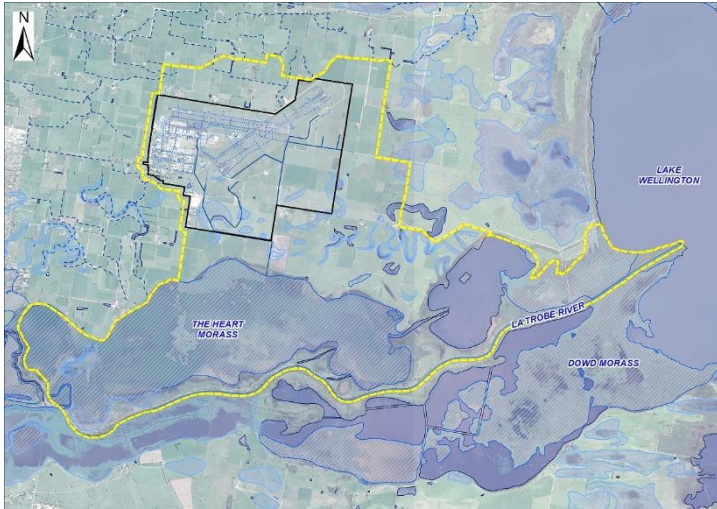




Background

In April 2016, the Department of Defence (Defence) engaged an independent environmental consultant to undertake a detailed environmental investigation into the presence of per- and poly-fluoroalkyl substances (PFAS) on, and in the vicinity of, RAAF Base East Sale (the base).



RAAF Base East Sale investigation area (yellow boundary)

The base has a history of using legacy Aqueous Film Forming Foam (AFFF) for emergency fire-fighting situations and fire-fighting training. In 2004, Defence commenced phasing out its use of legacy AFFF containing perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA) as active ingredients. The AFFF now used by Defence is a more environmentally safe product.

About per- and poly-fluoroalkyl substances (PFAS)

PFOS, PFOA and perfluorohexane sulfonate (PFHxS) belong to a group of chemicals known as per- and poly-fluoroalkyl substances (PFAS).

AFFF containing PFOS and PFOA as active ingredients were once used extensively worldwide and within Australia because of their effectiveness in fighting liquid fuel fires. PFHxS was also commonly found in the AFFF as an impurity in the manufacturing process or as a breakdown product.

PFAS were also used across Australia and internationally in a range of common household products and specialty applications, including in the manufacture of non-stick cookware; fabric, furniture and carpet stain protection applications; food packaging and in some industrial processes. As a result, most people living in the developed world will have levels of PFAS in their body.



Common Sources of PFAS

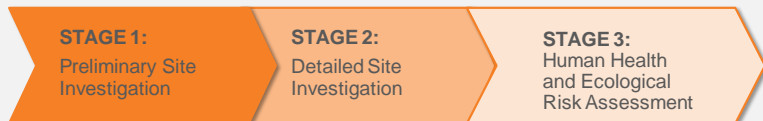
The Objective of the Investigation

The investigation is part of Defence's review of a number of its properties around Australia that used legacy fire-fighting foams containing PFAS.

The objective for the environmental investigation is to identify the nature and extent of PFAS in the environment from legacy AFFF use at the base and any potential risks to people or the environment. The understanding of these potential risks will assist in developing mitigation strategies to minimise exposure.

The environmental investigation is being undertaken in accordance with the National Environment Protection (Assessment of Site Contamination) Measure 1999 (NEPM). The NEPM process includes:

- Preliminary Site Investigation (PSI),
- Detailed Site Investigation (DSI), and
- Human Health and Ecological Risk Assessment (HHERA) if required.



Results of the investigation are being reported to relevant government agencies, regulatory bodies and the independent site auditor.





Stage 1: Preliminary Site Investigation

The first stage of the investigation, the preliminary site investigation (PSI), commenced in May 2016 and was reported in October 2016.

Key findings of the PSI included:

- understanding site characteristics
- identifying possible PFAS sources both on and off base based on historical AFFF storage, use and handling, including: fire truck maintenance, AFFF storage areas, fueling area, former and current fire stations, fire training grounds and waste burial areas
- identifying possible migration pathways of PFAS; principally surface water drainage and transport within groundwater
- identifying on-base and off-base receptors to inform the DSI, including:
 - People – on-base personnel, residents and adjoining land users
 - Environment – plants and animals principally in The Heart Morass and water bodies

These findings assisted in developing the understanding of potential impacts to people and the environment in the Sale area, from the use of legacy AFFF.

Sources: where and when legacy AFFF was used
Pathways: how PFAS moves in the environment and the possible exposure to people and the environment
Receptors: people and the environment that may possibly be exposed to PFAS

Stage 2: Detailed Site Investigation

The PSI findings were used to develop the sampling plan for the detailed site investigation (DSI). The DSI commenced in September 2016, and was finalized in June 2017. The DSI involved on and off-base sampling in soil, surface water, drainage lines and groundwater to further assess the nature and extent of PFAS on and near the base.

