Australian Government
National Health and Medical Research Council

NHMRC

Public consultation submissions on draft per- and polyfluoroalkyl substances (PFAS) guidance

This document contains submissions made to the 21 October – 22 November 2024 National Health and Medical Research Council (NHMRC) public consultation on draft per- and polyfluoroalkyl substances (PFAS) guidance for the Australian Drinking Water Guidelines. Only submissions for which respondents have granted permission for publication have been included. All individual names and contact information have been removed or redacted prior to release.

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1	**INDIVIDUAL RESPONSE 01** *Development of guidance* It appears that the process taken was to some degree based on evidence and findings from various studies. The findings were that, in general, there are significant health concerns related to PFAS. In response, governments from a number of other developed nations, along with WHO, have dramatically reduced their limits for PFAS, and in some cases have completely banned particular substances. According to the Administrative Report, in March 2024, the committee members generally agreed to maintain existing guidelines for a number of substances. My understanding is that this was done on the basis of evidence available at the time. There has since been media coverage that has highlighted inadequate PFAS testing being done by Australia governments As such, this suggests that the committee members made decisions based incorrect and missing information. Following the media coverage, Australia governments conducted water testing in several areas, and found evident of presence of PFAS greatly exceeding the guideline limits. This draft with updated PFAS limits has now been released. The proposed limits for some substances are notably higher than those set by a number of other developed nations, as well as WHO. Overall, this suggests that the approach taken to develop this draft is based on incomplete and/or missing evidence, and is based on a process that, until recently, in various cases did not consider water testing for PFAS to be necessary. This points to a process that is reactive and not proactive, and suggests an overall lower level of concern for heath in Australia compared to other developed nations. I have strong concerns that this approach is flawed and is not working to effectively achieve the best health outcomes. I do not think it is sufficient to wait until there is evidence of further demonstrated harm to health and then respond with incremental changes that fall short of what other developed nations and WHO are doing, when there are already a number of findings that show the ill effects of PFAS.
2	**ORGANISATION RESPONSE 01** Permission not given to publish.
3	**INDIVIDUAL RESPONSE 02** *Development of guidance* The Panel tries to apply findings from laboratory-restricted conditions to a wide, ever-changing environment where many PFAS are present to different degrees and where people are exposed not only to 5 PFAS but many of them. The Panel needs to consider the situation as a whole. Considering each PFAS separately is not viable in our current environment. These guidelines, even if they are better than the previous ones, are insufficient because they don't consider several factors. The perspective adopted by the Panel is not representative of the situation. The Panel approach is a scientific one that stands in a controlled environment. We need a global approach to the problem and we need to minimise any exposure at the lowest level possible if we are to protect people's health. Determining a "safe" threshold for each PFAS is not suitable. We should aim for zero levels for all PFAS in our drinking water, for our sake and our children's. *Implementation or application* Good implementation and monitoring strategies are proposed. *Fact Sheet* The PFAS Fact Sheet does not develop enough on the harmful effects of PFAS on human health. It does approach the international findings only to say that research in Australia has not been conclusive. It may give people the false idea

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	that PFAS are not as harmful as they really are. The PFAS Fact Sheet approaches only 5 PFAS and only SEPARATELY. Nothing is said about the cumulative effects each can have on a subject. For each PFAS, a summary is given of the scientific evidence, the most reliable study is selected, and a guideline is calculated. "A guideline value for total or sum of PFAS was not considered feasible or appropriate at this time without further research on the potential grouping of surrogates, the available toxicological evidence and the practical achievability and utility of this approach in the Australian context." Yet, both European and US authorities warn us about the cumulative effects of these chemicals: US PFAS Fact Sheet: "As the lead federal agency responsible for protecting America's drinking water, EPA is using the best available science on PFAS to set national standards. PFAS can often be found together in water and in varying combinations as mixtures. Decades of research shows mixtures of different chemicals can have additive health effects, even if the individual chemicals are each present at lower levels." https://www.epa.gov/system/files/documents/2024-04/pfas-npdwr_fact-sheet_general_4.9.24v1.pdf In Europe, 20 PFAS are considered together with a limit of 500 ng/L. Source: https://www.eea.europa.eu/en/european-zero-pollution-dashboards/indicators/treatment-of-drinking-water-to-remove-pfas-signal *NHMRC Statement* "[Other countries] can also use risk assessment approaches and policies that may differ from Australia's, and these approaches can result in different estimations of risks and differences in the basis for setting target values. It is not unusual for guideline values to vary from country to country due to different methodologies, calculations and the choice of endpoints used" Nonetheless, we are all human beings, and the harmful effects of these chemicals will be the same, wherever you are on the planet. The exposure might be different according to the different locations but given the extent of contamination and the cumulative effects of the thousands of PFAS that we are in contact with without even knowing, it would be wise to minimize at the maximum the exposure with the ones we know about. "The proposed health-based guideline values are health protective and include assumptions appropriate to the Australian context. The health-based guideline values are very conservative, and include a range of uncertainty factors, which always err on the side of caution." NHMRC Statement Document "NHMRC uses conservative assumptions in setting these values, ensuring that even very small potential risks are addressed. Drinking water is only one of many sources of possible PFAS exposure. Thus, higher values in drinking water for short periods is unlikely to increase health risks." Source: https://www.nhmrc.gov.au/about-us/news-centre/australian-drinking-water-guidelines-public-consultation-now-open#:~:text=NHMRC%20uses%20conservative%20assumptions%20in,unlikely%20to%20increase%20health%20risks. Given that PFAS are bioaccumulative, as described in the Draft PFAS Chemical Fact Sheet, it would be reasonable to think that ANY exposure is likely to increase health risks. The "range of uncertainty factors" considered is likely to be very small if PFAS are not considered as a class of harmful chemicals with cumulative effects on human health. With each exposure, the amount of chemical is stocked in the body and adds up until irreversible damages are done. We then, can surely say that higher values in drinking water even for a short period are likely to increase health risks. "It is important to note that drinking water is not the only potential source of PFAS exposure in Australia and the contribution from other sources might be significant. The public can be exposed to PFAS through the food supply and household products (e.g. personal care products, food packaging, clothing, furniture, air, dust)" Here again, as the exposure is global, it is important to reduce as much as possible ALL types of exposure. Also, what about the pesticide residues found in the drinking water supply? As an example, if we take the Drinking Water Quality Report 2022-2023 for Perth, WA and we analyse each pesticide from their list, we find out that 6 of them are classified

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	under the PFAS class on the US National Library of Medicine (https://pubchem.ncbi.nlm.nih.gov/). If we consider a PFAS as being "fluorinated organic chemicals containing at least one fully fluorinated carbon atom" (Minnesota Department of Agriculture, online: https://www.mda.state.mn.us/environment-sustainability/active-inert-pfas) more can be added to the list with guideline values going up to 4000 µg/L. We agree that not all PFAS have the same harmful effects on human health, they are not all as bioaccumulative and toxic. However, this example shows that exposure to PFAS is everywhere. As they are in the pesticides we use on our food, what about the food residues? And all governmental authorities agree, including the Australian government, that very little is known about their effects: - On the European Environment Agency website, a picture can be seen with the 5 most common PFAS considered like only the top of the iceberg. Source: https://www.eea.europa.eu/en/analysis/publications/pfas-in-textiles-in-europes-circular-economy/figure-3-level-of-knowledge-of-human-health-and-environmental-impacts-of-pfas - "Many scientific studies have investigated potential health effects resulting from PFAS exposure, but the results have been mixed, and scientific understanding is still developing as more research is undertaken [...] As a precaution, enHealth recommends exposure to PFAS be minimised wherever possible whilst further research is undertaken on the potential health effects" Source: https://www.pfas.gov.au/about-pfas/affects
4	**INDIVIDUAL RESPONSE 03** *Development of guidance* Given the potential long-term health risks associated with PFAS exposure and the limitations of current scientific knowledge, a precautionary approach is essential. The Draft Guidance should reflect this. *Implementation or application* Many countries worldwide have adopted increasingly stringent regulations on PFAS due to growing concerns about their health and environmental impacts. Aligning with international best practices would ensure Australia remains at the forefront of PFAS management *Fact Sheet* Suggestions Lower Health-Based Guideline Values (HBGVs): Consider significantly reducing the HBGVs for PFAS in drinking water to account for the latest scientific evidence and the precautionary principle. Implement more stringent HBGVs for PFAS in recreational waters, recognizing the potential for exposure through skin contact and ingestion. Expanded Monitoring and Testing: Mandate regular monitoring of PFAS in drinking water and recreational water sources, particularly in areas with known or suspected contamination. Develop standardized testing methods to ensure accurate and reliable data collection. Enhanced Public Information and Education: Provide clear and accessible information to the public about the health risks associated with PFAS exposure and the steps being taken to mitigate them. Educate healthcare professionals about the potential health effects of PFAS exposure and how to diagnose and treat related illnesses. Robust Regulatory Framework: Implement strong regulations to limit the use and release of PFAS into the environment. Enforce strict compliance with these regulations to ensure the protection of public health and the environment.

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	By adopting more stringent guidelines and taking proactive measures, the NHMRC can help safeguard the health of Australians and protect our precious water resources for future generations.
5	**INDIVIDUAL RESPONSE 04** Thank you for updating the Australian Drinking Water Guidelines. I support the strengthening of these guidelines, as reported in the Guardian Australia.
6	**INDIVIDUAL RESPONSE 05** *Implementation or application* Please expedite the implementation and/or suggest the perfect filter which can be used by the time *NHMRC Statement* Please provide discounted filters or have similar arrangements

AUSTRALASIAN LAND + GROUNDWATER ASSOCIATION

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RE: NHMRC Review of PFAS in Australian drinking water – Response of Public Consultation on Draft Guidance for PFAS

The Australasian Land & Groundwater Association (ALGA) is a peak industry Association which supports professionals working in the Australasian contaminated land and groundwater industry. The core focus of ALGA is to advance the protection, restoration and responsible management of land and groundwater, safeguarding humans and the environment across Australasia.

ALGA has a broad membership base which includes landowners, property developers, industry, consultants, scientists, contractors, regulatory agency staff, government, legal professionals, laboratory staff, researchers and academics. Our volunteer members including committee leaders are the lifeblood of our Association. ALGA facilitates 11 Specialist Interest Groups (SIGs), which represent key industry sectors within the contaminated land and groundwater industry. These SIGs comprise a diverse mix of industry professionals from Australia and New Zealand.

In response to the NHMRC Review of PFAS in Australian drinking water, members of the Emerging Contaminants of Concern SIG (EMCOC SIG) and Risk Assessment SIG (RA SIG) have formed a subcommittee (hereafter "the Subcommittee") to review the draft guidance on per- and polyfluoroalkyl substances (PFAS) as part of the *Australian Drinking Water Guidelines* (the Guidelines), and the associated supporting information put forward by NHMRC. The Subcommittee is a representation of the ALGA member base noting that due to time constraints, consultation with the broader ALGA member base has been limited.

Changes to the Australian Drinking Water Guidelines are of interest to ALGA's member base as the drinking water guidelines, and their underlying toxicity benchmarks, are used to derive other guideline values adopted in contaminated land and groundwater management. The Subcommittee appreciates that NHMRC aim to provide a framework for the good management of drinking water supplies, and that if implemented will assure safety at the point of use. Further, it is understood that the proposed PFAS guideline values are based on the latest available evidence, including scientific reviews undertaken by other national and international agencies.

It is the Subcommittee's view that the proposed changes to the Drinking Water Guidelines may result in unintended impacts across the Australian regulatory environment that will impact both Australian industries and communities. The Subcommittee reflected on important practical considerations related to application of the proposed guidelines and aims to elucidate these in this response to the draft guidance.

The following responses have been structured to mirror the format of the response submitted via the submission portal under the appropriate heading (prompt), to the extent practicable. These headings have been reordered for the purposes of ensuring an appropriate flow and to emphasise the Subcommittee's focus being on the implications of the updated guidelines if implemented.

Implementation or application of the draft guidance (Portal Question 10)

The Subcommittee understands that the draft guidance provided by NMHRC is focused on the protection of human health as related to PFAS and drinking water. However, the Subcommittee considers the update of the guideline values has broader implications. The below section aims to provide specific context how the application of the updated guidance can impact Australian industry and communities.

The Subcommittee, as a representative of the ALGA membership is appropriately positioned to provide this response, as our membership engages as end users of the guidance across water management, waste management, planning, contaminated land, and remediation. The Subcommittee considers that while protective of human health, the draft guidance may also have the following, possibly unintended, impacts:

- **Impact on other guideline values:** The Tolerable Daily Intake (TDI) and drinking water guidelines are critical inputs into a variety of other PFAS criteria in the PFAS NEMP as well as state and territory regulations/guidelines. Impacted criteria may include:
    - **Site assessment screening values:** through the adjustment of site assessment criteria because of changes to the drinking water guidance that (in part) inform these criteria, a greater proportion of sites will be identified under Australia's primary process to assess contaminated sites, the National Environmental Protection Measure (NEPM), as being potentially contaminated. This means that

for landowners there will be a significant increase to the number and extent of sites that need to be investigated. Additionally, a greater number of sites will progress from preliminary site investigation, through to the latter stages of the NEPM process such as detailed site assessment and risks assessment, in some cases culminating in a need for remediation or management of PFAS. Many of these sites may not have required the same degree of attention to assess and manage PFAS contamination under the current framework which applies the principles of the NEPM via the PFAS NEMP (which contains guidance based on the existing drinking water guidelines). It is not clear how increased site assessment requirements, or increased remediation and management actions would materially benefit the Australian public or the environment.

- **Health investigation levels (HILs) for Residential Land Use**: – adjustment of HIL values may identify many properties with soil concentrations of PFAS above the threshold for low density residential use. This may limit the availability of land for development based on exceedance of the adjusted HIL values. It may also result in significantly increased need for soil excavation, soil remediation and landfill disposal of soil. These activities increase the cost of management while the actual benefits of the increased effort and cost are unclear. Further, there will be a need to reassess many properties with known PFAS impacts which may culminate in property owners being advised their land is contaminated above the guideline value for the current land use scenario, such as growing produce. Again, it is unclear how these increased restrictions would materially benefit the Australian public or the environment.
- Landfill Acceptance Criteria – These criteria are largely based on drinking water guideline values as compared to the Australian Standard Leaching Procedure (ASLP) results for a given waste. A significant reduction (approx. 20x) in these landfill acceptance criteria, in tandem with more stringent site investigation and land use criteria could:
    - Divert large volumes of low concentration PFAS material (currently reused) to landfill, impacting the circular economy (including soil reuse). The Subcommittee is aware that a range of soil remediation techniques are available for PFAS, however the practical and economic viability of such techniques is challenging at trace concentrations of PFAS in soil and the benefits of these actions are unclear. This is especially relevant when considering the carbon footprint of completing the relevant management action.

- Limit available landfill space due to increase volume of material requiring landfilling.
- Exceed the current market capacity to destroy materials not suitable for disposal to landfill, usually by incineration or other means which are energy intensive.
- Result in landfills exiting the market for PFAS due to risks associated with impacting groundwater and managing PFAS, particularly in leachate.

- Biosolids and compost guidelines – A proportional reduction in PFAS criteria for biosolids (an approximate 17.5x reduction in the case of PFOS), which are based on the current TDI, would likely see biosolids and compost rendered unfit for many land applications, particularly the critical application area of intensive agriculture. Further, legacy land where biosolids have been applied may no longer be able to bear produce that meets acceptable criteria for food (i.e., produce for local or export consumption) or for agriculture activities (no PFAS soil guideline currently exists; this is assessed under some biosolids application frameworks). In addition, this would likely suggest that any land where biosolids have previously been applied may be considered contaminated and potentially unfit for agricultural uses.
- Recreational Water Criteria – As identified in the quote below, a reduction in the TDIs for some PFAS could impact water guidelines and indicate that some waterways across Australia are unsuitable for primary contact recreation.

"Recreational water quality guidelines in Australia are based on DWGs so changing the DWG will change the recreational guideline to a value of around 100 ng/L instead of the current 2,000 ng/L. This will result in a multitude of waterways in urban areas being no longer acceptable for swimming."

p 92 of the Administrative Report

- The impact of reduced TDIs for PFAS on the use of recycled water from wastewater treatment plants for irrigation, or on infrastructure projects for dust suppression, ground improvement, or irrigation is currently unknown. However, considering the volume and geographical, operational and economic scale of many of these operations, achieving compliance may present a challenge not only from a cost perspective, but also for the perspective of scale (some WWTPs are very large and technologies do not yet exist to treat water at that scale cost-effectively) and logistics (many remote communities have relatively simple waste water management infrastructure, and would not have the funding or

local expertise required to manage a complex plant to remove PFAS and achieve the guideline value or associated discharge criteria).

- **Impact when guideline values are inevitably applied as compliance values** – while not the intent of the guideline values, at times PFAS investigation values in soil and water (as discussed above) are applied as compliance values for industry (rather than trigger points for further assessment as they were intended). This is particularly the case when state/territory environmental authorities have not derived criteria for compliance. Where this occurs, the large reduction in TDIs may result in several non-compliances across a variety of areas, resulting in excessive costs related to the management of PFAS in areas including:
    - **Spoil management**: where large volumes of soil will need to be treated or disposed of across infrastructure projects and development projects potentially making these projects unviable and ultimately adversely impacting the Australian economy and communities.
    - **Water utilities:** where effluent, biosolids, and recycled water may not be fit for reuse/discharge and the management costs associated with removing PFAS before reuse/discharge may not be feasible.
    - **Trade waste discharge:** to reduce PFAS input, water authorities may reduce trade waste discharge allowances, with the cost of PFAS management passed onto industry, presenting a new burden for many industries and potentially impacting their ongoing viability. In most instances, these costs will be passed onto consumers, including Australian households.
    - **Water treatment and discharge:** large construction sites and some industries may be subject to discharge or reuse criteria that cannot be feasibly achieved with commercially available plants (excessive volumes).
    - **Remediation:** contaminated land remedial objectives may become more restrictive, and it may be difficult to demonstrate environmental or human health benefit and that the cost of management is proportionate to the risk.

Overall, the above collectively demonstrate the proposed updated guideline values could have far reaching implications for contaminated land, planning, waste management, and circular economy approaches crucial to re-use of soil, treated wastewater, as well as organics. Collectively there is a risk that the focus on complying with very low PFAS criteria at will come at the expense of managing other contaminants, and/or the overwhelming cost of management may inadvertently result in no action at all. Additionally, more information is required to demonstrate the

material benefits of the increased management actions for the Australian public and/or the environment.

- **TDI approaching background exposure**: As identified in the targeted response below, the TDI for PFOS is approaching background exposures seen in the general community in Australia. This will have flow-on effects to guideline values for food and water, but also to investigation values for soil, such as the PFAS NEMP health Investigation Levels (HILs), which may be recalculated to at or below background environmental concentrations. A potential solution is the recalculation of background human exposure level using the most recent data (e.g. Taucare et al. 2024):

  "This TDI is essentially background (Thompson et al. 2010). Estimated intakes ranged from1.6–3.8 ng/kg bw/day for PFOS based on pools collected in 2002– 2003, and 1.7–3.6 ng/kg bw/day for those collected in 2006–2007. Setting TDI at background level does not allow for any exceedances from other exposure pathways".

  p 91 of the Administrative Report

  While analytical laboratory limits of reporting (LORs) for PFAS are currently appropriate for the draft drinking water guideline values, there will be significant challenges presented for other matrices such as biosolids, foods, products, composts, soil leachates. Measurements at or near the detection limit present significant uncertainty and variability and QAQC challenges which will often need to be communicated to stakeholders including the community.

  "The FSANZ trigger points would also go down by around 20-fold which will mean food will generally not comply. The last FSANZ total diet survey (FSANZ 2021) did look for PFAS. They did detect low levels in some samples. The updated trigger points would be less than the common LORs – i.e. unimplementable. (particularly fish and meat)".

  p 91 of the Administrative Report

- **Conflicting TDI values across agencies:** The derivation of the drinking water guideline values effectively establishes new TDI for the PFAS species (noting that the Draft PFAS Chemical Fact Sheet uses the term "acceptable daily intake" or ADI). The Administrative Report includes the feedback from the targeted consultation which includes a comment that the Australian TDIs from FSANZ are the basis for a range of health-based values in Australia (e.g. food trigger points, soil guideline values) and that a change to the TDIs for PFOS, PFHxS and PFOA not only changes the drinking water guideline values for these PFAS, but all other guidelines values that were based on the same TDIs.

  In response to this comment, NHMRC have stated that the TDI used by other agencies might not change as a result of the NHMRC review. By extension, the Subcommittee considers this comment implies that two TDI values could be adopted for the same

PFAS (i.e. PFOS, PFHxS/PFOA) across various agencies within Australia, which is considered by the Subcommittee an undesirable outcome and next to impossible to explain to PFAS-affected communities. Further, in the interim, even if reconciled, the question that needs to be considered is how will the perception that there have been 'two safe levels' known for 6-8 months be communicated to Australian industries and communities to ensure that there remains trust that the regulatory system is adequately protective, cohesive and aligned?

