

Interim position statement on PFAS



Environment
Protection
Authority Victoria

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* This replaces 1669 issued October 2017

Purpose of this interim position statement

The purpose of this interim position statement is to outline EPA Victoria's (EPA) current state of knowledge regarding per- and polyfluorinated alkyl substances (PFAS). It also provides guidance on EPA's current approach to the assessment and management of PFAS sources and how to approach potential contamination.

This document is intended to be updated as new information becomes available. It is intended for guidance and information purposes only and is not a legally binding document. It does not require PFAS to be managed in particular ways as management approaches must recognise the individual characteristics of a site and situation. Individual sites will have specific regulatory requirements that will be determined by EPA.

A PFAS National Environment Management Plan (NEMP) is currently under consultation. This position paper will be reviewed and updated in line with the final PFAS NEMP.

Visit EPA's [website](#) for further information.

Why are we focusing on PFAS?

PFAS are a group of manufactured chemicals that have been used in firefighting foams and other industrial and consumer products for many decades. There are over 3000 individual PFA substances, the two most well studied are PFOS (perfluorooctane sulphonate) and PFOA (perfluorooctanoic acid).

There is worldwide concern about PFAS due to their wide use, environmental persistence, and chemical properties that allow easy movement through the environment and subsequent bioaccumulation through the food chain.

The general public are exposed to small amounts of PFAS in everyday life through exposure to dust, indoor and outdoor air, food, water and contact with consumer products that contain these, such as outdoor gear, new carpets and cookware. This explains why there are background levels of these chemicals found in humans who have no occupational exposure to these products (Agency for Toxic Substances and Disease Registry 2015).

For most people, food is thought to be the most important source of exposure. Treated carpets and floors treated with waxes and sealants that contain PFAS can be an important source of exposure for babies and infants.

Where larger quantities of PFAS have been released into the environment, communities located near those sites may be exposed to higher levels than the general public. In these sites contaminated by PFAS, drinking water and specific foods are the primary exposure pathways.

Conceptual models of the potential for PFAS movement and exposure of humans and the environment from two key pathways (industrial sites and in the domestic environment) are shown in Figures 1 and 2.

Environmental effects of PFAS

PFAS have been used widely, are persistent and move easily through the environment through surface water run-off and leaching to groundwater. Low concentrations of PFAS can be found in Australia in soil, sediment, surface water, groundwater, biota and waste.

Environmental contamination is of growing concern as PFAS have been shown to have adverse impacts on fish and some animals. PFAS accumulate in the bodies of animals, particularly those that breathe air and consume fish (such as dolphins, whales, seals, sea birds and polar bears), and concentrations increase significantly in the tissues of animals higher up in the food chain.

In studies where large doses of PFAS are given to laboratory animals, possible links with effects on the immune system, liver, reproduction, development and benign (non-cancer) tumours have been reported.

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Health effects of PFAS

There is no consistent evidence that PFAS are harmful to human health, or cause any specific illnesses such as cancer, including in highly exposed occupational populations (enHealth, 2016). Possible links between PFOS and PFOA exposure and several health effects have been reported in epidemiological studies around the world. However, many of these findings have been inconsistent, with some studies identifying problems and others finding none.

Experimental animal studies indicate possible effects on the immune system, liver, reproduction and development. PFAS behaves differently in the bodies of animals compared with humans, therefore the results of animal studies may not reflect health impacts in humans (Department of Health, undated). Because these chemicals remain in humans and the environment for many years, it is recommended that as a precaution human exposure to PFAS be minimised wherever possible.

For further information on the potential health effects and exposure pathways of PFAS, see the Australian Department of Health's website: <http://www.health.gov.au/internet/main/publishing.nsf/Content/ohp-pfas.htm#pfas>

