RAAF Base Townsville
Ecological Risk Assessment & Seasonal Monitoring Findings
PFAS Investigation and Management Program

In March 2017, Defence commenced a detailed environmental investigation into the nature and extent of per- and poly-fluoroalkyl substances (PFAS) on, and in the vicinity of, RAAF Base Townsville as a result of the historical use of legacy firefighting foams at the Base.

As part of the environmental investigations, a Seasonal Monitoring Program and an Ecological Risk Assessment (ERA) have been completed. The findings of these reports are detailed in this factsheet.

The Seasonal Sampling and ERA Reports are available to view at: www.defence.gov.au/environment/pfas/Townsville

Preliminary Site Investigation (PSI)
Completed March 2017

Water Use Survey
Completed June 2017

Detailed Site Investigation Report released and Community Walk-in Session
May 2018

Human Health Risk Assessment (HHRA) Report released and Community Walk-in Session
October 2018

Seasonal Monitoring Reports and Ecological Risk Assessment (ERA) Report released
December 2019

PFAS Management Area Plan released
December 2019

WE ARE HERE

Community Information Session
December 2019

Ongoing Monitoring
Biannual surface water, sediment and groundwater monitoring

*Dates may be subject to rescheduling

Seasonal Monitoring Reports Findings

Seasonal monitoring has been conducted to provide a better understanding of the movement of PFAS within the Investigation Area during wet and dry periods and following significant rain events.

Sampling of sediment, surface water and groundwater was conducted in April 2018, December 2018 and April 2019. Surface water sampling also occurred in March 2018 during the first significant rainfall in Townsville for three years and has allowed an assessment of PFAS migration while the Base is in flood.

The sampling results from the seasonal monitoring have been analysed with the findings presented in two reports, one report for sampling conducted in March/April 2018 (Seasonal Monitoring Report 1) and the second report for sampling conducted in December 2018 and April 2019 (Seasonal Monitoring Report 2.)

The Seasonal Monitoring Reports have also involved an analysis of the biota sampling results that were used to inform the Human Health Risk Assessment (HHRA) and the ERA. The types of biota reviewed included:

- Estuarine biota sampling (i.e. fish, prawns, mud crabs, oysters, mangroves, and samphire) within the waterways of the Investigation Area;
- Marine biota sampling (i.e. fish, spanner crab, seagrass and sargassum) offshore adjacent to the Investigation Area; and
- Semi-terrestrial biota sampling (i.e. frogs, toads, snakes and turtles).

An additional round of sampling for surface water, sediment and groundwater was undertaken in October 2019. This data will be presented in a report, expected to be released in the first-quarter of 2020.

Summary of Seasonal Monitoring Findings

A summary of key findings are presented below:

- Surface water discharge during high-flow events has been identified as the main method for PFAS moving off the Base into the Town Common, Louisa Creek, Three Mile Creek and Mundy Creek Catchments. Defence is not aware of anyone using groundwater for drinking purposes, within the investigation area.
- Concentrations of PFAS in groundwater were generally higher when measured following rainfall events, as evident in the April 2018 results. This is from the increase in PFAS impacted surface water moving off-base into groundwater.

Samples analysed for the Seasonal Monitoring Reports

Sample Type	No. On-base	No. Off-base
Soil	165	41
Groundwater	182	130
Surface water	45	78
Sediment	29	68
Aquatic plants	0	57
Estuarine animals	0	319
Marine animals	0	226
Semi-terrestrial animals	0	84

RAAF Base Townsville Investigation Area

Ecological Risk Assessment (ERA)

The ERA considered the potential for elevated exposure to PFAS for plants and animals located near the Base and the potential for adverse effects as a result of exposure. Water-based and land-based ecosystems that are potentially exposed to PFAS in the Investigation Area have been examined as part of the ERA.

ERA Receptor Species

As it is not possible to directly assess the risk to every potential animal species that inhabits environments within the Investigation Area, the ERA assessed a range of 'indicator species'. Indicator species are representative species of animal groups with similar food and habitat needs and are likely to be exposed to PFAS in similar ways.

Indicator species were selected from the following broad animal groups:

- Water-based animals:
  - Birds that eat insects/aquatic invertebrates (invertivorous), or plants & animals (omnivorous).
  - Birds that eat fish (predatory).
  - Reptiles that eat fish.
  - Aquatic mammals that eat fish.
- Land-based animals:
  - Predatory reptiles.
  - Mammals that eat plants, insects and animals.
  - Birds that eat plants (herbivorous).
  - Birds that eat insects, or plants & animals/insects.