If the broader community does not understand why there is conflicting health guidance across agencies, industry are likely to have a multitude of challenges in a commercial, industrial relations and public relations context, in demonstrating its practices are acceptable and in line with the health guidance, and where each guidance is applicable. Support from health agencies may be more frequently be required to support the delivery of projects and generally deliver appropriate messaging to the community to alleviate concerns.

- **Impact on guideline finalisation considering responses provided under the current timeframe and format:** In the Subcommittee's view, the allocated response time and selected format are not conducive to supporting ALGA's member base organisations in providing NHMRC the information required to get a full understanding of the impacts the draft guidelines may have on industry. Concerns include:
    - The current format, a questionnaire approach, is restrictive and means that some items that are important to industry do not fit into the response format, and there is not an alternative channel available to provide these (such as the ability to attach a submission document). The format hinders the ability for respondents to provide NHMRC with crucial insights into the impact of the draft guidelines.
    - The timeframe for response does not allow respondents adequate time to collect the information required to adequately comment on draft guideline implementation and application impacts

Were sufficient time and an appropriate submission format available, the Subcommittee would have consulted more broadly across the ALGA membership and potentially requested that additional information be collected and passed on to NHMRC to support its understanding the impacts on Australian industry should the TDI effectively be approximately lowered by a factor of 17.5.

Overall approach taken to develop the draft guidance (Portal Question 9)

- **Review Process:** The Subcommittee considers that the administrative report demonstrates that the outcome of the work by the contracted consultant (SLR), targeted peer review (FSANZ), and independent review all put forward scientific evidence-based options wherein retaining the existing TDIs was acceptable.

  "A review of existing guidance and guidelines (SLR 2024a, b) found that the current Australian guidance value for PFOS of 20 ng/kg/day and guideline value of 70 ng/L are still considered suitable for guideline derivation. It is also considered reasonable to retain the existing guideline value of 70 ng/L as the sum of PFOS and PFHxS; however, it is noted that the retention of the current health-based guideline value for the sum of PFOS and PFHxS should be considered in the context of the available health evidence for PFHxS".

  p 53 of the Administrative Report

  The rationale behind the NHRMC deviating from this advice and proceeding with a different approach is unclear making it difficult to provide meaningful commentary. If the factors driving the decision are not driven by the scientific evidence (and consider other factors), or the reasoning is not transparently communicated, then NHMRC may need to consider whether a regulatory impact statement, or similar, is required. The impacts of the proposed changes were identified in the Administration report targeted response

  "The current Australian TDIs from FSANZ work are the basis for food triggers points and soil guidelines etc. So, changing the TDI not only changes the DWG it must result in a change in ALL the other guidelines"

  p 91 of the Administrative Report

- **Uncertainty factors**: Based on the information presented in the draft fact sheet and administrative report, the specific basis for the uncertainty factors applied is unclear to the Subcommittee despite the more detailed information on uncertainty factors being provided in the technical report/s. Further clarity on the basis / rationale for the uncertainty factors is important detail because:
  - The uncertainty factors are large and have a 1-2 orders of magnitude impact on the resultant health-based guideline values. The uncertainty factors appear to have a greater influence on the resultant guideline values than any differences between studies (toxicological endpoints) selected for input as acceptable daily intake.

- The Subcommittee acknowledges that uncertainty factors may be reduced in the future as the state of knowledge on the toxicology and health outcomes associated with exposures advances. However, it is not clear how this would be undertaken without understanding the rationale underpinning the current uncertainty factors.
- Application of overly conservative uncertainty factors can result in guideline values which have unintended consequences for industry and communities. The primary concern relates to the proposed PFOS guideline value where an overall uncertainty factor of 300 applies (this overall uncertainty factor was also applied to PFHxS and PFBS). The independent expert reviewer, Adjunct Professor Brian Priestly, provided specific comments regarding the uncertainty factors applied including that they are possibly overly conservative.
- The draft fact sheet provides the calculations for the health-based guideline values, which includes a brief description of the uncertainty factors applied. Based on this limited information it may be difficult for industry and community to understand what the uncertainty factors mean in the context of potential adverse health outcomes associated with exposure to PFAS at or above the proposed drinking water guideline values.

- **Deviation from SLR advice at committee meeting:** The Subcommittee notes the governance applied to the process for deriving the guideline values, as outlined in the Administrative Report. We also note that this included targeted consultant feedback from the Department of Health and Aged Care, FSANZ and the enHealth Water Quality Expert Reference Panel. The notes from the October 2024 Water Quality Advisory Committee document identified that the Committee made key decisions which deviated from the advice from SLR. As currently presented, it is unclear how the final decision points were reached. For example, in relation to the PFOS guideline value, it is unclear why greater reliance was placed on the Benchmark Dose Level (BMDL), as opposed to the No Observed Adverse Effect Level (NOAEL), given the relatively large differences in these values and the resultant changes to the derived drinking water guideline value for PFOS.
- **Limited nature of targeted consultation:** A target consultation process was undertaken as part of the guideline value development process which involved key Commonwealth Departments / stakeholders directly related to drinking water quality and public health. Additional, targeted consultation of stakeholder groups that may be indirectly affected by changes to drinking water guideline values and health-based guideline values such as the PFAS National Environmental Management Plan (PFAS NEMP 2020) which includes several additional guideline

values that are based on drinking water guideline values and/or health-based guideline values (such as investigation levels for soil and soil leachate) may have been beneficial.

Specific comments on the draft PFAS Fact Sheet (Portal Question 11)

A preamble contextual introduction in the Fact Sheet would assist with messaging for those communities affected by PFAS in their drinking water or soil, and for whom the lowered drinking water guideline values (and/or associated lowered soil and food guideline values) change their perception of risk. Some of this information is available in the NHMRC Statement on PFAS in drinking water and it may be useful to include this information in the Fact Sheet.

Specific comments on the draft NHMRC Statement on PFAS in drinking water (Portal Question 12)

Considering the implementation timeline, the language and communication employed in the drinking water statement is important. For communities potentially exposed to PFAS, 6-8 months is a long time to wait for an outcome, then longer before something meaningful can be done to address the scenario. In its current form the NHMRC Statement on PFAS in drinking water does not address risks for communities consuming water above both current and proposed guideline values over extended periods (i.e., not short term). It is the view of the Subcommittee that this is a critical consideration for vulnerable communities living on contaminated land that may have additional exposure via other pathways in addition to drinking water that has exceeded, or will exceed, the drinking water guideline values.

It is the view of the Subcommittee that ideally, there needs to be further consideration regarding communicating risk and possible actions across four groups:

1. Communities with water below both the existing and proposed updated drinking water guideline values – no impact.
2. Communities with water below the existing drinking water values, but above the draft drinking water values– minimal impact and covered in the current statement
3. Communities with water at or near the current drinking water guideline values that will be well above the draft values –describing the potential risks and what action may be needed to reduce or manage risks would be useful.
4. Communities that are/have been at or above the existing drinking water guideline values for extended periods of time, for whom the existing advice on the current guideline values being safe for whole of life exposure (see excerpt below), may not be appropriate as their exposure to elevated PFAS concentrations in drinking water has not necessarily been short term. How will these communities be identified and what are the recommended management options?

"All of the guideline values were calculated using a threshold approach as outlined in Chapter 6 of the Guidelines. This means that based on the findings of the review, NHMRC considers that concentrations of PFAS below the proposed guideline values would not be expected to result in any significant risk to health over a lifetime of consumption. Short-term exposures to higher levels of PFAS are unlikely to change this risk".

p 2 of the NHMRC Statement

Closing

The Subcommittee, representing the ALGA membership, considers that the proposed changes to the Drinking Water Guidelines, while aimed at protecting human health in relation to PFAS in drinking water, require consideration of the unintended consequences for the broader industry and the community. Additionally, if not fully considered, the draft guidelines could influence areas of the circular economy and stifle other government policies to decrease waste sent to landfill and increase resource recovery rates.

The Subcommittee would like to thank NHMRC for the opportunity to respond to the proposed changes to the guidelines. Our response is intended to be informative regarding potential issues and unintended consequences for the land and groundwater industry associated with the draft guidelines and provide NHMRC further insights as to the potential implementation and communication considerations prior to finalising revised guidelines.

Kind Regards,

ALGA NHMRC Response Subcommittee

Reference

Grechel Taucare, Gary Chan, Sandra Nilsson, Leisa-Maree L. Toms, Xingyue Zhang, Jochen F. Mueller, Olivier Jolliet, Temporal trends of per- and polyfluoroalkyl substances concentrations: Insights from Australian human biomonitoring 2002–2021 and the U.S. NHANES programs 2003–2018, Environmental Research, Volume 262, Part 1, 2024, 119777, ISSN 0013-9351, https://doi.org/10.1016/j.envres.2024.119777.

ATSE

22 November 2024

Professor Steve Wesselingh, CEO
National Health and Medical Research Council
16 Marcus Clarke St
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Dear Professor Wesselingh

Submission on Australian Drinking Water Guidelines – Public Consultation on Draft Guidance for Per- and Polyfluoroalkyl Substances (PFAS)

The Australian Academy of Technological Sciences and Engineering (ATSE) is a Learned Academy of independent, non-political experts helping Australians understand and use technology to solve complex problems. Bringing together 900 of Australia's leading thinkers in applied science, technology and engineering. ATSE provides impartial, practical and evidence-based advice on how to achieve sustainable solutions and advance prosperity.

Attached is a submission ATSE prepared in response to the concurrent inquiry by the Parliament of Australia's Select Committee on PFAS (per and polyfluoroalkyl substances). Aspects of ATSE's submission are also relevant to the current consultation by the National Health and Medical Research Council (NHMRC).

Our submission highlights growing concerns around the environmental and health impacts of PFAS in Australia. It emphasises that, due to the chemical stability of PFAS, these substances persist in the environment and accumulate in the human body, potentially leading to immune, reproductive, and cancer-related health risks. Current Australian standards for PFAS levels in drinking water are less stringent compared to international benchmarks, such as those set by the U.S. Environmental Protection Agency. The submission outlines gaps in PFAS monitoring, especially in remote communities, and advocates for a national, legally binding framework to ensure consistent data collection. ATSE's recommendations focus on:

- establishing standardised monitoring
- leveraging appropriate water technologies
- enforcing wastewater treatment, and
- strengthening regulatory standards to better protect public health and ecosystems

ATSE thanks NHMRC for the opportunity to provide feedback on the draft guidance and associated documents concerning PFAS and looks forward to participating in future consultations on the Australian Drinking Water Guidelines. We also confirm that we grant permission for the publication of our submission, recognising the value of open dialogue in addressing PFAS-related challenges.

Yours sincerely

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ATSE Australian Academy of Technological Sciences & Engineering

SUBMISSION

Submission to Select Committee on PFAS

Submission to the Inquiry into PFAS (per- and polyfluoroalkyl substances)

22 November 2024

The Australian Academy of Technological Sciences and Engineering (ATSE) is a Learned Academy of independent, non-political experts helping Australians understand and use technology to solve complex problems. Bringing together Australia's leading thinkers in applied science, technology and engineering, ATSE provides impartial, practical and evidence-based advice on how to achieve sustainable solutions and advance prosperity.

There has been increasing recognition of the environmental and potential health impacts of per- and polyfluoroalkyl substances (PFAS). PFAS are a group of synthetic chemicals with carbon-fluorine (C-F) bonds, giving them high resistance to heat, water, and oil. These properties have led to their use in applications like firefighting foams, non-stick cookware, food packaging, textiles, and medical devices. The stability of the C-F bond, recognised as one of the strongest in organic chemistry, contributes to the persistence of PFAS in the environment and human body. In addition to PFAS contamination at military or industrial sites, PFAS has also been introduced into soil and potentially into the food chain due to agricultural practices.

Health risks associated with PFAS exposure include immune system disruption, reproductive issues, and increased risk of certain cancers. While the Australian Expert Health Panel has indicated that these effects are relatively minor, there is ongoing concern about the long-term impacts on public health. Current guidelines for drinking water are inherently conservative but based primarily on animal studies with significant uncertainty factors when extrapolating to human health risks. For example, perfluorooctanoic acid (PFOA) guidelines assume it accounts for only 10% of an individual's daily intake from water, leaving gaps in actual exposure assessments (NHMRC, 2019). Australia's approach, while evolving, still lags behind some of the more stringent international standards. The national guidelines set in 2023, recommending a combined limit of 70 ng/L for perfluorooctane acid (PFOS) and perfluorohexanesulfonic acid (PFHxS), and 560 ng/L for perfluooctanoic acid (PFOA) in drinking water, are significantly less restrictive than those proposed by the U.S. Environmental Protection Agency, which has suggested enforceable limits of 4 ng/L for both PFOA and PFOS (Braun, 2023). This submission addresses PFAS contamination challenges in Australia, and advocates for comprehensive monitoring and regulatory improvements to safeguard public health and the environment.

ATSE makes the following recommendations:

Recommendation 1: Develop a standardised national framework for monitoring PFAS levels across all states and territories based on legally binding guidelines.

Recommendation 2: Leverage appropriate water technologies to support drinking water monitoring and management, particularly in remote communities.

Recommendation 3: Require utilities to use additional wastewater treatment technologies specifically designed to capture and degrade PFAS, as required.

Recommendation 4: Create a renewed National Water Commission to drive water reform.

Improving PFAS data collection for drinking water

Data collection of PFAS in drinking water supply is relatively new. The first known instance of PFAS monitoring in a drinking water catchment by an Australian water authority was carried out by Melbourne Water in January 2011, with PFOA detected in the Sugarloaf Reservoir offtake on the Yarra River (Friends of the Earth Australia, 2024). While there is ongoing research and monitoring efforts, significant gaps

remain in comprehensive data collection, which hinders effective management and remediation strategies. A notable case is the delayed identification of PFAS contamination in the Blue Mountains by Water NSW (WaterNSW, 2024).

To improve oversight of PFAS levels, the Australian government, in collaboration with states and territories, previously launched some PFAS monitoring initiatives, including the PFAS National Environmental Management Plan, the PFAS Investigation and Management Program and other state specific efforts. These programs aim to assess PFAS concentrations across diverse environmental matrices, such as drinking water, soil, and biosolids. However, these programs are often inconsistent and lack the comprehensive scope needed to fully understand the extent of PFAS contamination across the country. A standardised national framework with consistent data requirements for PFAS monitoring would enable better oversight.

The Australian Drinking Water Guidelines (ADWG), established by the National Health and Medical Research (NHMRC), provide a comprehensive and regularly updated framework for maintaining the quality and safety of drinking water across Australia. Though not legally binding, they guide regulators, suppliers, and health authorities in assessing and managing water quality risks to protect public health. Reported breaches in regions like Victoria highlight inconsistencies in meeting the ADWG, indicating variability in enforcement across regions (Victoria State Government, 2024). ATSE's explainer on Closing the water gap also points to a lack of baseline water quality and regular testing in remote communities to meet drinking water guidelines. The ADWG's capacity to address the complex microbial communities in diverse water systems - especially in remote regions with unique geological conditions - may be limited. Implementation challenges are particularly pronounced in rural and remote locations, where resources and infrastructure are often constrained (Clifford et al., 2015). These guidelines could form a starting point from which to standardise PFAS monitoring nationally. ATSE agrees with the proposed inclusion of PFAS in these guidelines and encourages improvements in monitoring activities to support consistent adherence to the guidelines. As highlighted by ATSE's explainer, fit-for-context water treatment technologies can improve access to safe drinking water in remote Aboriginal and Torres Strait Islander communities.

Recommendation 1: Develop a standardised national framework for monitoring PFAS levels across all states and territories based on legally binding guidelines.

Recommendation 2: Leverage appropriate water technologies to support drinking water monitoring and management, particularly in remote communities.

Mitigating widespread PFAS contamination in consumer products and agriculture

PFAS are not only found in water but are also found in a range of consumer products, including non-stick cookware, food packaging, stain-resistant fabrics, and cosmetics (NHMRC, 2024). These chemicals are used to enhance non-stick, water-resistant, and stain-repellent properties. Investigations have identified approximately 90 sites across Australia with elevated PFAS levels, particularly at military bases and airports where firefighting foams were heavily used (PFAS Project Lab, 2018). Additionally, biosolids applied to agricultural soils contribute significantly to PFAS contamination. Environmental concerns include the "time bomb effect", which describes the delayed, yet potentially harmful, impact of using biosolids (treated sewage sludge) as fertilisers. Over time, this can lead to the gradual release of toxic heavy metals like cadmium and lead into the soil, which may accumulate and eventually contaminate the

food chain. PFAS compounds also interact with soil through hydrophobic adsorption and can be taken up by plants, especially in soils with low organic carbon.

Conventional sewage treatment methods are ineffective at removing these compounds, leading to their presence in effluents and sludge from wastewater treatment plants. When biosolids containing PFAS are applied to soil, these substances can leach into groundwater (Johnson, 2022). The transfer of PFAS from biosolids to soil and subsequently into crops poses serious risks to human health. Crops grown in PFAS-contaminated soils can accumulate these chemicals, leading to direct human exposure through dietary consumption. Root vegetables and leafy greens are prone to absorbing higher levels of these substances. Livestock grazing on contaminated pastures or fed with PFAS-affected crops can also accumulate these substances, potentially resulting in contaminated meat, milk, and eggs entering the human food supply. Given the persistence of PFAS in the environment, once they enter the food chain, they can continue to affect human health over time.

Standard water treatments (such as chlorination) often fail to remove PFAS. Additional treatments such as granular activated carbon, anion exchange, and reverse osmosis are more effective at reducing PFAS. Emerging technologies such as foam fractionation require further development but may prove effective in future for water treatment and for remediation of contaminated sites. Water utilities and the overseeing state-based environmental departments can lead in the reduction of PFAS contamination by implementing these additional water treatment methods.

Recommendation 3: Require utilities to use additional wastewater treatment technologies specifically designed to capture and degrade PFAS, as required.

Strengthening Australia's PFAS standards

There are currently no enforceable guidelines for protecting aquatic ecosystems from PFAS contamination. The Australian and New Zealand Guidelines for Fresh and Marine Water Quality, which provide trigger values for PFOS in freshwater (0.13 µg/L) and marine water (0.00023 µg/L), demonstrate an attempt to address PFAS contamination holistically across various aquatic environments. Converting these into enforceable standards would uplift Australia's regulatory approach.

The absence of a functioning Ministerial Council for Water Ministers has hindered effective governance and oversight of water quality management strategies in Australia. To strengthen governance around water management more generally, ATSE has recommended re-establishing an evolved National Water Commission (ATSE, 2024). While this has been raised in the broader context of National Water Reform, this approach would provide a mechanism to manage environmental impacts of PFAS in Australia's waterways and agricultural communities.

Recommendation 4: Create a renewed National Water Commission to drive water reform.

ATSE thanks the Select Committee for the opportunity to respond to the Select Committee on PFAS. For further information, please contact [redacted]

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Australian Beverages
AUSTRALASIAN BOTTLED WATER INSTITUTE ABWI
The Australian Beverages Council Limited's response to the Australian Drinking Water Guidelines – Public Consultation on Draft Guidance of Per- and Polyfluoroalkyl Substances (PFAS)
22 November 2024

About the Australian Beverages Council Limited

The Australian Beverages Council Limited (ABCL) has been the leading peak body representing the non-alcoholic beverages industry for more than 75 years and is the only dedicated industry representative of its kind in Australia. The ABCL represents approximately 95 per cent of the industry's production volume and Member companies range from some of Australia's largest drinks manufacturers to small and micro beverages companies whose drinks are enjoyed nationally as well as around the world. These drinks include carbonated soft drinks, energy drinks, sports and electrolyte drinks, frozen drinks, bottled and packaged waters, juice with no added sugar and fruit drinks, cordials, iced teas, ready-to-drink coffees, flavoured milk products and flavoured plant milks.

Collectively, the ABCL's Members contribute more than $9 billion annually to the Australian economy and support more than 63,000 full time equivalent employees. The industry pays more than $1.5 billion in tax per annum along its supply chain and for every direct employee in the beverages manufacturing industry, there are 4.9 jobs required elsewhere in the Australian economy to produce and retail our drinks.

The ABCL would like to thank the NHMRC for the opportunity to submit to this consultation. Please find our comments below.

Do you have any comments on the overall approach taken to develop the draft guidance?

- **Yes**
- No
  Please provide comments on the overall approach taken to develop the draft guidance

Overall, the ABCL supports the intention of the approach the NHMRC has taken to develop the draft guidelines, but recognises there are data gaps both specific to the testing of PFAS in Australian drinking water and on the health implications of exposure to PFAS from drinking water. The ABCL believes that any guidelines that are established must take into account the total dietary intake of PFAS. Without such data, it is difficult to comment on whether the proposed limits and approach are appropriate.

Do you have any comments about the implementation or application of the draft guidance?

- **Yes**
- No
  Please provide comments about the implementation or application of the draft guidance

Yes, while the ABCL supports the intention of the proposed guidelines and recognises the importance for rigorous guidelines to safeguard the health and well-being of all Australians, we would like to reiterate the significant data gaps that exist regarding the testing of PFAS in Australian drinking water and the health implications on exposure to PFAS through drinking water. As referenced in the Implementation section of the NHMRC Statement "there are ongoing monitoring activities across the country" and "publicly available information shows most water supplies are below the proposed guideline values". Given this information, the ABCL recommends the NHMRC waits for further results from the ongoing monitoring of water supplies to become available before determining whether the proposed limits are relevant and/or even required for the Australian Drinking Water Guidelines.

