<0.0002	<0.0002	<0.0002	0.0007	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
EP2107280	0960_SD199_210624		24/06/2021	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
207115	0960_SD200_0.0_180219	SD200	19/02/2018	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0002	<0.0001	<0.0002	<0.0001	<0.0001	<0.0005	<0.0005	<0.0001	<0.005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001
EP1912675	0960_SD200_191129		29/11/2019	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
EP2005407	0960_SD200_200526		26/05/2020	<0.0002	<0.0002	<0.0002	<0.0002	0.0004	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
EP2006529	0960_SS200_200624		24/06/2020	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
EP2012955	0960_SD200_201120		20/11/2020	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
EP2102259	0960_SD200_210304		4/03/2021	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
EP2107280	0960_SD200_210624		24/06/2021	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
207115	0960_SD205_0.0_180219	SD205	19/02/2018	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0002	<0.0001	<0.0002	<0.0001	<0.0001	<0.0005	<0.0005	<0.0001	<0.005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001
212372	0960_SD205_0.0_180614		1																					

Table 2 - Summary of Soil and Sediment Analytical Results

				Perfluoroalkyl Sulfonic Acids						Perfluoroalkyl Carboxylic Acids										Fluorotelomer Sulfonic Acids				
				Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluorohexanoic acid (PFHxA)	Perfluoropentanoic acid (PFPeA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorononanoic acid (PFNA)	Perfluorotetradecanoic acid (PFTrDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnDA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)
				mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL				0.0001	0.0001	0.0001	0.0002		0.0002	0.0002	0.0001	0.0002	0.0001	0.0001	0.0002	0.0002	0.0001	0.0005	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001
PFAS NEMP 2020 Ecological direct exposure								1						10										
PFAS NEMP 2020 Ecological indirect exposure								0.01																
PFAS NEMP 2020 Industrial/ commercial (HIL D)														50										
Lab Report Number	Field ID	Location Code	Date																					
EP2107194	0960_SD219_210623	SD300	23/06/2021	<0.0002	<0.0002	<0.0002	<0.0002	0.0006	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
EP1912674	0960_SD300_191129		29/11/2019	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	
EP2005407	0960_SD300_200526		26/05/2020	<0.0002	<0.0002	<0.0002	<0.0002	0.0087	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	
EP2012945	0960_SD300_201120		20/11/2020	<0.0002	<0.0002	<0.0002	<0.0002	0.0015	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	
EP2102261	0960_SD300_210304		4/03/2021	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	
EP2107271	0960_SD300_210623	SD301	23/06/2021	<0.0002	<0.0002	<0.0002	<0.0002	0.0013	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	
EP1912674	0960_SD301_191129		29/11/2019	<0.0002	<0.0002	<0.0002	<0.0002	0.0003	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	
EP2005400	0960_SD301_200525		25/05/2020	<0.0002	<0.0002	<0.0002	<0.0002	0.0018	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	
EP2006525	0960_SD301_200624		24/06/2020	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	
EP2012945	0960_SD301_201120		20/11/2020	<0.0002	<0.0002	<0.0002	<0.0002	0.0005	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	
EP2102261	0960_SD301_210304	SD302	4/03/2021	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	
EP2107271	0960_SD301_210623		23/06/2021	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	
212372	0960_SS302_0.0_180614		14/06/2018	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0002	<0.0002	<0.0001	<0.0002	<0.0001	<0.0001	<0.0005	<0.0005	<0.0001	<0.0005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001
EP1912675	0960_SD302_191129		29/11/2019	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	
EP2005407	0960_SS302_200526		26/05/2020	<0.0002	<0.0002	<0.0002	<0.0002	0.0006	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	
EP2006527	0960_SS302_200624	SD303	24/06/2020	<0.0002	<0.0002	<0.0002	<0.0002	0.0003	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<				

				Perfluoroalkyl Sulfonic Acids						Perfluoroalkyl Carboxylic Acids										Fluorotelomer Sulfonic Acids				
				Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOs)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluorohexanoic acid (PFHxA)	Perfluoropentanoic acid (PFPeA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorononanoic acid (PFNA)	Perfluorotetradecanoic acid (PFTrDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnDA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)
				mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL				0.0001	0.0001	0.0001	0.0002	0.0001	0.0002	0.0002	0.0001	0.0002	0.0001	0.0001	0.0002	0.0002	0.0001	0.0005	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001
PFAS NEMP 2020 Ecological direct exposure								1						10										
PFAS NEMP 2020 Ecological indirect exposure								0.01																
PFAS NEMP 2020 Industrial/ commercial (HIL D)														50										
Lab Report Number	Field ID	Location Code	Date																					
EP2006513	0960_SS122_0.00-0.10_200624	SS122	24/06/2020	<0.0002	<0.0002	<0.0002	<0.0002	0.0452	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0003	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
EP2012919	0960_SS122_201119		19/11/2020	<0.0002	<0.0002	0.0029	<0.0002	0.0056	<0.0002	<0.001	0.0002	<0.0002	<0.0002	0.0004	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
EP2102259	0960_SS122_210304		4/03/2021	<0.0002	<0.0002	<0.0002	<0.0002	0.0069	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
EP2107194	0960_SS122_210623		23/06/2021	<0.0002	<0.0002	0.0004	0.0006	0.0082	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	0.0003	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
206628	0960_SS123_0.0_180205	SS123	5/02/2018	<0.0001	<0.0001	0.0005	<0.0001	0.039	0.0044	<0.0002	<0.0001	<0.0002	<0.0001	<0.0001	<0.0005	<0.0005	<0.0001	<0.005	<0.0005	<0.0005	<0.0001	<0.0001	0.0001	<0.0001
212572	0960_SS123_0.0_180619		19/06/2018	<0.0001	<0.0001	0.0004	<0.0001	0.04	0.0047	<0.0002	<0.0001	<0.0002	<0.0001	<0.0001	0.0005	<0.0005	0.0002	<0.005	<0.0005	<0.0005	<0.0001	<0.0001	0.0002	<0.0001
EP1912484	0960_SS123_191126		26/11/2019	<0.0002	<0.0002	0.0008	<0.0002	0.108	0.0014	<0.001	0.0003	<0.0002	<0.0002	<0.0002	0.0004	0.0002	0.0003	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
EP2005481	0960_SS123_200527		27/05/2020	<0.0002	<0.0002	0.0005	<0.0002	0.0344	0.0032	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
EP2006513	0960_SS123_0.00-0.10_200624		24/06/2020	<0.0002	<0.0002	0.0006	<0.0002	0.0840	0.0020	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0002	0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
EP2012893	0960_SS123_0.00-0.10_201119		19/11/2020	<0.0002	<0.0002	0.0003	<0.0002	0.127	0.0032	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	0.0003	<0.0002	0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
EP2102259	0960_SS123_210304		4/03/2021	<0.0002	<0.0002	<0.0002	<0.0002	0.0900	0.0011	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
EP2107194	0960_SS123_210623		23/06/2021	<0.0002	<0.0002	<0.0002	<0.0002	0.0466	0.0008	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
207454	0960_SS124_0.0_180223	SS124	23/02/2018	<0.0001	<0.0001	0.0004	<0.0001	0.0026	<0.0002	<0.0002	<0.0001	<0.0002	0.0001	0.0003	<0.0005	<0.0005	<0.0001	<0.005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001
EP1912674	0960_SS124_191129		29/11/2019	<0.0002	<0.0002	<0.0002	<0.0002	0.0222	0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	0.0003	<0.0002	0.0004	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
EP2005481	0960_SS124_200527		27/05/2020	<0.0002	<0.0002	<0.0002	<0.0002	0.0390	0.0007	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	0.0012	0.0002	0.0007	<0.0005	<0.0002	0.0004	<0.0005	<0.0005	<0.0005	<0.0005
EP2006592	0960_SS124_200625		25/06/2020	<0.0002	<0.0002	<0.0002	<0.0002	0.0426	0.0002	<0.001	<0.0002	<0.0002												

				Perfluoroalkyl Sulfonic Acids						Perfluoroalkyl Carboxylic Acids										Fluorotelomer Sulfonic Acids				
				Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOs)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluorohexanoic acid (PFHxA)	Perfluoropentanoic acid (PFPeA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorononanoic acid (PFNA)	Perfluorotetradecanoic acid (PFTrDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnDA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)
				mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL				0.0001	0.0001	0.0001	0.0002	0.0001	0.0002	0.0002	0.0001	0.0002	0.0001	0.0001	0.0002	0.0002	0.0001	0.0005	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001
PFAS NEMP 2020 Ecological direct exposure								1						10										
PFAS NEMP 2020 Ecological indirect exposure								0.01																
PFAS NEMP 2020 Industrial/ commercial (HIL D)														50										
Lab Report Number	Field ID	Location Code	Date																					
211879	0960_SS265_0.0_180607	SS265	7/06/2018	<0.0001	<0.0001	<0.0001	<0.0001	0.0032	<0.0002	<0.0002	<0.0001	<0.0002	<0.0001	<0.0001	<0.0005	<0.0005	<0.0001	<0.005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001
211879	0960_SS265_0.4_180607		7/06/2018	<0.0001	<0.0001	<0.0001	<0.0001	0.0009	<0.0002	<0.0002	0.0003	<0.0002	0.0001	<0.0001	<0.0005	<0.0005	<0.0001	<0.005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001
EP1912674	0960_SS265_191129		29/11/2019	<0.0002	0.0002	0.0059	0.0003	0.0038	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
EP2005481	0960_SS265_200527		27/05/2020	<0.0002	<0.0002	<0.0002	<0.0002	0.0003	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
EP2012895	0960_SS265_201119		19/11/2020	<0.0002	<0.0002	0.0017	<0.0002	0.0076	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	0.0003	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
EP2102261	0960_SS265_210304		4/03/2021	<0.0002	<0.0002	<0.0002	<0.0002	0.0012	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
EP2107198	0960_SS265_210623		23/06/2021	<0.0002	<0.0002	<0.0002	<0.0002	0.0032	0.0006	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
211879	0960_SS277_0.0_180606	SS277	6/06/2018	<0.0001	<0.0001	<0.0001	<0.0001	0.015	0.0005	<0.0002	<0.0001	<0.0002	<0.0001	<0.0001	<0.0005	<0.0005	<0.0001	<0.005	<0.0005	<0.0005	<0.0001	<0.0001	<0.0001	<0.0001
EP1912674	0960_SS277_191129		29/11/2019	<0.0002	<0.0002	<0.0002	<0.0002	0.0012	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
EP2005481	0960_SS277_200527		27/05/2020	<0.0002	<0.0002	<0.0002	<0.0002	0.0035	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
EP2006592	0960_SS277_200625		25/06/2020	<0.0002	<0.0002	<0.0002	<0.0002	0.0469	0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
EP2006687	0960_SS277_200626		26/06/2020	<0.0002	<0.0002	<0.0002	<0.0002	0.0054	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
EP2012919	0960_SS277_201119		19/11/2020	<0.0002	<0.0002	<0.0002	<0.0002	0.0076	0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
EP2102261	0960_SS277_210304	SS278	4/03/2021	<0.0002	<0.0002	<0.0002	<0.0002	0.0124	0.0004	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005
EP2107198	0960_SS277_210623		23/																					



Table 2 - Summary of Soil and Sediment Analytical Results

		Perfluoroalkyl Sulfonic Acids						Perfluoroalkyl Carboxylic Acids												Fluorotelomer Sulfonic Acids			
		Perfluorobutane sulfonic acid (PFBS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorodecane sulfonic acid (PFDS)	Perfluorobutanoic acid (PFBA)	Perfluorohexanoic acid (PFHxA)	Perfluoropentanoic acid (PFPeA)	Perfluoroheptanoic acid (PFHpA)	Perfluorooctanoic acid (PFOA)	Perfluorodecanoic acid (PFDA)	Perfluorododecanoic acid (PFDoDA)	Perfluorononanoic acid (PFNA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnDA)	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer sulfonic acid (6:2 FTS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	
mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	
EQL	0.0001	0.0001	0.0001	0.0002	0.0001	0.0002	0.0002	0.0001	0.0002	0.0001	0.0001	0.0002	0.0002	0.0001	0.0005	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001		
PFAS NEMP 2020 Ecological direct exposure					1						10												
PFAS NEMP 2020 Ecological indirect exposure					0.01																		
PFAS NEMP 2020 Industrial/ commercial (HIL D)											50												
Lab Report Number	Field ID	Location Code		Date																			
EP2107279	0960_SS301_210624			24/06/2021		<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005

Environmental Standards
HEPA, January 2020, PFAS NEMP 2020 Ecological direct exposure
HEPA, January 2020, PFAS NEMP 2020 Ecological indirect exposure
HEPA, January 2020, PFAS NEMP 2020 Industrial/ commercial (HIL D)

Note:
First Time detect of PFOA or PFHxS+PFOS
New exceedance of guideline value

Table 2 - Summary of Soil and Sediment Analytical Results

				Perfluoroalkyl Sulfonamides								PFAS			Inorganics										Organic
				Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	Sum of PFAS (WA DER List)	Sum of PFHS and PFOS	Sum of PFAS	Exchangeable Sodium Percent	Moisture Content	Exchangeable Calcium	Exchangeable Magnesium	Exchangeable Potassium	Exchangeable Sodium	CEC	Electrical conductivity ^μ S/cm (lab)	pH (Lab)	Organic Matter		
				mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	%	meq/100g	meq/100g	meq/100g	meq/100g	meq/100g	μS/cm	pH Units	%		
EQL				0.0002	0.0005	0.0002	0.0005	0.0005	0.0002	0.0005	0.0002	0.0002	0.0002	0.1	0.1	0.1	0.1	0.1	0.1	1	0.1	0.5			
PFAS NEMP 2020 Ecological direct exposure																									
PFAS NEMP 2020 Ecological indirect exposure																									
PFAS NEMP 2020 Industrial/ commercial (HIL D)												20													
Lab Report Number	Field ID	Location Code	Date																						
207115	0960_SD199_0.0_180219	SD199	19/02/2018	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005															
EP1912675	0960_SD199_191129		29/11/2019	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0013	0.0013	0.0013	0.3	2.5	20.0	2.0	0.3	<0.1	22.3	5,910	8.4	0.7		
EP2005407	0960_SD199_200526		26/05/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	0.3	23.7	16.2	1.4	0.3	<0.1	17.9	58	8.9	0.9		
EP2006525	0960_SS199_200624		24/06/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0009	0.0009	0.0009	2.1	8.2	27.0	3.6	1.2	0.7	32.4	209	8.3	1.7		
EP2012955	0960_SD199_201120		20/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0005	0.0005	0.0005	0.6	3.3	19.7	2.6	0.5	0.1	22.9	12,200	7.8	1.5		
EP2102261	0960_SD199_210304		4/03/2021	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0007	0.0007	0.0007	0.2	20.2	20.2	2.0	0.8	<0.1	23.2	74	8.9	1.2		
EP2107280	0960_SD199_210624		24/06/2021	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002		18.2										
207115	0960_SD200_0.0_180219	SD200	19/02/2018	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005															
EP1912675	0960_SD200_191129		29/11/2019	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	3.8	19.9	11.4	1.0	<0.1	0.5	13.0	109	9.2	0.8		
EP2005407	0960_SD200_200526		26/05/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0004	0.0004	0.0004	0.5	17.8	23.1	1.7	0.5	0.1	25.3	74	8.8	1.0		
EP2006529	0960_SS200_200624		24/06/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	6.2	3.0	16.2	1.7	0.4	1.2	19.6	265	9.3	<0.5		
EP2012955	0960_SD200_201120		20/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	0.2	0.7	12.3	1.1	0.2	<0.1	13.6	302	9.1	<0.5		
EP2102259	0960_SD200_210304		4/03/2021	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	0.4	24.0	23.8	2.6	0.8	0.1	27.3	64	9.1	1.4		
EP2107280	0960_SD200_210624		24/06/2021	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002		25.6										
207115	0960_SD205_0.0_180219	SD205	19/02/2018	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005															
212372	0960_SD205_0.0_180614		14/06/2018	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005					20							8.0			
EP1912675	0960_SD205_191129		29/11/2019	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	1.4	16.7	16.4	4.9	0.6	0.3	22.2	6,490	9.0	0.7		
EP2005481	0960_SD205_200527		27/05/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	0.4	15.5	15.4	4.1	0.1	<0.1	19.8	4,390	8.8	1.4		
EP2006529	0960_SS205_200624		24/06/2020	<0.0002	<0.0005	<0.0002	<0.0005																		

				Perfluoroalkyl Sulfonamides								PFAS			Inorganics										Organic
				Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	Sum of PFAS (WA DER List)	Sum of PFHS and PFOS	Sum of PFAS	Exchangeable Sodium Percent	Moisture Content	Exchangeable Calcium	Exchangeable Magnesium	Exchangeable Potassium	Exchangeable Sodium	CEC	Electrical conductivity ^μ S/cm (lab)	pH Units (Lab)	Organic Matter		
				mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	%	meq/100g	meq/100g	meq/100g	meq/100g	meq/100g	μS/cm	pH Units	%		
EQL				0.0002	0.0005	0.0002	0.0005	0.0005	0.0002	0.0005	0.0002	0.0002	0.0002	0.1	0.1	0.1	0.1	0.1	0.1	1	0.1	0.5			
PFAS NEMP 2020 Ecological direct exposure																									
PFAS NEMP 2020 Ecological indirect exposure																									
PFAS NEMP 2020 Industrial/ commercial (HIL D)												20													
Lab Report Number	Field ID	Location Code	Date																						
EP2107194	0960_SD219_210623		23/06/2021	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0006	0.0006	0.0006	1.0	3.7	19.9	1.8	0.5	0.2	22.4	70	9.2	1.0		
EP1912674	0960_SD300_191129	SD300	29/11/2019	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	1.5	24.3	27.2	10.6	0.9	0.6	39.3	12,700	8.8	1.9		
EP2005407	0960_SD300_200526		26/05/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0087	0.0087	0.0087	3.2	47.2	26.3	12.2	1.0	1.3	40.9	5,500	8.8	4.7		
EP2012945	0960_SD300_201120		20/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0015	0.0015	0.0015	2.8	29.5	22.5	11.8	0.9	1.0	36.2	7,600	8.6	3.2		
EP2102261	0960_SD300_210304		4/03/2021	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	0.7	18.7	10.1	2.4	0.2	<0.1	12.7	1,510	8.9	<0.5		
EP2107271	0960_SD300_210623		23/06/2021	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0013	0.0013	0.0013	4.5	33.5	19.4	9.7	1.6	1.4	32.2	2,620	8.9	2.5		
EP1912674	0960_SD301_191129	SD301	29/11/2019	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0003	0.0003	0.0003	3.2	27.4	21.0	8.0	1.0	1.0	31.0	20,200	8.8	2.3		
EP2005400	0960_SD301_200525		25/05/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0018	0.0018	0.0018	2.0	29.6	15.2	9.3	0.5	0.5	25.5	2,350	9.1	2.2		
EP2006525	0960_SD301_200624		24/06/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	2.0	22.1	20.7	12.1	1.0	0.7	34.4	7,740	8.6	1.0		
EP2012945	0960_SD301_201120		20/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0005	0.0005	0.0005	2.2	29.0	17.6	9.2	1.2	0.6	28.6	5,150	8.8	1.9		
EP2102261	0960_SD301_210304		4/03/2021	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	0.8	19.3	2.9	1.4	<0.1	<0.1	4.4	3,460	9.1	<0.5		
EP2107271	0960_SD301_210623		23/06/2021	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	1.8	22.3	20.0	7.9	0.7	0.5	29.1	9,760	8.7	1.2		
212372	0960_SS302_0.0_180614	SD302	14/06/2018	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005					20	22	5.2	0.9	1.6	30		8.0			
EP1912675	0960_SD302_191129		29/11/2019	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	1.7	19.6	13.0	2.5	0.4	0.3	16.0	6,580	8.8	0.8		
EP2005407	0960_SD302_200526		26/05/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0006	0.0006	0.0006	1.7	27.1	15.1	7.9	0.5	0.4	24.0	4,080	9.1	0.9		
EP2006527	0960_SS302_200624		24/06/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0003	0.0003	0.0003	1.8	21.1	21.4	5.8	0.8	0.5	28.6	4,330	8.8	<0.5		
EP2012944	0960_SD302_201120		20/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	1.9	24.8	17.6	7.7	0.6	0.5	26.4	10,700	8.7	2.6		
EP2102261	0960_SD302_210304		4/03/2021	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<																

EQL				0.0002	0.0005	0.0002	0.0005	0.0005	0.0002	0.0005	0.0002	0.0002	0.0002	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1	0.1	0.5
PFAS NEMP 2020 Ecological direct exposure																							
PFAS NEMP 2020 Ecological indirect exposure																							
PFAS NEMP 2020 Industrial/ commercial (HIL D)												20											
Lab Report Number	Field ID	Location Code	Date																				
EP2006513	0960_SS122_0.00-0.10_200624	SS123	24/06/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0452	0.0452	0.0455	0.2	1.2	21.7	2.4	0.5	<0.1	24.7	479	8.4	<0.5
EP2012919	0960_SS122_201119		19/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0091	0.0085	0.0091	0.7	24.2	21.3	2.4	0.6	0.2	24.5	1,460	8.9	<0.5
EP2102259	0960_SS122_210304		4/03/2021	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0069	0.0069	0.0069	2.1	16.4	22.4	2.7	1.0	0.6	26.6	132	8.9	1.5
EP2107194	0960_SS122_210623		23/06/2021	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0089	0.0086	0.0095	4.3	13.0	23.3	3.2	1.0	1.2	28.7	391	10.0	1.4
206628	0960_SS123_0.0_180205		5/02/2018	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005													
212572	0960_SS123_0.0_180619		19/06/2018	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005					17							9.2	
EP1912484	0960_SS123_191126		26/11/2019	0.0003	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.109	0.109	0.112	0.4	0.8	23.0	1.0	0.3	<0.1	24.5	96	8.6	0.9
EP2005481	0960_SS123_200527		27/05/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0349	0.0349	0.0381	<0.1	20.2	18.7	1.2	0.6	<0.1	20.6	4,800	8.6	2.6
EP2006513	0960_SS123_0.00-0.10_200624		24/06/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0846	0.0846	0.0868	0.6	1.4	20.6	1.2	0.5	0.1	22.5	103	8.2	0.6
EP2012893	0960_SS123_0.00-0.10_201119		19/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.127	0.127	0.131	1.4	0.4	10.6	0.8	0.3	0.2	12.0	125	8.8	<0.5
EP2102259	0960_SS123_210304	4/03/2021	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0900	0.0900	0.0911	1.5	13.4	23.2	2.5	0.6	0.4	26.7	96	8.9	1.0	
EP2107194	0960_SS123_210623	23/06/2021	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0466	0.0466	0.0474	1.6	9.2	21.7	2.4	0.6	0.4	25.1	98	9.0	1.2	
207454	0960_SS124_0.0_180223	23/02/2018	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005					4.6									
EP1912674	0960_SS124_191129	29/11/2019	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0222	0.0222	0.0231	0.5	1.3	19.9	1.8	0.9	0.1	22.7	115			

