

Regulatory position statement

Per- and poly-fluoroalkyl substances (PFAS) in organic material processing (composting)

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1. Summary

The Queensland Government, through Queensland's Organics Strategy 2022-2032, is supporting a range of initiatives to divert organic material from landfill and to produce high value products.

Concentrations of per- and poly-fluoroalkyl substances (PFAS) in organic wastes used to produce compost are typically absent or quite low, however, there are certain types of organic waste that are more likely to contain PFAS contamination and need to be carefully screened, managed and monitored by operators.

This regulatory position statement briefly describes how the Department of Environment, Science and Innovation (the department) as the environmental regulator is managing PFAS contamination in organic waste and compost, and how it will support operators to produce high quality, safe and sustainable compost in Queensland.

Position on PFAS in compost:

1. Queensland supports the expansion of a sustainable organics industry to divert material from landfill, but this must not be at the expense of the broader environment or lead to long term contamination and community health risks.
2. The department, as the environmental regulator, is actively working across multiple sectors to manage historical contamination and prevent the further spread of PFAS. For the organics industry, this is particularly important given the wide and unrestricted use of compost and potential for spread of contamination.
3. As part of the roll out of Food Organics and Garden Organics (FOGO) in Queensland, a considered and careful approach is being taken, including not allowing food packaging or materials other than food and organic matter into the FOGO waste stream. Behaviour change programs to reduce contamination are also being rolled out.
4. Queensland is actively working with the Commonwealth to support the phase out of PFAS in food packaging and other materials to reduce the risk of contamination.
5. The environmental regulator is currently working with environmental authority (EA) holders to modernise conditions of their authorities to ensure a safe, sustainable composting industry moving forward. This includes working to set appropriate PFAS limits for finished compost based on the best available science to protect environmental values, including human and ecological health.
6. The environmental regulator is working with individual EA holders to discuss their operations and the application of new EA conditions. A range of EA holders have already adopted these conditions. This includes monitoring for contaminants and making changes to feedstocks to ensure compliance with conditions.
7. The environmental regulator will generally be taking a measured approach to compliance as the industry adjusts to the limits and as broader work is undertaken at the national level to phase out PFAS imports, manufacturing and use. Any compliance approach will consider site specific issues and what an EA holder has done to investigate and reduce the levels of contamination in the finished compost and demonstrate that they have met their general environmental duty (GED).
8. The government, through the Recycling and Jobs Fund, will provide further funding to undertake further PFAS monitoring of feedstocks (other than just FOGO) to help EA holders better understand the risks of different feedstocks on finished compost.
9. The environmental regulator will develop education materials to assist EA holders with understanding expectations and how to appropriately implement monitoring and testing of finished compost.

2. Background

PFAS are a group of 'forever chemicals' that can persist in the environment long-term, bioaccumulate in living organisms and are highly mobile in water and soils. Globally, scientific knowledge is emerging on the long-term nature and negative impacts of PFAS in the environment and to human health. The Queensland Government recognises the importance of managing PFAS contamination to protect community and environmental health. We are taking a precautionary approach in line with the Intergovernmental Agreement on a National Framework for Responding to PFAS Contamination.

In Queensland, the composting industry converts over a million tonnes of organic residues and waste per annum into products which generally improve soil health and quality. Composting also reduces the volume of solid wastes reaching landfill and reduces emissions.

In Queensland, limits and restrictions have been applied to several activities to ensure PFAS contamination is minimised and managed to protect the community and environment.

The Queensland Government was the first jurisdiction to phase out PFAS in firefighting foam and placed management requirements on biosolids through an end of waste code.

The environmental regulator has also developed a Best Practice Environmental Management Guideline (ESR/2021/5670) and Model Operating Conditions (MOCs) (ESR/2015/1665) for composting activities to address a range of issues, including PFAS contamination in compost.