In addition to the ongoing monitoring of water supplies, the ABCL is also conducting its own monitoring of PFAS in drinking water and has conducted some testing to better inform its members, and to help gain further insight into PFAS in drinking water. As such it has conducted ad-hoc market sample testing of drinks ranging from bottled spring water to carbonated soft drinks. The anonymised results of these tests can be viewed in Appendix A. We note that all products tested below both the current and proposed limits of reporting. Testing was completed by a NATA-accredited laboratory.

Through the Australasian Bottled Water Institute (ABWI) ABCL has also introduced the practice of PFAS testing for underground water source owners/operators and bottled/packaged water manufacturers within the revised ABWI Model Code which will be rolled out in early 2025. The introduction of PFAS testing along with the already robust hydrogeological and sustainability requirements for source owners/operators demonstrates the industry's commitment, through the Model Code, to providing consumers with safe drinking water.

The ABCL is open to collaborating with the NHMRC regarding data gathering with specific reference to source water i.e. groundwater, and the bottled/packaged water industry.

Do you have any specific comments on the draft PFAS Fact Sheet?

- **Yes**
- No
  Please provide comments on the draft PFAS Fact Sheet

Yes, as previously mentioned the ABCL supports the overall intention set out by the NHMRC in the development of proposed guidelines and the draft fact sheet. It also supports the majority of content within the PFAS Fact Sheet. However, ABCL believes that the drinking water industry would benefit from clear mitigation guidance if PFAS is detected above drinking water guideline limits. A response playbook that provides further details regarding effective removal of PFAS depending on the type of contamination is essential. Also critical are details regarding where the responsibility lies in terms of treating any contaminated water (e.g. ground spring water contamination responsibility would lie with the contaminator of the source and contamination of municipal water would lie with the municipal water authorities).

Do you have any specific comments on the draft NHMRC Statement on PFAS in drinking water?

- **Yes**
- No
  Please provide comments on the draft NHMRC Statement on PFAS in drinking water

The ABCL supports the comments in the draft statement specifically in relation to PFAS exposure not solely coming from drinking water and highlighting that a broader approach to managing PFAS contamination and limiting exposure is required across multiple sectors. We also appreciate the acknowledgement that not every jurisdiction's public health advice within its own legislative framework is relevant to Australia e.g. the United States. Highlighting these factors and the need for continuous monitoring to understand PFAS in drinking water and the impact to public health is important and ABCL believes it will serve the industry well as a reference source if such concerns are raised by customers or consumers. Again, we would like to emphasise that we strongly recommend further testing throughout Australia to have a robust data set available to facilitate a more informed decision regarding proposed limits.

Conclusion

To conclude, the ABCL supports the continued investigation and understanding of health impacts to PFAS, but would like to ensure the health risk is proportionate to the dietary intake, prior to drinking water guideline limits being reduced.

Appendix A: ABCL anonymised ad-hoc market testing

PFOA Testing & Results

General Product Name	Limit Of Reporting	ADWG Limits (µg/L)	Proposed ADWG Limits (µg/L)	Results (µg/L)
Bottled Water	0.01	0.56	0.2	<0.01
Bottled Water	0.01	0.56	0.2	<0.01
Bottled Water	0.01	0.56	0.2	<0.01
Flavoured Sparkling Water	0.01	0.56	0.2	<0.01
Carbonated Soft Drink	0.01	0.56	0.2	<0.01
Bottled Water	0.0005	0.56	0.2	<0.0005
Bottled Water	0.0005	0.56	0.2	<0.0005
Bottled Water	0.0005	0.56	0.2	<0.0005
Bottled Water	0.0005	0.56	0.2	<0.0005
Bottled Water	0.0005	0.56	0.2	<0.0005
Bottled Water	0.0005	0.56	0.2	<0.0005
Carbonated Soft Drink	0.0005	0.56	0.2	<0.0005
Carbonated Soft Drink	0.0005	0.56	0.2	<0.0005
Bottled Water	0.0005	0.56	0.2	<0.0005
Flavoured Water	0.0005	0.56	0.2	<0.0005
Flavoured Sparkling Water	0.0005	0.56	0.2	<0.0005
Bottled Water	0.0005	0.56	0.2	<0.0005

PFOS Testing & Results

General Product Name	Limit Of Reporting	ADWG Limits (µg/L)	Proposed ADWG Limits (µg/L)	Results (µg/L)
Bottled Water	0.02	0.07 (sum of PFOS & PFHxS)	0.004	<0.02
Bottled Water	0.02	0.07 (sum of PFOS & PFHxS)	0.004	<0.02
Bottled Water	0.02	0.07 (sum of PFOS & PFHxS)	0.004	<0.02
Flavoured Sparkling Water	0.02	0.07 (sum of PFOS & PFHxS)	0.004	<0.02
Carbonated Soft Drink	0.02	0.07 (sum of PFOS & PFHxS)	0.004	<0.02
Bottled Water	0.0002	0.07 (sum of PFOS & PFHxS)	0.004	<0.0002
Bottled Water	0.0002	0.07 (sum of PFOS & PFHxS)	0.004	<0.0002
Bottled Water	0.0002	0.07 (sum of PFOS & PFHxS)	0.004	<0.0002
Bottled Water	0.0002	0.07 (sum of PFOS & PFHxS)	0.004	<0.0002
Bottled Water	0.0002	0.07 (sum of PFOS & PFHxS)	0.004	<0.0002
Bottled Water	0.0002	0.07 (sum of PFOS & PFHxS)	0.004	<0.0002
Carbonated Soft Drink	0.0002	0.07 (sum of PFOS & PFHxS)	0.004	<0.0002
Carbonated Soft Drink	0.0002	0.07 (sum of PFOS & PFHxS)	0.004	<0.0002
Bottled Water	0.0002	0.07 (sum of PFOS & PFHxS)	0.004	<0.0002
Flavoured Water	0.0002	0.07 (sum of PFOS & PFHxS)	0.004	<0.0002
Flavoured Sparkling Water	0.0002	0.07 (sum of PFOS & PFHxS)	0.004	<0.0002
Bottled Water	0.0002	0.07 (sum of PFOS & PFHxS)	0.004	<0.0002

PFHxS Testing & Results

General Product Name	Limit Of Reporting	ADWG Limits (µg/L)	Proposed ADWG Limits (µg/L)	Results (µg/L)
Bottled Water	0.01	0.07 (sum of PFOS & PFHxS)	0.03	<0.01
Bottled Water	0.01	0.07 (sum of PFOS & PFHxS)	0.03	<0.01
Bottled Water	0.01	0.07 (sum of PFOS & PFHxS)	0.03	<0.01
Flavoured Sparkling Water	0.01	0.07 (sum of PFOS & PFHxS)	0.03	<0.01
Carbonated Soft Drink	0.01	0.07 (sum of PFOS & PFHxS)	0.03	<0.01
Bottled Water	0.0002	0.07 (sum of PFOS & PFHxS)	0.03	<0.0002
Bottled Water	0.0002	0.07 (sum of PFOS & PFHxS)	0.03	<0.0002
Bottled Water	0.0002	0.07 (sum of PFOS & PFHxS)	0.03	<0.0002
Bottled Water	0.0002	0.07 (sum of PFOS & PFHxS)	0.03	<0.0002
Bottled Water	0.0002	0.07 (sum of PFOS & PFHxS)	0.03	<0.0002
Bottled Water	0.0002	0.07 (sum of PFOS & PFHxS)	0.03	<0.0002
Carbonated Soft Drink	0.0002	0.07 (sum of PFOS & PFHxS)	0.03	<0.0002
Carbonated Soft Drink	0.0002	0.07 (sum of PFOS & PFHxS)	0.03	<0.0002
Bottled Water	0.0002	0.07 (sum of PFOS & PFHxS)	0.03	<0.0002
Flavoured Water	0.0002	0.07 (sum of PFOS & PFHxS)	0.03	<0.0002
Flavoured Sparkling Water	0.0002	0.07 (sum of PFOS & PFHxS)	0.03	<0.0002
Bottled Water	0.0002	0.07 (sum of PFOS & PFHxS)	0.03	<0.0002

PFBS Testing & Results

General Product Name	Limit Of Reporting	ADWG Limits (µg/L)	Proposed ADWG Limits (µg/L)	Results (µg/L)
Bottled Water	0.01	N/A	1	<0.01
Bottled Water	0.01	N/A	1	<0.01
Bottled Water	0.01	N/A	1	<0.01
Flavoured Sparkling Water	0.01	N/A	1	<0.01
Carbonated Soft Drink	0.01	N/A	1	<0.01
Bottled Water	0.0005	N/A	1	<0.0005
Bottled Water	0.0005	N/A	1	<0.0005
Bottled Water	0.0005	N/A	1	<0.0005
Bottled Water	0.0005	N/A	1	<0.0005
Bottled Water	0.0005	N/A	1	<0.0005
Bottled Water	0.0005	N/A	1	<0.0005
Carbonated Soft Drink	0.0005	N/A	1	<0.0005
Carbonated Soft Drink	0.0005	N/A	1	<0.0005
Bottled Water	0.0005	N/A	1	<0.0005
Flavoured Water	0.0005	N/A	1	<0.0005
Flavoured Sparkling Water	0.0005	N/A	1	<0.0005
Bottled Water	0.0005	N/A	1	<0.0005

NO.	CONSULTATION SUBMISSION
10	**AUSTRALIAN INSTITUTE OF PETROLEUM** The Australian Institute of Petroleum (AIP) provides this submission on behalf of its core members: • Ampol Limited • BP Australia Pty Ltd • Mobil Oil Australia Pty Ltd • Viva Energy Australia Pty Ltd. AIP member companies operate across all or some of the liquid fuels supply chain including crude and petroleum product imports, refinery operations, fuel storage, terminal and distribution networks, marketing and retail. Underpinning this supply chain is considerable industry investment in supply infrastructure, and a requirement for significant ongoing investment in maintaining existing capacity. Over the last decade, AIP Member Companies have invested over $10 billion to maintain the reliability and efficiency of fuel supply meeting Australian quality standards. AIP's submission focuses on NHMRC's interpretation of the toxicological literature and subsequent derivation of health-based guideline values for drinking water (Drinking Water Guidelines, DWGs) for perfluorooctanoic acid (PFOA), perfluorooctane sulfonic acid (PFOS), perfluorohexane sulfonic acid (PFHxS), and perfluorobutane sulfonic acid (PFBS). NHMRC calculated DWGs in a manner consistent with typical regulatory practices using default exposure parameters (e.g., drinking water volume consumed per day, adult body weight, etc.) and PFAS-specific Tolerable Daily Intake (TDI) values (also known as "Acceptable Daily Intake" or "Reference Doses"). TDI values were selected from reviewing toxicological studies on PFAS (in this case, controlled laboratory studies in which rodents were exposed to PFAS). A review of the toxicological literature was performed for NHMRC by a consulting firm, SLR Consulting Australia. The review is provided in two separate SLR technical documents, (referred to collectively as the "SLR Review") that are available on the NHMRC website. Our comments in this submission focus on the selected TDI values for PFOA, PFOS, and PFBS. We have no comments on the TDI value selected for PFHxS. The toxicological endpoint associated with the NHMRC PFHxS TDI (effects of PFHxS on thyroid hormone) is currently viewed as a relevant toxicological endpoint by the regulatory and scientific community. Additionally, the PFHxS TDI value selected by NHMRC is reasonable given the toxicological study from which the TDI value is derived, and the value is consistent with TDIs selected by other regulatory agencies." 1. PFOA In the SLR Review, the toxicological endpoints considered for the PFOA TDI value included effects on the pancreas and liver. SLR reviewed a key toxicological study using rats exposed to PFOA, as well as the United States Environmental Protection Agency (USEPA) review of that study. The SLR Review concluded that the neoplastic pancreatic effects in rats were "unlikely to be relevant to humans". For example, the PFOA mode of action for the development of the pancreatic tumors following exposure to PFOA is activation of the peroxisome proliferator-activated receptor alpha (PPARα), a pathway that is robust in rats but does not occur to the same extent in humans , thus, it is uncertain if these effects would occur in a human pancreas. Additionally, the histological type of tumor observed in the rats is distinctly different from pancreatic tumors observed in humans. The SLR Review did note that one study (an "in vitro" study using cells instead of animals) may support pancreatic effects through modes of action other than the PPARα pathway. However, results from a single in vitro study, that has not been replicated in vivo with animals, does not provide strong support for a non-PPARα mode of action that would indicate the pancreatic effects are relevant to humans. The SLR Review also evaluated adverse effects of PFOA on the liver (non-neoplastic hepatic necrosis) and noted that this endpoint is also of uncertain relevance to humans (because the effects are also mediated by PPARα). SLR concluded that the currently available information is insufficient to rule out relevancy of the effects to humans. It is notable that the SLR Review (Table 6-4 of the Addendum document) used both endpoints, neoplastic pancreatic effects and non-neoplastic hepatic necrosis, in deriving TDI values (65 and 115 nanograms per kilogram body weight per day (ng/kg bw*d), respectively) and DWGs (227 and 402 nanograms per liter (ng/L), respectively). NHMRC selected the lower (more conservative value) associated with neoplastic pancreatic effects, despite the uncertainties on this endpoint noted by SLR, rounding the PFOA DWG to 200 ng/L. However, we agree with SLR that the non-neoplastic hepatic necrosis is a less uncertain endpoint and recommend that it should serve as the basis for a TDI and DWG for PFOA.

NO.	CONSULTATION SUBMISSION
	As such, we recommend that NHMRC set the PFOA DWG at 400 ng/L, not 200 ng/L. 2. PFOS In the SLR Review, the toxicological endpoint selected for the PFOS TDI value focused on extramedullary haematopoiesis in the spleen. SLR reviewed a key toxicological study using rats exposed to PFOS, as well as the USEPA review of that study. In the study, 20 rats were not exposed to PFOS (control) and 100 additional rats were exposed to five dose levels of PFOS (20 rats per dose). Half of the rats in each group were male and half were female. Based on the incidence of adverse effects (extramedullary haematopoiesis) observed in the study, USEPA evaluated the data separately by sex to identify a PFOS exposure dose that could be used to derive a TDI value. Exposure dose, as measured in this study, was the concentration of PFOS measured in the plasma of the rats. Using the data for females, EPA applied a non-linear dose-response regression model to the incidence and exposure data and identified a benchmark dose of 2.3 milligrams per liter (mg/L), representing an exposure level at which no effects would be expected. However, the non-linear dose-response regression model applied to this data (shown in Figure E-18 of USEPA's review document on PFOS) is a poor fit to the data, resulting in significant uncertainty in the 2.3 mg/L benchmark dose that was derived using the model. Actual measurements in the toxicological study confirmed that rats with much higher PFOS in their plasma (i.e., 52 mg/L for males and 67 mg/L for females) exhibited no statistically detectable differences in incidence rates for extramedullary haematopoiesis compared to the control rats. These No Observable Adverse Effect Level (NOAEL) dose values are much more robust and scientifically defensive values to use for the TDI values than the modelled benchmark dose level. It is notable that the SLR Review (Table 5-2 of the Addendum document) used both the 2.3 mg/L and 52 mg/L dose values in deriving TDI values (0.97 and 22 ng/kg bw*d, respectively) and DWGs (3.4 and 77 ng/L, respectively). Importantly, SLR noted that the 52 mg/L NOAEL-based dose was "considered to be associated with a lower degree of uncertainty" compared to the USEPA's model-derived value. The subsequent DWG value derived using the 52 mg/L NOAEL-based dose was 77 ng/L, comparable to the other two primary DWGs (70 and 95 ng/L) calculated using other toxicological endpoints in the SLR Review. Despite the technical recommendations by SLR and similarity to the other DWGs, NHMRC selected the lower, more conservate and uncertain USEPA model-derived dose value for their recommended DWG of 3.4 ng/L (which was subsequently rounded to 4 ng/L). We support SLR's original technical evaluation that the measured NOAEL-based dose is a more robust value for calculation of TDI and DWG values for PFOS. As such, we recommend that NHMRC set the PFOS DWG value at 77 ng/L, not 4 ng/L. 3. PFBS In the SLR Review, the toxicological endpoint selected for the PFBS TDI focused on effects on thyroid hormone (T4) levels. SLR reviewed a key toxicological study using rats exposed to PFBS, as well as reviews of that study by other regulatory agencies. In the study, rats were exposed to no PFBS (control) and three different dose levels of PFBS. Exposure dose, as measured in this study, was the nominal mass of PFBS provided on a daily basis. As noted in the SLR Review, the rats in the lowest dose (50 milligrams per kilogram body weight per day (mg/kg bw*d)) did not exhibit statistically detectable differences in thyroid hormone levels from the control rats. Thus, 50 mg/kg bw*d would be the "no effect" NOAEL dose. As reviewed by SLR, several regulatory agencies applied non-linear dose-response regression modelling to calculate benchmark dose levels ranging from 22 to 28 mg/kg bw*d, and the lower value (22 mg/kg bw*d) was used by SLR to calculate a TDI of 316 ng/kg bw*d and subsequent DWG of 1,107 ng/L (rounded to 1,000 ng/L by NHMRC). There is no technical justification for applying dose-response models to generate a benchmark dose for the rat study. The nominal 50 mg/kg bw*d NOAEL dose is a robust and defensible "no effect" value to use for TDI and DWG generation (730 ng/kg bw*d and 2,500 ng/L, respectively). As such, we recommend that NHMRC set the PFBS DWG value at 2,500 ng/L, not 1,000 ng/L.

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SUBMISSION

Friday, 15 November 2024

AMA submission: Australian Drinking Water Guidelines - Public Consultation on Draft Guidance for Per- and Polyfluoroalkyl Substances

Submitted via survey: https://consultations.nhmrc.gov.au/environmental-health/australian-drinking-water-guidelines-2024-pfas/

Introduction

The Australian Medical Association (AMA) welcomes the opportunity to make a submission to the National Health and Medical Research Council's Australian Drinking Water Guidelines, Public Consultation on Draft Guidance for Per- and Polyfluoroalkyl Substances (PFAS). Having access to safe drinking water is a fundamental human right, and these guidelines are an important step in ensuring that Australian's have limited exposure to hazardous substances in the water they drink.

9. Do you have any comments on the overall approach taken to develop the draft guidance?

- o **Yes**
- o No

Please provide comments on the overall approach taken to develop the draft guidance

Overall, the AMA applauds the NHMRC for the diligence it has taken to better understand the impact of per- and poly-fluoroalkyl substances (PFAS) concentration levels found in drinking water on human health.

The AMA supports the NHMRC guidance embracing caution, with the health-based guideline values being conservative, and identifying a range of uncertainty factors to protect against potential risk. We are pleased to see the values prioritise health protection and include reasonable assumptions appropriate to our unique Australian context across multiple jurisdictions, and our difference in localities.

The AMA notes that studies on the impact of PFAS on human health are limited, with many reliant on animal studies, and the research conclusions are often weak quality. Where the NHMRC's guidance related to GenX Chemicals, the AMA requests the NHMRC include a framework/timeline for regular review of Australian and global research and data regarding PFAS. This should include a review early on in the introduction of the new guidelines around PFAS, to analyse if the guidelines are having the desired impact on drinking water quality. It is important to stay vigilant to emerging contaminate risks, as just because these chemicals are not tested for routinely in Australia, and not currently authorised to be introduced in Australia, does not mean they do not exist or present a level of health risk to the community.

The AMA wishes to highlight the United States' Environmental Protection Agency Fact Sheet specific to GenX Chemicals, updated in March 2023 (https://www.epa.gov/system/files/documents/2023-

03/GenX-Toxicity-Assessment-factsheet-March-2023-update.pdf) . The factsheet highlights animal studies following oral exposure to GenX Chemicals, which have shown adverse health effects including on the liver, kidneys, the immune system, development of offspring, and an association with cancer. Monitoring of water for GenX chemicals started in the United States in 2017, and we ask the NHMRC to continue to consider the value of testing water in Australia for GenX Chemical levels and to continue to investigate if a health-based guideline value would be appropriate for these chemicals if a risk of contamination is found in Australia.

10. Do you have any comments about the implementation or application of the draft guidance?

- o **Yes**
- o No

Please provide comments about the implementation or application of the draft guidance

The AMA agrees with the statement made in the draft PFAS factsheet on page 3, that a preventive approach is the best way to manage risks of PFAS contamination of drinking water supplies and reduce the level of treatment needed. Prevention of contamination must be at the forefront of the implementation plan for the guidance.

The AMA acknowledges the importance of dissemination of information such as PFAS water sources to the public, and recommends that resources such as the Australian PFAS Chemicals Map (https://pfas.australianmap.net/) are kept up to date, as these updated standards in the guidelines come into effect. We note that this map is privately funded through Friends of the Earth Australia, and ask NHMRC to explore whether a similar resource could be created through NHMRC's work, with the help of local councils and environment agencies, and water providers.

The AMA advocates that a One Health approach should be applied at all policy levels (including local, regional, federal, and global) in all disciplines to avoid jurisdictions working in silos. This approach is especially poignant to ensuring continued equity of access to water, that is of a safe quality under the guidelines, across all communities around Australia. Important stakeholders to ensure provision of safe water include government departments and agencies, educational and research bodies, Aboriginal and Torres Strait Islander communities, non-government organisations, and industry bodies.

