RAAF Base Darwin PFAS Investigation

In March 2017, Defence commenced a detailed environmental investigation into per- and poly-fluoroalkyl substances (PFAS), related to the historical use of legacy firefighting foams on RAAF Base Darwin (the Base).

Detailed Site Investigation

As part of the investigation, a Detailed Site Investigation was completed to better understand the nature and extent of PFAS on, and in the area surrounding, RAAF Base Darwin. The Detailed Site Investigation was completed in two parts due to the large seasonal variations between the Wet and Dry Seasons, which have a major influence on the movement of PFAS impacted surface water and which may also affect groundwater.

In February 2018, the Detailed Site Investigation Report was published based on the field work conducted from April to October 2017 (Dry Season). The field work involved a comprehensive sampling program of soil, sediment, surface water and groundwater on and off the Base.

The Detailed Site Investigation identified a number of potential pathways for PFAS to move through the environment including:

- From soil in the source areas to groundwater or surface water;
- With groundwater into creeks and ultimately the ocean (Darwin Harbour or the Beagle Gulf); and
- From surface water runoff into drains and Ludmilla Creek, Sadgroves Creek, Reichardt Creek and Rapid Creek.

We know that the large seasonal variations between the Wet and Dry Seasons have a significant influence on the movement of PFAS impacted surface water and may also affect groundwater, so a Supplementary Detailed Site Investigation has also been conducted to monitor seasonal variation through the Wet Season (October 2017 to May 2018).


Figure 1: Updated investigation timeline

Supplementary Detailed Site Investigation

Testing for the supplementary investigation, on the Base, occurred at the main source areas of PFAS – the Former Fire Training Ground 2, Former ARFF Fire Station, Hangar 31/Fuel Farm 1 and other areas around the Base where legacy firefighting foam may have been used in the past. Testing was also conducted in areas, off the Base, that may have been impacted from drains leading off the Base, Rapid Creek and Ludmilla Creek.

Supplementary sampling included:

- Surface water samples from drains and creeks located on and adjacent to the Base, and at Darwin International Airport. Locations included Rapid Creek, Ludmilla Creek, Sadgroves Creek and Reichardt Creek;
- Fruit and vegetable samples from Jingili Council Orchard, Jingili Community Gardens and Lakeside Community Gardens. These locations are within the flood zone of Rapid Creek; and
- Samples from animals, fish, crustaceans and molluscs at Rapid Creek, Rapid Estuary, Ludmilla Creek and Darwin Harbour including Sadgroves Creek and Reichardt Creek.

- Groundwater samples from monitoring wells located on the Base and in other nearby locations including Bagot and Winnellie;

- Samples from a stockpile of soil located at Former Fire Training Ground 2 as well as soil sampling in residential areas surrounding the Base including The Narrows, Ludmilla, Coconut Grove, Millner and Jingili;

- Samples from animals, fish, crustaceans and molluscs at Rapid Creek, Rapid Estuary, Ludmilla Creek and Darwin Harbour including Sadgroves Creek and Reichardt Creek.

November 2018
**Key Supplementary Detailed Site Investigation findings**

The results of the Supplementary Detailed Site Investigation sampling supported the initial Detailed Site Investigation Report and did not identify any additional PFAS sources or pathways.

The results of soil, surface water and groundwater testing were used to identify the distribution of PFAS across the Investigation Area. Estimations were made about the levels of PFAS in soil and groundwater, by reviewing the extent of contamination at different concentrations. The mass estimates for groundwater and soil indicate that approximately 70% of the total reported PFAS is spread beyond the immediate source areas.

Sampling through the Wet Season for the Supplementary Detailed Site Investigation identified the following:

**Surface water**

- Concentrations of PFAS in freshwater Rapid Creek decreased by approximately half in the Wet Season and increased during the Dry Season.

- PFAS concentrations in lower reaches of Rapid Creek increased in the Wet Season as the flow of contaminated freshwater from the creek overcame the tidal flushing of seawater.

- PFAS concentrations increased in Ludmilla Creek at Dick Ward Drive over the Wet Season, but increases were not observed downstream.

- No trend in PFAS concentration between seasons could be observed at Reichardt Creek and Sadgroves Creek.

- Highest concentrations of PFAS reported in surface water on-Base were in drains located near Fire Training Area 1, the current Fire Training Ground, former ARFF Fire Station, Hangar 31 and the main Darwin International Airport drain that crosses Charles Eaton Drive.
Groundwater

- The extent of PFAS impact in groundwater did not noticeably change between the Dry and Wet Seasons.
- By reviewing the direction and speed of groundwater flow, along with concentrations present in groundwater at that location, the mass of contaminant leaving that location can be estimated. Most PFAS being transported in groundwater is migrating from former Fuel Farms 4 and 6, former ARFF Fire Station and the current Fire Training Ground.

Plants and animals

- Biota testing of wild plants and animals as well as cultivated fruits and vegetables was conducted on- and off-Base.
- Testing identified concentrations of PFAS in animals and plants in contact with contaminated soil and waters on Base, and relating to contaminated waters of Rapid Creek and Ludmilla Creek, off the Base. Concentrations of PFAS in plants and animals were very low in waters south of the base, in Sadgroves and Reichardt creeks. The results were used in the site specific Human Health Risk Assessment and Ecological Risk Assessment.

On 7 May 2018, an independent expert health panel conclude there is mostly limited, or in some cases no evidence, that human exposure to PFAS is linked with human disease. The panel also advised that the evidence does not support any specific health of disease screening or other health interventions for highly exposed groups in Australia, except for research purpose; and decisions and advice by public health officials about regulating or avoiding specific PFAS chemicals should be mainly based on scientific evidence about the persistence and build-up of PFAS.


On 3 April 2017, the Department of Health published Food Standards Australia New Zealand’s (FSANZ) report, Perfluorinated Chemicals in Food, which includes health based guidance values for site investigations in Australia, a dietary exposure assessment, and risk management advice, for authorities investigating PFAS contamination. The health based guidance values derived by FSANZ help inform Human Health Risk Assessments.


The investigation is being conducted in accordance with the National Environmental Protection (Assessment of Site Contamination) Measures 1999 (NEPM) and PFAS National Environmental Management Plan (NEMP). The NEPM was established by Commonwealth legislation and incorporated into the laws of each of the States and Territories to provide a nationally consistent approach in the assessment of site contamination.

Next steps

The outcomes from this investigation are being used to develop a PFAS Management Area Plan (PMAP) for the Darwin Management Area. To find out more visit http://www.defence.gov.au/environment/pfas/Darwin/publications.asp.

Keeping the community informed

Defence will continue to keep the community informed on the outcomes of further sampling and the implementation of management plans. As additional information becomes available, updates will be provided through the website, direct mail, fact sheets and newsletters.

Contact Information

National PFAS information line
Phone  1800 365 414
Email  PFASDefenceCoordination@golder.com.au

Media enquiries should be directed to Defence Media Operations on (02) 6127 1999 or media@defence.gov.au