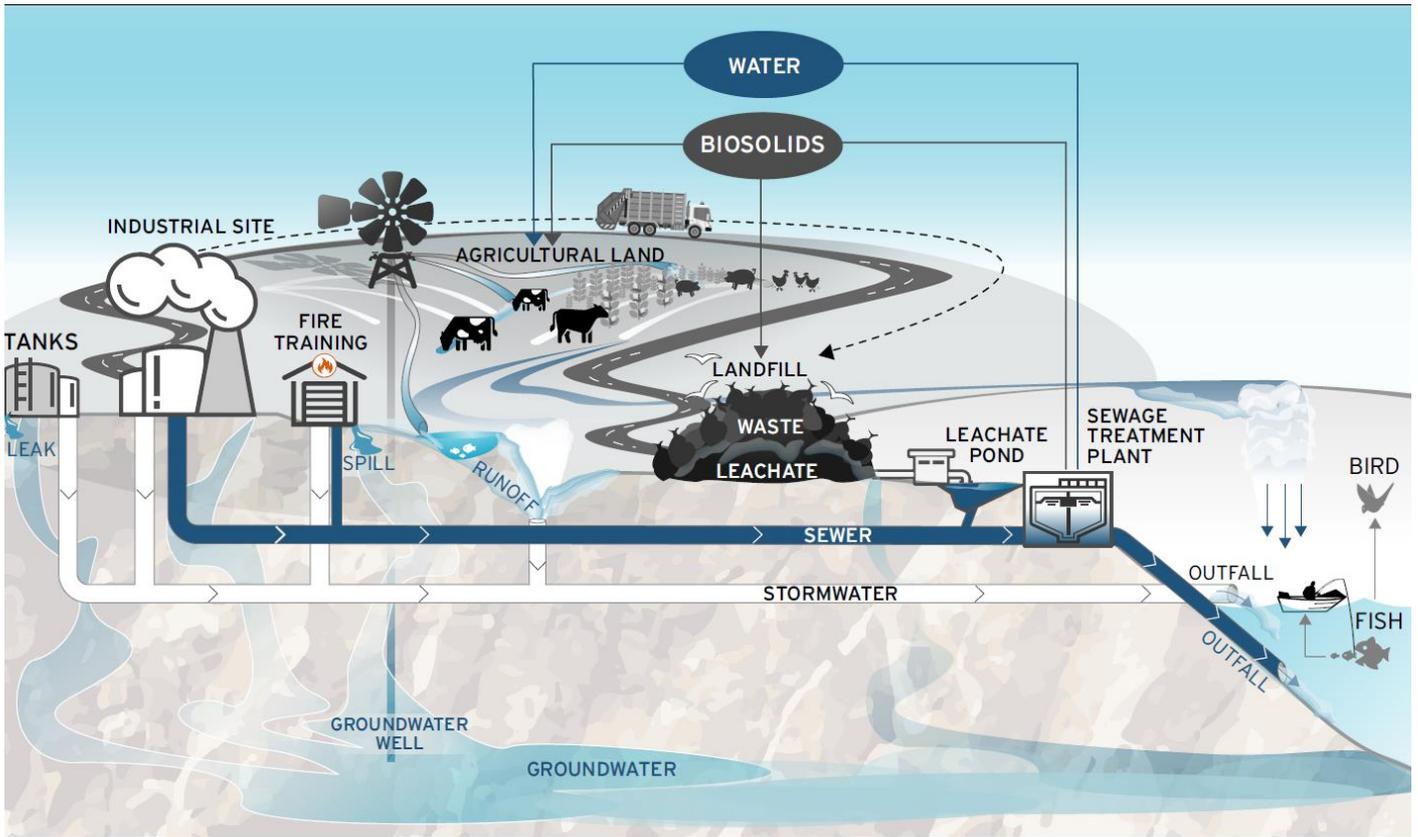


Figure 1 Potential for PFAS movement from industrial sites and potential pathways for human and environmental exposure.

