

Environmental Management of Firefighting Foam

Operational Policy

Overview

An increasing number of contamination sites are being identified in Australia and overseas from the historic and current use of firefighting foams containing fluorinated organic chemicals, which today are recognised as a significant threat to human health and environmental values.

To address this, the Queensland Department of Environment and Heritage Protection undertook an extensive review of the issue and developed the Operational Policy for the Environmental Management of Firefighting Foam, which was released in July 2016.

The Policy sets out:

- foam management standards that need to be met by users
- the relevant test standards and baseline information necessary to help users make sound decisions when selecting foam for a particular situation and planning for and responding to incidents.

The use of any firefighting foam has the potential to have a combination of environmental, health and economic impacts and it is ultimately the end user bears the range of risks and liabilities.

The Policy requires firefighting foam end users to implement best-practice management practices for foam handling, use and disposal in compliance with Queensland's *Environmental Protection Act 1994*.

This fact sheet summarises the key issues and should be read in conjunction with the Operational Policy and associated Explanatory Notes.

Firefighting foam

Firefighting foam refers to a variety of liquid concentrates and their aqueous solutions that are used in the production of streams or blankets of air/gas-filled bubbles to suppress flammable or toxic vapours; increase water penetration; reduce static spark generation; control or extinguish fires; and, prevent re-ignition by excluding air and cooling the fuel.

Firefighting foams may be applied by hand, portable or fixed systems to prevent or extinguish fires involving:

- **Class A fires**—in carbonaceous combustible materials, such as wood, paper, fabric, plastics and rubber, where the fire can be deep-seated in the burning material.
- **Class B fires**—of flammable and combustible liquids or spills such as liquid hydrocarbon fuels and polar solvents where the fire and vapours are on the surface of the liquid.

When deciding on the most appropriate foam for a particular application, and whether or not proposed or current systems are adequate, the user has an obligation to carefully consider the full range of short-term and long-term risks and factors that influence how balanced best practice can be achieved in protecting Life-Property-Environment.

The primary consideration in managing any hazardous activity is safety and the protection of life, especially in situations where foam may be used; however, long-term risk factors must also be considered to minimise the risk to the end user and the community.

Characteristics of firefighting foam

The characteristics of firefighting foam that most need to be considered for environmental effects include:

- **Acute toxicity**—the short-term adverse effects on plants and animals, mostly in regard to releases to waterways.
- **Biochemical oxygen demand (BOD)**—the depletion of oxygen levels in waterways from the decay of organics.
- **Persistence**—of toxic components, especially persistent organic pollutants (POPs).
- **Chronic toxicity**—the long-term adverse effects in plants and animals (including humans) of ongoing or repeated exposure to toxins. Especially persistent organic chemicals.
- **Bioaccumulation**—the accumulation of released toxic components in plants and animals over time, as well as bio-concentration of toxins up the food chain.

Key operational policy requirements

The Policy addresses the management of all firefighting foams with a particular focus on the need to prevent the ongoing release of fluorinated organic chemicals.

For the purposes of the Policy firefighting foams are grouped according to:

- **Non-persistent foams** that are fully biodegradable and do not contain persistent organic chemicals. Fluorine-free foams are non-persistent foams provided that they do not contain any other types of persistent organic compounds.
- **Persistent foams** that contain persistent organic compounds that do not degrade under environmental conditions. These are foams that contain any persistent toxic chemicals such as siloxanes, perfluorinated or polyfluorinated compounds, fluorotelomers, fluoropolymers, or similar composite compounds. This includes all foams called AFFF, FP, FFFP, etc. and their alcohol resistant (e.g. AFFF-AR) variants.



Main changes under Policy:

- **PFOS legacy foams** must be removed from service as soon as possible.
- **Long-chain legacy fluorinated foams ($\geq C7$)** must be phased-out as soon as practicable within the implementation timeline.
- **Interim containment and control measures** for long-chain legacy foams must be implemented while being phased out.
- **Alternative short-chain C6-PURE foam ($\leq C6 = 99.5\%$ of PFAS)** use is acceptable but all firewater and wastes must be fully contained in impervious bunding or sumps.
- **No discharge of fluorinated organic foams** of any sort is allowable directly to the environment.
- **PFOS plus PFHxS contamination of replacement foam** stocks limit of 10 mg/kg (0.001%) in concentrate.
- **PFOA, PFOA precursors or higher homologues ($\geq C7$)** contamination of replacement foam stocks limit of 50 mg/kg (0.005%) in concentrate.
- **All fluorinated organic wastes** must be disposed of by high-temperature destruction (contaminated soils are dealt with outside of the Policy).
- **Non-persistent foam wastes**, including fluorine-free foam, must be contained where possible. Essential uses and emergency incidents where there are direct releases to the environment are tolerable provided that all reasonable and practicable measures are taken to minimise environmental harm. E.g. roadside fires and spills, on-water incidents in ports or marinas.

*Note that foams described as 'C6-based' are unlikely to be C6 pure and probably contain significant concentrations of PFOA, PFOA precursors or higher homologues.

Implementation timeline

Foam end users must phase out and adopt best-practice measures by July 2019 (three years after the Policy was introduced).

This general period of grace is provided for users with legacy persistent foams, recognising the need for upgrades to come into compliance with the Policy. However, achieving compliance must be as-soon-as-practical within the implementation period.

It is recognised that some larger facilities may require additional time to undertake components such as design, budgeting, installation and commissioning while maintaining day-to-day operations.

During the implementation period where legacy persistent foam is currently in use (or where other measures are needed to contain wastes and firewater), the user must adopt interim measures to minimise the release of foam.

Waste management and disposal

Where there are wastes from foam use on a spill or fire, there may also be other contaminants—such as hydrocarbons and combustion products—present. The considerations for the foam-related components of the waste are outlined below—these apply even when there are other contaminants which may require more stringent management measures.

Once foam is used, spilled or the concentrate requires disposal, the resulting firewater, wastewater or waste is classed as a regulated waste under environmental regulations. This is due to them containing surfactants, and in many cases, persistent organo-halogen compounds including all fluorinated organic compounds.

Foam waste disposal requirements depend on whether or not the foam waste is fully degradable or contains persistent organic compounds (or other contaminants). Generally:

- **Non-persistent foam wastes** that do not contain other contaminants can be disposed of according to their degradable organic and surfactant content. This can be by appropriate and approved treatment on-site or off-site through standard wastewater treatment plants, biodegradation in ponds or bunds or irrigation to land under similar restrictions to the irrigation of other similar effluent.
- **Persistent foam wastes** that contain persistent organic chemicals including fluorinated organic chemicals can only be disposed of by high-temperature incineration. The facility accepting the waste and/or destroying it must be licensed to receive those sorts of wastes for high-temperature destruction.

Further information

The Environmental Management of Firefighting Foam—Operational Policy, explanatory notes, and other further information is available at <https://www.qld.gov.au/environment/pollution/management/investigation-pfas/firefighting-foam/>.