				Perfluoroalkyl Sulfonamides								PFAS			Inorganics										Organic
				Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	Sum of PFAS (WA DER List)	Sum of PFHxS and PFOS	Sum of PFAS	Exchangeable Sodium Percent	Moisture Content	Exchangeable Calcium	Exchangeable Magnesium	Exchangeable Potassium	Exchangeable Sodium	CEC	Electrical conductivity (lab)	pH (Lab)	Organic Matter		
				mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	%	meq/100g	meq/100g	meq/100g	meq/100g	meq/100g	µS/cm	pH Units	%		
EQL				0.0002	0.0005	0.0002	0.0005	0.0005	0.0002	0.0005	0.0002	0.0002	0.0002	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1	0.1	0.5		
PFAS NEMP 2020 Ecological direct exposure																									
PFAS NEMP 2020 Ecological indirect exposure																									
PFAS NEMP 2020 Industrial/ commercial (HIL D)												20													
Lab Report Number	Field ID	Location Code	Date																						
207228	0960_SS189_0.0_180220	SS189	20/02/2018	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005				0.6	3.3	26	6.1	1.5	3.2	37		10.1			
EP1912674	0960_SS189_191129		29/11/2019	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0005	0.0005	0.0005	0.6	23.1	29.3	5.8	0.6	0.2	36.0	13,200	8.6	1.2		
EP2005559	0960_SS189_200528		28/05/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0042	0.0042	0.0042	0.6	23.1	17.3	5.2	0.4	0.1	23.0	520	9.2	1.5		
EP2006687	0960_SD189_200626		26/06/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0114	0.0111	0.0114	3.5	11.2	10.0	5.2	1.2	0.6	17.0	5,530	8.8	<0.5		
EP2012955	0960_SS189_201120		20/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0087	0.0081	0.0087	1.3	5.2	24.7	6.9	1.3	0.4	33.4	20,200	8.4	1.2		
EP2102259	0960_SS189_210304		4/03/2021	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0051	0.0051	0.0051	0.8	10.8	19.3	3.7	0.7	0.2	23.9	91	9.0	2.7		
EP2107275	0960_SS189_210624		24/06/2021	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0017	0.0017	0.0019	4.2	21.5	18.8	3.8	0.7	1.0	24.3	158	9.2	1.0		
207228	0960_SS190_0.0_180220	SS190	20/02/2018	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005				2.1	8.0	24.0	11.0	1.8	0.8	37.7	3,610	8.9	2.1		
EP1912674	0960_SS190_191129		29/11/2019	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0085	0.0085	0.0088	2.1	8.0	24.0	11.0	1.8	0.8	37.7	3,610	8.9	2.1		
EP2005559	0960_SS190_200528		28/05/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0355	0.0355	0.0363	3.4	24.5	18.5	7.5	1.6	1.0	28.5	753	9.2	1.8		
EP2006592	0960_SS190_200625		25/06/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0206	0.0206	0.0209	3.1	19.0	20.6	8.6	1.5	1.0	31.6	3,310	9.0	1.2		
EP2012945	0960_SS190_201120		20/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0293	0.0293	0.0303	2.4	7.7	41.8	19.6	2.5	1.6	65.4	66,500	8.8	4.7		
EP2102259	0960_SS190_210304		4/03/2021	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0178	0.0178	0.0190	2.1	22.1	20.8	10.2	1.2	0.7	32.9	144	9.5	1.7		
EP2107271	0960_SS190_210623		23/06/2021	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0019	0.0019	0.0019	2.9	30.4	20.0	9.5	1.8	0.9	32.2	918	9.1	1.6		
207228	0960_SS192_0.0_180220	SS192	20/02/2018	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005												9.6			
EP1912683	0960_SS192_191130		30/11/2019	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	1.1	0.1	7.9	1.0	<0.1	<0.1	9.1	73	9.5	<0.5		
EP2005559	0960_SS192_200528		28/05/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0004	0.0004	0.0004	1.2	12.7	8.8	0.9	<0.1	0.1	9.8	1,950	9.1	1.2		
EP2006592	0960_SS192_200625		25/06/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	1.7	1.3	6.9	1.0	<0.1	0.1	8.0	3,600	9.0	<0.5		
EP2012945	0960_SS192_201120		20/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	2.6	5.1	7.2	1.0	0.1	0.2	8.6	10,900	9.4	1.6		
EP2102259	0960_SS192_210304		4/03/2021	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	6.1	19.2	5.1	0.7	<0.1	0.4	6.2	108	9.6	1.1		
EP2107271	0960_SS192_210623		23/06/2021	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0002	1.7	6.9	3.3	0.3	<0.1	<0.1	3.7	610	9.4	1.2		
207228	0960_SS193_0.0_180220	SS193	20/02/2018	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005												8.4			
EP1912683	0960_SS193_191130		30/11/2019	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0009	0.0009	0.0009	2.7	0.2	7.3	1.1	0.1	0.2	8.8	97	9.7	<0.5		
EP2005559	0960_SS193_200528		28/05/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	&														

				Perfluoroalkyl Sulfonamides								PFAS			Inorganics										Organic
				Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	Sum of PFAS (WA DER List)	Sum of PFHxS and PFOS	Sum of PFAS	Exchangeable Sodium Percent	Moisture Content	Exchangeable Calcium	Exchangeable Magnesium	Exchangeable Potassium	Exchangeable Sodium	CEC	Electrical conductivity (lab)	pH (Lab)	Organic Matter		
				mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	%	meq/100g	meq/100g	meq/100g	meq/100g	meq/100g	μS/cm	pH Units	%		
EQL				0.0002	0.0005	0.0002	0.0005	0.0005	0.0002	0.0005	0.0002	0.0002	0.0002	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1	0.1	0.5		
PFAS NEMP 2020 Ecological direct exposure																									
PFAS NEMP 2020 Ecological indirect exposure																									
PFAS NEMP 2020 Industrial/ commercial (HIL D)												20													
Lab Report Number	Field ID	Location Code	Date																						
211879	0960_SS265_0.0_180607	SS265	7/06/2018	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005					8.0	31	9.6	2.6	4.9	48					
211879	0960_SS265_0.4_180607		7/06/2018	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005					7.1										
EP1912674	0960_SS265_191129		29/11/2019	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0097	0.0097	0.0102	1.6	4.8	28.2	8.9	1.6	0.6	39.4	11,500	8.7	1.4		
EP2005481	0960_SS265_200527		27/05/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0003	0.0003	0.0003	3.8	21.5	21.4	4.9	1.1	1.1	28.4	927	9.5	1.4		
EP2012895	0960_SS265_201119		19/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0096	0.0093	0.0096	0.9	7.6	22.3	3.7	0.6	0.2	26.8	4,980	8.6	<0.5		
EP2102261	0960_SS265_210304		4/03/2021	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0012	0.0012	0.0012	0.4	20.2	19.3	3.3	0.7	<0.1	23.4	108	8.7	<0.5		
EP2107198	0960_SS265_210623		23/06/2021	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0032	0.0032	0.0038	3.2	27.5	17.8	6.8	1.9	0.9	27.3	354	9.3	1.6		
211879	0960_SS277_0.0_180606	SS277	6/06/2018	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005					15	36	6.0	2.3	0.8	45					
EP1912674	0960_SS277_191129		29/11/2019	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0012	0.0012	0.0012	0.5	2.6	21.2	4.1	1.2	0.1	26.7	343	8.7	0.7		
EP2005481	0960_SS277_200527		27/05/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0035	0.0035	0.0035	0.6	16.6	21.9	5.0	1.6	0.2	28.6	66	9.0	1.4		
EP2006592	0960_SS277_200625		25/06/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0469	0.0469	0.0471	1.8	2.4	10.7	1.9	1.1	0.2	13.9	105	8.8	<0.5		
EP2006687	0960_SS277_200626		26/06/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0054	0.0054	0.0054	1.8	5.0	11.6	1.8	0.5	0.2	14.2	96	8.9	<0.5		
EP2012919	0960_SS277_201119		19/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0076	0.0076	0.0078	0.3	24.6	13.8	1.4	0.7	<0.1	16.0	94	8.4	0.5		
EP2102261	0960_SS277_210304		4/03/2021	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0124	0.0124	0.0128	0.5	19.4	12.1	1.6	1.0	<0.1	14.8	93	8.5	1.6		
EP2107198	0960_SS277_210623		23/06/2021	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0014	0.0014	0.0014	3.8	7.5	17.0	4.9	1.4	0.9	24.3	175	9.1	0.6		
211733	0960_SS278_0.0_180605	SS278	5/06/2018	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005					11							9.0			
EP1912674	0960_SS278_191129		29/11/2019	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0069	0.0069	0.0069	0.6	3.7	21.3	2.6	0.8	0.2	24.8	90	8.9	0.8		
EP2005481	0960_SS278_200527		27/05/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0069	0.0069	0.0069	0.3	13.8	16.2	1.8	0.8	<0.1	18.9	56	9.0	1.1		
EP2006592	0960_SS278_200625		25/06/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0494	0.0494	0.0503	0.6	2.9	19.4	1.5	1.2	0.1	22.2	118	8.5	0.9		
EP2012919	0960_SS278_201119		19/11/2020	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0023	0.0023	0.0023	1.7	1.2	8.3	1.4	0.6	0.2	10.5	139	8.6	0.6		
EP2102261	0960_SS278_210304		4/03/2021	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0137	0.0137	0.0142	0.6	25.2	21.0	3.3	1.7	0.1	26.1	182	8.1	1.9		
EP2107198	0960_SS278_210623		23/06/2021	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0039	0.0039	0.0039	<0.1	7.2	16.3	1.1	0.5	<0.1	18.0	81	8.8	1.6		
211879	0960_SS279_0.0_180607	SS279	7/06/2018	<0.001	<0.001	<0.0002	<0.001	<0.001	<0.0002	<0.005					8.7	30	8.1	1.6	2.6	42					
EP1912674	0960_SS279_191129		29/11/2019	<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	0.0088	0.0086	0.0090	0.6	2.7	16.6	1.9	0.5	0.1	19.1	15,700	8.1	1.2		
EP																									

	Perfluoroalkyl Sulfonamides							PFAS			Inorganics									Organic
	Perfluorooctane sulfonamide (FOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	N-methyl perfluorooctane sulfonamidoethanol (MeFOSE)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	Sum of PFAS (WA DER List)	Sum of PFHxS and PFOS	Sum of PFAS	Exchangeable Sodium Percent	Moisture Content	Exchangeable Calcium	Exchangeable Magnesium	Exchangeable Potassium	Exchangeable Sodium	CEC	Electrical conductivity *(lab)	pH (Lab)	Organic Matter
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	%	meq/100g	meq/100g	meq/100g	meq/100g	meq/100g	µS/cm	pH Units	%
EQL	0.0002	0.0005	0.0002	0.0005	0.0005	0.0002	0.0005	0.0002	0.0002	0.0002	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1	0.1	0.5
PFAS NEMP 2020 Ecological direct exposure																				
PFAS NEMP 2020 Ecological indirect exposure																				
PFAS NEMP 2020 Industrial/ commercial (HIL D)									20											
Lab Report Number	Field ID	Location Code		Date																
EP2107279	0960_SS301_210624			24/06/2021		<0.0002	<0.0005	<0.0002	<0.0005	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005	<0.0002	<0.0005
											1.6	27.9	29.6	8.8	0.7	0.6	39.7	2,590	8.6	3.6

Environmental Standards

HEPA, January 2020, PFAS NEMP 2020 Ecological direct exposure
HEPA, January 2020, PFAS NEMP 2020 Ecological indirect exposure
HEPA, January 2020, PFAS NEMP 2020 Industrial/ commercial (HIL D)

Note:

First Time detect of PFOA or PFHxS+PFOS

New exceedance of guideline value

Date	Site ID	Bore Description	Bore Depth (mbTOC)	Screen Interval (mbTOC)	SWL (bTOC)	TOC (mAHD)	RWL (mAHD)
2/12/2019	MW016	Single Level	6.8	3.1-6.1	3.03	4.022	0.992
24/06/2020	MW016	Single Level	6.1	3.1-6.1	3.596	4.022	0.426
19/11/2020	MW016	Single Level	6.1	3.1-6.1	3.873	4.022	0.149
23/06/2021	MW016	Single Level	6.1	3.1-6.1	3.335	4.022	0.687
26/11/2019	MW018	Single Level	8.5	5.5-8.5		6.403	
24/06/2020	MW018	Single Level	8.5	5.5-8.5	5.54	6.403	0.863
19/11/2020	MW018	Single Level	8.5	5.5-8.5	5.7	6.403	0.703
23/06/2021	MW018	Single Level	8.5	5.5-8.5	5.2	6.403	1.203
26/11/2019	MW021	Single Level	8.6	5.6-8.6	5.9	6.745	0.845
24/06/2020	MW021	Single Level	8.6	5.6-8.6	5.865	6.745	0.88
19/11/2020	MW021	Single Level	8.6	5.6-8.6		6.745	
23/06/2021	MW021	Single Level	8.6	5.6-8.6	5.521	6.745	1.224
26/11/2019	MW063	Single Level	7.0	4.0-7.0	5.5	6.3	0.8
24/06/2020	MW063	Single Level	7.0	4.0-7.0	5.38	6.3	0.92
19/11/2020	MW063	Single Level	7.0	4.0-7.0	5.51	6.3	0.79
2/12/2019	MW102	Single Level	8.5	2.5-8.5	4.12	4.6266	0.5066
24/06/2020	MW102	Single Level	8.5	2.5-8.5	4.506	4.6266	0.1206
19/11/2020	MW102	Single Level	8.5	2.5-8.5	4.66	4.6266	-0.0334
23/06/2021	MW102	Single Level	8.5	2.5-8.5	4.163	4.6266	0.4636
30/11/2019	MW103	Single Level	5.8	1.0-5.8	2.37	2.2785	-0.0915
24/06/2020	MW103	Single Level	5.8	1.0-5.8	2.057	2.2785	0.2215
20/11/2020	MW103	Single Level	5.8	1.0-5.8	2.328	2.2785	-0.0495
23/06/2021	MW103	Single Level	5.8	1.0-5.8	1.605	2.2785	0.6735
29/11/2019	MW104	Single Level	6.5	1.0-6.5	2.7	2.7256	0.0256
24/06/2020	MW104	Single Level	6.5	1.0-6.5	2.498	2.7256	0.2276
19/11/2020	MW104	Single Level	6.5	1.0-6.5	2.45	2.7256	0.2756
23/06/2021	MW104	Single Level	6.5	1.0-6.5	2.133	2.7256	0.5926
29/11/2019	MW105	Single Level	8.0	2.0-8.0	3.54	3.7272	0.1872
25/06/2020	MW105	Single Level	8.0	2.0-8.0	3.372	3.7272	0.3552
19/11/2020	MW105	Single Level	8.0	2.0-8.0			
23/06/2021	MW105	Single Level	8.0	2.0-8.0	3.05	3.7272	0.6772
26/11/2019	MW112	Single Level	8.0	3.0-8.0	4.53	5.1191	0.5891
25/06/2020	MW112	Single Level	8.0	3.0-8.0	4.39	5.1191	0.7291
19/11/2020	MW112	Single Level	8.0	3.0-8.0	4.55	5.1191	0.5691
24/06/2021	MW112	Single Level	8.0	3.0-8.0	4.054	5.1191	1.0651
29/11/2019	MW113	Single Level	10.0	4.0-10.0	6.56	7.3165	0.7565
24/06/2020	MW113	Single Level	10.0	4.0-10.0	6.46	7.3165	0.8565
19/11/2020	MW113	Single Level	10.0	4.0-10.0	6.6	7.3165	0.7165
23/06/2021	MW113	Single Level	10.0	4.0-10.0	6.1	7.3165	1.2165
26/11/2019	MW114	Single Level	10.0	4.0-10.0	6.95	7.7467	0.7967
26/11/2019	MW114	Single Level	10.0	4.0-10.0		7.7467	7.7467
24/06/2020	MW114	Single Level	10.0	4.0-10.0	6.835	7.7467	0.9117
19/11/2020	MW114	Single Level	10.0	4.0-10.0	7.04	7.7467	0.7067
23/06/2021	MW114	Single Level	10.0	4.0-10.0	6.53	7.7467	1.2167
29/11/2019	MW115	Single Level	8.0	3.0-8.0	4.38	4.9133	0.5333
25/06/2020	MW115	Single Level	8.0	3.0-8.0	4.312	4.9133	0.6013
19/11/2020	MW115	Single Level	8.0	3.0-8.0	4.475	4.9133	0.4383
24/06/2021	MW115	Single Level	8.0	3.0-8.0	3.997	4.9133	0.9163
30/11/2019	MW122	Single Level	8.56	1.7-7.7	3.81	3.9702	0.1602
25/06/2020	MW122	Single Level	7.7	1.7-7.7	3.93	3.9702	0.0402
21/11/2020	MW122	Single Level	7.7	1.7-7.7	3.87	3.9702	0.1002
24/06/2021	MW122	Single Level	7.7	1.7-7.7	3.35	3.9702	0.6202
2/12/2019	MW124	Single Level	6.0	1.0-6.0	2.99	2.9183	
19/11/2020	MW124	Single Level	6.0	1.0-6.0	2.907	2.9183	0.0113
23/06/2021	MW124	Single Level	6.0	1.0-6.0	2.444	2.9183	0.4743
29/11/2019	MW126	Single Level	8.0	2.0-8.0	5.5	4.5088	-0.9912