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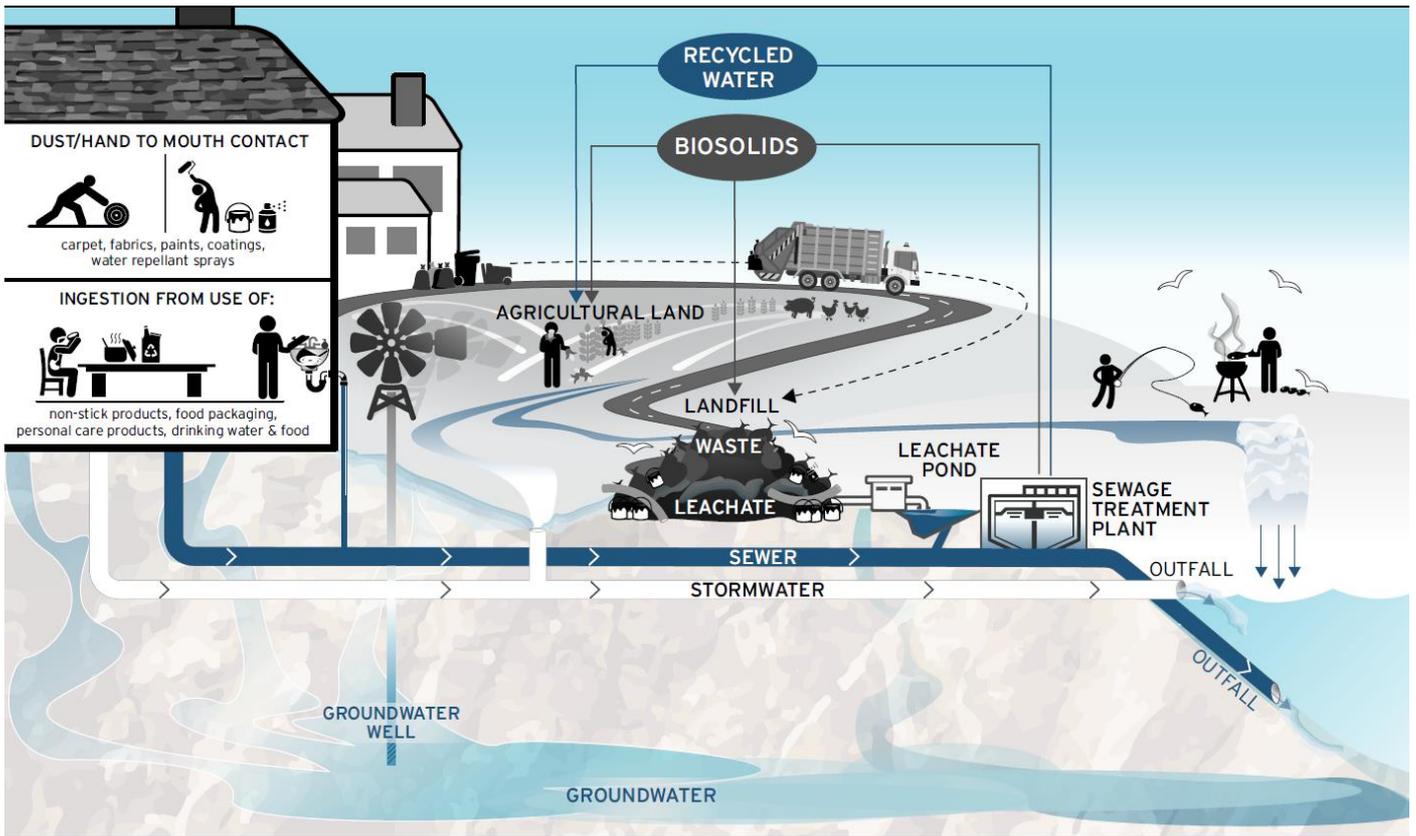


Figure 2 Potential for PFAS movement and potential pathways for human and environmental exposure in the domestic environment.

Stocks of PFAS in Victoria

EPA has identified a number of PFAS stocks in Victoria and focused on the likely major industries that would use PFAS, in collaboration with industry.

The major sources of PFAS found were:

- oil and gas industry
- firefighting
- bulk storage facilities for flammable products
- chemical manufacturing
- metal plating.

The stocktake indicated that:

- short-chain PFAS have been substituted in firefighting foams for PFOS and PFOA-containing foams. There is little information on the environmental and human health impacts of these short-chain compounds; and
- there are gaps in knowledge regarding the appropriate management and disposal of PFAS, representing a risk to the environment.

What do we know about PFAS in the environment in Victoria

Nationally, PFAS compounds have been identified at a number of sites with a historic use of firefighting foams and other PFAS-containing substances. Wastewater discharges, recycled water, landfill leachate and biosolids have been identified as sources of PFAS. Through EPA's regulatory activity, PFAS have been found in water discharges, waters, sediments, waste and contaminated soils in Victoria.

To better understand the scale of potential contamination in the environment by PFAS, EPA undertook a limited assessment of the amount of contamination in the surrounding environment in Victoria for key PFAS. The study focused on soil, groundwater, surface water (freshwater), landfill leachate and groundwater as well as marine biota, variously in greater Melbourne, the Yarra River and Goulburn catchments, and Port Philip Bay. In addition, some data was provided by duty holders for landfill leachate and groundwater, freshwater, wastewater discharges and biosolids.

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PFAS were found in all types of samples collected by EPA, but not at all locations where these types of samples were taken (see Table 1 for a summary of results). EPA is currently preparing a publication summarising the results in more detail.