The AMA suggests that a plan to disseminate the guidance updates is devised, which should include planned communication with health practitioners, local councils and health departments that see the risk of water contamination at a localised level. As the NHMRC is aware, the issue of water contamination does not just relate to PFAS but other water contaminants that impact health.

11. Do you have any specific comments on the draft PFAS Fact Sheet?

- o **Yes**
- o No

Please provide specific comments on the draft PFAS Fact Sheet

The AMA notes the significant effort put into this version of the draft PFAS Fact Sheet, to ensure health advice is evidence-based and cognisant of the risks of PFAS to public health. We reiterate previous comments about the content of the fact sheet included within the Australian Drinking Water Guidelines, being a living guideline of the most current research findings, especially as new substances and risks emerge. We suggest to the NHMRC that the Fact Sheet will need to be reconsidered and revised regularly in line with new and more substantial findings.

The AMA also suggests that the fact sheet will be of greater use to the public, if it is released with some public health communications that are accessible to all members of the community, to address a growing rhetoric on the risk of 'forever chemicals'. This may involve an update to the Australian Government's PFAS website (https://www.pfas.gov.au/) where many of the pages appear to have been last updated in 2019. This information update should include up-to-date contact details for water providers, to ensure the public can contact providers with PFAS related inquiries specific to their locality. The AMA also suggests a broader media campaign, to educate the public through various outlets, including publications, broadcast and online media platforms.

12. Do you have any specific comments on the draft NHMRC Statement on PFAS in drinking water?

- o **Yes**
- o No

Please provide specific comments on the draft NHMRC Statement on PFAS in drinking water

The AMA highlights the point made in the NHMRC statement on PFAS in drinking water, that only 2-3% of total PFAS exposure is from drinking water. We suggest that this messaging is appropriately publicised at the time of guideline republication, to bring public awareness to the other avenues for exposure of PFAS, and to combat the fear-based rhetoric around 'forever chemicals'. The AMA believes that undermining confidence in Australia's drinking water is dangerous, and the rhetoric' should be a caution over PFAS, and not a fear of Australia's drinking water supplies. The NHMRC also has an opportunity through this work to discuss how many PFAS have already been identified and removed from drinking water supply, showing past and continuing protection and prevention efforts. The AMA also recommends that messaging around the importance of cross-government and departmental work, to reduce PFAS exposure, is clearly mentioned in the NRHMC statement. This could be done in the implementation and monitoring sections. Information dissemination should not be left solely to water providers, when PFAS contamination is linked to broader exposure sites than just the water coming out of taps, regardless of the drinking water guidelines' scope.

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22 November 2024

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NMHRC CEO and the Water Quality Advisory Committee
National Health and Medical Research Council
GPO Box 1421
CANBERRA ACT 2601

RE: Submission on the NHMRC Review of PFAS in Australian Drinking Water

The Australian Sustainable Business Group (ASBG) welcomes the opportunity to comment on The NHMRC Review of PFAS in Australian Drinking Water (the Review).

The Australian Sustainable Business Group (ASBG) is a leading environment and energy business representative body that specializes in providing the latest information, including changes to environmental legislation, regulations and policy that may impact industry, business and other organisations. We operate in NSW and Queensland and have over 100 members comprising of Australia's largest manufacturing and infrastructure companies and other related businesses.

1 Overview

In general, ASBG welcomes the review of PFAS[1] for Australian drinking water guidelines, and fully supports a robust scientific approach that reflects Australia's risks. ASBG believes that NHMRC has put forward a proposed framework that begins to address a number of stakeholder concerns. The proposal serves as a good starting point for setting Health Based Guideline values (HBGV) for PFAS compounds in drinking water.

However, ASBG is concerned that even slight non-scientific based assessment, especially in terms of risk assessment, interpretation of results, international influences and use of safety factors has resulted in some PFAS limits being lower that is necessary. The NHMRC needs to also consider that setting of too tight limits can result in significant costs to the general public, due to removal and management systems required. Also to improve public understanding of the levels set and their safety margins should be put into context, directly and with comparison to other known substances posing health risks —e.g. heavy metals, pathogens, toxins etc. This would assist in placing PFAS into a comparable metric with other controlled substances, helping the public better understand the health risk PFASs pose.

The following issues are identified including:

- Issues with how the proposed limits were reached
- Acceptance of how the new limits will be adopted by Government agencies and others

[1] The term PFAS is broadly used, but varies considerably in its catchment. In this submission it refers to PFOA, PFOS, PFHxS and GenX only.

- Dealing with public perception and placing PFAS risk in context

ASBG is concerned over the public consultation process timeframe, as provided, is limited given the complexity of the science and especially its interpretation.

2 Issues with the Derivation of Proposed Limits

This section discusses issues ASBG has with the methodology used in setting PFAS limits, especially PFOS guideline values.

2.1 Safety Factors

In the Review the Health Based Guideline Values (HBGV) were derived using the following equation:

$$\text{HBGV} = \frac{\text{Benchmark Dose Level (ng/kg bw/day x 70 kg x daily proportional intake (0.1)}}{\text{2 L/day x safety factor}}$$

The Review described the details of the above as:

- *300 is the uncertainty factor applied to the human equivalent dose derived from an animal study. The uncertainty factor incorporates a factor of 3 to account for the uncertainty of extrapolating from animals to humans, a factor of 10 to account for human variability and a factor of 10 for use of a short-term study (SLR 2024c).*
- *70 kg is taken as the average weight of an adult.*
- *0.1 is a proportionality factor based on the conservative assumption that drinking water accounts for 10% of the acceptable daily intake.*
- *L/day is the reference value of water consumed by an adult.*

More explanations were provided for each individual PFAS species. All PFASs had safety factors of 300, Except for PFOA, which used a safety factor of 30. Interestingly, the US EPA used a different set, which derived a safety factor of 1,000, but for PFOS came to the same 4 ng/L HBGV result. Overall, the use of safety factors should follow a common agreed method, which provides for a conservative—not overly conservative— HBGVs based on a credible—not absolute— worst case ingestion model for humans. ASBG has a few issues with this approach as it does not consider Australia's circumstances, which is discussed in section 2.3.

There are a number of studies which are critical of the risk assessment processes used for PFASs. A recent paper[2] on EU PFAS levels where it states:

> *Our study shows that the level of health protection embedded in the studied thresholds may differ by three orders of magnitude, even in similar exposure settings… We also indicate that currently, no consensus exists on the appropriate level of required health protection regarding PFAS and that the recently adopted tolerable intake value in the EU is too cautious.*

[2] Inconsistencies in the EU regulatory risk assessment of PFAS call for readjustment, Environment International 186,(2024) 108614, J Reinikainen et al

While the above paper focuses on the EU's methodology, it does expose that considerable variations can result depending on the parameters of the risk assessment used. The paper proposes simple improvements such as taking into account background PFAS concentrations and PFAS in food consumption rates. ASBG notes the NHMRC has also not conducted such work, unlike the work done by Food Standards Australia and New Zealand (FSANZ)[3] (see also section 2.3).

How the Benchmark Dose Levels (BMDL) and safety factors are derived is also subject to scientific and professional debate and scientific controversy, with claims of lack of transparency on how such BMDL are derived. ASBG notes that your reviewer, A Prof. Brian Priestly, provided specific comments regarding the uncertainty factors applied including that they are possibly overly conservative. Clarification here would be welcomed as these processes can be variable. Variations of these rules of thumb, can be used to introduce bias, which given the differences across international health standard setting organisations appears to be present. Overall, ASBG is concerned that for PFASs there is an international race to have the tightest criteria, which is over riding the science.

To be consistent, the next round of assessments of HBGVs, NHMRC should use the same set of safety factor and BMDL assumptions.

2.2 International Comparison of PFAS Limits

Table 1 compares the proposed NRMHC limits with current and international limits.

Table 1: Comparison of PFAS limits on Drinking Water (ng/L)

	NHMRC proposal	NHMRC current	US EPA	WHO	FSANZ (TDI)
PFOA	200	560	4	100	160 ng/kg bw/day
PFOS	4	70	4	100	20 ng/kg bw/day
PFHxS	30	30	10		
PFBS	1000	1000	10		

ASBG supports NHMRC adoption of the World Health Organisations approach to HBGV, which uses a threshold approach. There is much controversy within the scientific profession[4] with the US EPA use of the non-threshold values for genotoxic carcinogens from both the epidemiological and animal studies as a carcinogen for PFOA, hence their 4 ng/L compared to NHMRC's HBGV of 200 ng/L.

Where ASBG has an issue is the NHMRC general adoption of the US EPA's 4 ng/L limit for PFOS. There is concern that a spate of media coverage[5] citing differences between Australia's and the newly issued US EPA PFOS limit influenced the NHMRC to accept the 4 ng/L HBGV. The American Water Works Association has undertaken a detailed scientific critique of the US EPA's methodology[6], especially its risk assessment processes, choice of safety margins, interpretation of results of scientific studies. It recommended, supported with strong scientific argument, that the PFOS and PFOA drinking water limits should be set at

[3] FSANZ Perfluorinated chemicals in food
[4] Non threshold linear controversy, see: The Linear Non-threshold Extrapolation of Dose-Response Curves Is a Challenge for Managing the Risk Associated with Occupational Exposure to Carcinogenic Agents, more generally https://en.wikipedia.org/wiki/Linear_no-threshold_model
[5] One example: https://www.abc.net.au/listen/programs/radionational-breakfast/high-rates-of-forever-chemical-found-in-aussie-tapwater-/103727942
[6] AWWA Comments on the [US EPA] Proposal

10 ng/L, not 4 ng/L. They note such a change would have reduced drinking water PFAS treatment costs by 65%. Following the release of the US EPA's 4ng/L PFOS and PFOA limit they stated:

> *We are concerned, however, that EPA did not use the best available data and appropriate processes in developing the PFAS regulation. For example, we question the use of a novel 'Hazard Index' in place of a Maximum Contaminant Level for mixtures of certain PFAS, and the issuing of a preliminary determination to regulate certain PFAS simultaneously with the proposed rule.*

While the NHMRC methodology for determining the PFOA, PFHxS and PFBS HBGVs differed, the US EPA approach appears generally accepted by NHMRC for PFOS. This is despite both guideline levels reached being scientifically questionable.

2.3 PFAS in Food in Australia

At the Australasian Land and groundwater Association (ALGA) PFAS Summit in March 2024, FSANZ provided a presentation on why no Australian PFAS limits on foods has been made. The main points made by FSANZ, relevant to the NHMRC's PFAS Review, includes:

- FSANZ found that levels of PFAS in the general Australian food supply are very low
- PFOS was the only congener detected of 30 different PFAS for which analysis was conducted
- PFOS was detected in five of 112 food types and in less than 2% of all samples
- The overall dietary exposure to PFOS for the general Australian population is lower than the TDI
- On the dose escalation trial for PFOA: For levels of PFOA more than four orders of magnitude higher than the levels observed in general populations there was no evidence of any major effects
- No need to establish maximum limits for PFAS in the Australia New Zealand Food Standards Code

FSANZ concluded there are far more important food contaminants to focus on such as cadmium, lead, inorganic arsenic and methyl mercury. FSANZ is of the opinion that HBGVs established in 2017 remain health protective. Should further evidence arise this will be considered.

Given the evidence provided by FSANZ, that only PFOS was detected in food samples, 2% of the time, this should provide reasonable Australian background levels for use in the risk assessment process. For PFOS, this means the intake via food, appears far lower than the 90% attributed to it in the HBGV equation provided in section 2.1 above. 2% in food would indicate that 98% of ingested PFOS comes from drinking water. When given a safety factor, in the Australian context the PFAS HBGV would be 5 or more conservatively, 2.5 times higher, 10 ng/L. Even higher HBGVs could be attributed to the other PFASs.

R1 ASBG recommends the NHMRC reconsider their HBGVs for PFAS, especially for PFOS, given the processes used to determine HBGVs, where Australian contextual data from local sources including from FSANZ was not included.

3 Regulatory Uptake and Implications

The issue of PFAS in drinking water has also become a highly emotional issue with the media and general public. Consequently, NHMRC needs to provide clear unbiased scientific advice to all Australians on drinking water guidelines, to provide scientific leadership based on good evidence and repeatable results.

3.1 Regulatory Use

When published, NHMRC's PFAS HBGVs will be used by environmental and health agencies across Australia, often as maximum hard limits to be adhered to by drinking water suppliers. Use of NRMHC PFAS limits will then expand. largely via other Government agencies, to many other areas, based on any potential to impact on raw waters for drinking water sources. The following is a list of areas where the NHMRC PFAS HBGVs will be used as either hard limits or the basis for a similar set of tightening of existing PFAS criteria including:

- **Clean-up criteria for ground water land and soils levels**. PFAS National Environmental Management Plan 3.0 (PFAS NEMP 3.0) limits[7] will likely be impacted by the NHRMC's final PFAS HBGVs. This will result in considerable increase in costs due to the lower limit concentrations that will be set. Currently soils with low PFAS levels are beneficially reused as fill and or for soil conditioning. With lower limits on PFAS set, large volumes would be required to be sent to landfill.
- **Environmental discharge limits into waters**: This would be again impacted by changes to the PFAS NEMP 3.0. Limits could result in much lower PFAS criteria, such as the % species protection required. Often the 99% species protection is used for raw drinking water catchments. This is set very low for PFAS at 0.03 ng/L[8]. For example, further tightening by 17.5 times would push this to 1.7 pg/L. Laboratories would need to gear up to be able to measure PFAS this low.
- **Sewage acceptance levels**. Sewerage operators will likely revise down their sewage acceptance criteria, for example, by 17.5 times on PFOS, or simply do this across all PFAS. Grit from sewage is a solid waste which must go to landfill. However, many sewage system operators accept leachate from landfills.
- **Landfill acceptance levels**: These are usually set by state and territory environmental agencies, which will also be strongly influenced to tighten landfill acceptance limits for PFAS with NHMRC PFAS changes and the expected knock-on PFAS NEMP 3.0 changes setting the lest stringent. This may in turn place contaminated soils, sewage operators grit, and other wastes, above the new acceptance limits, requiring expensive treatments, which are limited and or long haul distances to hazardous waste landfills. Tightening of sewage limits, including leachate to sewer acceptance criteria, will limit the disposal/management choices of sewage grit, creating a Catch 22 loop for sewerage operators.
- **Recycled materials impacts**: There are many which are directly affected:
    - **Biosolids:** Tightening the PFAS limits via PFAS NEMP 3.0 — another sewer treatment operator's waste—by 17.5 times tighter[9] will likely cause this large waste stream to be sent to landfill, rather than be beneficially reused as a soil conditioner. Around 1.6 MT p.a. of biosolids (wet) is generated in Australia, with most beneficially reused, but a large % would

[7] Likely impacting on Health investigation levels, (HILs) Ecological investigation levels (EILs) etc.
[8] Note the limit was 0.0091 ng/L using the CSIRO Burrlsoz model, the 0.03 ng/L uses the Canadian SSDTools. Both use the same data but differ in their statistical assumptions and methods, a similar issue in the setting of HBGVs.
[9] 17.5 is the current 70 ng/L / proposed 4 ng/L for PFOS

be diverted to landfill if they fail new PFAS acceptance limits. Some may not meet new landfill limits requiring further treatment.

- **Organic wastes:** Australia generates about 14.4 million tonnes of organic waste which is made up of food waste, garden organics, timber waste and biosolids. About 8.29 million tonnes (58%) of this component was either recycled or recovered. Currently, Queensland has issued PFOS & PFHxS limit of 2 µg/L and PFOA at 1 2 µg/L. However, regulators are likely to reduce this considerably due to the NHMRC's PFAS HBGVs outcomes. Placing tighter PFAS limits on organic waste would render a significant portion of organic wastes unrecyclable and unusable as a soil conditioner, sending more to landfill. This would significantly undermine Australia's percent recovery of waste to beneficial reuses.
- **Commercial perception**: Some fast food companies are indicating they will refuse to accept recycled paper and cardboard in their packaging for fear of detection of PFAS. As the limits of detection for PFAS would drop by around 20 times to 0.1 ng/L the amount of positive detects for PFAS will increase exponentially. NHMRC must consider the impacts on public perception of risks when publishing limits with safety factors of 300.

Overall, tightening of PFAS limits will impact on wastes at all levels. Of particular concern is the impact on recycling and beneficial reuse of wastes across Australia. Costs of treatment and management of impacted wastes will increase. Tightening's of PFAS limits will result in far more waste being sent to landfill, which is also running out of available space and sites in many areas across Australia.

3.2 Background PFAS Levels need Recognition

PFASs have been used for over 80 years across many countries, including Australia. Consequently, many PFAS have background levels, which must be recognised. If background PFAS levels are unrecognised, the PFAS limit are often set at or close to background levels, even zero levels. Consequently, the regulatory process can become a Catch 22 position resulting in paralysis.

For example, in New Zealand (NZ), background PFAS levels are not recognised, based on the simple position that PFASs are not naturally occurring. A default zero level results based on Limit of Reporting (LOR). Hence, when remediating land or waters the PFAS is concentrated into a smaller volume for later treatment or disposal. However, with a zero level, the cleaned soils or waters must return below detectable limits. Currently, most laboratories in Australia and NZ have most PFAS LORs at around +-10 ng/L. However, setting PFOS to 4 ng/L will require and LOR of at least 1 or 0.1 ng/L or lower. Consequently, the pass mark for soils and water is reduced by at least an order of magnitude in this case. The Catch 22 in NZ is the >LOR limit for PFAS going to landfill. Consequently, a land remediation of PFAS cannot proceed as there is no reasonable disposal solution for the concentrated PFAS and high costs associated with treatments down to >LOR.

All of the above have costs associated with meeting these new criteria, which generally increases in costs inversely exponentially with the limit set. The NHMRC should also include background levels of the main PFASs they are reviewing.

Also important is to ensure that the definition of PFAS is maintained at the set of substances of concern. For example, under the OECD definition, which is very broad, PFAS would capture over 7 million compounds, which includes all with CF2 bonds in their structure.

3.3 Cost Impacts

For example, a study by Black & Veatch[10] for the American Water Works Association found the costs, in the USA of removing PFAS from drinking water includes:

- CAPX to reach 4 ng/L for PFOS & PFOA is around $34 billion
- CAPX to reach 10 ng/L for PFOS & PFOA is around $12 billion
- OPEX to reach 4 ng/L for PFOS & PFOA is around $2.8 billion
- OPEX to reach 10 ng/L for PFOS & PFOA is around $820 million
- Household annualised costs varies from $65 to $310 depending on PFAS treatment plant scale

This cost study is limited to the USA where 16% of drinking water sources would require PFAS removal systems to reach the 4ng/L PFOS limit.

That these are Guideline Values will be ignored by local regulators as well as they will take a risk adverse approach, and use the HBGV as hard limits. There will be no flexibility used, by regulators, as any level above this hard line will be seen in emotional health damaging terms by the public and the media.

R2 ASBG Recommends that the NHMRC also consider the:

- ***Additional safety levels being added by overseas regulators and others to appease stakeholders, which will increase public fear reinforced by tighter new limits based on NHMRC PFAS position on drinking water.***
- ***Knock-on implications, damage to the circular economy and increased costs to the public in setting new tighter PFAS HBGVs, which will be the basis for new hard PFAS limits especially on wastes.***
- ***Increased public fear and nocebo impacts of an overly conservative PFAS HBGVs***

Overall the NHMRC should be reviewing PFASs in context of their overall risks compared to other substances and not just based on PFAS's health impacts in isolation. A focus on a Government chosen limited set of chemicals for their hazards, removes a holistic approach where resources should be focused and proportioned to the main health risks Australians face. What is required is a much broader assessment of health risks where PFASs can be put into context. For example, there are no know deaths directly associated with PFAS exposure in Australia, only estimated health impacts. All the HBGVs for PFAS are based on are largely on animals with increased risks of human diseases. Linking these to human health impacts is area of lacking clear scientific methods where guestimates can vary by a few orders of magnitude with flow on cost consequences.

[10] See reference 5

4 Placing PFAS Information in Context for the Public

The very low HBGVs given to PFAS need to be placed in context for public consideration. Such contextual information should provide evidence that NHMRC's HBGVs use considerable safety factors and are at least conservative if not highly conservative. Such information should provide a balance against public fears and stakeholders calling for zero PFAS levels to be set. Such information would show that the NHMRC is doing its part well to protect the health of Australians and address concerns it is not.

4.1 Concentration Levels in Context

The US EPA does this in part by citing that 4 ng/L PFOS equals 4 ppt, placing the concentration levels in context. Then explains[11]:

> *For example, one part per trillion in time,* is the equivalent of one second out of nearly 32,000 years.

Hence, 4 ng/L concentration can be expressed as 4 seconds in 32,000 years. Note if a tighter limit of 0.1 ng/L, which the EU uses, represents 1 second in 320,000 years.

4.2 Drinking Water Source of PFAS Assumptions

Other contextual data which could be published by the NHMRC to place its PFAS limits in context include:

- That a 300 times safety factor is used based on conservative estimates of the BMDL for PFOS, PFHxS & PFBS.
- In addition, it is assumed that to reach the drinking water HBGV an individual would:
    - Drink 2 litres per day of drinking tap water is drunk
    - Where 90% of PFAS is ingested from other sources, largely foods and beverages
- In the last point note that FSANZ found only PFOS in 2% of routine food sampling for contaminants, no other PFAS were detected.