The Queensland Waste Management and Resource Recovery Strategy (Waste Strategy) outlines a priority to transition towards a circular economy, where the recovery of organic waste through activities such as composting is a major contributor to this transition. Queensland's Organics Strategy 2022-2032 (Organics Strategy) also outlines a range of targets and actions to minimise organic waste, divert it from landfill and recycle it into products. FOGO and the expansion of composting is not the only initiative supported by the Organics Strategy, which also includes other initiatives such as education, food rescue, bioenergy and biochemical processing.

3. Regulation of organic material processing by composting

Under the Environmental Protection Regulation 2019 (EP Regulation), an EA is required to carry out the Environmentally Relevant Activity (ERA) of organic material processing by composting (ERA 53(a)). As defined in the EP Regulation, organic material processing consists of operating a facility for processing, by way of composting or anaerobic digestion, more than 200t of organic material in a year. Where, for the purpose of this position statement, composting is the controlled biological decomposition of organic material under aerobic and thermophilic conditions to manufacture a pasteurised finished compost.

ERA 53(a) is not an activity that:

- Can treat or remove PFAS compounds; or
- Involves diluting waste containing hazardous substances into products for unrestricted use.

The EP Regulation further details the types of organic materials and wastes that are permitted for composting in Queensland. Wastes that are not included or are specifically excluded by the definition of organic material or organic waste must not be incorporated into composting under ERA 53(a).

What wastes can be used in composting?

Under the EP Regulation, organic waste is defined as including the following:

- i. a substance used for manufacturing fertiliser for agricultural, horticultural or garden use;**
- ii. animal manure;**
- iii. biosolids;**
- iv. cardboard and paper waste;**
- v. fish processing waste;**
- vi. food and food processing waste;**
- vii. grease trap waste;**
- viii. green waste;**
- ix. poultry processing waste;**
- x. waste generated from an abattoir; but**

does not include:

- i. biosecurity waste; or**
- ii. clinical or related waste; or**
- iii. contaminated soil; or**
- iv. synthetic substances, other than synthetic substances used for manufacturing fertiliser for agricultural, horticultural or garden use.**

Synthetic substances, such as PFAS, are excluded from the definition of organic waste and must therefore not be used as a composting feedstock. It is acknowledged, however that some organic wastes are likely to contain a level of PFAS contamination. This issue was recognised in the draft PFAS National Environmental Management Plan (NEMP) Version 3.0, which identifies animal manure; biosolids; cardboard and paper waste; food and food processing waste; grease trap waste; and abattoir waste as moderate to high risk for PFAS contamination (Section 12.4.2 of the Draft PFAS NEMP 3.0).

In addition, Appendix B of the Best Practice Environmental Management Guideline (ESR/2021/5670) identifies the need to understand the source feedstocks and take measures to quantify potential PFAS contamination:

“Materials originating from activities or sites associated with PFAS contamination, except where representative analysis results for the load using lowest practicable limits of reporting, including paired standard and total oxidisable precursor assay and for solids, Australian Standard Leaching Procedure (ASLP) leachability with an unbuffered leach

solution, indicate absence of PFAS.”

Where there is a potential of environmental risk from adding a feedstock received onsite to the compost, the EA holder must assess the risk and characteristics of the feedstock and source before inclusion.

4. Queensland PFAS limits in compost

Use of finished compost in Queensland is largely unrestricted, including for use in broadscale landscaping, agriculture, and food and vegetable production. As our knowledge of the impacts of PFAS contamination continues to grow on the local and international scale, the Queensland Government will continue to periodically review and update advice and regulation to ensure that community health and safety and the environment is protected.

Under the *Environmental Protection Act 1994* (EP Act), all PFAS are regulated as regulated waste, hazardous contaminants or prescribed water contaminants.

Finished compost PFAS limits:

The following PFAS limits are outlined in the MOCs. These limits were updated in early 2024 from the July 2021 version to combine a number of PFASs in order to provide greater flexibility without reducing the protection provided.