Date	Site ID	Bore Description	Bore Depth (mbTOC)	Screen Interval (mbTOC)	SWL (bTOC)	TOC (mAHD)	RWL (mAHD)
24/06/2020	MW126	Single Level	8.0	2.0-8.0	4.245	4.5088	0.2638
19/11/2020	MW126	Single Level	8.0	2.0-8.0		4.5088	
23/06/2021	MW126	Single Level	8.0	2.0-8.0	3.95	4.5088	0.5588
29/11/2019	MW127	Single Level	8.5	2.5-8.5	3.88	5.6238	1.7438
25/06/2020	MW127	Single Level	8.5	2.5-8.5	5.32	5.6238	0.3038
19/11/2020	MW127	Single Level	8.5	2.5-8.5	5.29	5.6238	0.3338
23/06/2021	MW127	Single Level	8.5	2.5-8.5	4.85	5.6238	0.7738
29/11/2019	MW134	Single Level	5.7	1.0-5.7		2.5155	2.5155
26/06/2020	MW134	Single Level	5.7	1.0-5.7	2.164	2.5155	0.3515
20/11/2020	MW134	Single Level	5.7	1.0-5.7	2.4	2.5155	0.1155
24/06/2021	MW134	Single Level	5.7	1.0-5.7	1.76	2.5155	0.7555
29/11/2019	MW135	Multi level	3.0	2.5-3.0	2.47	2.7781	0.3081
25/06/2020	MW135	Multi level	3.0	2.5-3.0	2.25	2.7781	0.5281
21/11/2020	MW135	Multi level	3.0	2.5-3.0	2.535	2.7781	0.2431
24/06/2021	MW135	Multi level	3.0	2.5-3.0	1.945	2.7781	0.8331
29/11/2019	MW137	Multi level	5.0	4.5 - 5.0	1.91	2.2017	0.2917
24/06/2020	MW137	Multi level	3.0	2.5-3.0	1.52	2.1691	0.6491
20/11/2020	MW137	Multi level	3.0	2.5-3.0	1.74	2.1691	0.4291
24/06/2021	MW137	Multi level	3.0	2.5-3.0	1.257	2.1691	0.9121
29/11/2019	MW138	Multi level	5.5	5.0-5.5	3.41	3.3166	-0.0934
24/06/2020	MW138	Multi level	3.5	3.0-3.5	3.3	3.3074	0.0074
20/11/2020	MW138	Multi level	7.5	7.0-7.5	3.38	3.3205	-0.0595
24/06/2021	MW138	Multi level	3.5	3.0-3.5	2.865	3.3074	0.4424
29/11/2019	MW139	Single Level	7.0	2.0-7.0	3.95	4.1386	0.1886
24/06/2020	MW139	Single Level	7.0	2.0-7.0	1.67	4.1386	2.4686
21/11/2020	MW139	Single Level	7.0	2.0-7.0	4.03	4.1386	0.1086
24/06/2021	MW139	Single Level	7.0	2.0-7.0	3.46	4.1386	0.6786
29/11/2019	MW140	Multi level	4.0	3.5-4.0	2	2.5035	0.5035
24/06/2020	MW140	Multi level	4.0	3.5-4.0	1.82	2.5035	0.6835
20/11/2020	MW140	Multi level	4.0	3.5-4.0	1.798	2.5035	0.7055
24/06/2021	MW140	Multi level	6.5	6.0-6.5	1.7	2.5081	0.8081
29/11/2019	MW141	Multi level	3.5	3.0-3.5	2.3	2.8073	0.5073
24/06/2020	MW141	Multi level	7.5	7.0-7.5	2.25	2.8224	0.6013
20/11/2020	MW141	Multi level	3.5	3.0-3.5	1.64	2.8073	1.1673
24/06/2021	MW141	Multi level	7.5	7.0-7.5	2.05	2.8224	0.7724
29/11/2019	MW143	Multi level	3.5	3.0-3.5	2.93	2.8174	-0.1126
25/06/2020	MW143	Multi level	3.5	3.0-3.5	2.82	2.8174	-0.0026
20/11/2020	MW143	Multi level	3.5	3.0-3.5	2.86	2.8174	-0.0426
24/06/2021	MW143	Multi level	3.5	3.0-3.5	1.11	2.8174	1.7074
29/11/2019	MW144	Multi level	3.5	3.0-3.5	2.5	3.0481	0.5481
25/06/2020	MW144	Multi level	3.5	3.0-3.5	2.83	3.0481	0.2181
20/11/2020	MW144	Multi level	3.5	3.0-3.5	3.01	3.0481	0.0381
24/06/2021	MW144	Multi level	3.5	3.0-3.5	2.44	3.0481	0.6081
29/11/2019	MW145	Multi level	5.5	5.0-5.5	3.25	3.1481	-0.1084
24/06/2020	MW145	Multi level	3.5	3.0-3.5	2.8	3.1416	0.3416
20/11/2020	MW145	Multi level	5.5	5.0-5.5	3.18	3.1481	-0.0319
24/06/2021	MW145	Multi level	5.5	5.0-5.5	2.53	3.1481	0.6181
29/11/2019	MW146	Multi level	5.5	5.0-5.5	2.76	2.8009	0.0409
24/06/2020	MW146	Multi level	5.5	5.0-5.5	2.57	2.8009	0.2309
21/11/2020	MW146	Multi level	5.5	5.0-5.5	2.84	2.8009	-0.0391
24/06/2021	MW146	Multi level	5.5	5.0-5.5	2.2	2.8009	0.6009
29/11/2019	MW147	Multi level	3.75	3.0-3.5	2.8	2.9123	0.1123
24/06/2020	MW147	Multi level	3.76	3.0-3.5	2.6	2.9123	0.3123
20/11/2020	MW147	Multi level	5.85	5.0-5.5	2.87	2.9152	0.0452
24/06/2021	MW147	Multi level	5.5	5.0-5.5	2.33	2.9152	0.5852
24/06/2020	MW148D	Single Level	20.0	14.0-20.0	3.361	3.5778	0.2168
2/12/2019	MW148D	Single Level	20.0	14.0-20.0	3.57	3.5778	0.0078
19/11/2020	MW148D	Single Level	20.0	14.0-20.0	3.59	3.5778	-0.0122
23/06/2021	MW148D	Single Level	20.0	14.0-20.0	2.899	3.5778	0.6788
24/06/2020	MW148S	Single Level	8.0	2.0-8.0	3.345	3.6851	0.3401
2/12/2019	MW148S	Single Level	8.0	2.0-8.0	3.57	3.6851	0.1151
19/11/2020	MW148S	Single Level	8.0	2.0-8.0	3.504	3.6851	0.1811
23/06/2021	MW148S	Single Level	8.0	2.0-8.0	2.899	3.6851	0.7861
24/06/2020	MW151	Single Level	8.0	2.0-8.0	3.661	4.0631	0.4021
19/11/2020	MW151	Single Level	8.0	2.0-8.0	3.849	4.0631	0.2141
23/06/2021	MW151	Single Level	8.0	2.0-8.0	3.307	4.0631	0.7561
29/11/2019	MW159	Single Level	9.0	3.0-9.0	4.1	4.1895	0.0895
24/06/2020	MW159	Single Level	9.0	3.0-9.0	3.706	4.1895	0.4835
20/11/2020	MW159	Single Level	9.0	3.0-9.0	3.92	4.1895	0.2695
23/06/2021	MW159	Single Level	9.0	3.0-9.0	3.365	4.1895	0.8245
26/11/2019	MW162	Single Level	20.0	17.0-20.0	6.1	6.3238	0.2238
24/06/2020	MW162	Single Level	20.0	17.0-20.0	6.01	6.3238	0.3138
19/11/2020	MW162	Single Level	20.0	17.0-20.0	6.16	6.856	0.696
23/06/2021	MW162	Single Level	20.0	17.0-20.0	5.64	6.856	1.216
26/11/2019	MW163	Single Level	20.0	17.0-20.0	6.05	6.7808	0.7308
24/06/2020	MW163	Single Level	20.0	17.0-20.0	5.955	6.7808	0.8258
19/11/2020	MW163	Single Level	20.0	17.0-20.0	6.09	6.7808	0.6908
23/06/2021	MW163	Single Level	20.0	17.0-20.0	5.55	6.7808	1.2308
26/11/2019	MW164	Single Level	20.0	17.0-20.0	6.07	6.7893	0.7193
24/06/2020	MW164	Single Level	20.0	17.0-20.0	5.95	6.7893	0.8393
19/11/2020	MW164	Single Level	20.0	17.0-20.0	6.11	6.7893	0.6793
23/06/2021	MW164	Single Level	20.0	17.0-20.0	5.55	6.7893	1.2393
26/11/2019	MW165	Single Level	9.0	3.0-9.0	5.34	6.1043	0.7643
24/06/2020	MW165	Single Level	9.0	3.0-9.0	5.26	6.1043	0.8443
19/11/2020	MW165	Single Level	9.0	3.0-9.0	5.36	6.1043	0.7443
23/06/2021	MW165	Single Level	9.0	3.0-9.0	4.85	3.1043	-1.7457
26/11/2019	MW166	Single Level	8.5	2.5-8.5	5.015	5.7441	0.7291
24/06/2020	MW166	Single Level	8.5	2.5-8.5	4.92	5.7441	0.8241
19/11/2020	MW166	Single Level	8.5	2.5-8.5	5.05	5.7441	0.6941
23/06/2021	MW166	Single Level	8.5	2.5-8.5	4.55	5.7441	1.1941
26/11/2019	MW167	Single Level	8.5	2.5-8.5	5.525	6.2094	0.6844
25/06/2020	MW167	Single Level	8.5	2.5-8.5	5.39	6.2094	0.8194
19/11/2020	MW167	Single Level	8.5	2.5-8.5	5.56	6.2094	0.6494
23/06/2021	MW167	Single Level	8.5	2.5-8.5	5.06	6.2094	1.1494
26/11/2019	MW168	Single Level	8.5	2.5-8.5	5.55	6.1713	0.6213
25/06/2020	MW168	Single Level	8.5	2.5-8.5	5.408	6.1713	0.7633

Date	Site ID	Bore Description	Bore Depth (mbTOC)	Screen Interval (mbTOC)	SWL (bTOC)	TOC (mAHD)	RWL (mAHD)
19/11/2020	MW168	Single Level	8.5	2.5-8.5	5.57	6.1713	0.6013
23/06/2021	MW168	Single Level	8.5	2.5-8.5	5.08	6.1713	1.0913
29/11/2019	MW170	Single Level	8.5	2.5-8.5	5.27	5.639	0.369
24/06/2020	MW170	Single Level	8.5	2.5-8.5	4.398	5.639	1.241
19/11/2020	MW170	Single Level	8.5	2.5-8.5	5.299	5.639	0.34
23/06/2021	MW170	Single Level	8.5	2.5-8.5	4.764	5.639	0.875
29/11/2019	MW172	Single Level	8.5	2.5-8.5	5.19	5.6193	0.4293
24/06/2020	MW172	Single Level	8.5	2.5-8.5	5.051	5.6193	0.5683
19/11/2020	MW172	Single Level	8.5	2.5-8.5	5.198	5.6193	0.4213
23/06/2021	MW172	Single Level	8.5	2.5-8.5	4.714	5.6193	0.9053
29/11/2019	MW175	Multi level	6.0	5.5-6.0	4.52	4.7982	0.2782
25/06/2020	MW175	Multi level	6.0	5.5-6.0	4.82	4.7982	-0.0218
20/11/2020	MW175	Multi level	6.0	5.5-6.0	5.00	4.7982	-0.2018
23/06/2021	MW175	Multi level	7.5	7.0-7.5	4.13	4.7995	0.6695
29/11/2019	MW176	Multi level	4.0	3.5-4.0	1.97	2.1279	0.1579
24/06/2020	MW176	Multi level	2.5	1.5-2.0	1.88	2.1274	0.2474
20/11/2020	MW176	Multi level	2.0	1.5-2.0	1.835	2.1274	0.2924
23/06/2021	MW176	Multi level	4.0	3.5-4.0	1.24	2.1279	0.8879
29/11/2019	MW177	Multi level	2.0	1.5-2.0	2.01	2.2299	0.2199
24/06/2020	MW177	Multi level	2.0	1.5-2.0	1.7	2.2299	0.5299
20/11/2020	MW177	Multi level	2.0	1.5-2.0	1.535	2.2299	0.6949
23/06/2021	MW177	Multi level	4.0	3.5-4.0	0.9	2.2517	1.3517
29/11/2019	MW178	Multi level	4.5	4.0-4.5	2.3	2.1614	-0.1386
24/06/2020	MW178	Multi level	2.5	2.0-2.5	1.95	2.1612	0.2112
20/11/2020	MW178	Multi level	4.5	4.0-4.5	2.06	2.1614	0.1014
24/06/2021	MW178	Multi level	4.5	4.0-4.5	1.75	2.1614	0.4114
29/11/2019	MW179	Multi level	3.7	3.2-3.7	1.71	2.2371	0.5271
24/06/2020	MW179	Multi level	1.5	1.0-1.5	1.43	2.222	0.792
20/11/2020	MW179	Multi level	3.7	3.2-3.7	2.1	2.2371	0.1371
24/06/2021	MW179	Multi level	3.7	3.2-3.7	2.46	2.2371	-0.2229
29/11/2019	MW180	Multi level	6.5	6.0-6.5	1.75	1.9368	0.1868
24/06/2020	MW180	Multi level	4.0	3.5-4.0	1.47	1.9226	0.4526
21/11/2020	MW180	Multi level	4.0	3.5-4.0	1.521	1.9226	0.4016
24/06/2021	MW180	Multi level	1.5	1.0-1.5	1.16	1.9179	0.7579
29/11/2019	MW181	Multi level	4.0	3.5-4.0	2.05	2.2773	0.2273
24/06/2020	MW181	Multi level	4.0	3.5-4.0	1.9	2.2773	0.3773
20/11/2020	MW181	Multi level	2.0	1.5-2.0	1.904	2.2333	0.3293
24/06/2021	MW181	Multi level	6.0	5.5-6.0	1.52	2.2789	0.7589
26/11/2019	MW211	Single Level	6.0	NA	5.57	6.3409	0.5481
24/06/2020	MW211	Single Level	6.0	NA	5.455	6.3409	0.8859
19/11/2020	MW211	Single Level	6.0	NA	5.64	6.3409	0.7009
23/06/2021	MW211	Single Level	6.0	NA	5.08	6.3409	1.2609
23/06/2021	MW233	Single Level	7.0	4.0-7.0	5	6.262	1.262

Notes: Blank cell indicate no records
 TOC - Top of Casing
 bTOC - below Top of casing
 mAHD - meters Australian Height Datum
 RWL - Raw Water Line
 NA - No Bore log available

Table 4 - Groundwater Field Parameters

Date	Location ID	Sample ID	Observations on Bore/Site	Sampling Method	Temp (°C)	DO (mg/L)	EC (us/Cm)	TDS (mg/L)	pH	Eh (mV)	Odour	Sample Colour
2/12/2019	MW016	0960_MW016_191202		Hydrasleeve	30.7	5.92	11597	6779.5	7.36	5.2		
24/06/2020	MW016	0960_MW016_200624		Hydrasleeve	28.2	1.36	11585	7091.5	7.3	-22.5	no	Brown
19/11/2020	MW016	0960_MW016_201119	sample ID MW106 in lab COA	Hydrasleeve	29.6	1.78	12869	7702.5	7.06	9.3	no	Brown,Cloudy
23/06/2021	MW016	0960_MW016_210623	mislabelled MW106 on CoC	HydraSleeve	25.1	1.26	10117	6589	7.33	4.1		Brown
26/11/2019	MW018	0960_MW018_191126	No field parameter recorded	Hydrasleeve								
24/06/2020	MW018	0960_MW018_200624		Hydrasleeve	29.5	2.7	3462		7.47	-52.8	no	Cloudy
19/11/2020	MW018	0960_MW018_201119		Hydrasleeve	30.8	2.99	5026	2938	7.67	20.8	no	Cloudy,Brown
23/06/2021	MW018	0960_MW018_210623		Hydrasleeve	26.5	3.25	3065	1995.5	7.88	136.5		Cloudy,Brown
26/11/2019	MW021	0960_MW021_191126		Hydrasleeve	30.4		4210	2463	7.66	131		
24/06/2020	MW021	0960_MW021_200624		Hydrasleeve	25.8	2.28	5275		7.19	-73	no	Clear
19/11/2020	MW021		Well appears to have been covered by recent placement of earth/rockworks								no	
23/06/2021	MW021	0960_MW021_210623	Bore cover concealed by dirt/rocks.	HydraSleeve	23.1	2.5	6746	4381	7.32	190.1		Clear,Brown
24/06/2020	MW063	0960_MW063A_200624		Hydrasleeve	28.4	3.84	1766		7.84	-115.8	no	Cloudy, Brown
26/11/2019	MW063	0960_MW063A_191126		Hydrasleeve	29.8	5.26	2078		7.94	88.9		
19/11/2020	MW063	0960_MW063_201119		HydraSleeve	28.7	4.11	3237	1963	8.22	63.3	no	Cloudy,Brown
2/12/2019	MW102	0960_MW102_191202		Hydrasleeve	29.8	1.61	95137	56615	6.82	8.5	no	Cloudy, Brown
24/06/2020	MW102	0960_MW102_200624		Hydrasleeve	30	3.17	88788	53105	7.02	49.1	no	Brown
19/11/2020	MW102	0960_MW102_201119		HydraSleeve	28.9	0.7	98424	59540	6.8	56.4	no	Brown,Cloudy
23/06/2021	MW102	0960_MW102_210623		HydraSleeve	25.4	16.2	90727	59060	6.95	72.4		Brown
30/11/2019	MW103	0960_MW103_191130		Hydrasleeve	31.4	1	80068	6345	6.82	-59.7	no	Cloudy, Brown
24/06/2020	MW103	0960_MW103_200624		Hydrasleeve	29.2	0.56	76604	46085	6.85	-142.1	no	Black
20/11/2020	MW103	0960_MW103_201120		HydraSleeve	28.9	0.53	79683	48100	6.66	-93.3	no	Cloudy,Brown
23/06/2021	MW103	0960_MW103_210623		HydraSleeve	26	0.78	77824	50590	6.87	-76.6		Brown
29/11/2019	MW104	0960_MW104_191129		Hydrasleeve	28.3	2.76	26369	7127.5	7.22	-66.2	no	Cloudy
24/06/2020	MW104	0960_MW104_200624		Hydrasleeve	28.4	0.66	86955	53105	7.02	-164.8	no	Cloudy
19/11/2020	MW104	0960_MW104_201119		HydraSleeve	29.1	4.22	89312	53901	6.83	27.2	no	Brown,Cloudy
23/06/2021	MW104	0960_MW104_210623		HydraSleeve	24.1	2.77	42018	27337	7.225	105.4		Clear
25/06/2020	MW105	0960_MW105_200625	Insufficient water to take field readings									
29/11/2019	MW105	0960_MW105_191129		Hydrasleeve	30.5	2.38	21924	4248	6.91	-80.3		
19/11/2020	MW105		Dry								no	
23/06/2021	MW105	0960_MW105_210623		HydraSleeve	22.9	2.31	44390	28853.5	7	1.5		Clear,Brown
26/11/2019	MW112	0960_MW112_191126		Hydrasleeve	30.3	2.86	15268	8989.5	6.98	142.8		
25/06/2020	MW112	0960_MW112_200625		Hydrasleeve	28.7	1.89	15350	9327.5	7.07	61.7	no	Brown
19/11/2020	MW112	0960_MW112_201119		HydraSleeve	29.2	2.39	15058		7.32	46.6	no	
24/06/2021	MW112	0960_MW112_210624		HydraSleeve	23.6	3.36	12943	8414	7.26	50.6		Clear
29/11/2019	MW113	0960_MW113_191129		Hydrasleeve	29.3	4.79	12161	7871	7.26	-37.3	no	Brown
24/06/2020	MW113	0960_MW113_200624		Hydrasleeve	28.9	2.5	10297		6.74	-51.7	no	Clear
19/11/2020	MW113	0960_MW113_201119		HydraSleeve	30.3	4.09	12515	7384	7.33	84.5	no	Cloudy,Brown
23/06/2021	MW113	0960_MW113_210623		HydraSleeve	26.2	2.6	10527	38405	7.06	125.1		Brown
26/11/2019	MW114	0960_MW114_191126		Hydrasleeve								
26/11/2019	MW114	0960_MW114_191126		Hydrasleeve	34.4	5.66	4991	2912	7	131.3		
24/06/2020	MW114	0960_MW114_200624		Hydrasleeve	26.3	1.78	8455		6.91	10.7	no	Clear
19/11/2020	MW114	0960_MW114_201119		HydraSleeve	27.7	2.89	10704	6617	7.26	125.3	no	Clear
23/06/2021	MW114	0960_MW114_210623		HydraSleeve	24	2.61	8998	5850	7.2	142.6		Clear,Brown
29/11/2019	MW115	0960_MW115_191129		Hydrasleeve	28.4	4.37	21318	3858	7.21	-67.4	no	Clear
25/06/2020	MW115	0960_MW115_200625		Hydrasleeve	27.4	3.12	38328	24583	6.87	57.4	no	Clear
19/11/2020	MW115	0960_MW115_201119		HydraSleeve	28.3	1.19	36921		7.03	41.3	no	
24/06/2021	MW115	0960_MW115_210624		HydraSleeve	23.7	2.69	35391	23005	7.09	59.1		Clear
30/11/2019	MW122	0960_MW122_191130		Hydrasleeve	30.3	1.87	34606	20423	7.28	-398.7		
25/06/2020	MW122	0960_MW122_200625		Hydrasleeve	27	0.92	33727	21138	7.37	40.6	no	Clear
21/11/2020	MW122	0960_MW122_201121		HydraSleeve	28	0.66	34302		7.44	69.9	no	
24/06/2021	MW122	0960_MW122_210624		HydraSleeve	25.1	0.89	46016	29906	7.08	55.6		Clear
2/12/2019	MW124	0960_MW124_191202		Hydrasleeve	29.8	0.84	94945	56420	6.97	28.3		Cloudy, Brown
19/11/2020	MW124	0960_MW124_201119		HydraSleeve	29.1	1.07	93370	56225	6.79	75.4	no	Cloudy,Brown
23/06/2021	MW124	0960_MW124_210623		HydraSleeve	24.7	3.51	52600	34173	7.45	13.4		Cloudy
29/11/2019	MW126	0960_MW126_191129		Hydrasleeve		2.18	25135	6328	-7	76.8	no	Brown
24/06/2020	MW126	0960_MW126_200624		Hydrasleeve	29	1.37	73576	44460	7.4	90.2	no	Black
19/11/2020	MW126		Dry								no	
23/06/2021	MW126	0960_MW126_210623		HydraSleeve	25.8	2.8	61001	39662	7.06	103.4		Clear
29/11/2019	MW127	0960_MW127_191129		Hydrasleeve	29.1	2.74	21454	3936	7.05	-71.4		
25/06/2020	MW127	0960_MW127_200625		Hydrasleeve	29.5	2.34	74776	44785	6.97	111.8	no	Brown
19/11/2020	MW127	0960_MW127_201119		HydraSleeve	31.4	1.52	66878		7.22	106.8	no	
23/06/2021	MW127	0960_MW127_210623		HydraSleeve	25.3	2.2	37527	24336	7.2	122.7		Brown
29/11/2019	MW134	0960_MW134_191129	Dipper not working	Hydrasleeve	29.2	0.92	64577	8870	7.02	-88.3	no	Cloudy, Brown
26/06/2020	MW134	0960_MW134_200626		Hydrasleeve	26.5	1.65	57148	36075	7.34	42.5	no	Brown
20/11/2020	MW134	0960_MW134_201120		Hydrasleeve	28.7	0.92	63692	38675	6.95	-81.2	no	Cloudy,Brown
24/06/2021	MW134	0960_MW134_210624		HydraSleeve	22.8	2.97	61680	40105	5.85	8.1		Cloudy,Clear,Brown
29/11/2019	MW135	0960_MW135_2.5-3.0_191129		Peristaltic Pump	29	2.05	31727	9097	7.19	-4.8	no	Cloudy, Brown
25/06/2020	MW135	0960_MW135_200625		Peristaltic Pump	25.6	1.97	33200	21359	7.38	-73.8		Brown, Cloudy
21/11/2020	MW135	0960_MW135_201121		Peristaltic Pump	28.2	1.76	38656	23562.5	7.37	-44.2	no	Cloudy,Brown
24/06/2021	MW135	0960_MW135_210624		Peristaltic Pump	25.7	2.48	33920	22054	6.64	-13.9		Cloudy,Brown