ASBG is also concerned that FSANZ has a different set of TDI / BMDL value than NHMRC uses to calculate its HBGV. If such a difference is used for the final HBGVs this will cause considerable confusion with for the scientific community, the professionals and regulators to base their interpretation of what limit will apply and by how much.

4.3 Placing PFAS Risk in Context with Other Australian Health Risks

Contextual information should also include other main health risks to Australians, placing PFAS in context. If possible the role of hazardous chemical intake should also be included as a comparison. For example, the following chart from the Australian Institute of Health and Welfare shows the leading risk factors contributing to disease burden in Australia.

[11] See US EPA Questions & Answers: PFAS National Primary Drinking Water Regulation

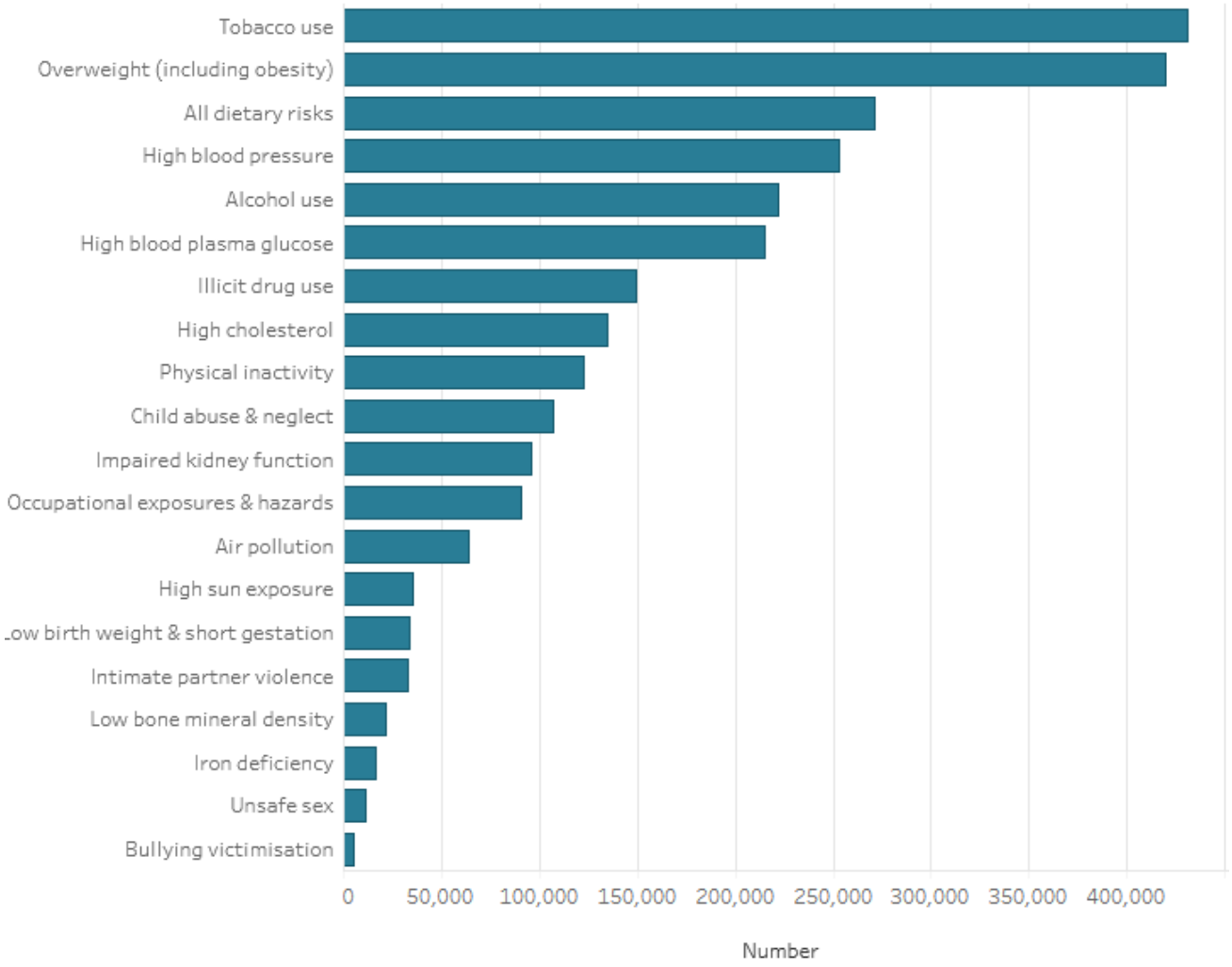

Chart 1: Leading Risk Factors Contributing to Disease Burden showing Disability Adjusted Life Years

The impact of PFASs of concern in the above could be linked to these risk factors. For example, all dietary risks could include PFAS risk. However, a scientifically justifiable portion of this overall risk attributed to PFAS would be required. ASBG considers such risks would be very low in comparison to the large set of dietary risks which are comprehensively listed.

Another comparison source would be from the Australian Bureau of Statistics (ABS) showing health outcomes rather than causes as in Chart 1. Here PFAS is more likely liked to multimorbidity by type of chronic condition, rather than deaths, as deaths attributed to PFAS are not listed due to low exposure rates and lack of any evidence. Chart 2 from ABS could be used as a source for comparison.

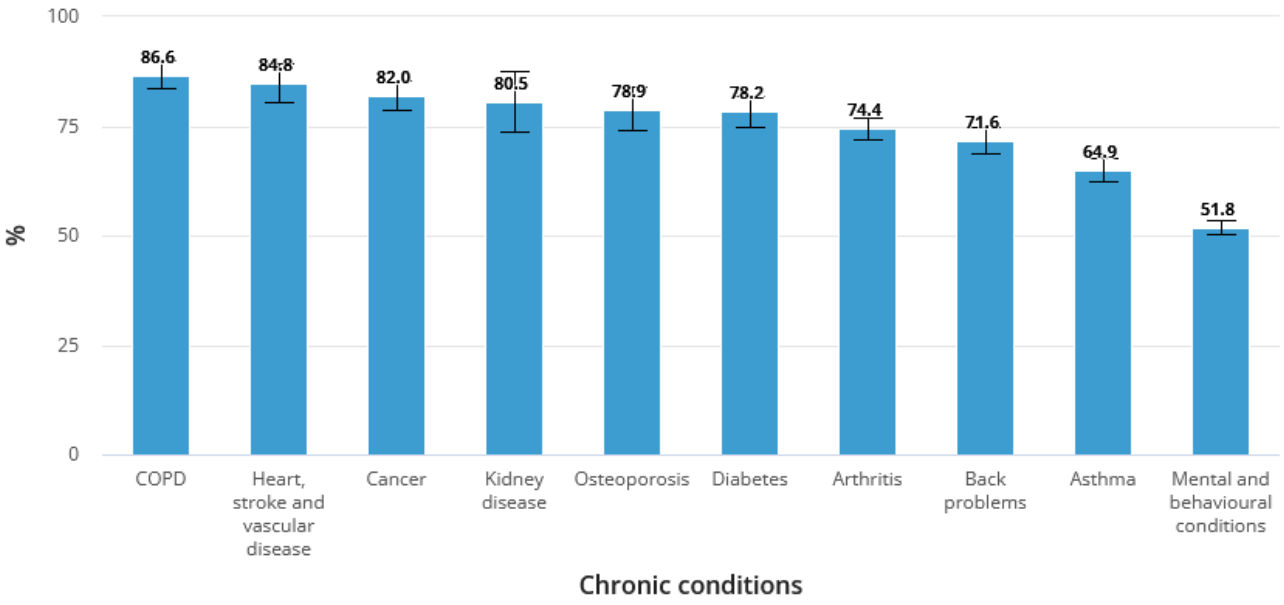

Chart 2: Proportion of People with Multimorbidity by Type of Chronic Condition, 2022

Here PFAS risks can be aligned with the chronic outcome conditions. Chart 2 can be used to compare mortality risk between one or more PFAS and another similar substance, such as a chlorinated pesticide, other halogenated organics or even some heavy metals.

An example of a chemical risk can be mesothelioma caused by asbestos exposure, which can be placed under the cancer risk area and proportioned accordingly to the total. For example, in 2024 an estimated 169,500 cancer cases are expected, of this mesothelioma estimated cases in 2024 is 874, consequently, mesothelioma represents 0.516% of all diagnosed cancers in Australia. Obviously avoidance of asbestos fibre inhalation should prevent mesothelioma, but this places it in perspective with all other cancers.

If PFOA is considered a cancer risk it can be aligned under cancer risk similarly, with a scientifically appropriate proportionated rate compared to all other cancers. The others such as PFOS, PFHxS, etc, may not fit into any of the above categories, but could be proportioned overall if possible.

Some form of contextual information should be published to enable a rational comparison of risks associated with PFAS. At a minimum NHMRC should include a statement along the lines of:

PFAS risks to Australians via drinking water is considered by NHMRC to be very low compared to other health risks.

R3 ASBG recommends the NHMRC provide a fact sheet or equivalent, with contextual information, which places the scale of the PFAS HBGVs in comparison with other significant health risks substances.

Should you require further details and clarification of the contents of this submission please contact me.

Yours Sincerely

Australian Sustainable Business Group (ASBG)

[redacted]

NO.	CONSULTATION SUBMISSION
13	**BANANA SHIRE COUNCIL** *Development of guidance* The proposed new ADWG values seem extremely conservative and incorporate a number of safety fac-tors. The derivation of guideline values for drinking water based on 2 litres of tap water consumed per day per person is questionable given the dietary habits of many Australians in 2024. Rather than tap water, the daily 'drinking' intake for many is arguably made up of commercially manufactured drinks (bottled water, soft drink, energy drink, flavoured milk, etc) that do not have any PFAS limits applied. Given that drinking water is a relatively low source of ingested PFAS, <10% according to the review lit-erature, it must be questioned whether the proposed new highly conservative ADWG values justify the cost of implementation when significantly greater gains can seemingly be made by introducing controls in the levels of PFAS present in food products, commercially manufactured drinks, personal use products, make-up/skin care products, lip gloss, sun-block, clothing, technology/devices, etc *Implications to Council and Ratepayers* Banana Shire Council is a regional Council located in Central Queensland and is a water supply provider to 11 communities in the Shire. Council wishes to provide safe and affordable water to our consumers via our various drinking water schemes. The Biloela town water supply (population approx. 6000) relies on the Callide Valley Aquifer for approximately 50% of it's annual water needs. Reliance on water from the aquifer increases during drought and times when the surface water source is difficult to treat. Council currently draws water from the aquifer via 7 bores and the water quality complies with current ADWG values for PFAS. Under the proposed new ADWG values, current monitoring puts water from 5 of the 7 bores at or above the proposed new guideline values. This is expected to have significant operational and cost implications for Council. Treatment options have previously been investigated to remove PFAS from the bore water with current cost of order $6M. Disposal of the PFAS contaminant waste removed is also difficult and expensive, with limited disposal options and transport costs prohibitive from Central Queensland to potential disposal facilities. If treatment is necessary Council will need to further investigate the most viable treatment technology given the proposed much lower PFAS guideline levels and the specific parameter values. In addition to capital costs, the significant increase in operational & maintenance costs moving from a chlorination only supply to advanced treatment process for the removal of PFAS to meet proposed PFAS guidance values is an ongoing cost the Biloela community cannot afford. The cost of PFAS testing to demonstrate compliance with ADWG is more than $20,000 per sampling round, excluding sample freight costs. This is for the Biloela bores alone and will increase with duplicate/triplicate sampling for quality checks, and additional sampling required for the other water supply schemes throughout the Shire. Additional costs associated with PFAS water treatment capital upgrades, operations & maintenance, and ongoing sampling costs associated with PFAs monitoring and removal will increase costs to Council and subsequently result in increased charges to ratepayers. Residents cannot afford continued increased cost of living expenses for essential services like power and water. *Limits of Reporting* The limit of reporting for many laboratories for PFAS is 5 nanograms per litre, which is greater than the proposed health-based guideline value of 4 nanograms per litre for PFOS. Higher levels of reporting come at increased cost. Council's experience is that there are limited laboratories capable of testing to the level of reporting required by the proposed new guidelines.

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	Sampling Appropriate sampling techniques, storage and transportation to the laboratory are considered critical for PFAS analysis. The potential for PFAS sample contamination during collection and analysis is very high due to presence of PFAS in a wide variety of common everyday products. Accordingly, PFAS sampling methodology includes strict protocols to minimize likelihood of contamination during the collection, storage and analysis for PFAS compounds. Protocols include that samplers cannot wash their hair or wear makeup, perfume, insect repellent, sunscreen, etc for a defined period, to help ensure they do not contaminate the samples. Specific types of containers and clothing must also be used. There is concern that suitably trained and experienced staff may not be available for ongoing PFAS sampling in regional areas. Recruiting and retaining water treatment plant operators and similar staff is extremely challenging for local governments, especially regional Councils competing with the resource sector. Engagement of consultants to undertake the specialist PFAS sampling and reporting is expensive. Availability is limited in regional areas and travel costs are expensive. It is envisaged that if the proposed guideline amendments are adopted, assistance will be required with development of sampling plans and procedures, provision of appropriate staff training as well as subsidised analysis/testing programs. *Phasing In Of Proposed New Guideline Values* Council would find it difficult to comply with guideline values if adopted as proposed in April 2025. This may render the aquifer source concerned unavailable for town water consumption. Any adoption of the proposed guideline values should be phased in over 5 to 7 years to provide sufficient time to plan and implement necessary upgrades and resulting increased charges to consumers. Financially, Council will need to seek capital subsidy from State and Federal Governments to at least fund the necessary capital works. Currently there are limited funding opportunities available. *Fact Sheet* In various instances, the document states a substance (eg PFOA, etc) has been detected at concentrations ranging from below detection to…….. If it's below detection, it hasn't been detected. Suggest rewording "from detection limit to…..".
14	**INDIVIDUAL RESPONSE 06** To Whom It May Concern, I am writing as a concerned citizen and a diabetic who consumes significant amounts of water daily. My health condition necessitates clean, safe drinking water. However, I am deeply troubled by the presence of substances such as fluoride, excessive chlorine, and per- and polyfluoroalkyl substances (PFAS) in Australia's drinking water, all of which pose significant health risks. I urge the National Health and Medical Research Council (NHMRC) to review and update Australia's drinking water standards to reflect current scientific evidence, modern public health practices, and uphold fundamental rights to individual choice. *Fundamental Rights to Choice and Informed Consent* Australians deserve the right to make informed decisions about the substances they consume. The addition of fluoride to drinking water denies this right, forcing people to ingest a substance recognised as a toxin. Dentists strictly warn against swallowing fluoride during treatments due to its toxicity, yet the same substance is deliberately added to our drinking water, where it has no role in cleaning or sanitising water. Moreover, Australians are exposed to these substances not only through drinking water but also during showers. Excessive chlorine and fluoride in water can have detrimental effects on the skin, exacerbating conditions like dermatitis, which has reached epidemic proportions in Australia. Chlorine strips the skin of its natural oils, leading to dryness, irritation, and increased sensitivity, while fluoride may further aggravate sensitive or damaged skin. *Outdated Public Health Policies* The origins of water fluoridation lie in the mid-20th century, a time when dental care options were limited. However, modern advancements in oral hygiene, such as fluoride toothpaste, professional treatments, and improved dental

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	access, have rendered water fluoridation an outdated and unnecessary practice. Countries like Germany, Sweden, and the Netherlands have rejected fluoridation, proving that education and targeted dental care can achieve comparable or better results without forcing ingestion. *Health Risks of Fluoride* Recent studies highlight the risks associated with fluoride exposure: 1. Cognitive Impairment: Research published in Environmental Health Perspectives found a strong association between fluoride exposure and reduced IQ levels in children. 2. Endocrine Disruption: Studies in the Journal of Clinical Endocrinology reveal that fluoride interferes with thyroid function, exacerbating conditions like hypothyroidism. 3. Skeletal Fluorosis: Prolonged fluoride exposure has been linked to weakened bones and joint pain. 4. Bioaccumulation: Fluoride builds up in the body over time, amplifying risks for vulnerable groups, such as pregnant women, infants, and the elderly. These findings, supported by sources like The Lancet Neurology and the International Journal of Environmental Research and Public Health, make a compelling case for revising current policies. *Chlorine and PFAS Contamination* Excessive chlorine in water creates harmful by-products, such as trihalomethanes (THMs), which studies in the American Journal of Epidemiology and Journal of the National Cancer Institute have linked to increased risks of bladder and colon cancers. PFAS, or "forever chemicals," are another growing concern. Persistent in both the body and the environment, PFAS compounds have been shown to disrupt immune and endocrine systems, as highlighted in Environmental Science & Technology. Their widespread presence in Australian water supplies underscores the need for urgent action. *Economic and Consumer Burdens* Water fluoridation disproportionately impacts low-income individuals who cannot afford expensive water filtration systems or bottled water. Moreover, the healthcare costs associated with chronic conditions linked to fluoride, chlorine, and PFAS exposure—such as dermatitis and cognitive impairments—place an avoidable financial strain on both individuals and the healthcare system. *Sustainable and Modern Alternatives* Countries like Norway and Switzerland have successfully adopted advanced water sanitation methods such as ozonation and UV disinfection, which eliminate pathogens without creating harmful by-products. Additionally, copper piping provides a natural antimicrobial alternative that reduces the need for chemical disinfectants. Investing in these alternatives would not only protect human health but also align Australia with global best practices, demonstrating leadership in water safety and sustainability. *Ethical, Environmental, and Economic Considerations* 1. Informed Consent and Choice: Australians should not be forced to consume potentially harmful substances without explicit consent. 2. Environmental Protection: Excessive chemical use harms ecosystems and wildlife, particularly through chlorine by-products and PFAS contamination. 3. Economic Efficiency: Preventative measures, such as reducing fluoride and chlorine levels, could lower healthcare costs and enhance quality of life. 4. Protecting Future Generations: Children are particularly vulnerable to environmental toxins. Prioritising safer drinking water is an investment in their health and development. *Transparency and Timely Action* I urge the NHMRC to commit to: 1. Conducting independent research on fluoride, chlorine, and PFAS safety, free from vested interests. 2. Involving the public in water quality decisions through a national referendum or open consultations. 3. Providing a clear timeline for implementing revised water standards to ensure swift action. *Call to Action* As the NHMRC, you have a responsibility to protect public health. I urge you to:

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	1. Conduct a comprehensive review of fluoride's safety, necessity, and ethical implications. 2. Investigate safer alternatives to chlorine, such as ozone and UV disinfection. 3. Establish stricter limits on PFAS contamination in drinking water. 4. Promote sustainable options like copper piping and advanced filtration systems. 5. Address the effects of chlorine and fluoride on skin health, particularly the rising prevalence of dermatitis. 6. Ensure transparency and public consultation in water quality decisions. This issue is not just about water quality—it is about safeguarding the health, safety, and fundamental rights of all Australians, now and for future generations. Thank you for considering these concerns. I look forward to your response and updates on this critical matter. Yours sincerely,
15	**INDIVIDUAL RESPONSE 07** Greetings NHMRC, Re: proposed guideline values for PFAS in Australian drinking water I applaud the NHMRC for initiating a review of the maximum permitted levels of PFAS chemicals in Australian drinking water. This review has obviously been prompted by recent research and recommendations from major health organisations such as the US Environmental Protection Agency (EPA) and the International Agency for Research on Cancer (IARC). While it's great to see the recommendation to lower the maximum level of PFOS to 4 ng/L (which mirrors that of the EPA), I am surprised and disappointed that the NHMRC is suggesting an upper limit of 200 ng/L for PFOA. This proposed level is 50 times the EPA's new limit! Why? This appears to be a dangerously high limit considering that the IARC, which is part of the World Health Organization (WHO), has recently classified PFOA as "carcinogenic to humans" (Group 1). Please reconsider this and lower the proposed maximum level of PFOA to 4 ng/L. It is also concerning that the NHMRC has not proposed any limits whatsoever for HFPO-DA (GenX chemicals). This is in stark contrast to the EPA's upper limit of 10 ng/L. Please reconsider this and introduce a maximum level of 10 ng/L. I thank you for the opportunity to provide feedback on the Draft Guidance for PFAS in Australian drinking water. Yours sincerely, *Implementation or application* The Australian Drinking Water Guidelines are not mandatory legally enforceable standards and the implementation of the Guidelines is at the discretion of each state and territory. This is absurd! It effectively permits any state or territory to ignore the Guidelines and set maximum levels of PFAS chemicals which are far higher than recommended. The Australian Government should pass legislation to enforce a uniformly consistent set of standards for the entire country.
16	**CANCER COUNCIL AUSTRALIA** *Development of guidance* Cancer Council Australia welcomes a cautious approach to PFAS exposure through Australia's water supply, considering the conflicting evidence for a link between PFAS and cancer. However, a more in-depth literature search, accessible resources and improved consumer engagement would increase the quality of the proposed guidance. We provide the below feedback on the overall approach of the development of the draft guidance.