Investigation and sampling included:

- 383 on-base, and 49 off-base soil sampling locations.
- 84 on-base, and 39 off-base groundwater locations.
- 49 on-base and 64 off-base surface water locations.
- 67 on-base, and 68 off-base sediment locations (paired with surface water locations where water was present).
- 12 on-base grass locations and 9 locations off-base, from two private properties.
- 4 on-base stock use and 1 on-base and 4 off-base human consumption water use supply locations.

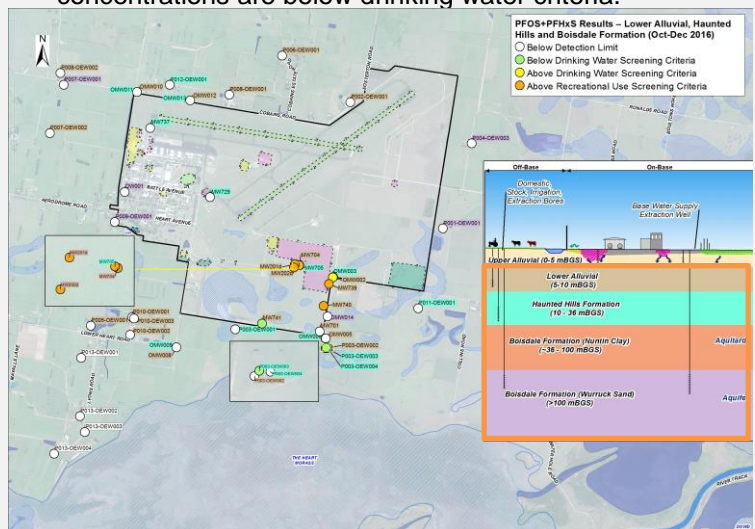
The findings of the PSI and DSI were used to establish the Investigation Area for the environmental investigation at the base and its surrounds (Page 1). The key findings of the DSI are presented as follows.

Soil Findings:

- Low PFAS concentrations were recorded in samples across the base. Most concentrations are below the adopted human health screening criteria for a residential setting. Samples from the child care centre, kindergarten and residential accommodation were many times lower than the residential human health screening criteria.
- PFAS concentrations recorded in samples from operational areas are generally below adopted human health screening criteria for a commercial/industrial setting.
- Samples collected on private properties off-base, recorded very low concentrations of PFAS that are many times lower than the adopted human health screening criteria for a residential setting.

Groundwater Findings:

- The highest concentrations of PFAS are within the shallow (upper alluvial) water table aquifer, generally at source areas where legacy AFFF was stored or used historically. On-base concentrations are generally above human health screening criteria.
- Boundary concentrations of PFAS above drinking water criteria, with potential for off-base migration to east and south.
- Shallow groundwater not extracted for use in the area on or off-base.
- Shallow groundwater has also been identified to be intermittently discharging into the main Eastern Drain.
- Concentrations of PFAS in deep groundwater (lower alluvial and haunted hills formation) are present in southeast of base, including on the boundary, above drinking water criteria.
- Deep groundwater (including Boisdale Formation) is extracted in the area, but private property bore concentrations are below drinking water criteria.



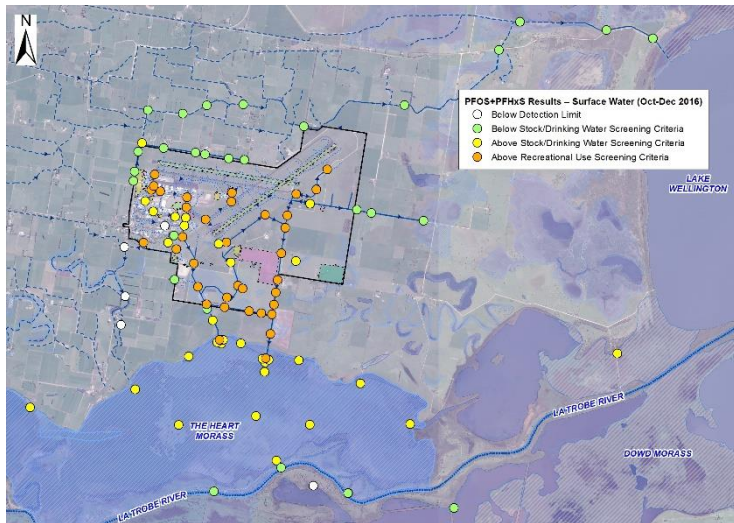
Deeper groundwater sample results compared to human health screening criteria.