Biota sampling confirmed PFAS in almost all species. PFAS was not detected in aquatic plants sampled.

Exposure Pathways

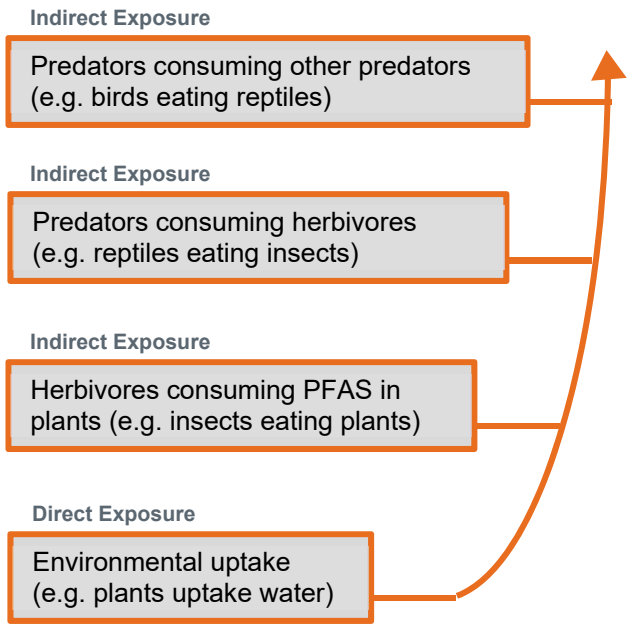
There are three main types of exposure pathways for animal species living in the Investigation Area. These are:

- 'Direct' exposure to PFAS through incidental ingestion of PFAS in soil, surface water and/or sediment.
- 'Indirect' exposure to PFAS through consuming PFAS accumulated in terrestrial plants and animals.
- 'Indirect' exposure to PFAS through consuming PFAS accumulated in aquatic plants and animals.

Exposure pathways for different indicator species vary depending on the food they eat, the habitat they live in and the way they interact with the environment.

Exposure Assessment

'Direct' exposure to PFAS contaminated soil, sediment or surface water, was considered for native plants and animals in the Investigation Area, by comparing PFAS concentrations against Australian and International screening benchmarks. Direct exposure does not account for exposure as a result of accumulation of PFAS (bioaccumulation) in the food-chain.



Bioaccumulation occurs when the animal absorbs PFAS at a rate faster than it leaves the animal. The potential for adverse effects to native plants and animals was assessed by estimating dietary intakes of PFAS incorporating 'indirect' exposures and comparing the sum of the pathways against relevant toxicity reference values.

Exposure Risks for Semi-terrestrial / Terrestrial Species	
Low & acceptable risk	• Invertivorous & omnivorous mammals • Predatory reptiles
Marginal risk	• Predatory mammals
Potential for unacceptable risk	• Herbivorous mammals • Herbivorous birds • Invertivorous & omnivorous birds • Predatory birds • Terrestrial / semi-terrestrial plants

Exposure Risks for Aquatic Species	
Low & acceptable risk	• Predatory birds • Predatory reptiles
Marginal risk	• No species in this category
Potential for unacceptable risk	• Herbivorous mammals • Invertivorous & omnivorous birds • Predatory mammals • Aquatic plants

Did you know?

PFAS is absorbed by plants at different rates and can bioaccumulate in animals. Animals may ingest small amounts of PFAS from plants and other animals in the food chain, by consuming surface water containing PFAS, or through ingestion of soil and/or sediment.

ERA Key Findings

The ERA concluded that there is the potential for unacceptable PFAS exposure to ecological receptors, which may inhabit both land and aquatic environments within the Investigation Area. This exposure-risk is primarily driven by:

- the discharge of PFAS-impacted surface water from the Base into waterways and The Townsville Town Common Conservation Park (The Common) during periods of high flow (e.g. flooding),
- bioaccumulation of PFAS in aquatic and terrestrial organisms, and
- risk of organisms with bioaccumulated PFAS being a food source for higher-order animals.

Summary of Ecological Risks

Ecological risks are determined to be 'acceptable' where the exposure is below the adopted risk threshold, while 'unacceptable' risks are where the exposure is estimated above the threshold. An unacceptable risk does not equate to an adverse outcome or harm, only that risk is heightened.

Next Steps

PFAS Management Area Plan

Based on the detailed environmental investigation findings, a PFAS Management Area Plan (PMAP) has been developed for the site. The PMAP recommends action to monitor and manage PFAS contamination at and around RAAF Townsville.

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