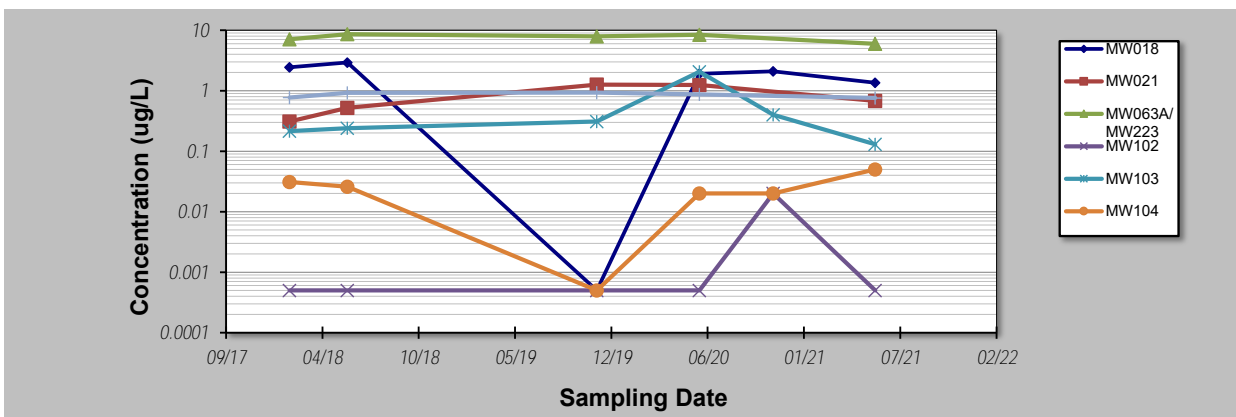
Table 4 - Groundwater Field Parameters

Date	Location ID	Sample_ID	Observations on Bore/Site	Sampling Method	Temp (°C)	DO (mg/L)	EC (us/Cm)	TDS (mg/L)	pH	Eh (mV)	Odour	Sample Colour
29/11/2019	MW137	0960_MW137_4.5-5.0_191129		Peristaltic Pump	28.9	2	44424	26884	7.46	35.7		
24/06/2020	MW137	0960_MW137_200624		Peristaltic Pump	24.2	1.92	78192	51610	7.77	55.2	no	Cloudy
20/11/2020	MW137	0960_MW137_201120		Peristaltic Pump	30.5	0.56	78837		7.51	191.3	no	
24/06/2021	MW137	0960_MW137_2.5-3_210624		Peristaltic Pump	25.6	2.77	73157	50805	7.68	13.1		Clear
29/11/2019	MW138	0960_MW138_5.0-5.5_191129		Peristaltic Pump	29.4	1.95	72287	43225	7.31	-18.6		
24/06/2020	MW138	0960_MW138_200624		Peristaltic Pump	29.4	0.75	78021	46800	7.36	-99.1		Cloudy, Brown
20/11/2020	MW138	0960_MW138_201120		Peristaltic Pump	29.6	1.12	55967		7.71	232.9	no	
24/06/2021	MW138	0960_MW138_210624		Peristaltic Pump	27.4	0.85	41420	26919	7.31	-177.2		Clear
29/11/2019	MW139	0960_MW139_191129		Hydrasleeve	29.4	3.99	41690		7.57	16.3		
24/06/2020	MW139	0960_MW139_200624		Hydrasleeve	25.7	1.24	71923	46215	7.07	66		Clear
21/11/2020	MW139	0960_MW139_201121		HydraSleeve	28.2	0.64	53232	7.34	89.3		no	
24/06/2021	MW139	0960_MW139_210624		HydraSleeve	25.8	0.45	69146	45471	6.99	126		Clear
29/11/2019	MW140	0960_MW140_3.5-4.0_191129		Peristaltic Pump	29	9.5	214		6.7	938		
24/06/2020	MW140	0960_MW140_200624		Peristaltic Pump	25.2	1.97	97682	63310	7.52	-22.2	no	Cloudy, Brown
20/11/2020	MW140	0960_MW140_201120		Peristaltic Pump	28	0.93	104111	64024.99	6.62	-83.6	no	Brown, Cloudy
24/06/2021	MW140	0960_MW140_6-6.5_210624		Peristaltic Pump	23.5	2.67	98966	64350	7.62	123.2		Cloudy
24/06/2020	MW141	0960_MW141_200624		Peristaltic Pump								
29/11/2019	MW141	0960_MW141_3.0-3.5_191129		Peristaltic Pump	30.9	1.78	43833	25571	7.18	-398.5		
20/11/2020	MW141	0960_MW141_3.5_201120		Peristaltic Pump	28.3	0.65	37786	23114.5	6.93	-134.1	no	Cloudy, Brown
24/06/2021	MW141	0960_MW141_7-7.5_210624		Peristaltic Pump	24.8	1.51	19068	12395	7.26	-80.6		Cloudy
29/11/2019	MW143	0960_MW143_3.0-3.5_191129		Peristaltic Pump	31.2	1.69	96237	25575	6.92	-12.4	no	Cloudy, Brown
25/06/2020	MW143	0960_MW143_200625		Peristaltic Pump	26.3	1.81	87884	55705	7.67	52.4		Cloudy, Brown
20/11/2020	MW143	0960_MW143_201120		Peristaltic Pump	31.4	1.69	86887		7.51	128.7	no	
24/06/2021	MW143	0960_MW143_210624		Peristaltic Pump	28.1	4.19	49386	32240	6.76	132.4		Cloudy, Brown
29/11/2019	MW144	0960_MW144_3.0-3.5_191129		Peristaltic Pump	29.2	1.16	38912	23354.5	7.02	-39.5	no	Cloudy, Brown
25/06/2020	MW144	0960_MW144_200625		Peristaltic Pump	25.8	2.07	36675	23432	7.41	8.5		Cloudy, Brown
20/11/2020	MW144	0960_MW144_201120		Peristaltic Pump	31.2	1.65	40485		7.52	76.8	no	
24/06/2021	MW144	0960_MW144_210624		Peristaltic Pump	25.3	3.78	18402	11966.5	6.4	-87.7		Cloudy, Brown
29/11/2019	MW145	0960_MW145_5.0-5.5_191129		Peristaltic Pump	33	1.85	116387	65585	7.05	-329.5		
24/06/2020	MW145	0960_MW145_200624		Peristaltic Pump	25.4	0.61	52412	33800	7.24	-71	no	Cloudy, Brown
20/11/2020	MW145	0960_MW145_201120		Peristaltic Pump	31.1	1.46	97272		7.39	187	no	
24/06/2021	MW145	0960_MW145_210624		Peristaltic Pump	23.6	2.78	54865	65640	7.15	1.1		Cloudy, Brown
29/11/2019	MW146	0960_MW146_5.0-5.5_191129		Peristaltic Pump	29.7	2.32	48507		7.33	7		
24/06/2020	MW146	0960_MW146_200624		Peristaltic Pump	27.8	1.77	100780	62205	7.33	3.5	no	Cloudy, Brown
21/11/2020	MW146	0960_MW146_201121		Peristaltic Pump	27.4	4.75	102759	64545	6.94	73	no	Clear
24/06/2021	MW146	0960_MW146_5-5.5_210624		Peristaltic Pump	25.8	2.5	50435	32799	7.58	28		Clear
29/11/2019	MW147	0960_MW147_3.0-3.5_191129		Peristaltic Pump	28.1	2.22	429		7.29	583		
24/06/2020	MW147	0960_MW147_200624		Peristaltic Pump	25.7	1.55	97183	62400	7.15	-10.6	no	Cloudy, Brown
20/11/2020	MW147	0960_MW147_201120		Peristaltic Pump	29	1.06	109345	65765	7.13	30.7	no	Cloudy, Brown
24/06/2021	MW147	0960_MW147_5-5.5_210624		Peristaltic Pump	25.4	1.8	102851	66950	7.25	156.8		Cloudy
24/06/2020	MW148D	0960_MW148D_200624		Hydrasleeve	28.7	0.44	85665	52065	7.14	-241.6	Sulphur	Black
2/12/2019	MW148D	0960_MW148D_191202		Hydrasleeve	29.6	3.18	80452	48035	7.42	-225.8		
19/11/2020	MW148D	0960_MW148D_201119		HydraSleeve	30.7	0.97	94652	55445	7.27	-129.7	no	Clear
23/06/2021	MW148D	0960_MW148D_210623		HydraSleeve	26.1	2.21	77031	50104	7.6	-4.3		Clear
24/06/2020	MW148S	0960_MW148S_200624		Hydrasleeve	28.9	0.55	50307	30485	6.79	6.79	no	Brown
2/12/2019	MW148S	0960_MW148S_191202		Hydrasleeve	29.6	3.01	24240	14469	6.85	-14.9		
19/11/2020	MW148S	0960_MW148S_201119		HydraSleeve	29.3	0.62	53311	32110	6.63	67.2	no	Brown, Cloudy
23/06/2021	MW148S	0960_MW148S_210623		HydraSleeve	27.8	1.04	43357	28220	6.91	36.8		Brown
24/06/2020	MW151	0960_MW151_200624		Hydrasleeve	28.5	0.98	11990	7312.5	7.19	50.2	no	
19/11/2020	MW151	0960_MW151_201119		HydraSleeve	30.1	2.93	16411	9724	6.84	31.4	no	Cloudy, Brown
23/06/2021	MW151	0960_MW151_210623		HydraSleeve	25.1	1.78	12800	8327	7.17	105	Hydrocarbon	Brown
29/11/2019	MW159	0960_MW159_1911										

GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 16-Sep-21	Job ID: DEF19009
Facility Name: Learmonth	Constituent: Sum of PFHxS + PFOS
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:		MW018	MW021	MW063A/MW223	MW102	MW103	MW104	MW105
Sampling Event	Sampling Date	SUM OF PFHXS + PFOS CONCENTRATION (ug/L)						
1	1-Feb-18	2.44	0.31	7.1	0.0005	0.214	0.031	0.771
2	1-Jun-18	2.93	0.52	8.6	0.0005	0.24	0.026	0.924
3	1-Nov-19	0.0005	1.26	7.9	0.0005	0.31	0.0005	0.93
4	1-Jun-20	1.9	1.24	8.37	0.0005	2.06	0.02	0.87
5	1-Nov-20	2.1			0.02	0.4	0.02	
6	1-Jun-21	1.35	0.68	5.96	0.0005	0.13	0.05	0.76
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
Coefficient of Variation:		0.57	0.54	0.14	2.12	1.33	0.66	0.10
Mann-Kendall Statistic (S):		-5	4	-2	3	3	0	-2
Confidence Factor:		76.5%	75.8%	59.2%	64.0%	64.0%	39.3%	59.2%
Concentration Trend:		Stable	No Trend	Stable	No Trend	No Trend	Stable	Stable



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing ($S > 0$) or decreasing ($S < 0$): $> 95\%$ = Increasing or Decreasing; $\geq 90\%$ = Probably Increasing or Probably Decreasing; $< 90\%$ and $S > 0$ = No Trend; $< 90\%$, $S \leq 0$, and $COV \geq 1$ = No Trend; $< 90\%$ and $COV < 1$ = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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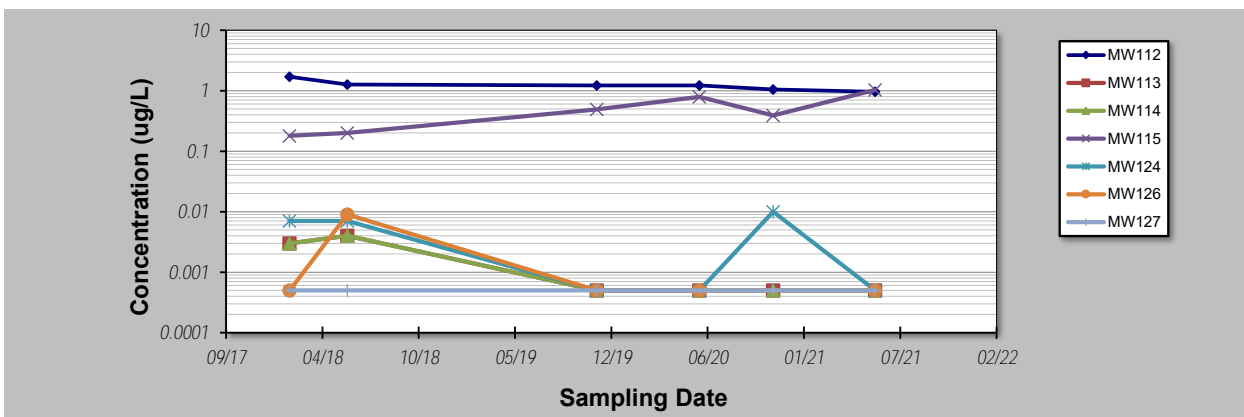
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 16-Sep-21	Job ID: DEF19009
Facility Name: Learmonth	Constituent: Sum of PFHxS + PFOS
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:	MW112	MW113	MW114	MW115	MW124	MW126	MW127
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Sampling Event	Sampling Date	SUM OF PFHXS + PFOS CONCENTRATION (ug/L)						
1	1-Feb-18	1.7	0.003	0.003	0.18	0.007	0.0005	0.0005
2	1-Jun-18	1.26	0.004	0.004	0.201	0.007	0.009	0.0005
3	1-Nov-19	1.22	0.0005	0.0005	0.49	0.0005	0.0005	0.0005
4	1-Jun-20	1.22	0.0005	0.0005	0.79	0.0005	0.0005	0.0005
5	1-Nov-20	1.05	0.0005	0.0005	0.39	0.01		0.0005
6	1-Jun-21	0.96	0.0005	0.0005	1.03	0.0005	0.0005	0.0005
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Coefficient of Variation:		0.21	1.05	1.05	0.66	1.00	1.73	0.00
Mann-Kendall Statistic (S):		-14	-7	-7	11	-3	-2	0
Confidence Factor:		99.6%	86.4%	86.4%	97.2%	64.0%	59.2%	39.3%
Concentration Trend:		Decreasing	No Trend	No Trend	Increasing	No Trend	No Trend	Stable



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing ($S > 0$) or decreasing ($S < 0$): $> 95\%$ = Increasing or Decreasing; $\geq 90\%$ = Probably Increasing or Probably Decreasing; $< 90\%$ and $S > 0$ = No Trend; $< 90\%$, $S \leq 0$, and $COV \geq 1$ = No Trend; $< 90\%$ and $COV < 1$ = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

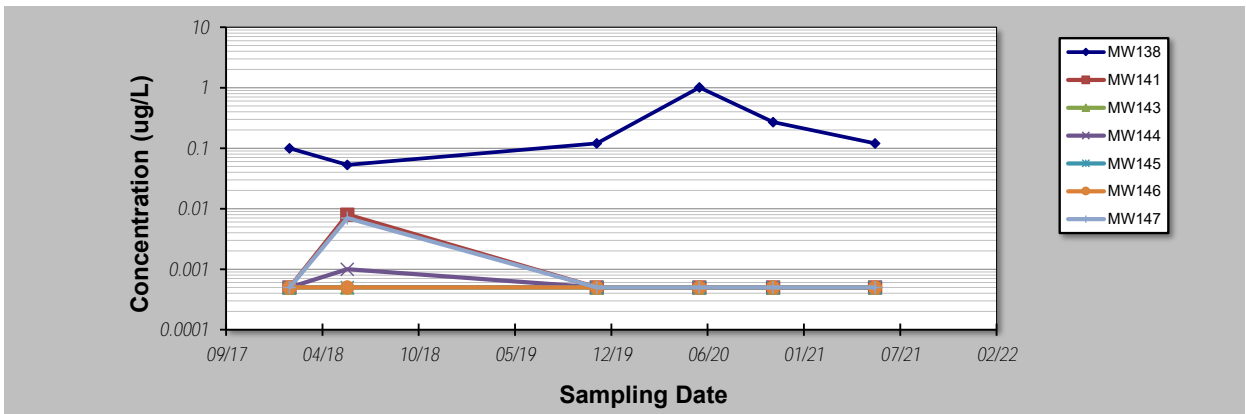
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 16-Sep-21	Job ID: DEF19009
Facility Name: Learmonth	Constituent: PFHxS + PFOS
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:		MW138	MW141	MW143	MW144	MW145	MW146	MW147
Sampling Event	Sampling Date	PFHxS + PFOS CONCENTRATION (ug/L)						
1	1-Feb-18	0.1	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
2	1-Jun-18	0.053	0.008	0.0005	0.0005	0.001	0.0005	0.007
3	1-Nov-19	0.12	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
4	1-Jun-20	1.01	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
5	1-Nov-20	0.27	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
6	1-Jun-21	0.12	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
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Coefficient of Variation:		1.31	1.75	0.00	0.35	0.00	0.00	1.68
Mann-Kendall Statistic (S):		6	-3	0	-3	0	0	-3
Confidence Factor:		81.5%	64.0%	39.3%	64.0%	39.3%	39.3%	64.0%
Concentration Trend:		No Trend	No Trend	Stable	Stable	Stable	Stable	No Trend



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing ($S > 0$) or decreasing ($S < 0$): $> 95\%$ = Increasing or Decreasing; $\geq 90\%$ = Probably Increasing or Probably Decreasing; $< 90\%$ and $S > 0$ = No Trend; $< 90\%$, $S \leq 0$, and $COV \geq 1$ = No Trend; $< 90\%$ and $COV < 1$ = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

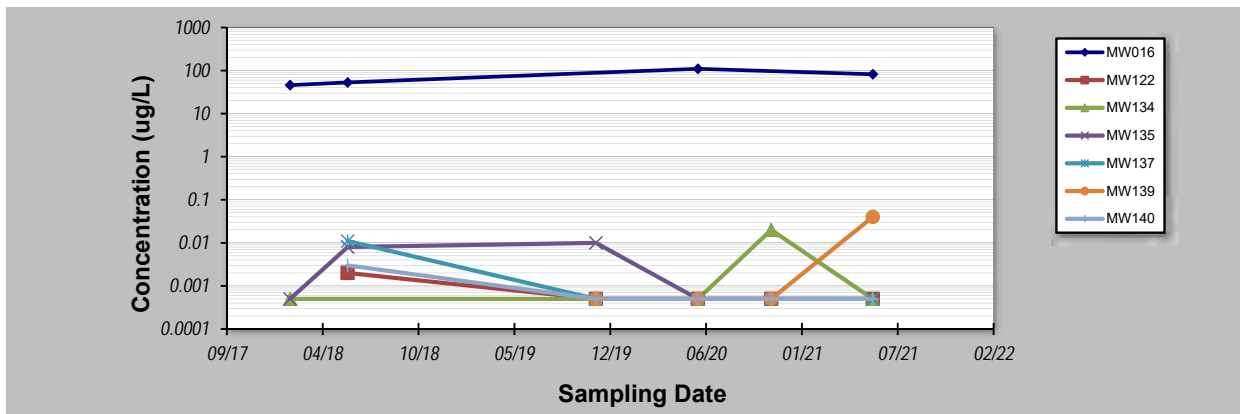
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 14-Dec-21	Job ID: DEF19009
Facility Name: Learmonth	Constituent: PFHxS + PFOS
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:		MW016	MW122	MW134	MW135	MW137	MW139	MW140
Sampling Event	Sampling Date	PFHXS + PFOS CONCENTRATION (ug/L)						
1	1-Feb-18	46		0.0005	0.0005			
2	1-Jun-18	53	0.002		0.008	0.011		0.003
3	1-Nov-19		0.0005	0.0005	0.01	0.0005	0.0005	0.0005
4	1-Jun-20	110	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
5	1-Nov-20		0.0005	0.02	0.0005	0.0005	0.0005	0.0005
6	1-Jun-21	82.2	0.0005	0.0005	0.0005	0.0005	0.04	0.0005
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Coefficient of Variation:		0.40	0.84	1.98	1.33	1.81	1.90	1.12
Mann-Kendall Statistic (S):		4	-4	2	-3	-4	3	-4
Confidence Factor:		83.3%	75.8%	59.2%	64.0%	75.8%	72.9%	75.8%
Concentration Trend:		No Trend	Stable	No Trend	No Trend	No Trend	No Trend	No Trend



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

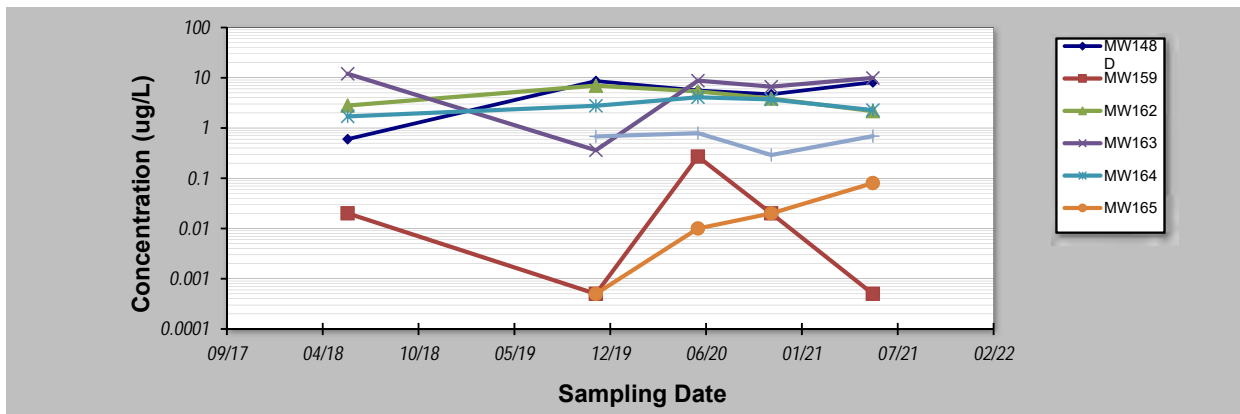
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 14-Dec-21	Job ID: DEF19009
Facility Name: Learmonth	Constituent: PFHxS + PFOS
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:		MW148D	MW159	MW162	MW163	MW164	MW165	MW166
Sampling Event	Sampling Date	PFHXS + PFOS CONCENTRATION (ug/L)						
1	1-Feb-18							
2	1-Jun-18	0.6	0.02	2.8	12	1.7		
3	1-Nov-19	8.6	0.0005	6.97	0.36	2.77	0.0005	0.68
4	1-Jun-20	5.57	0.27	5.35	8.77	4.09	0.01	0.79
5	1-Nov-20	4.69	0.02	3.85	6.64	3.7	0.02	0.29
6	1-Jun-21	8.13	0.0005	2.17	9.9	2.27	0.08	0.69
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Coefficient of Variation:		0.58	1.87	0.46	0.59	0.34	1.30	0.36
Mann-Kendall Statistic (S):		2	-2	-4	0	2	6	0
Confidence Factor:		59.2%	59.2%	75.8%	40.8%	59.2%	95.8%	37.5%
Concentration Trend:		No Trend	No Trend	Stable	Stable	No Trend	Increasing	Stable



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

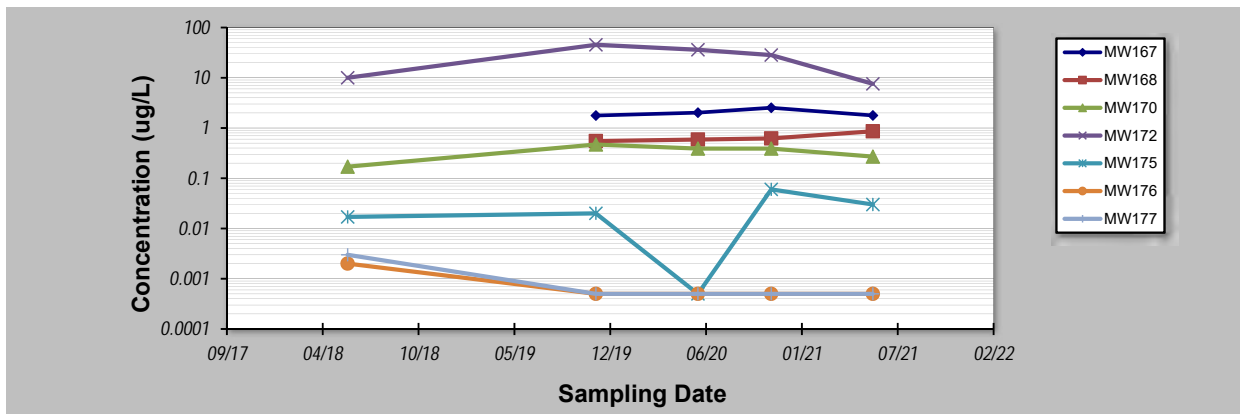
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 14-Dec-21	Job ID: DEF19009
Facility Name: Learmonth	Constituent: PFHxS + PFOS
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:		MW167	MW168	MW170	MW172	MW175	MW176	MW177
Sampling Event	Sampling Date	PFHXS + PFOS CONCENTRATION (ug/L)						
1	1-Feb-18			0.17	10	0.017	0.002	0.003
2	1-Jun-18							
3	1-Nov-19	1.77	0.55	0.47	45.4	0.02	0.0005	0.0005
4	1-Jun-20	2.02	0.59	0.39	36.1	0.0005	0.0005	0.0005
5	1-Nov-20	2.53	0.62	0.39	28.3	0.06	0.0005	0.0005
6	1-Jun-21	1.78	0.86	0.27	7.58	0.03	0.0005	0.0005
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Coefficient of Variation:		0.18	0.21	0.35	0.64	0.86	0.84	1.12
Mann-Kendall Statistic (S):		2	6	-1	-4	4	-4	-4
Confidence Factor:		62.5%	95.8%	50.0%	75.8%	75.8%	75.8%	75.8%
Concentration Trend:		No Trend	Increasing	Stable	Stable	No Trend	Stable	No Trend