Table 1 Summary of PFOS, PFOA and PFHxS (perfluorohexane sulfonate) results of EPA's ambient PFAS contamination assessment

Soil sample concentrations	Surface freshwater concentrations	Fish and mussels	Groundwater, wastewater and biosolid samples
PFOS (<0.5-8.4 ug/kg)	PFOS (<0.0002-0.016 ug/l)	Measurable concentrations of PFOS but not PFHxS or PFOA above the detection limit of 1 ug/kg	Elevated concentrations of PFOS, PFOA and PFHxS above the detection limit of 0.01 ug/L
PFOA (<0.5 – 0.56 ug/kg)	PFOA (0.0011 – 0.0287 ug/l)		
PFHxS (<0.5-0.82 ug/kg)	PFHxS (<0.0002-0.022 ug/l)		

Management of PFAS

PFAS contamination is dealt with like other types of environmental contamination. That means EPA can use its statutory powers under the *Environment Protection Act 1970* to hold polluters and landholders to account and issue remedial notices requiring sites to be investigated and cleaned up. As Victoria's environment regulator, it is EPA's role to investigate potential environmental contamination from PFAS and other chemicals, including in soil and groundwater.

EPA's focus is on preventing the potential for off-site environmental and human health impacts from PFAS through source control. EPA has been working with industries and locations where PFAS are known to have been used. Investigations of the concentrations and the potential for any off-site contamination of the environment with PFAS have also been undertaken.

PFAS contaminated sites, related impacts and waste are managed on a case by case basis proportionate to the risks posed to the environment and human health.

Preferred PFAS management hierarchy

- Treatment and destruction is preferred:** Given the persistent nature of PFAS, the great distances that it can move through the environment, and its bioaccumulation potential in the food chain, through flora and fauna uptake and accumulation in natural ecosystems.
- Immobilisation and onsite encapsulation in engineered facilities is second preference:** If the source site is hydrogeologically appropriate, has acceptably managed risk to the on and off-site beneficial uses (direct and indirect) for soils, surface water and groundwater and there is capacity at the site. Leachate would need to be captured, treated and the removed PFAS destroyed.
- Immobilisation and offsite removal to a specific landfill cell is third preference:** Leachate should be captured, treated and the removed PFAS destroyed. This option would be most appropriate when the landfill is better situated than the source site and where the PFAS–liner interaction is understood.

Interim recommendations for the management of low concentration PFAS contaminated soil

- There are currently limited treatment options available for PFAS contaminated waste in Australia. EPA recommends destruction technologies where available and practical, and containment where destruction is not an option. EPA does not recommend disposal of PFAS contaminated wastewater through trade waste.
- Onsite containment (with consideration of prior immobilisation). EPA will advise on containment onsite requirements. Landfill licence amendments will also be considered with a decision made as to whether this is required.
- Landfill disposal of low concentration, low volume wastes/soils. EPA will establish interim low concentration (total and leachable) values below which small volumes, not able to be otherwise managed at a contaminated site, of contaminated soils may be acceptable for landfill disposal. Criteria will also be established where such materials can remain in situ and for post-treatment waste where no further management action is required as the risks are considered acceptable.
- EPA will use waste code M160 as the interim waste code to determine which landfills can accept these materials. For contaminated soil, N codes with contaminant 17 should be used. As an interim measure these movements will be approved and tracked through a classification to go with the consignment to landfill where appropriate.

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Criteria for assessing PFAS under different exposure scenarios

There are a range of interim or draft criteria that have been released nationally and internationally for the purpose of assessing PFAS contamination and risk to human health. These criteria have been developed for a range of different exposure scenarios. It is expected that the final version of the PFAS NEMP will establish a single set of environment and health criteria that can be used to inform site investigations at sites contaminated with PFAS. Victoria will look to adopting these criteria once the PFAS NEMP has been finalised.

The tables in Attachment 1 provide a summary of Australian criteria and standards. These tables have been taken from the consultation draft of the PFAS NEMP (August 2017).

EPA recommends that these criteria are used as thresholds that indicate whether further investigation may be required. These values should only be used in conjunction with other investigations to account for leaching, off-site transport, bioaccumulation and secondary exposure. Along with testing for the main PFAS compounds, EPA also recommends using techniques such as Total Oxidisable Precursor Assay (TOPA) as well as determining Total Organic Fluorine (TOF) to indicate the total amount of other PFAS present.

