Army Aviation Centre Oakey
Stage 2C Environmental Investigation

Environmental Site Assessment (ESA) Report Factsheet

About the Investigation
The Department of Defence (Defence) is finalising an independent environmental investigation of per- and polyfluoroalkyl substances (PFAS) on, and in the vicinity of, Army Aviation Centre Oakey (the base). The investigation is part of Defence’s review of a number of its sites around Australia that used legacy fire-fighting foams containing PFAS including perfluorooctane sulfonate, known as PFOS and perfluorooctanoic acid, known as PFOA. Defence has phased out the use of the old foams that contained PFOS and PFOA as active ingredients and is proactively managing legacy contamination across its estate.

All detailed environmental investigations are undertaken in accordance with the Australian National Environment Protection Measure Framework (NEPM), specifically the Assessment of Site Contamination Measure. This is the national guidance document for the assessment of site contamination in Australia.

Environmental investigations conducted to date include:

- Stage 1 – groundwater sampling beneath the base
- Stage 2A – targeted off-site sampling
- Stage 2B – historical review of AFFF use and wider scale sampling

In July 2016 the first part of the Stage 2C Environmental Investigation was completed. The Stage 2C Environmental Investigation includes three main parts:

1. Environmental Site Assessment (ESA) – completed July 2016

This fact sheet provides an overview of the ESA report that is available on the AACO project website http://www.defence.gov.au/id/Oakey/Default.asp.

Objectives of the ESA
The objectives of the ESA were to:

- further assess the nature and extent of PFAS on, and near the base;
- investigate how PFAS moves through the environment; and
- generate data to be used in the HHRA and ERA.
ESA Key findings

PFAS Source Areas

Nine primary PFAS source areas were confirmed at the base, including current and historical areas used for refuelling, AFFF storage areas, fire fighting training and the old fire station area.

While the base no longer uses AFFF products containing PFOS and PFOA as active ingredients, residual PFAS in soil, sediments and pavement can leach to surface and groundwater.

Excavation, transportation and landfilling of soil containing PFAS could also create additional source areas. Defence will take this into account when planning and conducting redevelopment activities at the base.

PFAS behaviour

Where AFFF has been used:

- PFAS accumulates in the soil or soaks into pavements;
- rainwater leaching carries the highly soluble compounds through the soil profile to the groundwater table; and
- surface water run-off dissolves PFAS and carries it to surface water drains and creeks.
Detections of PFOS and PFOA in Groundwater

Sampling has shown that groundwater containing PFOS and PFOA has migrated off-base in a west/south westerly direction towards Oakey Creek.

The inferred extent of PFOS and PFOA in the groundwater is shown in the figures below.

The plumes extend further to the south of the base than would be expected based on the predominantly westerly regional groundwater flow direction. This is interpreted to be due to:

- infiltration of PFAS-impacted bore water to underlying aquifers during irrigation activities;
- migration of surface water to the south along drains and then infiltrating to groundwater;
- mobilisation of PFAS to the south and west along Oakey Creek during periods of high rain fall and flooding; and
- extraction from bores drawing groundwater to the south.

The groundwater plume maps:

- provide a visual representation of predicted PFOS and PFOA concentrations based on sampling data; and
- use conservative assumptions to reduce the potential for underestimating the extent of PFOS and PFOA in groundwater.

Groundwater Modelling

If no management actions or remediation activities are implemented, the groundwater modelling predicts that the plumes are likely to expand:

- up to 500m west beyond the current detection areas after 10 years; and
- up to approximately 2 km west from the current detection areas after 100 years.

PFAS concentrations in the Upper Oakey Creek Alluvium aquifer were generally greater than concentrations in the Lower Oakey Creek Alluvium aquifer. The presence of PFAS in the Lower Oakey Creek Alluvium shows there is a degree of connectivity between the two aquifers.

How are PFAS transported off the base?

PFAS migrate:

- vertically from the source areas through the soil profile to groundwater; and
- in surface water run-off from the source areas through the drain network across the base and off-base.

PFAS movement is likely influenced by:

- groundwater pumping from bores drawing from the Oakey Creek Alluvium; and/or
- migration of PFAS-impacted surface water along southerly unlined drains and Oakey Creek, with infiltration to groundwater;
- mobilisation of PFAS along Oakey Creek during periods of flow, with infiltration to groundwater at considerable distances from the base.