Substance	Concentration (µg/kg)
PFOS + PFHxS	2
PFOA	1
Sum of PFBA, PFPeA, PFHxA, PFHpA, PFNA, PFDA, PFUnDA, PFDODA, PFTrDA, PFTeDA, 4:2 FTS, 6:2 FTS, 8:2 FTS and 10:2 FTS (above LOR ¹)	3
Sum of PFOSA (or FOSA), N-MeFOSA, N-EtFOSA, N-MeFOSE, N-EtFOSE, N-MeFOSAA and N-EtFOSAA (above LOR ¹)	1
PFAS leachability	To be kept to minimum practicable (µg/L)

These PFAS limits are based on the trigger values in the Biosolids End of Waste code (Biosolids EoW Code) but are more conservative given the unrestricted use of compost products. The Biosolids EoW Code has a raft of requirements to manage the reuse of biosolids such as, registering as a user and producer of biosolids, placing biosolids in accordance with buffer distances to potential receptors, and testing of biosolids and soil prior to, and post application to inform management measures in accordance with GED.

The Biosolids EoW Code limits were derived to protect health and food quality based on the uptake rates of PFAS by plants and livestock in an agricultural setting. This same methodology forms the basis of the finished compost limits. In addition, the PFAS groupings have been determined based on their toxicity and fate and transport in the environment.

The finished compost PFAS limits are similar to guidance values for unrestricted re-use of PFAS impacted soils in other states, including South Australia and Victoria.

Monitoring and testing requirements

The minimum monitoring frequency is to consist of 1 composite sample (constituting at least 5 grab samples) and must be undertaken every 90 days or every 300 dry solid tonnes (dst) of finished compost being produced, whichever is more frequent. This sampling frequency is less than that required for biosolids (every 130 dry solid tonnes).

It is important to note that the MOCs provide a default set of conditions that may apply to all composting activities. An alternative monitoring frequency may be applicable to certain sites depending on site-specific monitoring data and consideration of the types and consistency of feedstocks received onsite. For example, a site that doesn't take high risk feedstocks and has demonstrated over a period of time that PFAS levels remain low, may revert to sampling biannually.

Each sample of finished compost must include both standard analysis (28 suite) and total oxidisable precursor (TOP) Assay analysis using the lowest practicable limit of reporting (LOR) <0.5 µg/kg solids and LOR <0.001 µg/L for liquids.

¹ Using the lowest practicable LOR <0.5 µg/kg for solids and LOR <0.001 µg/L for liquids. Where only those results above the LOR are summed (i.e., actual detections).

Further guidance on monitoring and testing is provided in the *Information Sheet: Monitoring and testing for PFAS in organic material processing (composting)* (ESR/2024/6782).

5. PFAS in compost

There have been numerous studies both in Australia and internationally that investigate PFAS contamination of organic wastes. The studies clearly show that PFAS contamination of some organic wastes is a challenge faced by composters.

Despite these challenges, monitoring programs undertaken by the environmental regulator in 2017 and 2023 across Queensland have demonstrated that the finished compost limits are achievable, with seven of the nine composting EA holders tested complying with the limits. As of March 2023, 18 composting EA holders in Queensland have adopted PFAS limits on their licences, further demonstrating that it is possible to manufacture safe and commercially viable compost.

Concerns have also been raised about the potential risks of PFAS contamination in FOGO. For example, the report by NSW EPA “What’s the Go with FOGO” looked at a range of contaminants, including PFAS at 18 FOGO and GO composting facilities across NSW. The results showed some of the facilities had average PFAS concentrations exceeding the Queensland finished compost MOC limits. The EPA report found that PFAS sources such as fibre-based food contact materials were being disposed of in FOGO bins, leading to a position statement being released by the NSW EPA to provide clarity on what can and can’t go into FOGO. Many facilities also reported contaminants in every load received at the facility, such as soft and hard plastics, food packaging, cardboard, textiles, meat, and Styrofoam. Despite these challenges the study also found that some facilities were compliant with the MOC limits. NSW does not currently have PFAS limits on finished compost.