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	Included evidence: From the guideline documentation, it does not appear that a comprehensive review of the current literature was completed. This limits the use of available evidence to inform the guidance and may potentially lessen the quality of the review. Additionally, the methodology to obtain and critically appraise the cited sources within the PFAS Fact Sheet is not disclosed. Mechanistic studies are noted as having a substantial impact on the International Agency for Research on Cancer's (IARC) classifications of PFOA as carcinogenic to humans (Group 1) and PFOS as possibly carcinogenic to humans (Group 2B), however this evidence is not discussed in the guideline documentation. It is evident that other jurisdictions' guidelines have formed the basis of the recommended guidance. Due to this, the evidence informing the guidance may have been limited by the quality of the methodology of other jurisdictions. Accessibility: The supporting documentation for public consultation is lengthy and technical, and the intended audience for each document is unclear. A more concise, user-friendly presentation of information would increase the document's accessibility and ease of interpretation for a wider audience. Consumer and sector engagement: It is concerning that the Administrative Report notes consumer consultation involved engaging with only three representatives prior to public consultation. Increased consumer engagement with key stakeholders, such as health regulators and water providers, would have improved understanding of the feasibility of the guidance and its implementation plan during its development. *Implementation or application* The resources required for Australian water providers to implement the proposed guidelines are not acknowledged. The NHMRC Statement references the grace period for the USA EPA's recent lowering of allowable PFAS levels in drinking water, however it does not note the funding the USA government has committed to achieving these targets.1 Whilst the Administrative Report notes the costs of additional treatment to drinking water may be borne by local providers, with potential flow on effects to consumers, this is not acknowledged or addressed in the NHMRC Statement or Fact Sheet. Regional and remote communities will be disproportionately impacted by smaller water providers having insufficient resources to implement the guidance, as exceedances to the Australian Drinking Water Guidelines is most prevalent in these areas.2 To ensure equity, it is crucial smaller water providers have access to the necessary resources to implement the guidelines. Support for providers to achieve these water levels could be emphasised to ensure consistent regulation across Australia. Additionally, further emphasis is needed on the implementation and monitoring for water catchments that are likely to have higher levels of exposure to PFAS. Considering Australia's ongoing cost of living crisis, cost of implementation and potential flow on costs to consumers is an important consideration to the implementation of this guidance. The guidelines must be responsive to new evidence as it emerges, as literature and international guidance on PFAS and their potential impact on cancer is a rapidly evolving space. It is crucial these guidelines are living documents that are adaptable to the fast-changing environment. The intention and process for re-evaluating these guidelines should be established and clearly outlined in the implementation plan. The inclusion of clearer, user-friendly guidance is required to minimise confusion and increase its accessibility for all stakeholders, including water suppliers and the public. References 1. United States Environmental Protection Agency. Key EPA Actions to Address PFAS 2024 [cited 2024 Oct 30]. Available from: https://www.epa.gov/pfas/key-epa-actions-address-pfas. 2. Wyrwoll PR, Manero A, Taylor KS, Rose E, Quentin Grafton R. Measuring the gaps in drinking water quality and policy across regional and remote Australia. npj clean water. 2022;5(1):1-14. *Fact Sheet* Target audience: The intended target audience and utility of the PFAS Fact Sheet is unclear. The fact sheet is lengthy and overly technical, with evidence for the key recommendations difficult to identify. As a result, the Fact Sheet is inaccessible and is not effective in its intended role, regardless of the target audience. Public awareness: There is a need for the public to have access to clear and accessible evidence-based resources on PFAS and the recommended allowable levels in drinking water. Media outlets and the public will look to NHMRC's guidance through the Australian Water Guidelines for clear, reputable evidence on the link between PFAS and health conditions. The widespread use and risk of exposure to PFAS has led to increasing media attention and subsequent

NO.	CONSULTATION SUBMISSION
	community concern, particularly regarding PFAS' potential carcinogenicity.1 The lack of clear evidence linking PFAS (including PFAS exposure from drinking water) to cancer complicates the public's ability to assess their risk arising from exposure and increases the potential for misinformation to be spread. References 1. Solan ME, Park JA. Per- and poly-fluoroalkyl substances (PFAS) effects on lung health: a perspective on the current literature and future recommendations. FRONTIERS IN TOXICOLOGY. 2024;6. *NHMRC Statement* The timeframes that will be required for Australian water providers to meet the recommended PFAS levels requires greater clarification. Clearer recommendations on the implementation of the new allowable PFAS limits would increase the feasibility of the guidelines, promote a consistent response across Australia and assist to ensure water providers can put adequate resources behind the activities needed to ensure alignment with the guidance. We appreciate that the Statement acknowledges the importance of regular monitoring and data collection, however increased specificity regarding these points would ensure a more consistent approach to data collection. Importantly, this would increase opportunities for national data collection on PFAS contamination within Australia's drinking water.
17	**INDIVIDUAL RESPONSE 08** I object and do NOT consent to any changes or updates being made to the NHMRC health-based drinking water guidelines. Some of the chemicals that are in this update are carcinogenic and potentially have other very negative consequences health consequences for both humans and wildlife. *Implementation or application* I object and do NOT consent to the implementation or application of this draft guidance. *NHMRC Statement* I object and do NOT consent to PFAS in our drinking water due to strong health concerns I mentioned earlier.
18	**INDIVIDUAL RESPONSE 09** *Development of guidance* It is common practice to define tolerable levels of toxins. For example the ""LD50"", or the ""lethal dose which is expected to kill 50%"" of the test subjects. This makes sense for something like sodium cyanide. However, PFAS does not conform to this type of thinking. The harms of PFAS to humans and wider ecosystems are not so much acute, but subtle, and complicated by bioaccumulation, biomagnification and the genetics of the contaminated individual. I have considered the proposed Australian standards for PFAS in drinking water, and compared those with the standards newly enacted in the United States of America (USA), April 2024. Whereas Australia proposes ""guidelines"", I prefer that Australia adopts the American model of ""Maximum Contamination Level Goals (MCLGs)"" and enforceable Maximum Contamination Levels (MCLs). Guidelines have no teeth; enforceable limits do. Australian limits for PFAS in drinking water must be enforceable in Australian law. That said, there is a risk that having reduced PFAS levels to the enforceable limits, the effort (or funding) to reduce PFAS levels further may stop. The virtue of having ""Maximum Contamination Level Goals"" is that they can, and should, motivate the drinking water providers to engage in a process of ""continual improvement"" consistent with ISO 14001 Environmental Management Systems. The effort to prevent PFAS from contaminating drinking water should never cease. Prevention of contamination is infinitely preferable to cleaning up post factum. *Implementation or application*

NO.	CONSULTATION SUBMISSION
	Whilst much publicity has been given to PFAS contamination arising from the use of fire fighting foams, there is another major looming threat to our water supplies, public health and wider environment from another PFAS source, not yet operational in Australia. At this time there is an epidemic of proposals, indeed some current construction, of waste incinerators in Australia. The feedstock (garbage) will certainly contain PFAS. This is unavoidable given that there is no practical way of removing PFAS contaminated garbage (e.g. stain-resistant textiles) from the waste stream. To destroy PFAS with heat, temperatures of over 1,100 Celsius are required. See Brunn et alia (2023). The Renex facility in Dandenong Victoria is specifically designed to do just that with contaminated soil, not garbage. However, all the Australian waste incinerator proposals that I have seen are designed to operate at 850 Celsius. Bjorklund et al (2024) suggest that a percentage of higher molecular weight PFAS may be broken into smaller PFAS at 850 Celsius, but this temperature does not destroy PFAS. Due to the chemically inert nature of most types of PFAS, we can expect that post combustion PFAS will, to a large degree, evade the air pollution controls and be broadcast into the wider environment from the incinerator's flue; including drinking water catchments. In other words, for standard waste incinerators, PFAS in = PFAS out. We can expect that the waste incinerator approved by EPA Victoria for Lara will contaminate the Hovell's Creek catchment and its farmlands with PFAS. Hovell's flows into the Limeburners Bay Ramsar Wetlands. We can also expect that the waste incinerator proposed for Wollert Victoria will contaminate the Merri Creek catchment and its farmlands with PFAS similarly. Merri Creek flows into the Yarra River, then into Port Phillip Bay. And so on. Each waste incinerator proposal in Australia needs to be examined through the PFAS lens. There is a long list of other landscape-scale human health consequences arising from waste incinerators, in addition to PFAS, See Tait (2020). See also what has happened in Lausanne Switzerland, Paris France, Harlingen Netherlands, and Beringen Belgium, to name a few. One of the first actions that any health authority would do to prevent PFAS contamination of drinking water is to ban industrial scale waste incinerators. *Fact Sheet* A useful reference which I do not see in the Fact Sheet is a comprehensive review paper about PFAS and its implications by Brunn et alia (2023). Brunn provides detail on the human health consequences of PFAS, as well as implications for other species and the wider environment. That is ... Brunn et al (2023) "PFAS: forever chemicals – persistent, bioaccumulative and mobile. Reviewing the status and the need to their phase out and remediation of contaminated sites" in Environmental Sciences Europe 2023, 35(1):20 https://doi.org/10.1186/s12302-023-00721-8. Available at: https://enveurope.springeropen.com/counter/pdf/10.1186/s12302-023-00721-8.pdf *NHMRC Statement* Here are my recommendations for enforceable PFAS limits (rather than ""guidelines"") for PFAS in drinking water. PFOA, Goal = Zero, Limit = 4 nanograms per litre PFOS, Goal = Zero, Limit = 4 ng/L PFHxS, Goal = 10 ng/L, Limit = 10 ng/L PFBS, Goal = Zero, Limit = 1,000 ng/L PFNA, Goal = 10 ng/L, Limit = 10 ng/L HFPO-DA (GenX), Goal = 10 ng/L, Limit = 10 ng/L Sum of all PFAS, Goal = 30 ng/L, Limit = 1,100 ng/L Regardless of the levels of PFAS achieved, drinking water providers should be constantly engaged in ""continual improvement"" as per ISO 14001, to reduce the levels and the risks of, PFAS contamination.

Chemistry Australia Limited ABN 77 063 335 615
Level 11, 10 Queen Street, Melbourne, VIC 3000
PO Box 422, Flinders Lane, VIC 8009
[redacted]

21 November 2024

National Health and Medical Research Council
Environmental Health Section
1300 064 672
water@nhmrc.gov.au

Dear Sir/Madam,

Australian Drinking Water Guidelines - Public Consultation on Draft Guidance for Per- and Polyfluoroalkyl Substances (PFAS)

Chemistry Australia is the peak national body representing the chemistry industry in Australia. Chemistry Australia members include chemicals manufacturers, importers and distributors, logistics and supply chain partners, raw material suppliers, plastics fabricators and compounders, recyclers, and service providers to the sector and the chemistry and chemical engineering schools of a number of Australian universities.

Chemistry Australia welcomes the opportunity to provide comment on the **draft updates on Per- and Polyfluoroalkyl Substances (PFAS).** It is important that any guidelines are well considered through the weight of evidence and through robust scientific approaches. This submission provides a review from our membership on the proposed draft PFAS guidelines. The current values already take a conservative approach as noted by the NHMRC, therefore, any decisions to move beyond these limits should be well considered against the evidence, to avoid undue public health alarm. We consider that the information provided in this submission, will be beneficial to the review committee in its development of establishing appropriate tolerances to PFAS.

For more information or if we can assist this review any further, please don't hesitate to contact me on [redacted] or by email at [redacted]. Chemistry Australia would be happy to coordinate anything further with our members if further information is warranted.

Yours sincerely,

[redacted]
Chemistry Australia

Chemistry Australia feedback on the Australian Drinking Water Guidelines - Public Consultation on Draft Guidance for Per- and Polyfluoroalkyl Substances (PFAS)

Chemistry Australia feedback on the Australian Drinking Water Guidelines - Public Consultation on Draft Guidance for Per- and Polyfluoroalkyl Substances (PFAS)

Introduction

In October of 2024, Australia's National Health and Medical Research Council (NHMRC) issued draft updates to the existing health-based guidelines for per- and polyfluoroalkyl substances (PFAS) in drinking water (NHMRC 2024a,b,c). NHMRC proposed reducing the current perfluorooctanoic acid (PFOA) guideline from 560 to 200 ng/L and reducing the current perfluorooctane sulfonic acid (PFOS) guideline from 70 to 4 ng/L. NHMRC also proposed new, separate guidelines for perfluorohexane sulfonic acid (PFHxS)[1] and perfluorobutane sulfonic acid (PFBS) of 30 and 1,000 ng/L, respectively. The PFOA and PFOS guidelines that NHMRC adopted in 2018 were based on an assessment conducted by Food Standards Australia New Zealand (FSANZ 2017). NHMRC's proposed changes were informed by the work of their contractor, SLR Consulting, which evaluated available assessments for PFAS in drinking water and toxicological studies of PFAS that have been published since 2017. NHMRC reviewed, but often disregarded, the SLR (2024a,b) evaluation.

The following comments address the exposure assumptions and toxicological bases underlying the proposed guidelines:

- NHMRC consistently acted counter to the recommendations of the SLR (2024a,b) Evidence Evaluations; in so doing, NHMRC selected drinking water guidelines based on toxicological effects that lack human relevance and are not supported by a sufficient weight of evidence.

- NHMRC's reliance on a default relative source contribution (RSC) of 0.1 to derive the drinking water guidelines for PFOA, PFOS, PFHxS, and PFBS deviates from standard practice of applying a minimum default RSC of at least 0.2. The lower RSC yields drinking water guidelines that are overly conservative.

- Reducing the PFOA guideline value from 560 to 200 ng/L is not justified because NHMRC relies on toxicological effects (i.e., pancreatic tumors observed in rodents) that have little or no human relevance.

- In reducing the PFOS guideline value from 70 to 4 ng/L, NHMRC deviated from the recommendation of the SLR Evidence Evaluation and relied on an analysis with greater uncertainty than that underlying the current drinking water guideline value.

- The new, distinct drinking water guidelines proposed for PFHxS and PFBS of 30 and 1,000 ng/L, respectively, are based toxicological effects (i.e., changes in thyroid hormones observed in rodents) that have little or no human relevance. Therefore, the weight of evidence does not support these new guideline values.

[1] The current PFOS guideline of 70 ng/L includes a sum of PFOS and PFHxS concentrations. The draft guideline proposes a separate standard for PFHxS of 30 ng/L.

NHMRC'S Relative Source Contribution is Overly Conservative And Counter To Best Practice

To derive the proposed drinking water guidelines for PFOA, PFOS, PFHxS, and PFBS, NHMRC used a default RSC of 0.1 (i.e., 10 percent). An RSC represents the proportion of total exposure to a chemical that is allocated to a specific source (in this case, drinking water intake) relative to exposures that may occur from all sources (i.e., drinking water intake as well as dietary intake, inhalation, etc.). In deriving drinking water standards, RSCs are applied to adjust the limit in drinking water to ensure that the total daily intake of the compound across all exposures combined does not exceed a toxicity reference value (i.e., the daily dose that is not expected to lead to increased health effects). Accordingly, an RSC of 0.1 means that 10 percent of the maximum daily dose is attributed to drinking water and 90 percent is attributed to all other potential exposure sources. As discussed below, NHMRC's reliance on an RSC of 0.1 is overly conservative, does not reflect the best practices for RSC selection as demonstrated by other authorities, and does not adequately consider available evidence related to population exposures to each PFAS compound.

In its *Australian Drinking Water Guidelines*, NHMRC (2022) stated that

> *"for chemicals that are used commercially or industrially, it is assumed, in the absence of other information, that water contributes 10 percent of intake. For compounds that are not used commercially or industrially, a higher proportion of intake (usually 20 percent but sometimes 80 percent or 100 percent) is assumed to come from drinking water. These figures are regarded as conservative (assuming a higher proportion deriving from drinking water would result in raising the guideline value), and the approach is consistent with that adopted by the WHO [World Health Organization] and by other countries" (p. 112).*

NHMRC (2022) did not cite any supporting documentation or literature to justify its adoption of a 0.1 default RSC for chemicals "used commercially or industrially", and as detailed below, was counter to practices of WHO and other agencies. NHMRC (2022) also did not provide clear guidance for selecting RSC values greater than the default. Notably, for other drinking water contaminants (e.g., cyanotoxins, disinfection byproducts, bromate), NHMRC applied RSC values of greater than 0.1, typically citing RSCs used by other authorities (NHMRC 2022). SLR (2024a,b) noted that, "all jurisdictions which have derived [drinking water guidelines] in the literature consulted applied an RSC of 0.2 (i.e. 20%)….but do not provide the rationale for this." This statement is erroneous, in that other agencies' PFAS drinking water guidelines reviewed by SLR were derived using RSC values ranging from 0.2 to 0.5, and consistently provide justification for those values (e.g., USEPA 2024a; MSAW 2019).

Despite NHMRC's use of an arbitrary default RSC of 0.1,standard practice for derivation of standards for drinking water and other media is to apply an RSC that is between 0.2 and 0.8 (Krishnan and Carrier 2013; Lindborg et al. 2022; USEPA 2000). For more than 40 years, the United States Environmental Protection Agency (EPA) has used a minimum default RSC of 0.2 for deriving drinking water and other water quality standards when there is insufficient data on exposures (Lindborg et al. 2022; USEPA 2000). As noted by Lindborg et al. (2022), EPA considers an RSC of 0.2 to be "a reasonably conservative estimate of the contribution from drinking water where most exposure is from nondrinking water sources." EPA does not recommend applying an RSC of less than 0.2 stating that below this value, "it is more appropriate to reduce other sources of exposure, rather than promulgating standards for *de minimus* reductions in overall exposure" (USEPA 2000; p. 4-15). EPA also developed an exposure decision tree that outlines approaches to deriving chemical-specific RSC values instead of relying on default values (USEPA 2000). According to EPA, selection of an RSC greater than 0.2 should reflect consideration of physical and chemical properties, chemical fate and transport, and information on the likelihood of exposure to relevant sources. From the

available consultation materials, it does not appear that NHMRC considered such factors in applying an RSC of 0.1.

In a review of the application of RSCs in the drinking water risk assessment process, Krishnan and Carrier (2013) concluded that selecting an RSC[2] of less than 0.2 is not supported. The authors note that a minimum RSC of 0.2 is typically used even for substances with low occurrence in drinking water because it accounts for interindividual variability in exposure patterns and uncertainty in exposure frequency, duration, and contact rates. The authors noted that allocation to drinking water should not "be unreasonably low" because it may lead to "extremely low" drinking water standards that "represent just a nominal fraction of total exposure" (Krishnan and Carrier 2013). Importantly, the authors concluded that "the proposal of low guideline values based on the use of small values of AF [allocation factor] for contaminants for which drinking water is not the significant source of exposure is **therefore neither defensible nor consistent with current science and practice**" [emphasis added]. Based on this analysis, an RSC of 0.1 does not reflect potential population variability in exposures to PFAS in drinking water and leads to drinking water guidelines that are overly conservative.

WHO's *Guidelines for Drinking-water Quality* also recommend applying RSC values of 0.2 to 0.8 (WHO 2022). WHO (2022) clearly states "[i]n the absence of adequate exposure data or where documented evidence is available regarding widespread presence in one or more of the other media (i.e. air, food, soil or consumer products), the normal allocation of the total daily intake to drinking-water is 20% (floor value), which reflects a reasonable level of exposure based on broad experience, while still being protective (Krishnan & Carrier, 2013). This value reflects a change from the previous allocation of 10%, **which was found to be excessively conservative**….Where chemical and context-specific allocation factors can be developed using exposure data or models, the allocation factor applied **should still be bounded by the floor and ceiling values (i.e. 20–80%)**" [emphasis added] (p. 176). Therefore, NHMRC (2022) is incorrect in its statement that an RSC of 0.1 is recommended by WHO. NHMRC's application of such a low value is counter to international best practices.

Numerous other jurisdictions use a minimum default RSC of 0.2 when deriving drinking water standards for PFAS. In fact, neither SLR nor NHMRC identified any other jurisdiction that applied an RSC of less than 0.2 for any PFAS drinking water standard (NHMRC 2024c; SLR 2024c). EPA applied an RSC of 0.2 in deriving its interim drinking water health advisories for PFOA and PFOS, as well as its maximum contaminant levels for PFHxS and PFBS (USEPA 2022a,b, 2024a). Several U.S. states reviewed by SLR (including California, New Jersey, Minnesota, and Michigan) derived PFAS drinking water standards based on a minimum RSC of 0.2; some states used an RSC of 0.5 for certain PFAS based on EPA's RSC decision tree (USEPA 2000). For example, as noted by SLR (2024c), Michigan used an RSC of 0.5 to derive drinking water standards for PFOA, PFOS, and PFHxS based on serum data to understand exposure levels (MSAW 2019). Health Canada also applied a minimum RSC of 0.2 in the derivation of drinking water standards, including those for PFOA and PFOS (HC 2016, 2018). Therefore, an RSC of 0.1 is overly conservative and not supported by scientific best practices, guidance, or precedent.

