PFAS Environmental Investigation Sampling

This fact sheet aims to explain sampling methodologies that may be undertaken by specialist environmental contractors as part of the Department of Defence's per- and poly-fluoroalkyl substances (PFAS) detailed environmental investigations.

Background

Defence has commenced a national program to investigate and implement a comprehensive approach to manage the potential impacts of PFAS resulting from the historical use of legacy fire fighting foams at some of its bases. These older formulations of foams were once used extensively worldwide and in Australia due to their effectiveness in fighting liquid fuel fires. When Defence commenced its investigations into PFAS, perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) were the primary contaminants of concern. More recently enHealth has advised perfluorohexane sulfonate (PFHxS) should also be considered and has developed screening criteria for drinking water and recreational water. All Defence environmental investigations into PFAS now consider PFOS, PFOA and PFHxS as the primary contaminants of concern.

Investigation Sampling

The environmental investigations include sampling and laboratory analysis of water, soil and biota (the animal and plant life of a particular region). There are two general categories of sampling:

1) **Residential water sampling, including extraction bores and rainwater tanks**: This includes samples from privately owned bores and tanks, used for household purposes, to understand conditions of bore water used for household purposes.

   Requests for sampling of private bores and tanks are assessed on a case-by-case basis, considerations may include the following:
   - is the site within a defined investigation area?
   - is there an operational bore on the site?
   - is there a tank on the site?
   - has bore water been used to fill a tank for drinking purposes?
   - has the tank or bore been sampled before?

2) **Environmental investigation sampling locations**. A range of sampling is undertaken on private and public land as well as Defence land in the investigation area. This sampling assesses the extent and characteristics of PFAS.-The investigations may involve:

   a) **Surface water and sediment samples**: This includes samples from specified drains, channels, dams, rivers or creeks which are used to characterise the local surface water and sediment conditions;
   b) **Soil samples**: This includes surface and deeper soil samples from specific locations throughout an investigation area to assess the local soil conditions and quality;
   c) **Groundwater samples:** Where necessary, monitoring wells are specifically designed and installed to assess the aquifer (i.e. *in-situ* groundwater) conditions, characteristics and quality;
   d) **Biota samples**: Should an ecological or human health risk assessment be required, animal and plant products such as animal meat and tissue, milk, eggs, pasture, fruit, vegetables and fish may be sampled.

   Sampling locations are chosen:
   - to identify potential locations of where PFAS originated
   - to target sensitive receptors (for example local environment, schools, hospitals and homes)
   - to understand the ground water system and the movement of surface water,
   - to understand possible exposure pathways.

For the purpose of the environmental investigations, not every property in the area being investigated needs to be tested.

Results from all samples, whether residential or part of the wider investigation sampling, inform environmental, human health and ecological risk assessments.

Data quality

All environmental investigation sampling is undertaken following strict procedures to ensure data is of a high quality. The methodologies described are consistent with relevant Australian standards and the National Environment Protection (Assessment of Site Contamination) Measure framework.

The following steps are undertaken during environmental sampling:

- laboratory-supplied sample containers are prepared and labelled
- a fresh pair of nitrile gloves are used by the field staff member taking the sample
- the sample is immediately placed in a cooler, and
- re-useable sampling equipment is cleaned between each location and each sample collection.

All samples are transported under industry standard, chain of custody procedures to a National Association of Testing Authorities (NATA) accredited laboratory.

Sampling Methodologies Explained

Residential water sampling, including extraction bore and rainwater tank sampling methodology

This involves sampling of water from the 'first flush' when the tap is turned on. A first flush sample is likely to represent the potential "worst case" conditions following stagnation of water in pipework. If targeted compounds have accumulated on pipework and are released into water during the first flush, the sample will include them.

The following steps are undertaken when sampling a private bore or tank:

- the sample container is placed beneath the tap outlet (connected to bore or tank) and the tap is slowly opened to collect the first draw
- field water quality parameters are recorded from tap water collected in a secondary container (e.g. pH, temperature, dissolved oxygen, electrical conductivity and reduction/oxidation potential), and
- general observations of water quality are recorded, including colour, turbidity and odour.

Surface water sampling methodology

The following steps are undertaken during surface water sampling:

- a sample container is attached to a sampling pole and lowered into the surface water to collect a sample directly into the container
- care is taken to ensure the water column and the base of the channel at the sampling location is not agitated during sampling, and
- field water quality parameters are recorded (e.g. pH, temperature, dissolved oxygen, electrical conductivity and turbidity) as well as general observations including water quality (colour, turbidity and odour) and water flow.

Sediment sampling methodology

The following steps are undertaken during sediment sampling:

- depending on the depth of the water body, sediment samples are collected using either a 'Dormer Piston' sediment sampler, or by using a hand auger driven into the drain, channel or creek to a typical sediment depth of 0.1 m. Sometimes deeper samples are also required, and
- field observations, including sediment type, texture and colour are recorded.

Soil sampling methodology

The following steps are undertaken during soil sampling:

- for surface soils, a shovel, hand trowel or hand auger may be used to collect samples,
- for deeper soils, a hand auger or specialist drill rig may be used to collect discrete interval samples, or continuous coring samples, and
- field observations, including soil types, texture, colour and quality (presence of waste, staining, odours) are recorded for the depth of investigation.

Groundwater monitoring well sampling methodology

The following steps are undertaken during groundwater sampling:

- depth to groundwater is measured using a water level meter. This allows calculation of groundwater flow direction when a number of points have been measured
- groundwater is removed from the well using one of a variety of sampling methods to ensure a representative sample is collected. These may include bladder pumps, suction pumps, inertial pumps, electric pumps and bailers
- field water quality parameters are recorded (e.g. pH, temperature, dissolved oxygen, electrical conductivity and turbidity)
- general observations about water quality are also recorded, including colour, turbidity, odour and water flow, and
- once water quality is considered representative of *in-situ* aquifer conditions, through consistent water quality parameters or removal of a pre-determined volume of groundwater, then groundwater is collected in a sample container.

Biota sampling methodology

Biota sampling is undertaken should initial ground and surface water sampling indicate the need to assess the potential human health and ecological risks from exposure to PFAS.

The sampling methodology used will vary based on the type of biota being sampled. Where possible, Defence aims to use existing biota data and will work collaboratively with State government agencies to access this data.

The types of biota sampled will also depend on the specific site being investigated. These may include:

- fruit and vegetable samples
- pasture samples
- native plants
- animal by-products, such as milk from cows or goats which graze in the investigation area
- backyard chicken eggs
- fish from local waterways and/or fisheries
- feral animals such as rabbits
- blood serum, and
- tissue samples.

Ethics permits and other legislative requirements are strictly adhered to before any biota sampling is undertaken.

Need more information?

Phone: 1800 365 414 (freecall during business hours)
Web: www.defence.gov.au/ID/PFOSPFOA/
Email: PFASDefenceCoordination@golder.com.au

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