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
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- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

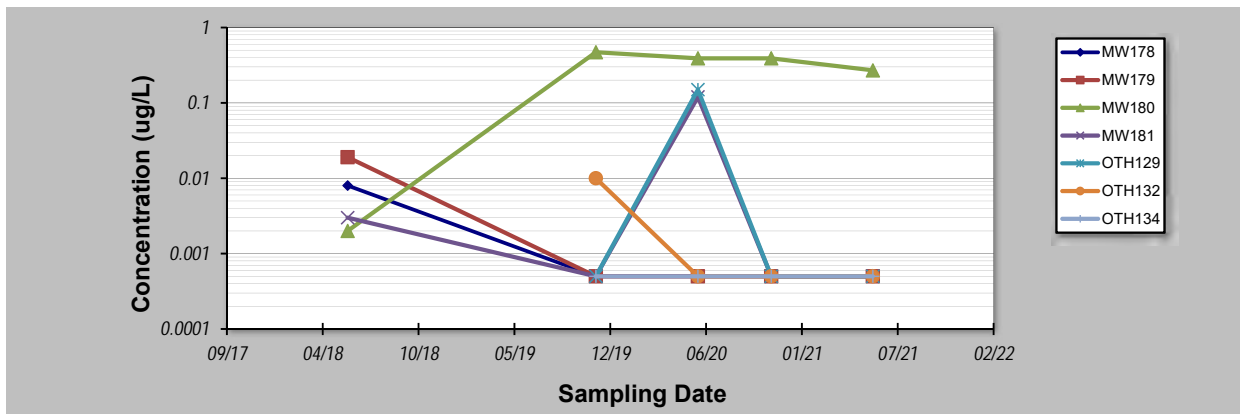
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 14-Dec-21	Job ID: DEF19009
Facility Name: Learmonth	Constituent: PFHxS + PFOS
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:		MW178	MW179	MW180	MW181	OTH129	OTH132	OTH134
Sampling Event	Sampling Date	PFHXS + PFOS CONCENTRATION (ug/L)						
1	1-Feb-18							
2	1-Jun-18	0.008	0.019	0.002	0.003			
3	1-Nov-19	0.0005	0.0005	0.47	0.0005	0.0005	0.01	0.0005
4	1-Jun-20	0.0005	0.0005	0.39	0.12	0.15	0.0005	0.0005
5	1-Nov-20	0.0005	0.0005	0.39	0.0005	0.0005	0.0005	0.0005
6	1-Jun-21	0.0005	0.0005	0.27	0.0005	0.0005	0.0005	0.0005
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Coefficient of Variation:		1.68	1.97	0.60	2.14	1.97	1.65	0.00
Mann-Kendall Statistic (S):		-4	-4	-1	-3	-1	-3	0
Confidence Factor:		75.8%	75.8%	50.0%	67.5%	50.0%	72.9%	37.5%
Concentration Trend:		No Trend	No Trend	Stable	No Trend	No Trend	No Trend	Stable



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
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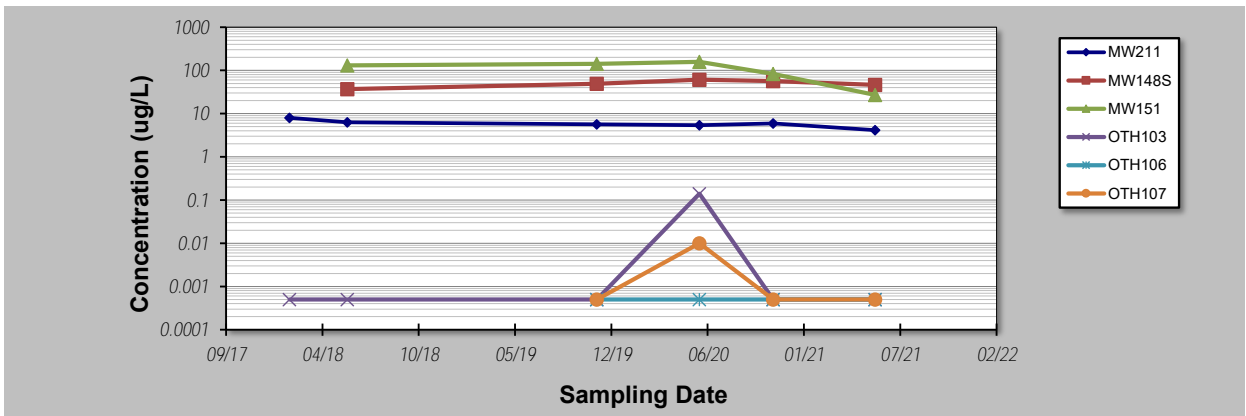
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 5-Oct-21	Job ID: DEF19009
Facility Name: Learmouth	Constituent: PFHxS + PFOS
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:		MW211	MW148S	MW151	OTH103	OTH106	OTH107
Sampling Event	Sampling Date	PFHXS + PFOS CONCENTRATION (ug/L)					
1	1-Feb-18	8			0.0005		
2	1-Jun-18	6.3	37	130	0.0005		
3	1-Nov-19	5.65	49	142	0.0005	0.0005	0.0005
4	1-Jun-20	5.4	61.1	158	0.14	0.0005	0.01
5	1-Nov-20	5.92	57	82.8	0.0005	0.0005	0.0005
6	1-Jun-21	4.15	46.3	27.1	0.0005	0.0005	0.0005
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Coefficient of Variation:		0.21	0.19	0.49	2.40	0.00	1.65
Mann-Kendall Statistic (S):		-11	2	-4	1	0	-1
Confidence Factor:		97.2%	59.2%	75.8%	50.0%	37.5%	50.0%
Concentration Trend:		Decreasing	No Trend	Stable	No Trend	Stable	No Trend



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing ($S > 0$) or decreasing ($S < 0$): $> 95\%$ = Increasing or Decreasing; $\geq 90\%$ = Probably Increasing or Probably Decreasing; $< 90\%$ and $S > 0$ = No Trend; $< 90\%$, $S \leq 0$, and $COV \geq 1$ = No Trend; $< 90\%$ and $COV < 1$ = Stable.
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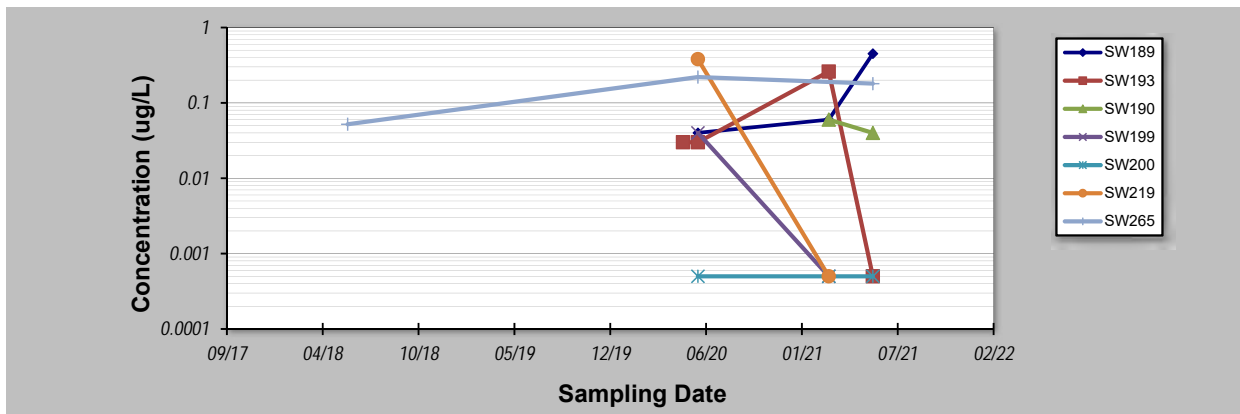
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 14-Dec-21	Job ID: DEF19009
Facility Name: Learmonth	Constituent: PFHxS + PFOS
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:		SW189	SW193	SW190	SW199	SW200	SW219	SW265
Sampling Event	Sampling Date	PFHXS + PFOS CONCENTRATION (ug/L)						
1	1-Jun-18							0.052
2	1-Nov-19							
3	1-May-20		0.03					
4	1-Jun-20	0.04	0.03		0.04	0.0005	0.38	0.22
5	1-Nov-20							
6	1-Mar-21	0.06	0.26	0.06	0.0005	0.0005	0.0005	
7	1-Jun-21	0.45	0.0005	0.04		0.0005		0.18
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Coefficient of Variation:		1.26	1.51	0.28	1.38	0.00	1.41	0.58
Mann-Kendall Statistic (S):		3	-1	-1	-1	0	-1	1
Confidence Factor:		50.0%						
Concentration Trend:			No Trend					



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
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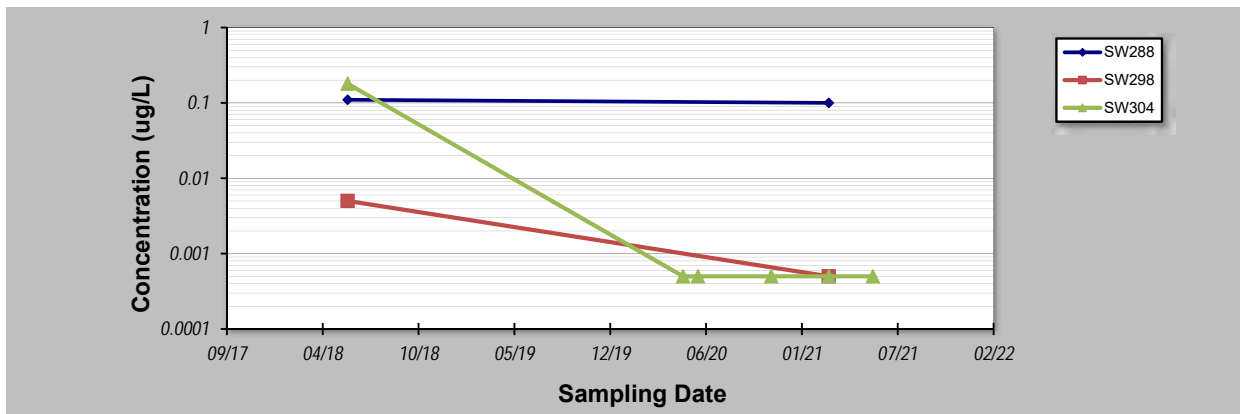
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 14-Dec-21	Job ID: DEF19009
Facility Name: Learmonth	Constituent: PFHxS + PFOS
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:		SW288	SW298	SW304				
Sampling Event	Sampling Date	PFHXS + PFOS CONCENTRATION (ug/L)						
1	1-Jun-18	0.11	0.005	0.18				
2	1-Nov-19							
3	1-May-20			0.0005				
4	1-Jun-20			0.0005				
5	1-Nov-20			0.0005				
6	1-Mar-21	0.1	0.0005	0.0005				
7	1-Jun-21			0.0005				
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Coefficient of Variation:		0.07	1.16	2.41				
Mann-Kendall Statistic (S):		-1	-1	-5				
Confidence Factor:		76.5%						
Concentration Trend:				No Trend				



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

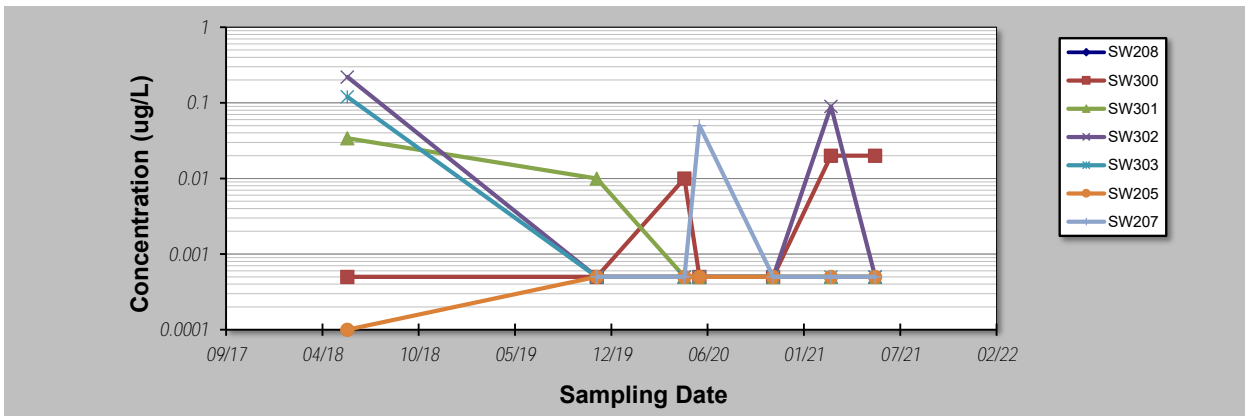
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 5-Oct-21	Job ID: DEF19009
Facility Name: Learmouth	Constituent: PFHxS + PFOS
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:		SW208	SW300	SW301	SW302	SW303	SW205	SW207
Sampling Event	Sampling Date	PFHXS + PFOS CONCENTRATION (ug/L)						
1	1-Jun-18	0.0005	0.0005	0.034	0.22	0.12	0.0001	
2	1-Nov-19	0.0005	0.0005	0.01	0.0005	0.0005	0.0005	0.0005
3	1-May-20	0.0005	0.01	0.0005	0.0005	0.0005	0.0005	0.0005
4	1-Jun-20	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.05
5	1-Nov-20	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
6	1-Mar-21	0.0005	0.02	0.0005	0.09	0.0005	0.0005	0.0005
7	1-Jun-21	0.0005	0.02	0.0005	0.0005	0.0005	0.0005	0.0005
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20								
Coefficient of Variation:		0.00	1.25	1.89	1.89	2.57	0.34	2.31
Mann-Kendall Statistic (S):		0	10	-11	-3	-6	6	-1
Confidence Factor:		37.9%	90.7%	93.2%	61.4%	76.4%	76.4%	50.0%
Concentration Trend:		Stable	Prob. Increasing	Prob. Decreasing	No Trend	No Trend	No Trend	No Trend



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing ($S > 0$) or decreasing ($S < 0$): $> 95\%$ = Increasing or Decreasing; $\geq 90\%$ = Probably Increasing or Probably Decreasing; $< 90\%$ and $S > 0$ = No Trend; $< 90\%$, $S \leq 0$, and $COV \geq 1$ = No Trend; $< 90\%$ and $COV < 1$ = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

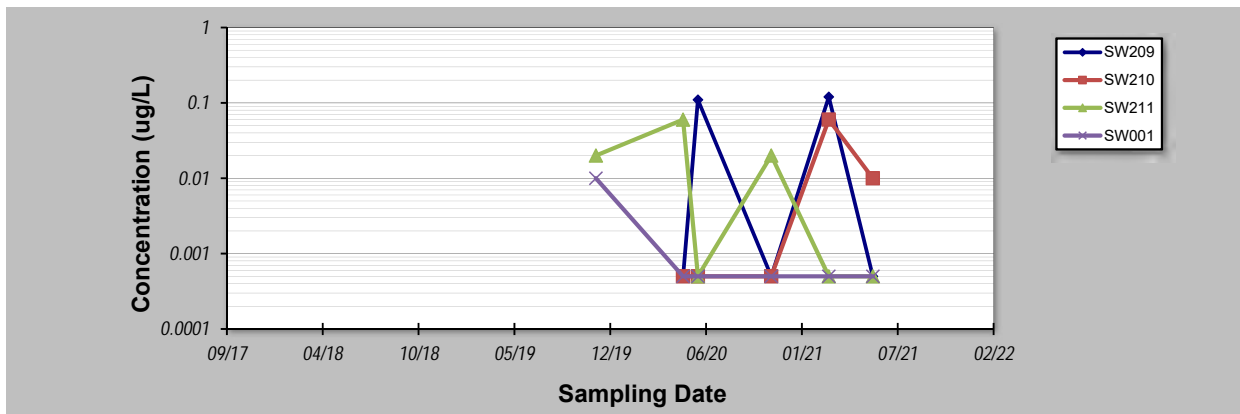
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 5-Oct-21	Job ID: DEF19009
Facility Name: Learmonth	Constituent: PFHxS + PFOS
Conducted By: Cardno	Concentration Units: ug/L

Sampling Event	Sampling Date	PFHXS + PFOS CONCENTRATION (ug/L)							
1	1-Jun-18								
2	1-Nov-19				0.02	0.01			
3	1-May-20	0.0005	0.0005	0.06	0.0005				
4	1-Jun-20	0.11	0.0005	0.0005	0.0005				
5	1-Nov-20	0.0005	0.0005	0.02	0.0005				
6	1-Mar-21	0.12	0.06	0.0005	0.0005				
7	1-Jun-21	0.0005	0.01	0.0005	0.0005				
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19									
20									
Coefficient of Variation:		1.36	1.81	1.37	1.86				
Mann-Kendall Statistic (S):		1	5	-7	-5				
Confidence Factor:		50.0%	82.1%	86.4%	76.5%				
Concentration Trend:		No Trend	No Trend	No Trend	No Trend				



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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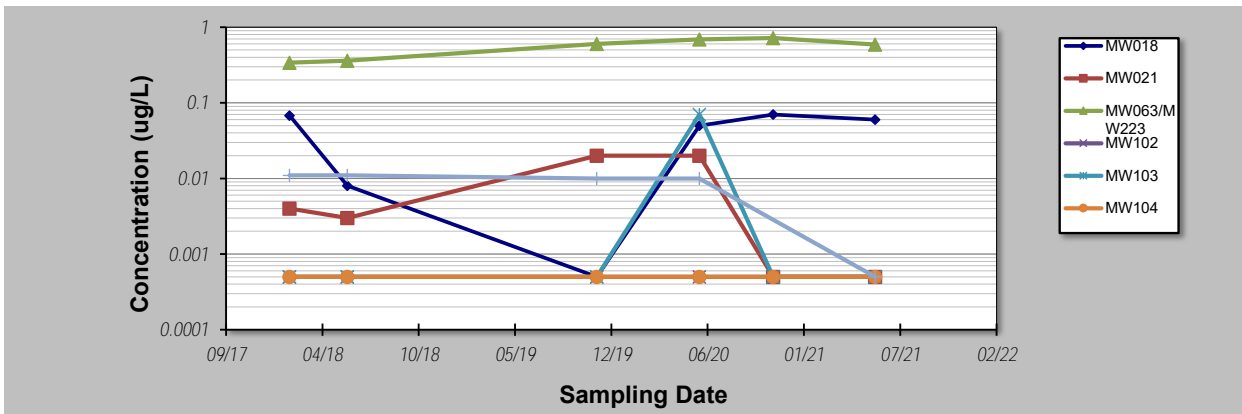
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: **5-Oct-21**
Facility Name: **Learmouth**
Conducted By: **Cardno**

Job ID: **DEF19009**
Constituent: **PFOA**
Concentration Units: **ug/L**

Sampling Point ID:		MW018	MW021	MW063/MW223	MW102	MW103	MW104	MW105
Sampling Event	Sampling Date	PFOA CONCENTRATION (ug/L)						
1	1-Feb-18	0.068	0.004	0.34	0.0005	0.0005	0.0005	0.011
2	1-Jun-18	0.008	0.003	0.36	0.0005	0.0005	0.0005	0.011
3	1-Nov-19	0.0005	0.02	0.6	0.0005	0.0005	0.0005	0.01
4	1-Jun-20	0.05	0.02	0.69	0.0005	0.07	0.0005	0.01
5	1-Nov-20	0.07	0.0005	0.72	0.0005	0.0005	0.0005	
6	1-Jun-21	0.06	0.0005	0.59	0.0005	0.0005	0.0005	0.0005
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Coefficient of Variation:		0.72	1.17	0.30	0.00	2.35	0.00	0.53
Mann-Kendall Statistic (S):		3	-5	9	0	1	0	-8
Confidence Factor:		64.0%	76.5%	93.2%	39.3%	50.0%	39.3%	95.8%
Concentration Trend:		No Trend	No Trend	Prob. Increasing	Stable	No Trend	Stable	Decreasing



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing ($S > 0$) or decreasing ($S < 0$): $> 95\%$ = Increasing or Decreasing; $\geq 90\%$ = Probably Increasing or Probably Decreasing; $< 90\%$ and $S > 0$ = No Trend; $< 90\%$, $S \leq 0$, and $COV \geq 1$ = No Trend; $< 90\%$ and $COV < 1$ = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

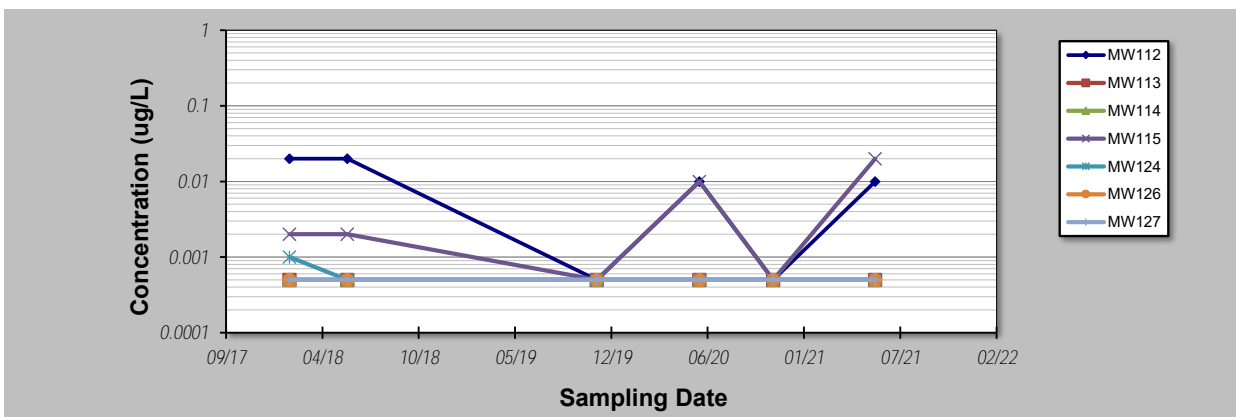
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 17-Sep-21	Job ID: DEF19009
Facility Name: Learmonth	Constituent: PFOA
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:		MW112	MW113	MW114	MW115	MW124	MW126	MW127
Sampling Event	Sampling Date	PFOA CONCENTRATION (ug/L)						
1	1-Feb-18	0.02	0.0005	0.0005	0.002	0.001	0.0005	0.0005
2	1-Jun-18	0.02	0.0005	0.0005	0.002	0.0005	0.0005	0.0005
3	1-Nov-19	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
4	1-Jun-20	0.01	0.0005	0.0005	0.01	0.0005	0.0005	0.0005
5	1-Nov-20	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
6	1-Jun-21	0.01	0.0005	0.0005	0.02	0.0005	0.0005	0.0005
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Coefficient of Variation:		0.86	0.00	0.00	1.34	0.35	0.00	0.00
Mann-Kendall Statistic (S):		-6	0	0	3	-5	0	0
Confidence Factor:		81.5%	39.3%	39.3%	64.0%	76.5%	39.3%	39.3%
Concentration Trend:		Stable	Stable	Stable	No Trend	Stable	Stable	Stable