As noted above, NHMRC failed to present clear scientific rationale for its default RSC of 0.1, which is the default applied for derivation of all drinking water contaminants in Australia (NHMRC 2022). NHMRC (2024a,b,c) discussed a range of potential relative exposure levels of PFAS in drinking water to populations in Australia. However, this assessment seems unlikely to reflect current exposure patterns. NHMRC (2024a) stated, "estimates of exposure to PFOS and PFOA via drinking water in 2011 ranged from 2-3% for a non-exposed community (i.e., not impacted by a point source) up to an estimated maximum of 22% and 24% respectively [for PFOS and PFOA] from contaminated water supplies (Thompson et al. 2011)." This finding

[2] Krishnan and Carrier (2013) use the term source allocation factor.

indicates that there may be widely ranging sources of exposure across the Australian population and that a higher RSC is justified to more accurately reflect the variability in population exposure levels, as is recommended by Krishnan and Carrier (2013). In addition, the cited analysis by Thompson et al. (2011) may not reflect current exposure levels to PFOA and PFOS, in particular. To calculate the relative exposure estimates to PFAS in drinking water, Thompson et al. (2011) relied on estimates of total daily PFAS intakes calculated in a related study (i.e., Thompson et al. 2010). Because the Thompson et al. (2011) analysis represented only 34 sampling locations, it does not accurately reflect drinking water source contributions for the broader Australian population or the variability in exposures across the Australia. Therefore, NHMRC did not sufficiently justify that a default RSC of 0.1 reflects a current source contribution of PFAS in drinking water for people in Australia.

In summary, NHMRC's reliance on an RSC of 0.1 is overly conservative and does not reflect the best practices for RSC selection, as demonstrated by other authorities and publications. NHMRC did not adequately consider current population-specific exposures for each PFAS compound.

The Proposed PFOA Guidance Value is Based on Effects with Little or No Human Relevance

NHMRC proposes to reduce the PFOA drinking water guidance value from 560 to 200 ng/L, based on SLR's evaluation of assessments and toxicological studies of PFAS published since 2017. In its evaluation, SLR (2024b) identified potentially suitable guideline values for PFOA ranging from 63 to 560 ng/L, including the current Australian guideline value of 560 ng/L. According to SLR (2024b), though the candidate study underlying the proposed 200 ng/L value was considered high quality, the critical effects are "unlikely to be relevant to humans based on currently available information." As discussed below, NHMRC acted contrary to the evidence presented in the SLR Evidence Evaluation, and the proposed reduction in the guideline value is not justified.

The current 560 ng/L standard is based on the critical effect of decreased growth rate in pups observed in an oral developmental study in mice (Lau et al. 2006). The proposed guideline value of 200 ng/L is based on the critical effect of pancreatic tumors (pancreatic acinar adenomas and adenocarcinomas) observed in a 2-year chronic oral study in rats (NTP 2023). As noted in the SLR Evidence Evaluation Addendum (2024b), these tumors are unlikely to be relevant to humans because they are likely mediated via peroxisome-proliferator alpha (PPARα). It is well established that rodents are more sensitive to chemicals that activate PPARα and that effects modulated via PPARα mechanisms have little to no relevance to humans (Corton et al. 2018; Klaunig et al. 2003). As noted by SLR (2024b), there is not consistent epidemiological evidence supporting an association between PFAS exposures and pancreatic tumors in humans. Despite the SLR Evidence Evaluation conclusion that the pancreatic tumors observed in rats may not be relevant to humans (SLR 2024b), NHMRC selected the candidate guideline value based on the pancreatic adenomas and adenocarcinomas as the critical effect.

The other potential candidate guideline values also are not suitable to serve as the basis of a revised drinking water guideline. As noted by SLR, the NTP (2023) study also identified noncancer effects (i.e., liver necrosis), which if selected as the critical effect, would result in a guidance value of 400 ng/L. However, these effects also are likely mediated through PPARα and also have little to no human relevance, because rats are more sensitive to PPARα induced effects (Corton et al. 2018). Further, SLR (2024b) notes that "[the candidate] values of 227 ng/L and 402 ng/L were derived from a study with high confidence, whereas other values were derived from studies of medium or low confidence." Thus, the other candidate guideline values that are less than 200 ng/L are not based on high-confidence studies and should not be selected as

the drinking water guideline value. Notably, the current guideline value of 560 ng/L is derived from a high-confidence developmental study (i.e., Lau et al. 2006).

In conclusion, NHMRC's proposed reduction of the PFOA guideline value from 560 to 200 ng/L is not justified because the toxicological effects (i.e., pancreatic tumors observed in rodents) that serve as the basis of the proposed guideline have little or no relevance to humans.

Reducing the PFOS Guidance Value is Not Justified Based on Uncertainties in the Underlying Analysis

NHMRC proposes to reduce the PFOS drinking water guideline value from 70 to 4 ng/L, based on SLR's evaluation of assessments and toxicological studies of PFAS published since 2017. In its evaluation, SLR (2024b) identified potentially suitable guideline values for PFOS ranging from 3.4 to 95 ng/L, including the current Australian guideline value of 70 ng/L. SLR (2024b) noted that, though the candidate study underlying the proposed 4 ng/L value was considered high quality, the modeling analysis supporting the 4 ng/L value (which was conducted by EPA) has considerable uncertainty. As such, the SLR Evidence Evaluation (SLR 2024b) recommended relying on the available non-modeled, experimental data, which yields a drinking water guideline of 77 ng/L. As discussed below, NHMRC acted contrary to the recommendation presented in the SLR Evidence Evaluation, and the proposed reduction in the guideline value is not justified.

The current PFOS guideline value of 70 ng/L is based on decreased body weight gain in adults and pups in a two-generation developmental study in rats (Luebker et al. 2005). The proposed guideline value is based on bone marrow effects (i.e., extramedullary hematopoiesis and bone marrow hypocellularity) observed in a 28-day study in rats (NTP 2022). EPA also evaluated NTP (2022) and these critical effects in its PFOS toxicity assessment (USEPA 2024b). In its analysis, EPA converted the exposure doses associated with the bone marrow effects to modeled rodent serum PFOS concentrations. EPA then conducted benchmark dose modeling on the modeled serum values to derive the toxicological point of departure. SLR used this point of departure to derive the candidate drinking water value of 4 ng/L (calculated as 3.4 ng/L and rounded to 4 ng/L). However, SLR (2024b) noted that EPA's modeled serum values are approximately 29-fold and 5-fold lower for female and male rats, respectively, than the actual experimental serum values reported by NTP (2022). Thus, EPA assumed that the critical effect occurs at a dose lower than indicated by the measured values. SLR (2024b) noted that EPA did not comment on the discrepancy between the experimental and modeled values. The candidate drinking water guideline (3.4 ng/L) that SLR calculated using EPA's modeled serum values is lower than the candidate drinking water guideline (77 ng/L) calculated using the measured serum values. Accordingly, SLR (2024b) correctly concluded that the use of the measured serum values to derive the drinking water guideline is "associated with a lower degree of uncertainty."

Furthermore, SLR acknowledged that the candidate guideline of 77 ng/L derived from the measured serum values aligns with the current drinking water guideline of 70 ng/L derived from the developmental study in rats (i.e., Luebker et al. 2005). SLR (2024b) indicated that the fact that "two different sensitive endpoints from two separate experimental toxicological studies result in the same guidance value, lends further support for the use of this value."

Contrary to SLR's (2024b) conclusion, NHMRC's proposed PFOS drinking water guideline of 4 ng/L is based on EPA's analysis. NHMRC (2024c) noted that EPA's approach was more "statistically robust" than relying on the measured serum values to derive a point of departure. NHMRC's conclusion does not specifically

address any limitations of the modeling or consider the toxicological implications of the differences in the modeled serum values with the experimental serum values.

In conclusion, NHMRC acted counter to the recommendations from SLR (2024b) and relied on an assessment with greater uncertainty than that underlying the current drinking water guideline value. Accordingly, reducing the PFOS drinking water standard from 70 to 4 ng/L is not justified.

The Toxicological Basis for the PFHxS and PFBS Guidelines Have Little or No Human Relevance

NHMRC proposed new separate drinking water guidelines for PFHxS [3] and PFBS of 30 and 1,000 ng/L, respectively (NHMRC 2024a,b). Both proposed standards are based on changes in thyroid hormones observed in studies in rodents. The PFHxS proposed guideline is based on a critical effect of decreased T4 (thyroxine) observed in male rats in a 28-day oral exposure study (NTP 2022). The PFBS proposed guideline is based on decreased total T4 observed in female mice offspring in an oral developmental study (Feng et al. 2017). Though these studies were evaluated by other agencies for drinking water standard derivation (e.g., EPA), these critical effects have little or no human relevance due to differences in thyroid hormone regulation in rodents and humans, as well as inconsistent epidemiological associations of PFAS exposure and thyroid effects. As a result, reliance on thyroid effects as the basis for drinking water guidelines has substantial scientific uncertainty. Despite SLR's acknowledgement of the limited human relevance for these effects, NHMRC inappropriately based the proposed drinking water guidelines on thyroid endpoints.

The mechanisms of thyroid hormone regulation differ between rodents and humans with respect to specific binding protein types, affinity, turnover rate, and metabolism; these differences contribute uncertainty in the relevance of effects observed in rodents for humans (Jahnke et al. 2004; Li et al. 2019; Marty et al. 2021). Rats have increased metabolism of T4 compared to humans (Li et al. 2019) and rats may be more sensitive to changes in thyroid hormones than are humans (Jahnke et al. 2004). As a result, rodent models may not be predictive of thyroid effects, such as changes in T4, for humans. Therefore, the critical effects used as the basis for the PFHxS and PFBS drinking water guidelines lack sufficient support demonstrating their relevance to humans and/or may occur at doses that are greater than relevant for human exposure levels.

In its review of the candidate studies for drinking water guideline derivation, SLR (2024a) acknowledged these uncertainties regarding thyroid effects observed in rodents. For PFHxS, the SLR Evidence Evaluation (SLR 2024a) noted that there are uncertainties as to the human relevance of decreased T4 and other thyroid effects observed in rodent studies. Specifically, SLR (2024a) noted that, "the 28-day NTP (2022) study found no significant changes to TSH [thyroid stimulating hormone] levels or histopathological findings in the pituitary in PFHxSK dosed rats. It could therefore be argued that the decreased T4 and T3 observed in rats administered PFHxSK in the NTP (2022) study may not be relevant to humans." SLR (2024a) further stated that, "no chronic toxicity study has been conducted with PFHxS which could be used to determine whether the effects observed on thyroid hormone levels in the 28-day study are likely repeatable and relevant to humans, e.g. whether in a chronic study, the effects are repeatable and would be accompanied by changes in TSH or histopathological findings on the thyroid gland or pituitary." Thus, there is not sufficient evidence to demonstrate whether effects on thyroid hormones would be observed following longer exposures or whether exposures would result in thyroid effects relevant for humans. As

[3]The current PFOS guideline of 70 ng/L includes a sum of PFOS and PFHxS concentrations. The draft guideline proposes a separate standard for PFHxS of 30 ng/L.

indicated by SLR (2024a), the critical effect used for the PFBS guideline derivation also has little or no human relevance

In addition, as indicated by SLR (2024a), PFAS exposures are inconsistently associated with thyroid hormone effects in epidemiological studies. PFAS effects on the thyroid in humans differ across sex, age group, pregnancy status, and other biological factors. In a review of animal, epidemiological, and mechanistic studies on PFAS and thyroid effects, Coperchini et al. (2021) stated that, "*in vivo* data in humans are by far more controversial as to the potential thyroid disrupting effect of PFAS with great discrepancy among different studies." The authors also noted that both increases and decreases with T4 in humans have been associated with PFAS exposure. Though SLR and NHMRC did not use epidemiological studies to derive candidate drinking water guidelines, they also did not thoroughly evaluate the weight of evidence for concordance of human studies with animal data. Overall, the weight of evidence for thyroid impacts of PFAS is not consistent across the different lines of evidence.

Furthermore, for PFBS, the only candidate critical effects that SLR and NHMRC considered for drinking water guideline derivation were thyroid-related (Table 8-1 of SLR 2024a). For PFHxS, SLR (2024a) also considered the current PFHxS standard (70 ng/L for the sum of PFOS and PFHxS), which is based on a developmental study of PFOS (i.e., Luebker et al. 2005). No other PFHxS-specific studies besides the NTP (2022) study demonstrating thyroid effects are considered for candidate values for PFHxS. Given that the thyroid effects observed in rodents have limited relevance for humans, NHMRC has not provided sufficient weight of evidence for potential adverse health effects from PFBS of PFHxS exposure to justify the derivation of separate drinking water guidelines.

Therefore, the proposed drinking water guidelines for PFHxS and PFBS rely on thyroid effects in rodents with little or norelevance for adverse effects in humans. Thyroid effects are not consistently observed in epidemiological studies. NHMRC did not sufficiently consider the weight of evidence to support derivation of drinking water guidelines for these compounds.

Conclusions

The following critical concerns were identified in NHMRC's proposed drinking water guideline values for PFOA, PFOS, PFBS, and PFHxS, which result in guidelines that are overly conservative and are not supported by the underlying evidence:

- NHMRC consistently acted counter to the recommendations of the SLR (2024a,b,) Evidence Evaluations; in doing so selected drinking water guidelines based on toxicological effects with little or no human relevance and that are not supported by a sufficient weight of evidence.

- NHMRC's reliance on a default RSC of 0.1 to derive the drinking water guidelines for PFOA, PFOS, PFHxS, and PFBS is unjustified and deviates from standard practice of applying a minimum default RSC of at least 0.2. The RSC of 0.1 also fails to account for variability and uncertainty in exposure sources across the population and may not represent current PFAS exposures. The lower RSC yields drinking water guidelines that are overly conservative.

- Reducing the PFOA guideline value from 560 to 200 ng/L is not justified because NHMRC relies on toxicological effects (i.e., pancreatic tumors observed in rodents) that have little or no human relevance.

- In reducing the PFOS guideline value from 70 to 4 ng/L, NHMRC deviated from the recommendation of the SLR Evidence Evaluation and relied on an analysis with greater uncertainty than that underlying the current drinking water guideline value.

- The new, distinct drinking water guidelines proposed for PFHxS and PFBS of 30 ng/L and 1,000 ng/L, respectively, are based on toxicological effects (i.e., changes in thyroid hormones observed in rodents) that have little or no human relevance. Therefore, the weight of evidence presented does not support these new guideline values.

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20	**INDIVIDUAL RESPONSE 10** *Development of guidance* We need to lead the world with legislation that demands the lowest level of these chemicals. I strongly believe we should be as close to zero as possible. If zero can physically be achieved, it must be. And should be legislated as zero. *Implementation or application* There needs to be extreme deterrence for companies that breach the legislation. Australias are so sick of hearing mega corporations making billion dollar profits and then getting slapped on the wrist with a million dollar fine - barely an inconvenience for said companies. Perhaps mandatory jail sentence for CEOs who knowly provide water with high levels of PFAS. Water companies must have frequent and spontaneous water samples by an independent company with absolutely no financial ties or other avenues for coercion. Australians have the basic human right to clean, safe drinking water. PFAS is not safe. *Fact Sheet* I am concerned that the fact sheet and the legislation it's self will only look at 4 types of "forever chemicals". When there are hundreds on known forever chemicals *NHMRC Statement* legislation needs to look at and mention every single type of "forever chemicals" ever manufactured - there are hundreds of known chemicals. If a company is allowed to make and mass produce a chemical, then need to know with 100% certainly what the health implications are. Otherwise they can't mass produce it. Because it will end up in our water eventually if it isn't naturally broken down.
21	**INDIVIDUAL RESPONSE 11** We should be matching the criteria adopted by the US- not setting Maximum levels significantly higher, and in some cases above those recommended by the WHO! We should be leading the world on safety for current & future generations of Australians, not trailing behind!
22	**INDIVIDUAL RESPONSE 12** *Development of guidance* The foundational input to setting a drinking water guideline is the best available health-related evidence from the relevant epidemiology and toxicology studies. The Fact Sheet and draft guidelines have utilised that evidence. The guideline values themselves are then set within a broader context. This context includes consideration of a range of pertinent factors. Many of those pertinent factors have yet to be considered in the derivation of the final guideline value that goes forward to the ADWG. I recommend that the final guideline be developed, drawing upon the health-based evidence, after due consideration of those other factors. The factors include evidence of occurrence, analytical achievability, treatment achievability, potential for adverse diversionary health consequences, community expectations, socioeconomic implications, and further consideration of the relative source allocation to water vs. other exposures. *Implementation or application* There is some important information that is already in the ADWG that sets the context within which the PFAS guideline values should be applied. These do not need to be discussed in detail in the Fact Sheet. However, since the Fact Sheet is likely to be used standalone it would be helpful to the community to include some very upfront clauses that capture the thrust of those that are relevant. To avoid undue concern among the public if occasional PFAS test results are above the guideline values, some clear reiteration of the ADWG's advice on the following points would be helpful to the community. The guideline values are set based on long term, lifetime exposure, such that isolated exceedances of the guideline values by small margins (below their acute or short-term guideline values, which are typically ten-fold higher) do not imply an unsafe exposure to PFAS provided most test results are below the guideline value over the long term.

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	Where sufficient samples are collected, the reporting statistic for comparing observations to guideline values is the 95th percentile. There are significant safety factors used in deriving the guideline values, which are intentionally conservative. Therefore, consuming drinking water for periods of a few months to years with PFAS levels consistently above the long-term guideline values by small margins (below their acute or short-term guideline values, which are typically ten-fold higher) is not thought to present significant health risks. This allows time for water suppliers to implement source and and/or treatment changes to reduce PFAS levels to below the guideline values without the need to issue public health advisories. *Fact Sheet* In relation to the relative source allocation to water vs. other exposures, the Fact Sheet helpfully makes clear that drinking water is just one PFAS exposure pathway. It would be helpful to explicitly state something that is already implicit in the Fact Sheet: that PFAS contamination of drinking water is typically unrelated to the activity of the water supplier and that it has arisen due to polluting activities in the catchment by other parties. This will help direct community concerns over PFAS contamination of their water supplies to historical and current polluters to help garner support for cleanup and prevention at source, consistent with the 'polluter pays' and 'protect at source' principles of environmental management. The setting of guideline values is rightly conservative due to the application of safety factors (for uncertainty and relative source contributions) combined with the use of conservative health-based targets. This does leave some room for setting guideline values above the level derived from screening level conservative health-based risk assessments, if there is a fair reason to do so. Unless there is a health-related argument to fast track the Fact Sheet, it makes sense to delay its finalisation pending some additional work to provide local evidence within Australia, and the completion of some current international work on setting guideline values for PFAS in drinking water. Since the current guideline values are considered 'safe', these current guideline values can be retained in the interim. Alternatively, more conservative guideline values can be issued, pending consideration of relevant factors. The following are examples of the important considerations. The typical percent of the TDI/ADI allocated to drinking water used by WHO has recently been standardised to a default of 20% for most chemicals. The Fact Sheet uses 10%, consistent with other chemical fact sheets in the ADWG. An evidence-based assessment of the contribution of drinking water PFAS exposure relative to other sources would ideally consider those contributions in circumstances where PFAS is at concentrations approximating the probable guideline values. That may lead to a proportionality factor other than 10% being considered appropriate. At present it is not clear that an assessment of those other exposures has been done. In the interim, a 20% proportionality factor might be preferable to align with the WHO default to help future-proof the guideline against where WHO might go if using the same evidence, albeit that is speculative. Where guideline values are difficult to achieve, necessitating significant cost, and prolonging the time between publication of the guideline values and their achievement in practice, there can be diversionary adverse health effects. In this case, it is worth seeking to understand whether the effort expended to meet the PFAS guideline values might distract and divert funding and resource allocation from other health-related interventions. For instance, efforts to reduce exposure to lead, pathogens, and other well-established contaminants might be delayed by efforts spent on responding to the PFAS guideline value. These considerations may result in a decision that the best overall health outcomes may arise from raising the guideline values to a higher provisional level, and/or delaying publication pending further work to enable water suppliers to meet the guidelines. There has been a good effort made to source occurrence data on PFAS in source waters and drinking water. However, there is limited data from smaller, remote and regional water supplies. This makes understanding the socioeconomic implications of the guideline value challenging. Systematically sourcing representative evidence from both existing and newly collected data would be extremely valuable. Whilst NHMRC could not fund such work, other parties may be prepared to contribute evidence from representative sites. NHMRC could assist by ensuring the evidence was good quality and as representative as practicable. Experience from laboratories collecting PFAS has found that it is challenging to avoid some occasional detections of PFAS arising due to sampling and analytical cross-contamination from sources other than the drinking water (e.g. clothing, cosmetics, and some materials used in some sampling taps and fittings). Where guideline values are very