The Queensland Government engaged the University of Queensland in 2023 to undertake a FOGO study to examine the rates of PFAS contamination in feedstocks and finished compost at several FOGO composting facilities around Queensland. The study found that 73% of the FOGO received at composting facilities met the Queensland finished compost limits, indicating that FOGO can be a suitable feedstock for composting. The results of this study confirm however that physical contamination of FOGO is also a challenge in Queensland. Exceedances for FOGO were largely associated with one subgroup of PFAS (PFCAs), likely from cardboards and packaging, reinforcing the need for behaviour change programs and the phasing out of PFAS in food packaging. Finished compost results also showed that meeting the limits is achievable, however some sites were taking other high-risk feedstocks that was likely contributing to exceedances, reinforcing the need for careful management of feedstocks.

While studies have shown elevated concentrations of PFAS in FOGO, it is likely these concentrations are a result of co-mingling PFAS contaminated wastes with FOGO. This is supported by the Food Safety Australia and New Zealand (FSANZ) Australian 27th Total Dietary study completed in 2021. The study analysed 1,336 samples of 112 commonly eaten foods. Of the 30 PFAS analysed, PFOS was the only PFAS identified and was detected in just 22 samples (less than 2%). Further, only 2 of the 1,336 samples tested exceeded the MOC limits.

In Queensland, the definition of FOGO includes garden organics, food waste and compostable bags. Other materials are not permitted. This contrasts with some other states that allow other materials in FOGO.

The Queensland Government is supporting EA holders with this challenge through other initiatives such as phasing out PFAS in food packaging, supporting behaviour change programs, and providing funding to undertake PFAS monitoring to help EA holders better understand the risks of different feedstocks on the finished compost.

6. What can composting EA holders do to meet the PFAS limit?

Compost data collected by the environmental regulator and industry has shown that it is possible to produce compost that meets the MOC limits. However, careful selection and management of feedstocks is required to prevent contamination of the finished compost, as well as the land and waters adjacent to where the composting is undertaken. The Best Practice Environmental Management Guideline (ESR/2021/5670) and draft NEMP 3.0 provide information that EA holders can use to inform operational decisions.

Particular caution should be taken where higher risk feedstocks are accepted. This may include, but is not limited to:

- Organic derived industrial liquid wastes (e.g., grease trap waste)
- Cardboard and paper waste (including some ‘compostable’ food containers)
- Biosolids
- Abattoir waste

Not all organic wastes are suitable for composting. As such, composting EA holders must be aware of the types of waste authorised to be received at the site, the potential for the waste to be contaminated with PFAS, as well as organic wastes that are prohibited under their EA. It is important for EA holders to have a thorough understanding of the nature, source and quality of the organic waste. This may include asking the waste transporter where the waste originated from, whether it has been mixed with other types of waste, and whether the waste has been tested for contaminants. Codes assigned to some wastes, as listed in Schedule 11 of the EP Regulation, can also help EA holders determine whether or not a waste is permitted for use in ERA 53. For example, the MOCs outline prohibited materials or feedstock containing prohibited materials which are not to be used in composting.

It is the responsibility of the EA holder to understand the potential risk of any waste prior to accepting the material onto the site for composting. This is particularly relevant for sites also approved to conduct waste processing or treatment activities (ERA 55), where regulated waste other than organic waste may be received.

Developing and implementing a feedstock management plan is an effective tool to help EA holders understand and assess the potential risk of a waste received onsite intended for composting. A feedstock management plan:

- Assesses if a feedstock is suitable for the processing techniques used onsite and identifies if it contains PFAS or other potential contaminants.
- May include a sampling program suitable for the operation that assists in understanding the potential risk prior to the incorporation of the feedstock into the composting process onsite.
- Allows for the EA holder to determine early on whether there may be the potential for the finished product feedstock limit to be exceeded and/or whether the feedstock contains prohibited materials (such as PFAS) which would need to be rejected.