Future work planned by EPA Victoria

Future EPA work on this issue will be informed by the results of a further ambient environmental assessment to understand the spatial extent, magnitude, sources and pathways of PFAS contamination, and site-specific assessments. EPA will be working on establishing waste codes, guidelines for onsite-containment of contaminated wastes and soils and landfill acceptance and leachate criteria.

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References

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Environment Protection Authority Victoria 2017, *Incoming water standards for aquatic ecosystem protection: PFOS and PFOA* (EPA Publication 1633.2), at <http://www.epa.vic.gov.au/our-work/publications/publication/2017/august/1633-2>

Food Standards Australia New Zealand (FSANZ) 2017, *Hazard assessment report – Perfluorooctane Sulfonate (PFOS), Perfluorooctanoic Acid (PFOA), Perfluorohexane Sulfonate (PFHxS)*, at [http://www.health.gov.au/internet/main/publishing.nsf/Content/2200FE086D480353CA2580C900817CDC/\\$File/6.sd1-Hazard-assessment-report.pdf](http://www.health.gov.au/internet/main/publishing.nsf/Content/2200FE086D480353CA2580C900817CDC/$File/6.sd1-Hazard-assessment-report.pdf)

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Attachment 1

Table 1: Australian interim and draft ecological criteria

Exposure Scenario	PFOS	PFOA	Land Use /Environment Value	Comments and Source
Ecological - freshwater	0.00023 µg/L	19 µg/L	High conservation value systems (99% species protection)	<p>Australian and New Zealand Guidelines for Fresh and Marine Water Quality – technical draft default guideline values</p> <p>Note: These investigation levels are protective of environmental values only and are not to be used in setting drinking water guideline values which are derived according to different methods – human health effects can differ from effects observed in aquatic ecosystems. See <i>Incoming water standards for aquatic ecosystem protection: PFOS and PFOA</i> (EPA Publication 1633.2) for further information on how these criteria should be applied.</p>
	0.13 µg/L	220 µg/L	Slightly to moderately disturbed systems (95% species protection)	
	2 µg/L	632 µg/L	Highly disturbed systems (90% species protection)	
	31 µg/L	1824 µg/L	Highly disturbed systems (80% species protection)	

Table 2: Australian interim and draft health based criteria by exposure scenario

Exposure Scenario	PFOS/PFHxS	PFOA	Land Use /Environment Value	Comments and Source
Health based guidance values	0.02 µg/kg _{bw} /d	0.16 µg/kg _{bw} /d	Tolerable Daily Intake (TDI)	FSANZ 2017a
	0.07 µg/L	0.56 µg/L	Drinking Water	Health 2017
	0.7 µg/L	5.6 µg/L	Recreational Water	
Soil – Health based screening levels	0.009 mg/kg	0.1 mg/kg	Residential	<p>Based on 20% of FSANZ TDI, ie. up to 80% of exposure is assumed to come from other pathways. ASC NEMP HIL-A assumptions with home grown produce included. OEH/NSW</p> <p>Note: For all soil screening values from OEH/NSW: these values should only be used in conjunction with other investigation to account for potential leaching, off-site transport, bioaccumulation and secondary exposure.</p>
	2 mg/kg	20 mg/kg	High Density Residential	<p>Based on 20% of FSANZ TDI, ie. up to 80% of exposure is assumed to come from other pathways. ASC NEMP HIL-B assumptions OEH/NSW</p> <p>Note: For all soil screening values from OEH/NSW: these values should only be used in conjunction with other investigation to account for potential leaching, off-site</p>

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Exposure Scenario	PFOS/PFHxS	PFOA	Land Use /Environment Value	Comments and Source
	20 mg/kg	100 mg/kg	Industrial/Commercial	<p>transport, bioaccumulation and secondary exposure.</p> <p>Based on 20% of FSANZ TDI, ie. up to 80% of exposure is assumed to come from other pathways. ASC NEPM HIL-D assumptions including 8 hrs time spent indoors and 1 hr spent outdoors at an industrial/commercial site OEH/NSW</p> <p>Note: For all soil screening values from OEH/NSW: these values should only be used in conjunction with other investigation to account for potential leaching, off-site transport, bioaccumulation and secondary exposure.</p>

Health based guidance values are available at <http://www.health.gov.au/internet/main/publishing.nsf/Content/ohp-pfas-hbgv.htm>.

Incoming water standards for aquatic ecosystem protection: PFOS and PFOA (EPA Publication 1633.2) is available at <http://www.epa.vic.gov.au/our-work/publications/publication/2017/august/1633-2>.