The movement of PFAS in surface water and groundwater has spread the impact more widely than anticipated by transport in groundwater alone.
INFERRED EXTENT OF PFOS IMPACTED GROUNDWATER - US EPA 2009 (0.2 μg/l)

INFERRED EXTENT OF PFOA IMPACTED GROUNDWATER - US EPA 2009 (0.4 μg/l)
**ESA Key findings**

**Sediment and surface water**

*Sediment samples* were collected from Oakey Creek, Doctor Creek, drainage lines and dams.

- PFAS were detected in the majority of drainage line sediment samples. The concentrations found in these samples were all below the adopted residential soil criteria of 6 mg/kg (PFOS) and 16 mg/kg (PFOA).
- PFOA was not detected in sediment samples from Oakey Creek or Doctor Creek.

*Surface water samples* were also collected from Oakey Creek, Doctor Creek, drainage lines and dams.

- Concentrations of PFAS were detected in all drainage line surface water samples both on-and-off the base.

The results of the sediment and surface water sampling indicated:

- Highest concentrations of PFAS were detected in surface water and sediment in drainage lines at the base, with concentrations declining down-gradient; and
- Drainage lines are an ongoing secondary source of contamination on-and-off base, and a pathway for PFAS migration off the base.

**Soil**

*Soil samples* were collected from 12 locations at the base and 8 locations off-base.

- On-base soil samples - PFOS was detected in less than half of the samples and PFOA was detected in one sample collected from the base.
- Off-base soil samples - PFOS was detected in one sample and PFOA was not detected in any of the samples collected from off the base.
- These PFAS detections were generally recorded in samples collected from surface soil, although PFAS was also detected in some samples collected from depths of up to 3 metres.
Next steps

HHRA and ERA
The Stage 2C Environmental Investigation includes three main parts:

1. Environmental Site Assessment (ESA) – completed July 2016
2. Human Health Risk Assessment (HHRA) – being finalised
3. Ecological Risk Assessment (ERA) – being finalised

Using the data included in the ESA report, the HHRA and ERA aim to assess the potential for human health and ecological risks to identified groups of people, animals and plants on-base and off-base. The HHRA and ERA consider PFAS reported in soil, groundwater, surface water, sediment, and terrestrial and aquatic plants and animals together with the pathways through which exposures may occur to determine potential risks. A ‘receptor’ is a person or thing (e.g. plant or animal) that can be exposed to these compounds. A ‘pathway’ is the way in which they can be exposed (e.g. drinking water or eating food containing these compounds).

Defence expects the HHRA to be completed by late August 2016 and the ERA to be completed by September 2016.

Management Options
Defence continues to engage with industry experts both nationally and internationally and is working collaboratively with the Queensland Government to explore a number of short and long-term PFAS management options. These include research into potential remediation technologies such as foam separation, ultrasonification, solidification and stabilisation.

Field trials commenced for some of these options in April 2016.

More information on these management options can be found at: http://www.defence.gov.au/id/Oakey/Guidance.asp

Drinking Water Assistance
Defence’s first priority continues to be that Oakey community members have access to an alternative source of drinking water. If you rely on bore water for drinking please contact 1800 136 129 to discuss possible management strategies.

Defence is currently supplying 31 households with alternative water supplies.

Further information

Queensland and Local Government
Defence is working collaboratively with a number of Queensland (QLD) and local government agencies.

- QLD Department of Environment and Heritage Protection: 13 74 68
- QLD Department of Natural Resources: 13 74 68
- QLD Department of Agriculture and Fisheries: 13 25 23
- QLD Department of Health: 13 43 25 84
- Darling Downs Hospital and Health Service (Oakey Hospital): 07 4691 4888
- Darling Downs Mental Health Acute Care Team (24/7): 07 4616 5210
- Toowoomba Regional Council: 131 872

Keeping the community informed
Defence is committed to regularly updating the community throughout the investigation. The project website will be updated as the investigation progresses. Community information sessions, direct mail and factsheets will be provided as new information becomes available. Enquiries or requests relating to individual properties will be considered on a case-by-case basis.

Contact the project team
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