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing ($S > 0$) or decreasing ($S < 0$): $> 95\%$ = Increasing or Decreasing; $\geq 90\%$ = Probably Increasing or Probably Decreasing; $< 90\%$ and $S > 0$ = No Trend; $< 90\%$, $S \leq 0$, and $COV \geq 1$ = No Trend; $< 90\%$ and $COV < 1$ = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

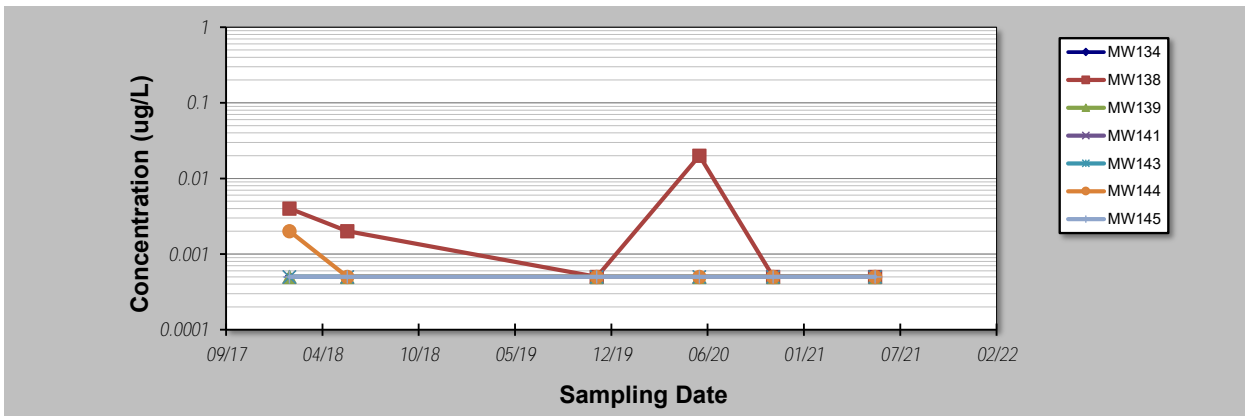
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 5-Oct-21	Job ID: DEF19009
Facility Name: Learmouth	Constituent: PFOA
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:		MW134	MW138	MW139	MW141	MW143	MW144	MW145
Sampling Event	Sampling Date	PFOA CONCENTRATION (ug/L)						
1	1-Feb-18	0.0005	0.004	0.0005	0.0005	0.0005	0.002	0.0005
2	1-Jun-18	0.0005	0.002	0.0005	0.0005	0.0005	0.0005	0.0005
3	1-Nov-19	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
4	1-Jun-20	0.0005	0.02	0.0005	0.0005	0.0005	0.0005	0.0005
5	1-Nov-20	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
6	1-Jun-21	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
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Coefficient of Variation:		0.00	1.68	0.00	0.00	0.00	0.82	0.00
Mann-Kendall Statistic (S):		0	-6	0	0	0	-5	0
Confidence Factor:		39.3%	81.5%	39.3%	39.3%	39.3%	76.5%	39.3%
Concentration Trend:		Stable	No Trend	Stable	Stable	Stable	Stable	Stable



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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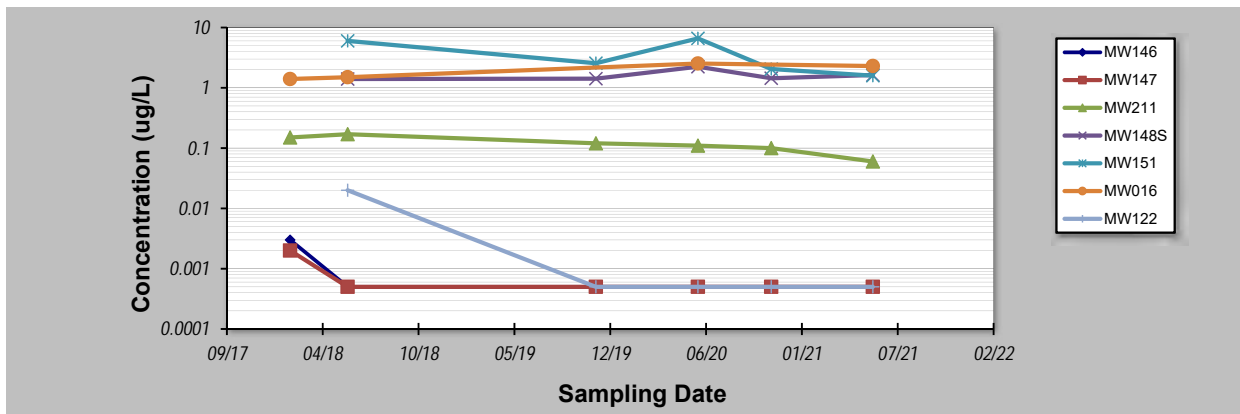
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GSI MANN-KENDALL TOOLKIT

for Constituent Trend Analysis

Evaluation Date: 14-Dec-21	Job ID: DEF19009
Facility Name: Learmonth	Constituent: PFOA
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:		MW146	MW147	MW211	MW148S	MW151	MW016	MW122
Sampling Event	Sampling Date	PFOA CONCENTRATION (ug/L)						
1	1-Feb-18	0.003	0.002	0.15			1.4	
2	1-Jun-18	0.0005	0.0005	0.17	1.4	6	1.5	0.02
3	1-Nov-19	0.0005	0.0005	0.12	1.42	2.56		0.0005
4	1-Jun-20	0.0005	0.0005	0.11	2.24	6.6	2.53	0.0005
5	1-Nov-20	0.0005	0.0005	0.1	1.44	2.05		0.0005
6	1-Jun-21	0.0005	0.0005	0.06	1.63	1.59	2.3	0.0005
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Coefficient of Variation:		1.11	0.82	0.33	0.22	0.63	0.29	1.98
Mann-Kendall Statistic (S):		-5	-5	-13	6	-6	4	-4
Confidence Factor:		76.5%	76.5%	99.2%	88.3%	88.3%	83.3%	75.8%
Concentration Trend:		No Trend	Stable	Decreasing	No Trend	Stable	No Trend	No Trend



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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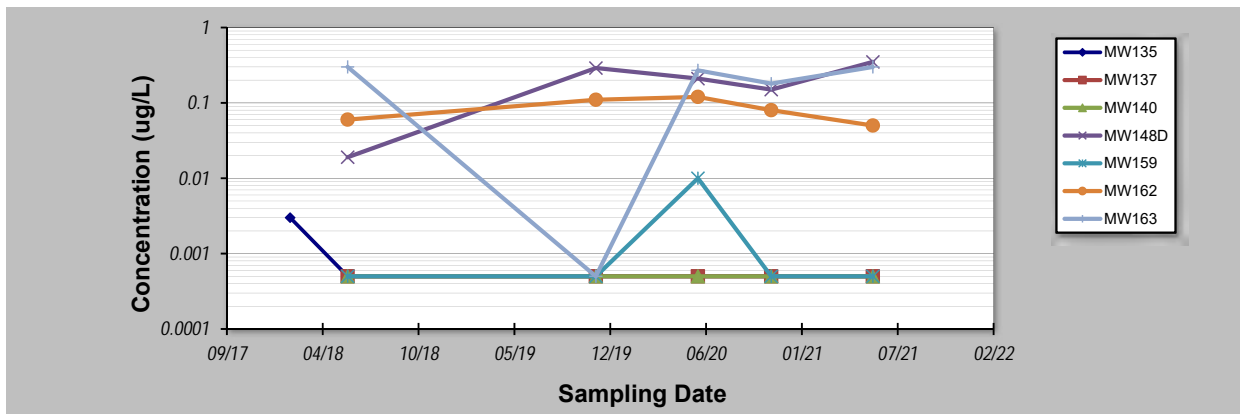
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GSI MANN-KENDALL TOOLKIT

for Constituent Trend Analysis

Evaluation Date: 14-Dec-21	Job ID: DEF19009
Facility Name: Learmonth	Constituent: PFOA
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:		MW135	MW137	MW140	MW148D	MW159	MW162	MW163
Sampling Event	Sampling Date	PFOA CONCENTRATION (ug/L)						
1	1-Feb-18	0.003						
2	1-Jun-18	0.0005	0.0005	0.0005	0.019	0.0005	0.06	0.3
3	1-Nov-19	0.0005	0.0005	0.0005	0.29	0.0005	0.11	0.0005
4	1-Jun-20	0.0005	0.0005	0.0005	0.21	0.01	0.12	0.27
5	1-Nov-20	0.0005	0.0005	0.0005	0.15	0.0005	0.08	0.18
6	1-Jun-21	0.0005	0.0005	0.0005	0.35	0.0005	0.05	0.3
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Coefficient of Variation:		1.11	0.00	0.00	0.63	1.77	0.36	0.60
Mann-Kendall Statistic (S):		-5	0	0	4	0	-2	1
Confidence Factor:		76.5%	40.8%	40.8%	75.8%	40.8%	59.2%	50.0%
Concentration Trend:		No Trend	Stable	Stable	No Trend	No Trend	Stable	No Trend



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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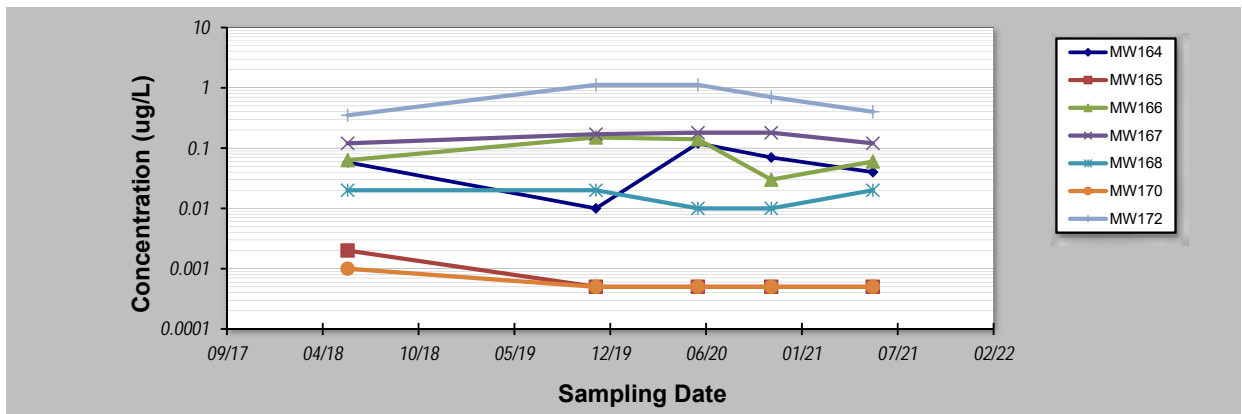
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GSI MANN-KENDALL TOOLKIT

for Constituent Trend Analysis

Evaluation Date: 14-Dec-21	Job ID: DEF19009
Facility Name: Learmonth	Constituent: PFOA
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:		MW164	MW165	MW166	MW167	MW168	MW170	MW172
Sampling Event	Sampling Date	PFOA CONCENTRATION (ug/L)						
1	1-Feb-18							
2	1-Jun-18	0.058	0.002	0.063	0.12	0.02	0.001	0.35
3	1-Nov-19	0.01	0.0005	0.15	0.17	0.02	0.0005	1.12
4	1-Jun-20	0.12	0.0005	0.14	0.18	0.01	0.0005	1.12
5	1-Nov-20	0.07	0.0005	0.03	0.18	0.01	0.0005	0.7
6	1-Jun-21	0.04	0.0005	0.06	0.12	0.02	0.0005	0.4
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Coefficient of Variation:		0.68	0.84	0.60	0.20	0.34	0.37	0.51
Mann-Kendall Statistic (S):		0	-4	-4	2	-2	-4	-1
Confidence Factor:		40.8%	75.8%	75.8%	59.2%	59.2%	75.8%	50.0%
Concentration Trend:		Stable	Stable	Stable	No Trend	Stable	Stable	Stable



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
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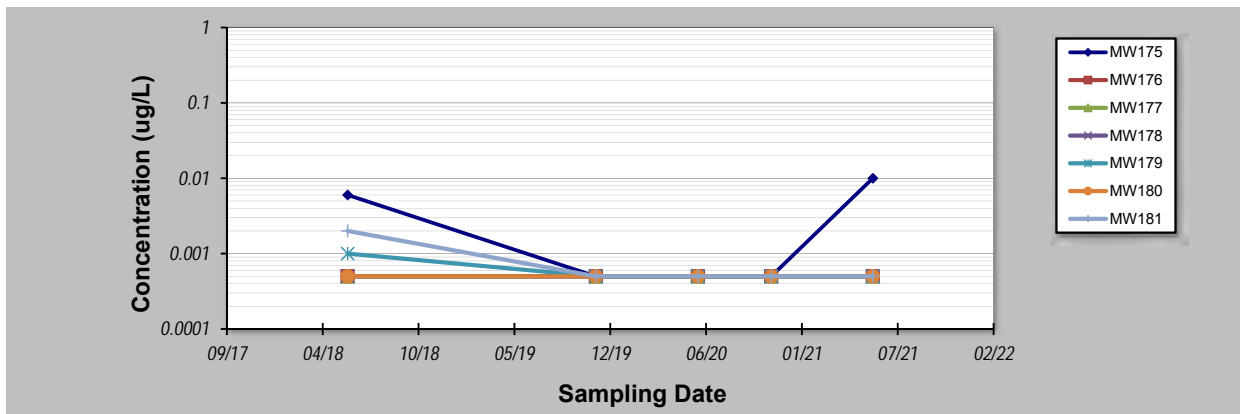
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 14-Dec-21	Job ID: DEF19009
Facility Name: Learmonth	Constituent: PFOA
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:		MW175	MW176	MW177	MW178	MW179	MW180	MW181
Sampling Event	Sampling Date	PFOA CONCENTRATION (ug/L)						
1	1-Feb-18							
2	1-Jun-18	0.006	0.0005	0.0005	0.0005	0.001	0.0005	0.002
3	1-Nov-19	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
4	1-Jun-20	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
5	1-Nov-20	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
6	1-Jun-21	0.01	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
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Coefficient of Variation:		1.24	0.00	0.00	0.00	0.37	0.00	0.84
Mann-Kendall Statistic (S):		1	0	0	0	-4	0	-4
Confidence Factor:		50.0%	40.8%	40.8%	40.8%	75.8%	40.8%	75.8%
Concentration Trend:		No Trend	Stable	Stable	Stable	Stable	Stable	Stable



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

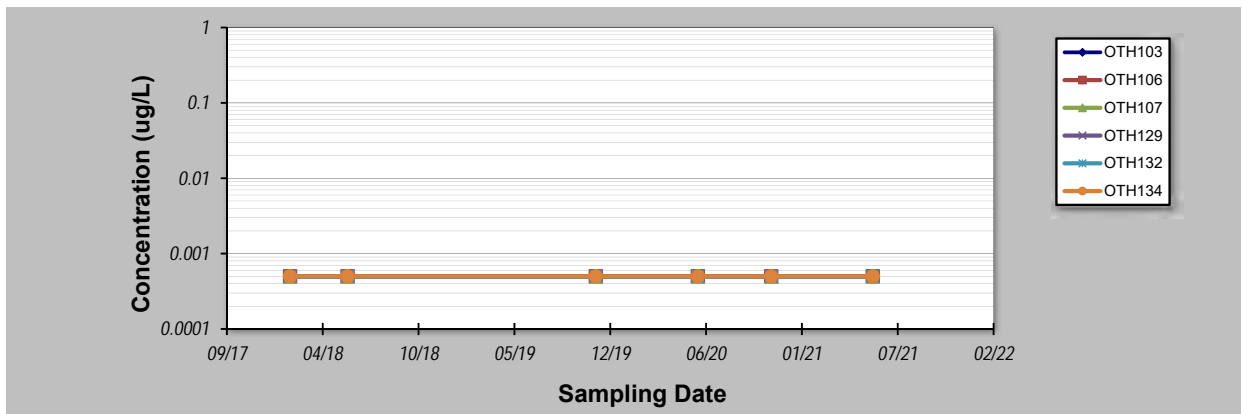
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 14-Dec-21	Job ID: DEF19009
Facility Name: Learmonth	Constituent: PFOA
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:		OTH103	OTH106	OTH107	OTH129	OTH132	OTH134	
Sampling Event	Sampling Date	PFOA CONCENTRATION (ug/L)						
1	1-Feb-18	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	
2	1-Jun-18	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	
3	1-Nov-19	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	
4	1-Jun-20	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	
5	1-Nov-20	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	
6	1-Jun-21	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	
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Coefficient of Variation:		0.00	0.00	0.00	0.00	0.00	0.00	
Mann-Kendall Statistic (S):		0	0	0	0	0	0	
Confidence Factor:		39.3%	39.3%	39.3%	39.3%	39.3%	39.3%	
Concentration Trend:		Stable	Stable	Stable	Stable	Stable	Stable	



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing ($S > 0$) or decreasing ($S < 0$): $> 95\%$ = Increasing or Decreasing; $\geq 90\%$ = Probably Increasing or Probably Decreasing; $< 90\%$ and $S > 0$ = No Trend; $< 90\%$, $S \leq 0$, and $COV \geq 1$ = No Trend; $< 90\%$ and $COV < 1$ = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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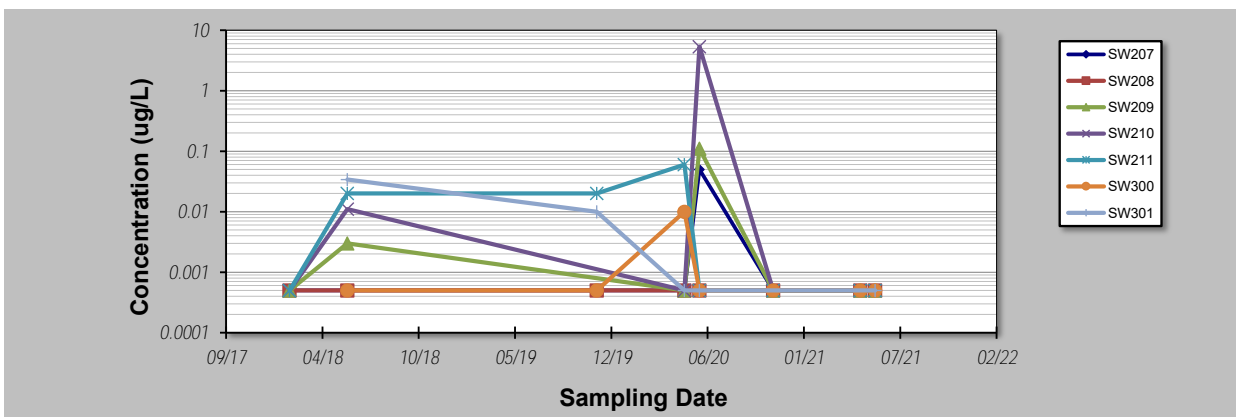
GSI MANN-KENDALL TOOLKIT

for Constituent Trend Analysis

Evaluation Date: 5-Oct-21	Job ID: DEF19009
Facility Name: Learmonth	Constituent: PFOA
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:		SW207	SW208	SW209	SW210	SW211	SW300	SW301
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Sampling Event	Sampling Date	PFOA CONCENTRATION (ug/L)						
1	1-Feb-18	0.0005	0.0005	0.0005	0.0005	0.0005		
2	1-Jun-18	0.0005	0.0005	0.003	0.011	0.02	0.0005	0.034
3	1-Nov-19	0.0005	0.0005			0.02	0.0005	0.01
4	1-May-20	0.0005	0.0005	0.0005	0.0005	0.06	0.01	0.0005
5	1-Jun-20	0.05	0.0005	0.11	5.37	0.0005	0.0005	0.0005
6	1-Nov-20	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	
7	1-May-21	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	
8	1-Jun-21	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
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Coefficient of Variation:		2.62	0.00	2.50	2.64	1.64	1.93	1.60
Mann-Kendall Statistic (S):		1	0	-3	-3	-7	-2	-7
Confidence Factor:		50.0%	45.2%	61.4%	61.4%	76.4%	55.7%	92.1%
Concentration Trend:		No Trend	Stable	No Trend	No Trend	No Trend	No Trend	Prob. Decreasing



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing ($S > 0$) or decreasing ($S < 0$): $> 95\%$ = Increasing or Decreasing; $\geq 90\%$ = Probably Increasing or Probably Decreasing; $< 90\%$ and $S > 0$ = No Trend; $< 90\%$, $S \leq 0$, and $COV \geq 1$ = No Trend; $< 90\%$ and $COV < 1$ = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