Surface Water and Sediment Findings:

- PFAS concentrations were recorded in almost all samples collected from drainage lines, irrigation channels and The Heart Morass.
- The highest concentrations were reported in drains close to on-base areas where legacy AFFF was stored or used historically, and in the main drains off-base where they enter The Heart Morass. Concentrations exceeded the recreational screening criteria, which is protective of people where incidental contact and splashing of water is likely to occur.
- Low PFAS concentrations were reported in most off-base samples within natural waterways, dams and irrigation channels, below the adopted recreational screening criteria, but above ecological screening criteria.
- The concentrations of PFAS recorded in surface water and sediment indicate the need for further evaluation of the risk to people and the environment. This is being progressed in the conduct of a human health and ecological risk assessment (HHERA).



Surface water sample results compared to human health screening criteria.

Water Supply Findings:

- PFAS concentrations above the limit of reporting were not recorded in the on-base drinking water supply, which is partially supplied by groundwater from the deep regional aquifer was sampled
- PFAS concentrations above the limit of reporting were not recorded in four private property water tanks.
- PFAS concentrations were either not above the limit of reporting or below stock drinking water screening criteria from on-base stock trough water.

Preliminary Risk Findings:

- All results compared against the adopted screening criteria (where available) to obtain a preliminary understanding of risks to people and the environment.
- The DSI works did not identify any imminent environmental hazards; however, it did indicate the need for assessment of biota like fish and ducks. This is being undertaken as part of the HHERA process.
- The main pathway for off-base migration of PFAS impact is via the surface water drainage features at the base, and to a lesser extent groundwater.
- Based on the findings of the DSI, the human receptors/pathways requiring further assessment primarily relate to:

- worker direct contact with surface water in drains and/or shallow groundwater, and
- consumption of agricultural products or wildlife/game into which PFAS may have bioaccumulated.

Ecological receptors requiring further assessment are primarily:

- predators who may feed on aquatic flora/fauna within open drains or other surface water bodies (e.g. fish eating birds),
- on-base terrestrial receptors within source areas, and
- aquatic flora and fauna within The Heart Morass and, to a lesser extent, the Latrobe River.





Stage 3: Human Health and Ecological Risk Assessment (HHERA)

Based on the DSI findings, it was identified that a HHERA was required to be conducted. The aim of the HHERA is to assess the risks to people and the ecology from exposure to PFAS in the environment caused by legacy AFFF use.

The HHERA involves a detailed scientific process using the results of environmental sampling, to assess the risk to human health and the receiving environment. The HHERA commenced in October 2016 and is expected to be reported to the community in late 2017. The process includes assessing:

- the potential for harm,
- receptors and pathways of exposure,
- exposure levels, and
- likelihood of effects occurring.

The HHERA is considering all pathways where exceedances of screening levels were identified, or where no relevant screening levels are available.

Additional data is currently being collected to support the HHERA. This includes the collection of the following biota samples from the Heart Morass and other surface waters (including on-base ponds):

- Fish, eels, and ducks.
- Aquatic Invertebrates (e.g. yabbies) and aquatic plants.

This data will be used to assess:

- Potential risks to humans consuming wildlife/game.
- Potential Ecological receptors higher up the food chain, who may feed on organisms into which PFAS has bioaccumulated.

A land use survey is also being completed within the Investigation Area to inform the inputs for the conduct of the HHERA.

The results of the risk assessment will assist with planning for managing identified risks and remediation or management of PFAS sources in the environment (where required).

Current Guidance

Defence investigations are informed by national guidelines. The Commonwealth Department of Health released final Health Based Guidance Values (HBGVs) for PFAS in water on 3 April 2017. These values were developed by Food Safety Australia New Zealand (FSANZ) at the request of the Department of Health and replace the interim Environmental Health Standing Committee (enHealth) guidelines released in June 2016.

Defence will adopt the final HBGVs in all its environmental investigations including RAAF Base East Sale.

Keeping the community informed

Defence is committed to regularly updating the community as the investigation progresses. As new information becomes available, updates will be provided through the project website, community information sessions, direct mail and fact sheets.

Results of the HHERA are expected in late 2017. Detailed findings from the HHERA will be reported to the relevant government agencies and regulatory bodies and the local community as soon as possible thereafter.

Useful Links

- Australian Government Department of Health:
Webpage:
<http://www.health.gov.au/internet/main/publishing.nsf/Content/ohp-pfas.htm>

Department of Health PFAS Hotline: **1800 941 180**
- Environment Protection Authority Victoria:
Webpage:
<http://www.epa.vic.gov.au/your-environment/land-and-groundwater/pfas-in-victoria>
- Food Standards Australia and New Zealand (FSANZ):
Webpage:
<http://www.health.gov.au/internet/main/publishing.nsf/Content/ohp-pfas.htm>

Contact the Project Team

Phone: 1800 365 414

Email: PFASDefenceCoordination@golder.com.au

Webpage: www.defence.gov.au/id/eastsale/

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