The feedstock management plan assists EA holders to make informed decisions about what to incorporate into the composting process in order to meet the PFAS limits for final compost.

7. What transition will there be to meet the new limits?

The environmental regulator is working with individual EA holders to discuss their operations and update their EAs to the modernised MOCs (ESR/2015/1665) that better reflect the contemporary understanding of risks associated with composting activities. Wherever possible, the environmental regulator is seeking to do this by agreement.

The conditions in the MOCs include monitoring for contaminants and managing feedstocks to ensure compliance. Many operators without modernised conditions are already undertaking monitoring for contaminants as part of the Australian Standard for compost (which currently has requirements for a number of contaminants, but not PFAS).

As EAs are transitioned to incorporate the new conditions, the environmental regulator will continue to consider and assess a range of factors including the site's proximity and location to sensitive receptors (e.g., environmental and human health pathways), authorised feedstocks that can be received onsite and the existing processing techniques being used.

A range of EA holders have adopted modernised conditions already. For those who adopted the conditions before early 2024, the environmental regulator will invite them to update their limits to the summed PFAS groups to provide greater flexibility and reduce the likelihood of exceeding individual PFAS limits.

8. What compliance approach will be taken?

The environmental regulator takes a proportionate approach to compliance as outlined in its Enforcement Guidelines (ESR/2021/5549). Compliance action may not be taken for minor exceedances or anomalous results provided that the EA holder has taken reasonably practicable steps to identify and reject prohibited and high-risk waste, monitor and manage contamination, and meet their GED. However, where there are significant and repeated exceedances with little demonstration of actions to reduce contamination, stronger compliance action should be expected.

The new finished composting limits are vital to protecting Queensland's environment and community from further PFAS exposure. However, as industry adjusts to the new limits and as broader work is undertaken at the national level to phase out PFAS imports, manufacturing and use by mid-2025, the environmental regulator will consider where sites are taking reasonable steps to manage PFAS sources and demonstrate their GED.

Under section 319 of the EP Act, a person has a GED to prevent environmental harm, nuisance, and contamination, including implications for outputs of the activity when it involves processing potentially hazardous materials into unrestricted use products. If an EA holder exceeds the new limits on their EA, the environmental regulator will consider whether the EA holder has complied with their GED, when considering an appropriate compliance response. This may include taking action to identify and investigate sources of PFAS that may have led to the exceedances and

implementing measures to reduce the potential of environmental harm. The environmental regulator has published the Best Practice Environmental Management ERA 53(a) Organic material processing by composting (ESR/2021/5670) guideline to assist EA holders in managing the environmental risks associated with their activities.

9. What happens if an EA holder exceeds the limit?

The environmental regulator does not support diluting PFAS contamination through blending of finished product as an appropriate management strategy for handling PFAS contamination. However, it may be considered in specific circumstances.

If the finished compost exceeds the PFAS limits on the EA, the EA holder may consider blending finished compost to comply with the limits provided the following criteria have been met:

- The EA holder has demonstrated they have complied with their GED as set out above;
- Appropriate changes are made to feedstock acceptance to minimise likelihood of a recurring problem; and
- The site conditions allow for blending of compost.

Further information on complying with GED and appropriately managing feedstocks can be found in the Best Practice Environmental Management ERA 53(a) Organic material processing by composting (ESR/2021/5670).

The environmental regulator is committed to working with EA holders to achieve positive outcomes for the industry whilst maintaining the necessary protections for our community and the environment. If onsite blending is not feasible or will not lower PFAS contamination enough to meet the limits on the EA, EA holders are encouraged to discuss alternatives with the environmental regulator. The environmental regulator will take a site-specific compliance approach where exceedances of the new limits occur and actions will be based on consideration of the EA holder's adherence to the principles of GED, the conditions of the EA, and how the composting on site is managed.