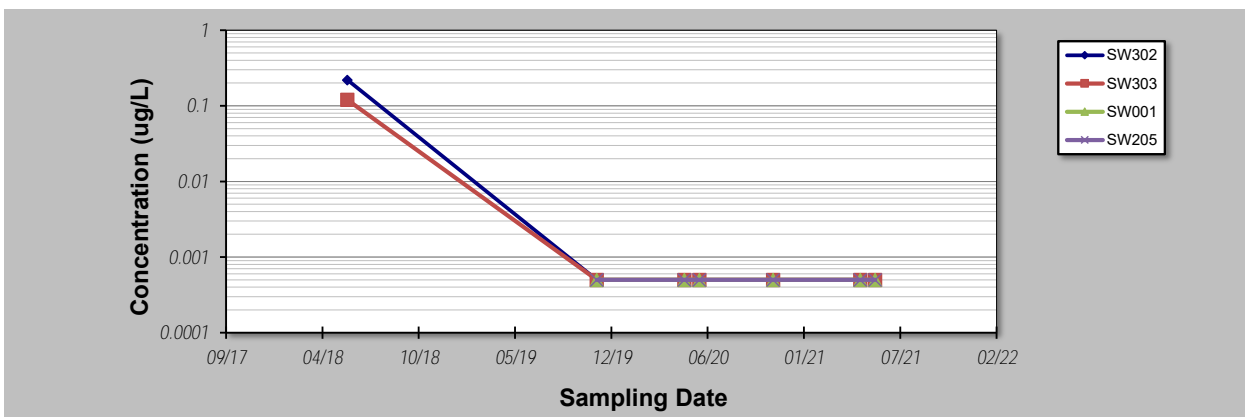
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 5-Oct-21	Job ID: DEF19009
Facility Name: Learmonth	Constituent: PFOA
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:		SW302	SW303	SW001	SW205			
Sampling Event	Sampling Date	PFOA CONCENTRATION (ug/L)						
1	1-Jun-18	0.22	0.12					
2	1-Nov-19	0.0005	0.0005	0.0005	0.0005			
3	1-May-20	0.0005	0.0005	0.0005	0.0005			
4	1-Jun-20	0.0005	0.0005	0.0005	0.0005			
5	1-Nov-20	0.0005	0.0005	0.0005	0.0005			
6	1-May-21	0.0005	0.0005	0.0005	0.0005			
7	1-Jun-21	0.0005	0.0005	0.0005	0.0005			
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Coefficient of Variation:		2.60	2.57	0.00	0.00			
Mann-Kendall Statistic (S):		-6	-6	0	0			
Confidence Factor:		76.4%	76.4%	39.3%	39.3%			
Concentration Trend:		No Trend	No Trend	Stable	Stable			



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

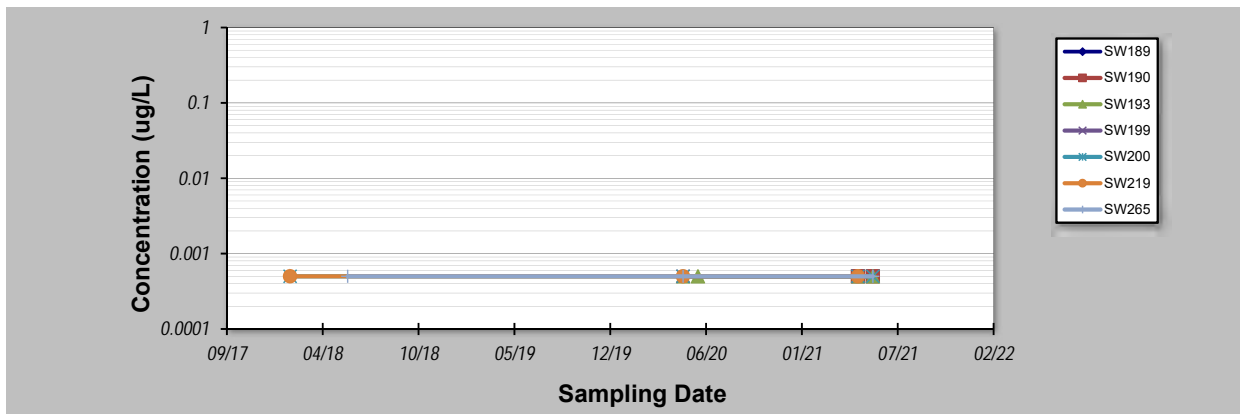
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 14-Dec-21	Job ID: DEF19009
Facility Name: Learmonth	Constituent: PFOA
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:		SW189	SW190	SW193	SW199	SW200	SW219	SW265
Sampling Event	Sampling Date	PFOA CONCENTRATION (ug/L)						
1	1-Feb-18					0.0005	0.0005	
2	1-Jun-18							0.0005
3	1-Nov-19							
4	1-May-20	0.0005		0.0005	0.0005	0.0005	0.0005	0.0005
5	1-Jun-20			0.0005				
6	1-Nov-20							
7	1-May-21	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	
8	1-Jun-21	0.0005	0.0005	0.0005		0.0005		0.0005
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Coefficient of Variation:		0.00	0.00	0.00	0.00	0.00	0.00	0.00
Mann-Kendall Statistic (S):		0	0	0	0	0	0	0
Confidence Factor:				37.5%			37.5%	
Concentration Trend:				Stable			Stable	



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing ($S > 0$) or decreasing ($S < 0$): $> 95\%$ = Increasing or Decreasing; $\geq 90\%$ = Probably Increasing or Probably Decreasing; $< 90\%$ and $S > 0$ = No Trend; $< 90\%$, $S \leq 0$, and $COV \geq 1$ = No Trend; $< 90\%$ and $COV < 1$ = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

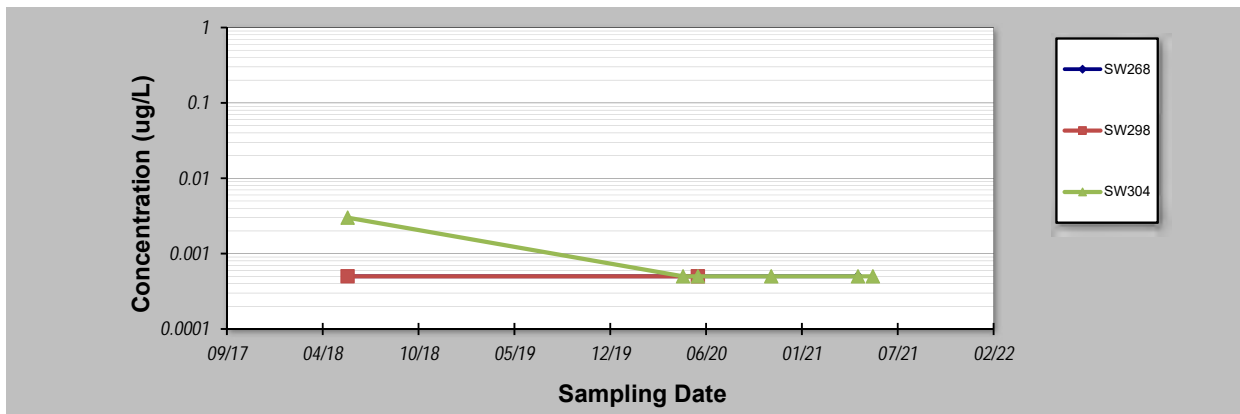
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 14-Dec-21	Job ID: DEF19009
Facility Name: Learmonth	Constituent: PFOA
Conducted By: Cardno	Concentration Units: ug/L

Sampling Event	Sampling Date	PFOA CONCENTRATION (ug/L)					
1	1-Feb-18						
2	1-Jun-18	0.0005	0.0005	0.003			
3	1-Nov-19						
4	1-May-20			0.0005			
5	1-Jun-20		0.0005	0.0005			
6	1-Nov-20			0.0005			
7	1-May-21	0.0005		0.0005			
8	1-Jun-21			0.0005			
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20							
Coefficient of Variation:		0.00	0.00	1.11			
Mann-Kendall Statistic (S):		0	0	-5			
Confidence Factor:				76.5%			
Concentration Trend:				No Trend			



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing ($S > 0$) or decreasing ($S < 0$): $> 95\%$ = Increasing or Decreasing; $\geq 90\%$ = Probably Increasing or Probably Decreasing; $< 90\%$ and $S > 0$ = No Trend; $< 90\%$, $S \leq 0$, and $COV \geq 1$ = No Trend; $< 90\%$ and $COV < 1$ = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

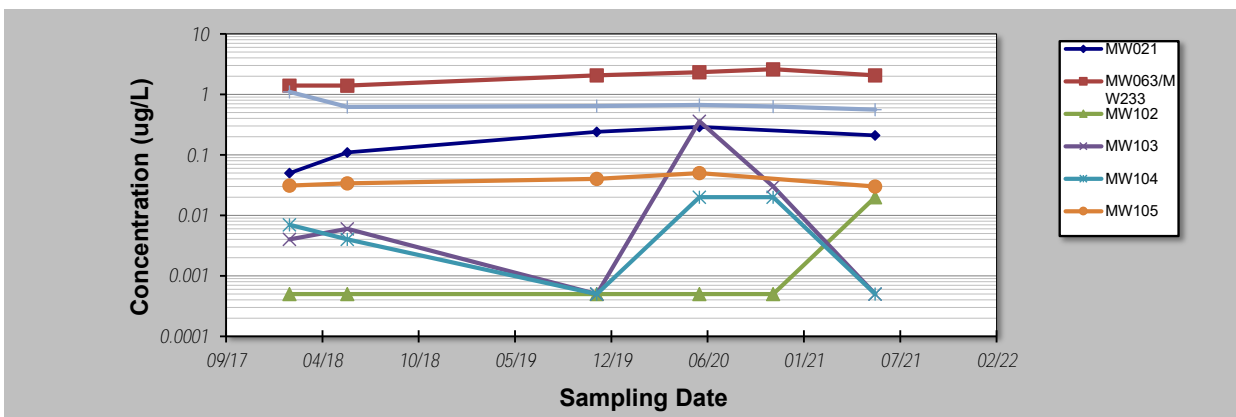
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 5-Oct-21	Job ID: DEF19009
Facility Name: Learmouth	Constituent: PFOS
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:		MW021	MW063/MW233	MW102	MW103	MW104	MW105	MW112
Sampling Event	Sampling Date	PFOS CONCENTRATION (ug/L)						
1	1-Feb-18	0.05	1.4	0.0005	0.004	0.007	0.031	1.1
2	1-Jun-18	0.11	1.4	0.0005	0.006	0.004	0.034	0.62
3	1-Nov-19	0.24	2.06	0.0005	0.0005	0.0005	0.04	0.64
4	1-Jun-20	0.29	2.32	0.0005	0.36	0.02	0.05	0.67
5	1-Nov-20		2.61	0.0005	0.03	0.02		0.63
6	1-Jun-21	0.21	2.07	0.02	0.0005	0.0005	0.03	0.56
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Coefficient of Variation:		0.54	0.25	2.12	2.16	1.05	0.22	0.28
Mann-Kendall Statistic (S):		6	10	5	0	-1	2	-7
Confidence Factor:		88.3%	95.2%	76.5%	39.3%	50.0%	59.2%	86.4%
Concentration Trend:		No Trend	Increasing	No Trend	No Trend	No Trend	No Trend	Stable



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing ($S > 0$) or decreasing ($S < 0$): $> 95\%$ = Increasing or Decreasing; $\geq 90\%$ = Probably Increasing or Probably Decreasing; $< 90\%$ and $S > 0$ = No Trend; $< 90\%$, $S \leq 0$, and $COV \geq 1$ = No Trend; $< 90\%$ and $COV < 1$ = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

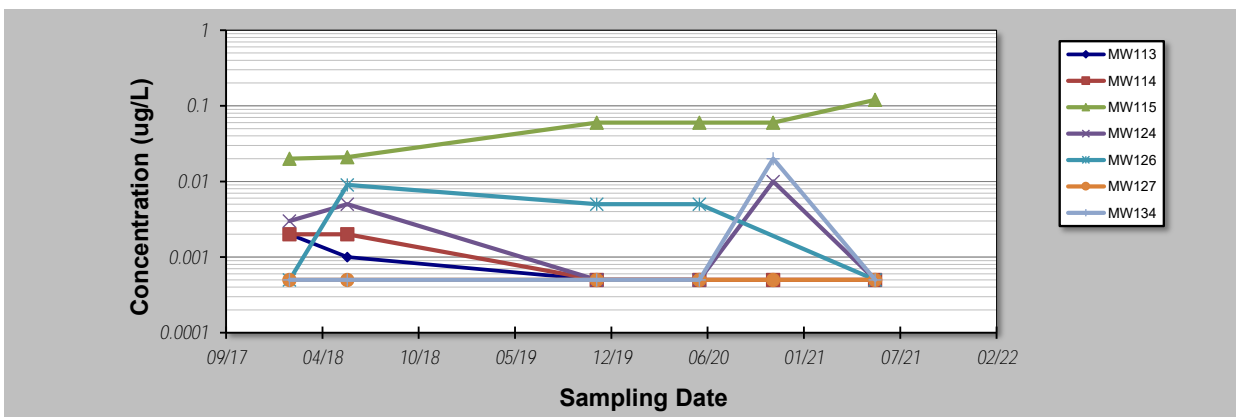
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 5-Oct-21	Job ID: DEF19009
Facility Name: Learmouth	Constituent: PFOS
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:		MW113	MW114	MW115	MW124	MW126	MW127	MW134
Sampling Event	Sampling Date	PFOS CONCENTRATION (ug/L)						
1	1-Feb-18	0.002	0.002	0.02	0.003	0.0005	0.0005	0.0005
2	1-Jun-18	0.001	0.002	0.021	0.005	0.009	0.0005	0.0005
3	1-Nov-19	0.0005	0.0005	0.06	0.0005	0.005	0.0005	0.0005
4	1-Jun-20	0.0005	0.0005	0.06	0.0005	0.005	0.0005	0.0005
5	1-Nov-20	0.0005	0.0005	0.06	0.01		0.0005	0.02
6	1-Jun-21	0.0005	0.0005	0.12	0.0005	0.0005	0.0005	0.0005
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Coefficient of Variation:		0.73	0.77	0.64	1.16	0.90	0.00	2.12
Mann-Kendall Statistic (S):		-9	-8	12	-2	-2	0	3
Confidence Factor:		93.2%	89.8%	98.2%	57.0%	59.2%	39.3%	64.0%
Concentration Trend:		Prob. Decreasing	Stable	Increasing	No Trend	Stable	Stable	No Trend



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing ($S > 0$) or decreasing ($S < 0$): $> 95\%$ = Increasing or Decreasing; $\geq 90\%$ = Probably Increasing or Probably Decreasing; $< 90\%$ and $S > 0$ = No Trend; $< 90\%$, $S \leq 0$, and $COV \geq 1$ = No Trend; $< 90\%$ and $COV < 1$ = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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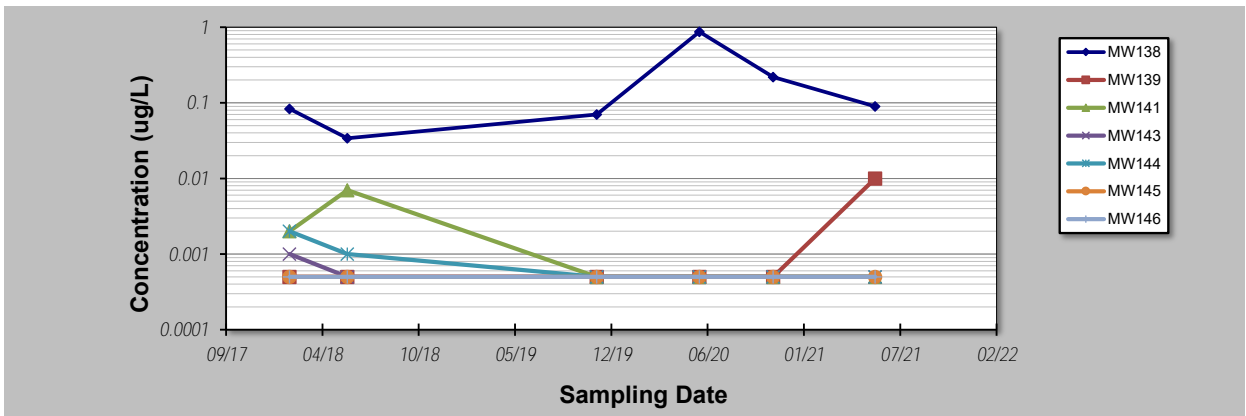
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 5-Oct-21	Job ID: DEF19009
Facility Name: Learmonth	Constituent: PFOS
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:		MW138	MW139	MW141	MW143	MW144	MW145	MW146
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Sampling Event	Sampling Date	PFOS CONCENTRATION (ug/L)						
1	1-Feb-18	0.083	0.0005	0.002	0.001	0.002	0.0005	0.0005
2	1-Jun-18	0.034	0.0005	0.007	0.0005	0.001	0.0005	0.0005
3	1-Nov-19	0.07	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
4	1-Jun-20	0.87	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
5	1-Nov-20	0.22	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
6	1-Jun-21	0.09	0.01	0.0005	0.0005	0.0005	0.0005	0.0005
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19								
20								
Coefficient of Variation:		1.41	1.86	1.42	0.35	0.73	0.00	0.00
Mann-Kendall Statistic (S):		5	5	-7	-5	-9	0	0
Confidence Factor:		76.5%	76.5%	86.4%	76.5%	93.2%	39.3%	39.3%
Concentration Trend:		No Trend	No Trend	No Trend	Stable	Prob. Decreasing	Stable	Stable



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

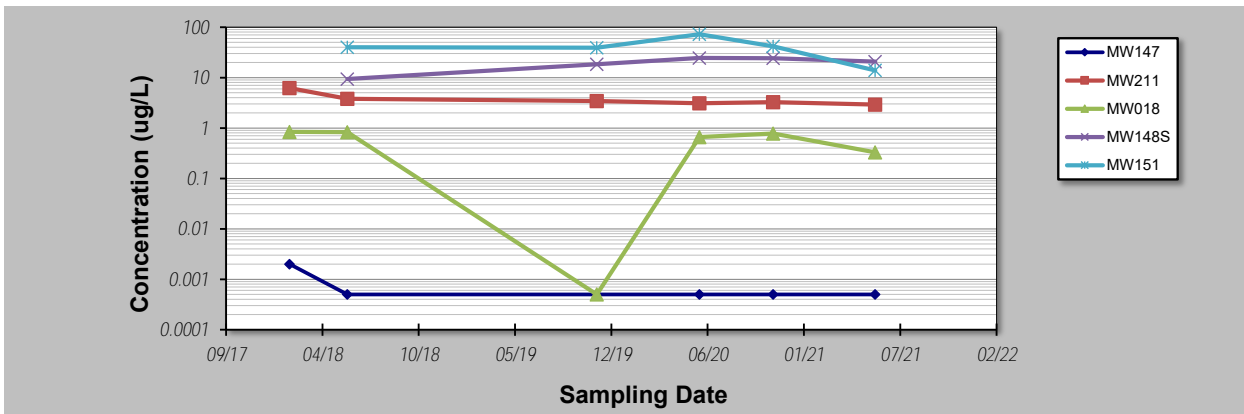
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 5-Oct-21	Job ID: DEF19009
Facility Name: Learmouth	Constituent: PFOS
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:		MW147	MW211	MW018	MW148S	MW151		
Sampling Event	Sampling Date	PFOS CONCENTRATION (ug/L)						
1	1-Feb-18	0.002	6.2	0.84				
2	1-Jun-18	0.0005	3.8	0.83	9.4	40		
3	1-Nov-19	0.0005	3.42	0.0005	18.4	39.1		
4	1-Jun-20	0.0005	3.09	0.66	24.6	72.6		
5	1-Nov-20	0.0005	3.27	0.78	24.2	41.9		
6	1-Jun-21	0.0005	2.92	0.33	20.8	13.9		
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Coefficient of Variation:		0.82	0.32	0.59	0.32	0.50		
Mann-Kendall Statistic (S):		-5	-13	-7	4	-2		
Confidence Factor:		76.5%	99.2%	86.4%	75.8%	59.2%		
Concentration Trend:		Stable	Decreasing	Stable	No Trend	Stable		



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

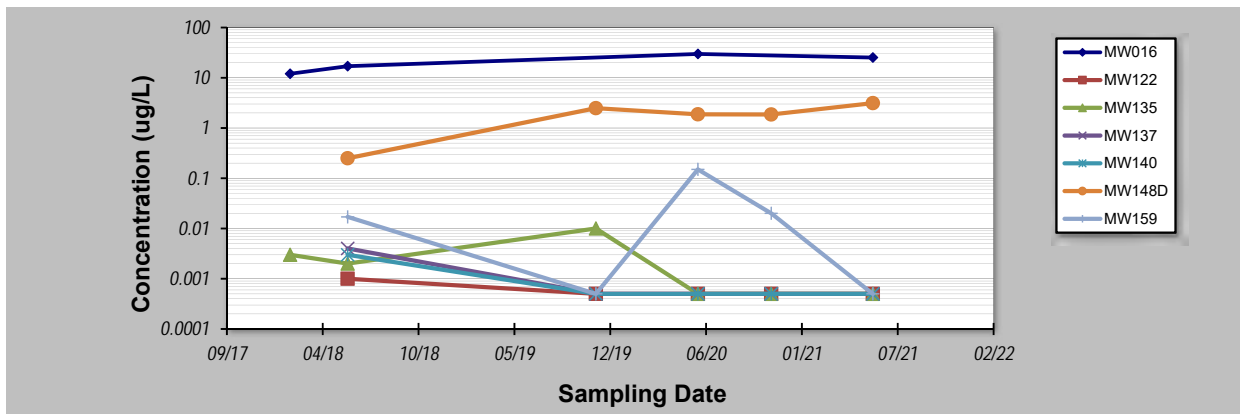
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 14-Dec-21	Job ID: DEF19009
Facility Name: Learmonth	Constituent: PFOS
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:		MW016	MW122	MW135	MW137	MW140	MW148D	MW159
Sampling Event	Sampling Date	PFOS CONCENTRATION (ug/L)						
1	1-Feb-18	12		0.003				
2	1-Jun-18	17	0.001	0.002	0.004	0.003	0.25	0.017
3	1-Nov-19		0.0005	0.01	0.0005	0.0005	2.48	0.0005
4	1-Jun-20	29.8	0.0005	0.0005	0.0005	0.0005	1.87	0.15
5	1-Nov-20		0.0005	0.0005	0.0005	0.0005	1.86	0.02
6	1-Jun-21	25.3	0.0005	0.0005	0.0005	0.0005	3.13	0.0005
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Coefficient of Variation:		0.38	0.37	1.34	1.30	1.12	0.56	1.69
Mann-Kendall Statistic (S):		4	-4	-8	-4	-4	4	-1
Confidence Factor:		83.3%	75.8%	89.8%	75.8%	75.8%	75.8%	50.0%
Concentration Trend:		No Trend	Stable	No Trend	No Trend	No Trend	No Trend	No Trend



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

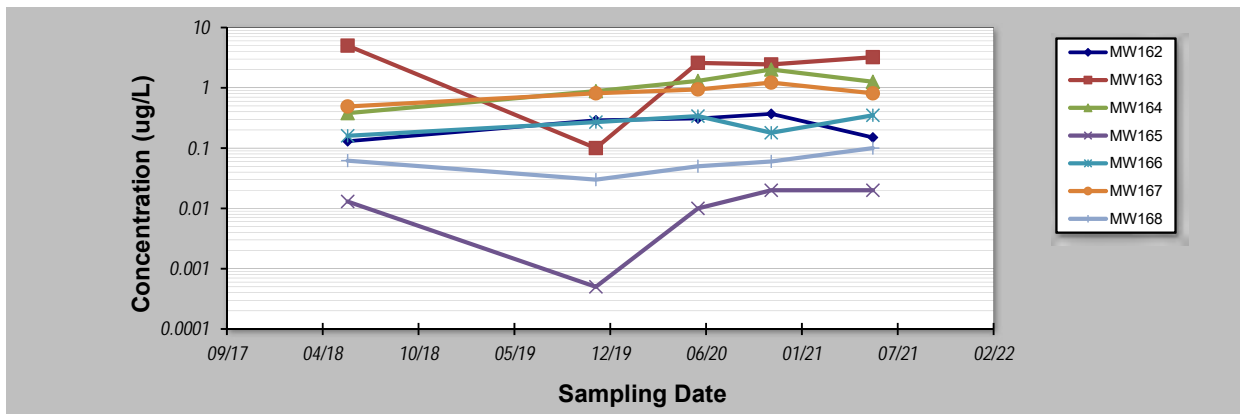
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 14-Dec-21	Job ID: DEF19009
Facility Name: Learmonth	Constituent: PFOS
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:		MW162	MW163	MW164	MW165	MW166	MW167	MW168
Sampling Event	Sampling Date	PFOS CONCENTRATION (ug/L)						
1	1-Feb-18							
2	1-Jun-18	0.13	5	0.38	0.013	0.16	0.49	0.062
3	1-Nov-19	0.29	0.1	0.88	0.0005	0.27	0.81	0.03
4	1-Jun-20	0.31	2.59	1.3	0.01	0.34	0.94	0.05
5	1-Nov-20	0.37	2.44	2.01	0.02	0.18	1.22	0.06
6	1-Jun-21	0.15	3.22	1.26	0.02	0.35	0.81	0.1
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Coefficient of Variation:		0.42	0.66	0.51	0.64	0.34	0.31	0.42
Mann-Kendall Statistic (S):		4	0	6	5	6	5	4
Confidence Factor:		75.8%	40.8%	88.3%	82.1%	88.3%	82.1%	75.8%
Concentration Trend:		No Trend	Stable	No Trend	No Trend	No Trend	No Trend	No Trend



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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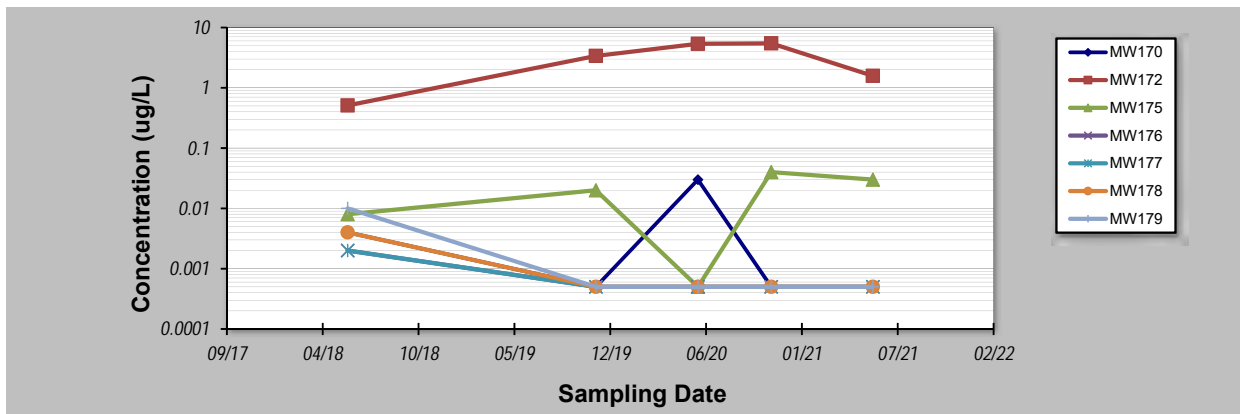
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GSI MANN-KENDALL TOOLKIT

for Constituent Trend Analysis

Evaluation Date: 14-Dec-21	Job ID: DEF19009
Facility Name: Learmonth	Constituent: PFOS
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:		MW170	MW172	MW175	MW176	MW177	MW178	MW179
Sampling Event	Sampling Date	PFOS CONCENTRATION (ug/L)						
1	1-Feb-18							
2	1-Jun-18	0.004	0.51	0.008	0.002	0.002	0.004	0.01
3	1-Nov-19	0.0005	3.38	0.02	0.0005	0.0005	0.0005	0.0005
4	1-Jun-20	0.03	5.37	0.0005	0.0005	0.0005	0.0005	0.0005
5	1-Nov-20	0.0005	5.46	0.04	0.0005	0.0005	0.0005	0.0005
6	1-Jun-21	0.0005	1.58	0.03	0.0005	0.0005	0.0005	0.0005
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Coefficient of Variation:		1.82	0.68	0.81	0.84	0.84	1.30	1.77
Mann-Kendall Statistic (S):		-3	4	4	-4	-4	-4	-4
Confidence Factor:		67.5%	75.8%	75.8%	75.8%	75.8%	75.8%	75.8%
Concentration Trend:		No Trend	No Trend	No Trend	Stable	Stable	No Trend	No Trend



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

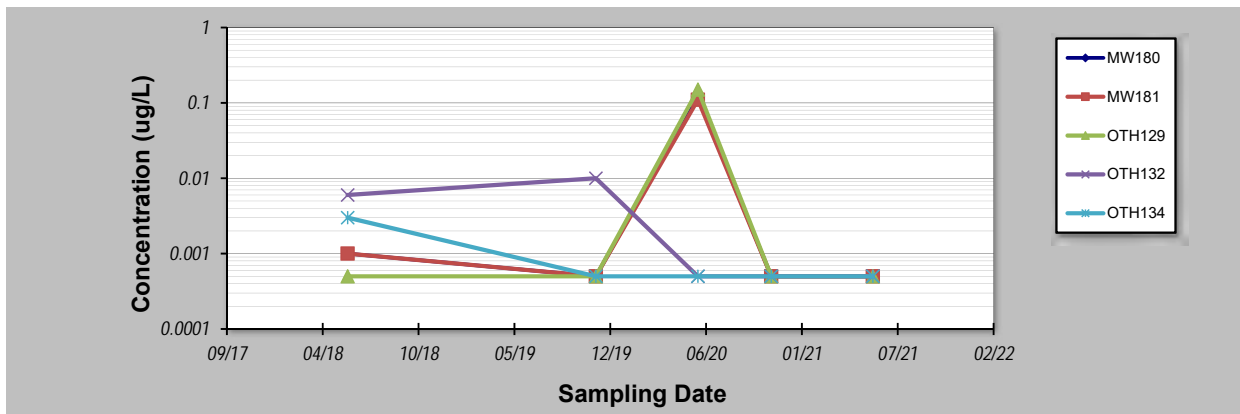
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 14-Dec-21	Job ID: DEF19009
Facility Name: Learmonth	Constituent: PFOS
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:		MW180	MW181	OTH129	OTH132	OTH134		
Sampling Event	Sampling Date	PFOS CONCENTRATION (ug/L)						
1	1-Feb-18							
2	1-Jun-18	0.001	0.001	0.0005	0.006	0.003		
3	1-Nov-19	0.0005	0.0005	0.0005	0.01	0.0005		
4	1-Jun-20	0.12	0.11	0.15	0.0005	0.0005		
5	1-Nov-20	0.0005	0.0005	0.0005	0.0005	0.0005		
6	1-Jun-21	0.0005	0.0005	0.0005	0.0005	0.0005		
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Coefficient of Variation:		2.18	2.17	2.20	1.24	1.12		
Mann-Kendall Statistic (S):		-3	-3	0	-5	-4		
Confidence Factor:		67.5%	67.5%	40.8%	82.1%	75.8%		
Concentration Trend:		No Trend	No Trend	No Trend	No Trend	No Trend		



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

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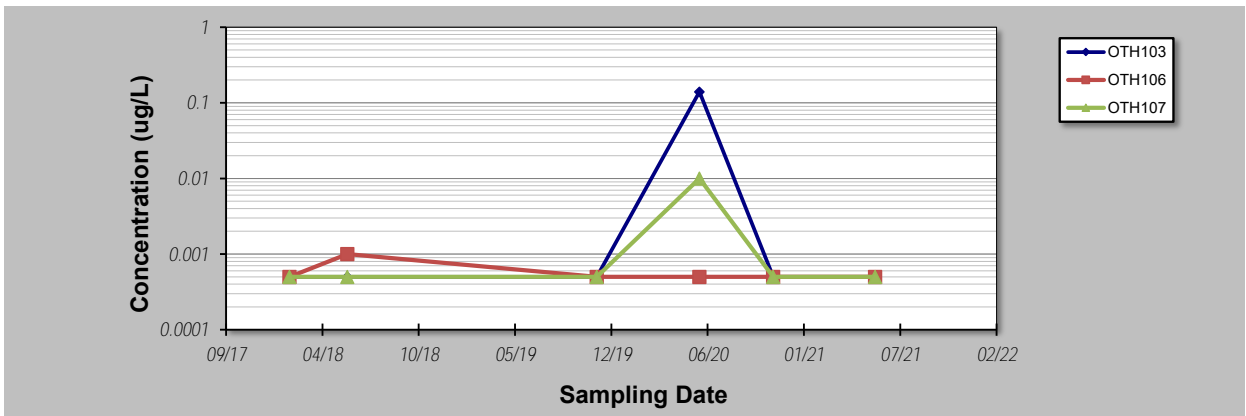
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GSI MANN-KENDALL TOOLKIT

for Constituent Trend Analysis

Evaluation Date: 5-Oct-21	Job ID: DEF19009
Facility Name: Learmonth	Constituent: PFOS
Conducted By: Cardno	Concentration Units: ug/L

Sampling Event	Sampling Date	PFOS CONCENTRATION (ug/L)					
1	1-Feb-18	0.0005	0.0005	0.0005			
2	1-Jun-18	0.0005	0.001	0.0005			
3	1-Nov-19	0.0005	0.0005	0.0005			
4	1-Jun-20	0.14	0.0005	0.01			
5	1-Nov-20	0.0005	0.0005	0.0005			
6	1-Jun-21	0.0005	0.0005	0.0005			
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20							
Coefficient of Variation:		2.40	0.35	1.86			
Mann-Kendall Statistic (S):		1	-3	1			
Confidence Factor:		50.0%	64.0%	50.0%			
Concentration Trend:		No Trend	Stable	No Trend			



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing ($S > 0$) or decreasing ($S < 0$): $> 95\%$ = Increasing or Decreasing; $\geq 90\%$ = Probably Increasing or Probably Decreasing; $< 90\%$ and $S > 0$ = No Trend; $< 90\%$, $S \leq 0$, and $COV \geq 1$ = No Trend; $< 90\%$ and $COV < 1$ = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

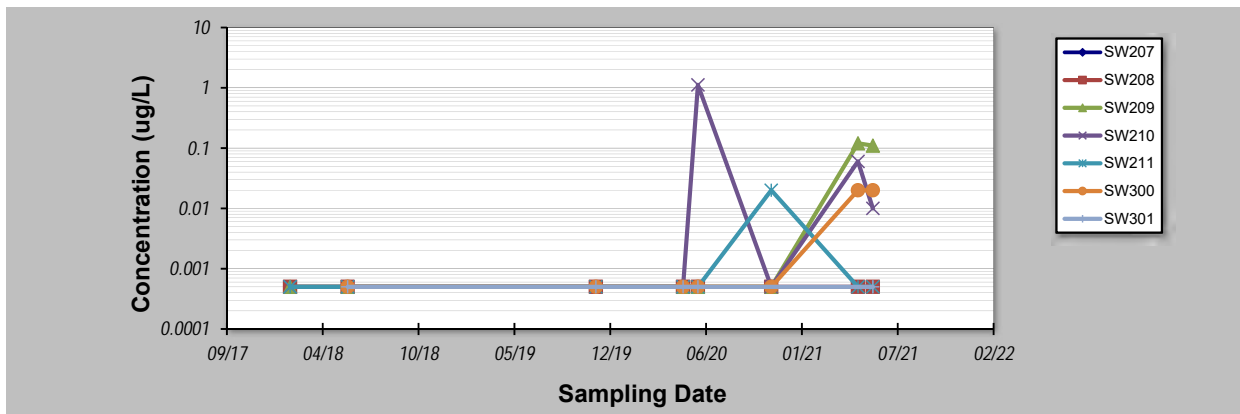
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 5-Oct-21	Job ID: DEF19009
Facility Name: Learmonth	Constituent: PFOS
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:		SW207	SW208	SW209	SW210	SW211	SW300	SW301
Sampling Event	Sampling Date	PFOS CONCENTRATION (ug/L)						
1	1-Feb-18	0.0005	0.0005	0.0005	0.0005	0.0005		
2	1-Jun-18	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
3	1-Nov-19	0.0005	0.0005			0.0005	0.0005	0.0005
4	1-May-20	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
5	1-Jun-20	0.0005	0.0005	0.0005	1.12	0.0005	0.0005	0.0005
6	1-Nov-20	0.0005	0.0005	0.0005	0.0005	0.02	0.0005	
7	1-May-21	0.0005	0.0005	0.12	0.06	0.0005	0.02	
8	1-Jun-21	0.0005	0.0005	0.11	0.01	0.0005	0.02	0.0005
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20								
Coefficient of Variation:		0.00	0.00	1.68	2.46	2.35	1.57	0.00
Mann-Kendall Statistic (S):		0	0	9	7	3	10	0
Confidence Factor:		45.2%	45.2%	88.1%	80.9%	59.4%	90.7%	40.8%
Concentration Trend:		Stable	Stable	No Trend	No Trend	No Trend	Prob. Increasing	Stable



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing ($S > 0$) or decreasing ($S < 0$): $> 95\%$ = Increasing or Decreasing; $\geq 90\%$ = Probably Increasing or Probably Decreasing; $< 90\%$ and $S > 0$ = No Trend; $< 90\%$, $S \leq 0$, and $COV \geq 1$ = No Trend; $< 90\%$ and $COV < 1$ = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

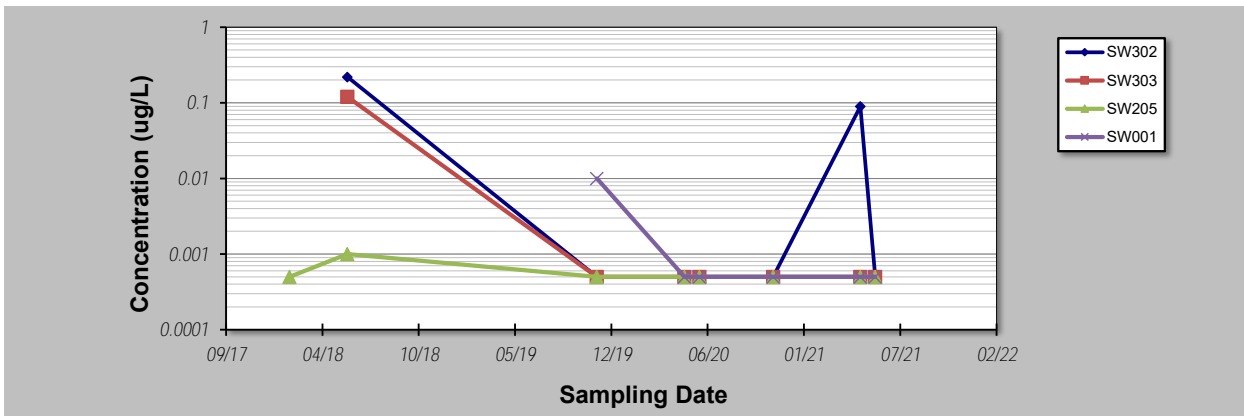
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 5-Oct-21	Job ID: DEF19009
Facility Name: Learmonth	Constituent: PFOS
Conducted By: Cardno	Concentration Units: ug/L

Sampling Event	Sampling Date	PFOS CONCENTRATION (ug/L)			
1	1-Feb-18			0.0005	
2	1-Jun-18	0.22	0.12	0.001	
3	1-Nov-19	0.0005	0.0005	0.0005	0.01
4	1-May-20	0.0005	0.0005	0.0005	0.0005
5	1-Jun-20	0.0005	0.0005	0.0005	0.0005
6	1-Nov-20	0.0005	0.0005	0.0005	0.0005
7	1-May-21	0.09	0.0005	0.0005	0.0005
8	1-Jun-21	0.0005	0.0005	0.0005	0.0005
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Coefficient of Variation:		1.89	2.57	0.31	1.86
Mann-Kendall Statistic (S):		-3	-6	-5	-5
Confidence Factor:		61.4%	76.4%	68.3%	76.5%
Concentration Trend:		No Trend	No Trend	Stable	No Trend



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

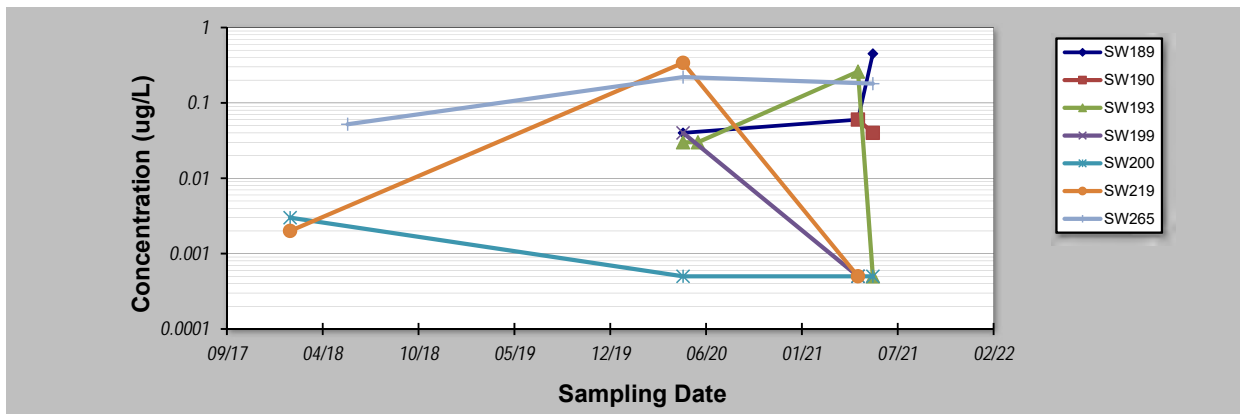
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 14-Dec-21	Job ID: DEF19009
Facility Name: Learmonth	Constituent: PFOS
Conducted By: Cardno	Concentration Units: ug/L

Sampling Point ID:		SW189	SW190	SW193	SW199	SW200	SW219	SW265
Sampling Event	Sampling Date	PFOS CONCENTRATION (ug/L)						
1	1-Feb-18					0.003	0.002	
2	1-Jun-18							0.052
3	1-Nov-19							
4	1-May-20	0.04		0.03	0.04	0.0005	0.34	0.22
5	1-Jun-20			0.03				
6	1-Nov-20							
7	1-May-21	0.06	0.06	0.26	0.0005	0.0005	0.0005	
8	1-Jun-21	0.45	0.04	0.0005		0.0005		0.18
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20								
Coefficient of Variation:		1.26	0.28	1.51	1.38	1.11	1.71	0.58
Mann-Kendall Statistic (S):		3	-1	-1	-1	-3	-1	1
Confidence Factor:		50.0%			72.9%			
Concentration Trend:				No Trend		No Trend		



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing ($S > 0$) or decreasing ($S < 0$): $> 95\%$ = Increasing or Decreasing; $\geq 90\%$ = Probably Increasing or Probably Decreasing; $< 90\%$ and $S > 0$ = No Trend; $< 90\%$, $S \leq 0$, and $COV \geq 1$ = No Trend; $< 90\%$ and $COV < 1$ = Stable.
- Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

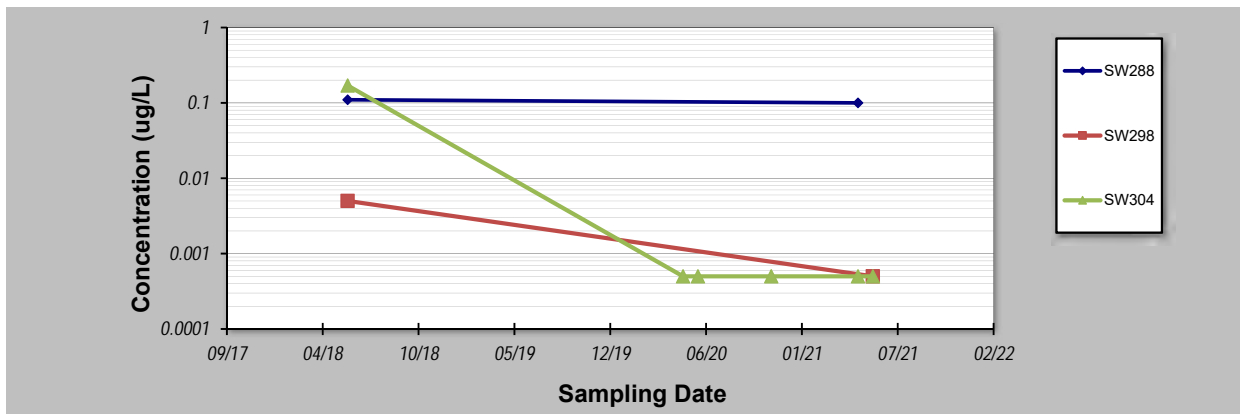
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GSI MANN-KENDALL TOOLKIT for Constituent Trend Analysis

Evaluation Date: 14-Dec-21	Job ID: DEF19009
Facility Name: Learmonth	Constituent: PFOS
Conducted By: Cardno	Concentration Units: ug/L

Sampling Event	Sampling Date	PFOS CONCENTRATION (ug/L)					
1	1-Feb-18						
2	1-Jun-18	0.11	0.005	0.17			
3	1-Nov-19						
4	1-May-20			0.0005			
5	1-Jun-20			0.0005			
6	1-Nov-20			0.0005			
7	1-May-21	0.1		0.0005			
8	1-Jun-21		0.0005	0.0005			
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
Coefficient of Variation:		0.07	1.16	2.41			
Mann-Kendall Statistic (S):		-1	-1	-5			
Confidence Factor:				76.5%			
Concentration Trend:				No Trend			



Notes:

- At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
- Confidence in Trend = Confidence (in percent) that constituent concentration is increasing ($S > 0$) or decreasing ($S < 0$): $> 95\%$ = Increasing or Decreasing; $\geq 90\%$ = Probably Increasing or Probably Decreasing; $< 90\%$ and $S > 0$ = No Trend; $< 90\%$, $S \leq 0$, and $COV \geq 1$ = No Trend; $< 90\%$ and $COV < 1$ = Stable.
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