10. What are the impacts if PFAS limits are not set?

The trend internationally (e.g., in the United States and European Union (EU)) has been to increasingly lower PFAS limits based on improved understanding of the potential health impacts and given their ability to bioaccumulate even at very low concentrations. Some international limits may impact on Queensland (e.g., meat exports to the EU if livestock become contaminated with PFAS).

Allowing widespread use of compost without appropriate PFAS limits presents a number of risks:

- Community health risks from using compost materials in home gardens and vegetable patches.
- Food safety risks as a result of using compost on agricultural land for food production.
- Contaminating nearby waterways and impacting food resources such as fish from contaminated waterways. A number of alerts are currently listed on the department's [website](#) advising against consuming fish from waterways around Queensland due to PFAS contamination.
- PFAS leaching into surface water and groundwater adversely affecting human uses such as drinking water, aquaculture, crop irrigation and stock watering, as well as placing compost users at unwitting risk of breaching state laws against releasing such contaminants into waters.
- Contamination of other land parcels or water bodies due to compost use (e.g., on linear infrastructure projects) and significant clean-up costs associated with contaminated land.
- Environmental risks to aquatic species and birds from PFAS leaching from compost into adjacent waterways and bioaccumulating. For example, freshwater turtles found in waters immediately downstream of an industrial area in Queensland were found to have some of the highest PFOS levels in the world. An analysis of the turtles' blood showed biochemical signatures associated with overall health problems. Turtle eggs were found to contain high levels of PFAS, which were then transferred to hatchlings. The biochemical signature of hatchlings was linked to immune system problems, decreased growth and development, and hatchling deformities.

11. What else is being done to prevent PFAS contamination?

The Queensland Government has taken a number of measures to restrict and manage PFAS in Queensland. In 2016, Queensland became the first jurisdiction in Australia to introduce a policy to phase out PFAS in firefighting foams. In 2019, Queensland also became the first state to regulate PFAS in biosolid reuse through the Biosolids EoW Code so that critical agricultural land is protected.

The Australian Government has scheduled PFOS, PFHxS, PFOA and their related substances through the Industrial Chemical Environmental Management Standard (IChEMS) framework. These scheduling decisions effectively prohibit the import, export, use and manufacturing of these PFAS in Australia by 2025.

Further, the Australian Packaging Covenant Organisation has committed to phasing PFAS out of all food packaging by 2025. The Federal Government has also committed to stepping up as the new regulator of packaging standards and will mandate how packaging is designed, set minimum recycled content requirements and prohibit harmful chemicals being used.

12. More information

Best Practice Environmental Management Guideline (ESR/2021/5670):

https://environment.des.qld.gov.au/__data/assets/pdf_file/0027/245169/era-gl-bpem-composting.pdf

DES Enforcement Guidelines ESR/2021/5549:

https://environment.des.qld.gov.au/__data/assets/pdf_file/0030/86619/enforcement-guidelines.pdf

Food Safety Australia and New Zealand (FSANZ) Australian 27th Total Dietary study:

<https://www.foodstandards.gov.au/science-data/monitor/australian-total-diet-study#:~:text=Overall%2C%20the%2027th%20ATDS%20found,New%20Zealand%20Food%20Standards%20Code>

Intergovernmental Agreement on a National Framework for Responding to PFAS Contamination:

<https://federation.gov.au/about/agreements/intergovernmental-agreement-national-framework-responding-pfas-contamination>

Model operating conditions (ESR/2015/1665):

https://environment.des.qld.gov.au/__data/assets/pdf_file/0027/87426/pr-co-composting.pdf

PFAS National Environmental Management Plan (PFAS NEMP) 2.0:

<https://www.dcceew.gov.au/environment/protection/publications/pfas-nemp-2>

Queensland Organics Strategy 2022–2032: https://www.qld.gov.au/__data/assets/pdf_file/0024/240747/organics-strategy-2022-2032.pdf

Risk based conditioning approach (ESR/2023/6443):

https://environment.des.qld.gov.au/__data/assets/pdf_file/0012/311502/era-is-risk-based-conditioning.pdf