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	low, whilst the instrumentation can detect and quantify PFAS reliably at the proposed guideline values, these cross-contamination issues can lead to trace levels of PFAS detection that could be above the guideline values. Setting a guideline value that is below the level that can be reliably evaluated in practice may lead to misleading results and undue concern arising. This problem will be particularly significant in samples collected in regional and remote locations with less access to specialist sampling taps, protective clothing, sample containers, transport chains, and so on. Understanding what represents a realistic concentration that sits above this typical level of background cross contamination would assist avoid undue concerns. Consultation with analytical services providers and water supplies would assist with understanding their experiences and documenting these reliably measurable concentrations. Such information would help refine the setting of the guideline values or provisional guideline values. In settings that have PFAS in their only viable water source, treatment will be required. Understanding treatment achievability for reasonably affordable treatment processes, particularly for regional and remote settings, would help set guideline values at levels that could realistically be affordably achieved. Consultation with treatment technology providers and water suppliers would assist understanding these reasonably achievable concentrations to help refine the setting of the guideline values or provisional guideline values. The ADWG is a "guideline", and other parties set standards and decide how to utilise the guideline. However, in practice, many jurisdictions have codified the ADWG in their regulations, standards, contracts, and other formal documents. This makes the ADWG de facto standards in many contexts. Furthermore, the community reasonably expects drinking water to meet the ADWG. As a result, once the PFAS guideline values are published, in the minds of many in the community, and in many contexts in the formal obligations of water supplies, there is no phasing in period before compliance with those guidelines is required. Understanding the socioeconomic implications of the PFAS guideline values may influence the guideline values and/or the date of publication as final guidelines. Further consideration of these socioeconomic implications, perhaps drawing from advice provided by water supplies on costs and timeframes, would be a useful action prior to finalising the guideline values and date of publication. It is worth considering the global context. A first observation is that NHMRC's detailed review work will provide a very valuable and timely contribution to the global work on setting PFAS norms in drinking water. However, the NHMRC's work may be going ahead faster than comparable jurisdictions. Other than the USEPA standards, the draft ADWG Fact Sheet includes a guideline value lower than that set in any other jurisdiction, i.e. 4 ng/L. Within the past five years many benchmark jurisdictions have issued guideline values that are less stringent than the USEPA (including the EU, UK and Canada). It is also noted that there are legal actions disputing the USEPA's standards. The US standards are not in effect legally until 2029. Hence there is time for those standards to change before they are required to be met. The US set its standards following a prolonged period of nationwide PFAS testing across the US. There is US funding available to assist with monitoring and compliance by water suppliers, along with a package of supporting technical resources to help with monitoring and compliance. Given these foregoing points, it is interesting to note that issuing the ADWG Fact Sheet in 2025, as proposed, would see the 4 ng/L drinking water guideline value become the most stringent then-current finalised parametric value for PFAS in drinking water (as the US has until 2029 to comply). But unlike the US, Australia has not had the benefit of a systematic nationwide monitoring program, and has no funding source, or other body of supporting technical resources, to help water supplies with achieving compliance. It is probably better to wait just a few more years before revising the guideline. Fortunately, the World Health Organization is actively reviewing and revising its PFAS drinking-water guideline values. In doing so WHO is considering all exposures (not just drinking water), and PFAS as a class (not just a selected subset of PFAS). WHO's Guidelines for Drinking-water Quality has long been the point of departure for the ADWG, and is the primary reference in the hierarchy of norms to refer to for substances for which the ADWG does not have guideline values. To avoid setting guideline values that are potentially out of step with global norms, particularly the WHO, it is worth holding off on finalising and publishing the ADWG PFAS guideline values until the WHO completes its holistic assessment of PFAS before. Instead, NHMRC can contribute its excellent work to the WHO review. Aligned with WHO, and most other comparable jurisdictions, when the PFAS guideline values are revised by NHMRC, it is worth providing a provisional 'sum of...' guideline value for all or selected PFAS, since when testing for the PFAS with specific guideline values, a few dozen others are likely to be reported in the standard PFAS suite that labs provide. As the older PFAS are phased out and very gradually reduce in concentration over time, these other PFAS may become more elevated. Therefore, having some guideline to help inform a response to those will be helpful, even if it is provisional. With respect to the ADI set for the drinking water guidelines, it is worth considering the implications if the same ADI is applied to other exposures. Whilst beyond the scope of the ADWG, liaison with FSANZ and other agencies on the implications for guideline values in food, clothes, cosmetics, recreational water, etc., is worth considering prior to

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	finalising the PFAS Fact Sheet. Ideally there would be a consistent approach across the various exposure pathways to defining the ADI and setting guideline values. *NHMRC Statement* It is positive to see NHMRC providing this sort of excellent summary statement as well as the more detailed Fact Sheet and supporting technical documents.
23	**INDIVIDUAL RESPONSE 13** *Development of guidance* Why has the NHRMC not considered these guidelines in collaboration with other National and International health advisors, as part of the broader health perspective, given there are other major sources of exposure than just drinking water? Also the review does not appear to have considered the World Health Organization's proposed draft guidelines for PFAS. Why has the NHMRC not considered the review from the World Health Organization for PFAS? What about all the other thousands of PFAS that are mentioned in the media? What approach is being taken when considering when evaluating these other substances that may be present in our water? *Implementation or application* Why are the NHMRC considering implementing a health-based guideline value for PFOS in drinking water, which uses a tolerable daily intake of 1 ng/kg bw/day, that would appear to be below the likely baseline level of exposure for the broader Australian population? This is based on food and water consumption from the conclusions of FSANZ's 27th Total Australian Diet Study that notes: ""Mean and P90 dietary exposures are estimated to be 0.011 – 1.7 ng/kg bw/day and 0.032 – 2.6 ng/kg bw/day, respectively for Australian consumers aged 2 years and above. Further details are provided in Table 3."""" - https://www.foodstandards.gov.au/science-data/monitor/australian-total-diet-study Will canned tuna and other seafood like prawns and saltwater fish fillets, mammalian offal and chicken eggs still be considered safe to eat based on the proposed TDI for PFOS? Can we even measure low enough for PFAS in humans, animals and the environment to confirm that as consumers, that our exposure from water and our broader dietary intake, as well as any other key sources of exposure, to PFOS, might be lower than 1 ng/kg bw/day based on current lab methods? https://www.industry.gov.au/national-measurement-institute/nmi-services/testing-and-analytical-services/environmental-testing-and-analytical-services/and-poly-fluoroalkyl-substances. *Fact Sheet* What guidance or references are included in the PFAS fact sheet that provides available information so people can seek to avoid other potential sources of PFAS from products in contact with drinking water (pipes, cups, saucepans) along with the other major sources that are listed (i.e., food, personal care and consumer products and dust)? Should I be asking my plumber not to use Teflon (commonly known as 'plumbers tape') in my home? https://www.bunnings.com.au/search/products?page=1&q=plumbers+tape&sort=BoostOrder. Should I throw out all of my old saucepans and plastic cups? While the public Statement notes that the guidelines should not be considered as a pass or fail, this does not appear to be reflected or specifically noted in the Fact Sheet. *NHMRC Statement* The statement notes that these guidelines are not to be considered as a pass or fail. However, if my drinking water supplier were to report a result above a finalised Australian proposed health-based guideline value, then consumers would be concerned, despite any public statements trying to reassure the community that based on the information and the uncertainty these guidelines are well below any suspected adverse health outcomes. These proposed guideline for PFOS appears to be highly conservative, and the current guideline concentrations were actually recommended to be retained by the consulting risk expert and independent expert review. I am concerned that such a low guideline will spark more fear and create undue mental health concerns, more so than it might achieve favorable health outcomes.
24	**INDIVIDUAL RESPONSE 14** *NHMRC Statement* I support the draft guidance to have lower level testing of PFAs in SEQ water.
25	**ORGANISATION RESPONSE 11** Permission not given to publish.

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26	**DEPARTMENT OF HEALTH WA** *Development of guidance* WA Department of Health supports the general approach adopted by NHMRC in this investigation. Having said that, the approach taken relies heavily on the information in the reports cited as SLR 2024a, 2024b and 2024c. As far as can be ascertained they are available from links on the consultation page, but nowhere else. Please ensure that these three SLR reports continue to be publicly available and maintained on the NHMRC web site after close of consultation. *Fact Sheet* Some of the individual paragraphs are too long and would benefit from breakdown into shorter paragraphs (without changing the content) e.g. the second paragraph on page 1 of the draft fact sheet runs for 17 continuous lines. Please also refer to the prior comment about ensuring the continued availability of the reports SLR 2024 a, b and c. *NHMRC Statement* The layout of the Statement, accompanied by excessively long sentences, can make it hard to follow for lay readers. We suggest breaking down long paragraphs into shorter ones and breaking up some of the complex sentences into shorter ones. For example, the main paragraph on page 4 is too long to be easily digestible. It would benefit from breakdown into three paragraphs, for readability, without changing any of the content: The ability of PFAS to move easily through ground and surface waters, the historical (often undocumented) use of PFAS in the environment for fire-fighting purposes and the potential for ongoing/unexpected contamination from landfill and biosolid7 applications means that unexpected PFAS detections may sometimes occur. [suggested para break] A robust set of background monitoring data and regular catchment/land use risk assessments can provide information about the appropriate frequency of monitoring requirements for a particular water supply. This should be in discussion with state/territory health and/or drinking water regulators, who are responsible for establishing monitoring requirements. [suggested para break] Longer term drinking water quality management should focus on selecting the best quality source water (noting the relative risks that may be present from other chemicals), taking into account all constituents, catchment protection, multiple barriers and management of critical control points as outlined in the Framework for Managing Drinking Water Quality (Chapter 3 of the Guidelines).
27	**ORGANISATION RESPONSE 13** Permission not given to publish.
28	**ORGANISATION RESPONSE 14** Permission not given to publish.
29	**INDIVIDUAL RESPONSE 15** *Development of guidance* I see the NHMRC review has considered "It is important to note that drinking water is not the only potential source of PFAS exposure in Australia and the contribution from other sources might be significant. The public can be exposed to PFAS through the food supply and household products (e.g. personal care products, food packaging, clothing, furniture, air, dust)" (NHMRC Statement: Per- and polyfluoroalkyl substances (PFAS) in drinking water, 2024).

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	In this context, my main question is, in revising the drinking water PFAS guidelines, have you considered that people are exposed to a large range of toxic chemical pollutants, not just PFAS, through air, water, and food, which may individually be below safe guideline limits, but collectively can be toxic? At least two published studies indicate a large range of toxic chemical pollutants are present in the blood of pregnant women. Importantly, Braun et al (2024) have demonstrated that while individual chemical pollutants can be below guideline levels, collectively these are neurotoxic. This is discussed in my online report "Chemical industry future: addressing the environmental and health impacts of industrial chemicals": https://www.researchgate.net/publication/361208654_Chemical_industry_future_better_addressing_the_environmental_and_health_impacts_of_industrial_chemicals.
30	**INDIVIDUAL RESPONSE 16** *Development of guidance* The PFAS problem is global challenge for regulators, researchers, industry, and the general public. With over 14,000 PFAS group chemicals, the regulation of PFAS continues to be reviewed every few years based on new evidence on health impacts. While many of the health impacts reported are more linked with acute exposure, rather than significant evidence on lower levels. We cannot wait for toxicological assessment of every PFAS group chemical to remove its potential impacts on the community. They are bioaccumulating - we have an opportunity to advise and shape Australia as a leader in tackling environmental pollutants in full measures. Several aspects need to be thoroughly reviewed: Testing - Matrix (water, soil, biowaste) - Most analytical measurements are specific to some PFAS group chemicals, many that have already been substituted are being regulated and tested for, while new substitutes are missed. Specific measurement (targeted, LC MS/MS, TOPA assays) should be coupled with non-targeted analysis (HRMS, CIC, PIGE, NAA, etc). Measuring all fluorine, organofluorine is more likely to capture all the PFAS pollutants than targeted analytical measurements. Remediation - water purification seems to be successful through nanofiltration, reverse osmosis and GAC. Destruction of the collected biosolids needs further research and review. A lot of the regulations have focused on human health and safety - we are missing a key aspect of regulation - untreated water, recreational water, water for all other species is still contaminated - remediation works have to incorporate all environments - not only those impacted humans. Regulation - Regulation of PFOA, PFOS, PFHxS and PFBS is great - it would be better to instead have a ban on all organofluorines (this will encompass all the PFAS group chemicals) and leave the very important inorganic fluoride for health teeth and prevention of caries. Is there evidence for PFOA, PFOS, PFHxS and PFBS being the most prevalent contamination, and therefore the most likely to be measured, or is this led by international regulations? Keen to see the final draft guidelines and welcome any further discussions.
31	**DUNGOG BRANCH OF COUNTRY WOMEN'S ASSOCIATION** *Development of guidance* The Dungog CWA is supportive of the approach to developing draft guidance which includes local and international information and evidence about the potential harms related to PFAS chemicals and to the ongoing monitoring of levels in local drinking water as a measure of the overall level of these chemicals in the environment more generally . The Dungog CWA would support any initiative which increases public awareness about these chemicals and which encourages wider community input about improving standards for the control of environmental animal and human exposure to the potential risks associated with these chemicals *Fact Sheet* The draft PFAS Fact sheet clearly indicates the goals advocated by NH&MRC whilst presenting evidence based information and references to local and international research . The document is sufficiently accessible to non scientifically trained individuals to make it useful in the process of public consultation

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32	**INDIVIDUAL RESPONSE 17** *Fact Sheet* Submission to change the Australian Drinking Water guidelines 2024 Based on the current scientific knowledge, the changes in the proposed guidelines to reduce the safe water levels of PFOA and PFOS are warrented, but may not go far enough. When genotoxic chemicals are first measured in water supplies and blood samples, and the first epidermilogical studies are carried out, this is likely to be only the tip of the iceberg as far as potential cancer cases are concerned. This is what has happened with air-borne PAHs, which initially were thought to cause a handful of cancer cases, and now could have a role in causing 30 % of today's global cancer (See www.pahs-and-cancer.org). Two research papers point to PAHs in water causing cancer globally and in Australia. A systematic global review by Ziyaei et al, 2024, showed that "PAH-contaminated water sources significantly amplify the risk of cancer among both children and adults." In Queensland, data from hospital admissions indicates childhood cancer could be doubled in CSG and Coal Mining (CHI) areas compared to a control area (RLI) (Werner et al, 2018). "Adjustment for covariates revealed a 95% increase per year in 'Neoplasms' admission rates in the CSG area relative to the RLI area." and "The CHI area also showed an increase of 94% per year relative to the RLI area." This data points to a carcinogen liberated by both CSG and open-cut coal mining; PAHs from the solubilization of coal are the prime contender. Orem et al (2007) identified a wide range of phenols, biphenyls, heterocyclic compounds, aromatic amines and aliphatic compounds, typical of those found in coal, in produce water from Wyoming CSG wells. PAHs were the most potent carcinogen found. Total PAHs were measured at levels of 23µg/l. Individual PAHs ranged from 0.01 to 18 µg/l. Produce water entering the water table can be a source of PAHs in drinking water. Reduction in the guideline values for safe water levels of PAHs is needed. When only early data is available with PFASs, and with water-borne PAHs, and when lives are at stake, I feel it is necessary to err on the safe side, and to make the safe levels of these genotoxins "level of detection". Please consider changing the safe water levels of PFOS, PFAS and PAHs to "level of detection". For more information please see the attachment "PFASs the forever chemicals; PAHs the now chemicals" and www.pahs-and-cancer.org. Ziyaei et al, 2024. Association between exposure to water sources contaminated with polycyclic aromatic hydrocarbons and cancer risk: A systematic review. Sci Total Environ. 2024 May 10;924:171261. Werner et al (2018). Werner, AK. Watt, K., Cameron C., Vink, S., Page, A., and Jagals, P., (2018). Examination of Child and Adolescent Hospital Admission Rates in Queensland, Australia, 1995–2011: A Comparison of Coal Seam Gas, Coal Mining, and Rural Areas. Matern Child Health J. ; 22(9): 1306–1318. Orem et al (2007). W. H. Orem, C. A. Tatu, H. E. Lerch, C. A. Rice, T. T. Bartos, A. L. Bates, S. Tewalt, M. D. Corum, Organic compounds in produced waters from coalbed natural gas wells in the Powder River Basin, Wyoming, USA. Appl. Geochem. 2007, 22, 2240-2256. *NHMRC Statement* PFASs the forever chemicals; PAHs the now chemicals. PFASs have caused hundreds of cases of cancer where peole have been in contact with fire retardants. PAFSs are being banned from manufatcured goods. This will prevent them reaching the levels in our air and water, that could cause cancer on a large scale in the future. PFAS cancer is decreasing. PAHs (Polycyclic Aromatic Hydrocarbons - "Pahs" rhymes with "cars") cause millions of cases of cancer each year, and this is increasing. Globally, in 2023, over 6 million cases of cancer are attributable to PAHs, this is 30% of today's cancer, mainly from PAHs in smoke. With the increase in wildfires, global levels of PAHs in air are increasing, PAH cancer will increase. When it rains, smoke and ash from wildfires are washed into local waterways, and drinking water supplies. Cancer from PAHs in drinking water will increase, unless PAH levels are reduced by adequate filtration and monitoring.

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	Both PFASs and PAHs are long-lived in our environment. PAFs have a half life of 6 weeks in soil, PAHs have a half life of 5 weeks. Once PAHs enter our bodies by breathing in smoke, they can cause many other types of cancer, not just lung cancer. Cigarette smoking has been shown to cause breast cancer and liver cancer, as well as lung cancer. Cooking with solid fuels has been found to increase cancer of the salivary glands, oral cavity, pharynx and larynx, gastric cancer, cancer of the kidney (renal-cell carcinoma), cervical cancer, liver cancer and oesophageal cancer. A recent Canadian study has shown people living within 50 kilometers of a wildfire in the past 10 years had a 4.9% higher risk of lung cancer and a 10% higher risk of brain tumors compared to people not exposed to wildfire, and the PAHs in the smoke. PAH levels in our air are causing some cancer now, but with climate change causing a worldwide escalation in wildfires, PAH levels will increase, and cancer will increase. Climate change means more cancer. For more information and the scientific papers to back up these facts, please visit: www. pahs-and-cancer.org [redacted] Bsc (Hons), PhD [redacted] has spent over 30 years working as a molecular biologist in Cancer Research at University of Qld and Qld Institute of Medical Research, studying the effects of chemical carcinogens on cultured human cells. Her publications include papers in Nature, the Lancet, New England Journal of Medicine, Mutation Research, Neurology, Oncogene, Biochemical Pharmacology and Plant Science. Invited speaker at the Dibble Cancer Research Centre, UDMS, London, and the International Congress for In Vitro Biology, Portland, OR, USA.
33	**INDIVIDUAL RESPONSE 18** *Development of guidance* https://amp.abc.net.au/article/104119668 I feel concerned that we have higher accepted limits of PFOAs than best practice recommendations in the USA and Europe. This makes me question the approach taken to develop the draft guidance. *Implementation or application* Since we are accepting much higher levels of PFOAs and the like in Australia, compared to best practice in the US and EU, it falls to the individual to filter their water to further reduce contaminants. This is inequitable - better drinking water is available only to those who can afford to filter it. I wonder if the guidelines are so comparatively lax because otherwise government would have a responsibility to improve equitable access to higher quality drinking water (at great expense presumably.)
34	**INDIVIDUAL RESPONSE 19** *Implementation or application* The regulations must restrict to the highest level, all of the contaminants, not just the worst ones. *Fact Sheet, NHMRC Statement* Aim for zero, these toxins are already too high in people's bodies. Reducing levels only slows the build up, we need to stop it.
35	**ENVIROLAB** *Fact Sheet* 4ng/L is a level easily achievable for laboratories in Australia.
36	**ORGANISATION RESPONSE 17** Permission not given to publish.

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21 November 2024

NHMRC

Attention: NHMRC

Re: Draft PFAS Drinking Water Guidelines – comments

1 Introduction

Environmental Risk Sciences Pty Ltd (enRiskS) is pleased to provide the following comments on the draft drinking water guidelines for various per- and polyfluoroalkyl substances (PFAS) as published by the National Health and Medical Research Council (NHMRC).

In October 2024, the NHMRC published draft drinking water guidelines for public comment (the "guidelines") for 4 key PFAS. The proposed guidelines are:

- PFOS = 0.004 µg/L
- PFHxS = 0.03 µg/L
- PFOA = 0.2 µg/L
- PFBS = 1 µg/L.

Comments are requested by 22 November. The information provided by NHMRC indicates that they will review the comments provided and publish the guidelines in final form in April 2025.

The documents provided for public comment include:

- Draft fact sheet – PFAS (NHMRC)
- NHMRC Statement on PFAS in Drinking Water
- SLR Consulting (2023) Research Protocol
- SLR Consulting (2024a) Technical Report
- SLR Consulting (2024b) Evidence Evaluation Report
- SLR Consulting (2024c) Addendum to Evidence Evaluation Report.

Existing drinking water guidelines for PFOS+PFHxS and PFOA are provided in the current version of the NHRMC Drinking Water Guidelines (NHMRC 2011 updated 2022). These values are:

- PFOS+PFHxS = 0.07 µg/L
- PFOA = 0.56 µg/L.

PFOS is arguably the key PFAS in Australia. The draft guideline for PFOS is around 20-fold lower than the existing guideline for PFOS.

A review of the NHMRC materials has been undertaken and a summary of that information and the issues arising is provided in the following sections.

From an overall perspective, we think it is important to acknowledge that the fundamental building blocks for the entire planet are chemicals. Whether it is the water we drink, the air we breathe, the food we eat, the ground we walk on, the houses we live in, the things we have inside our houses or workplaces or what we ourselves are made of, everything is made of chemicals. Some chemical substances like water, oxygen and nutrients are essential to keeping us alive or to let plants or other animals live. Other chemical substances are naturally occurring, but they can kill us – like spider and snake venoms or well-known poisons like arsenic or mercury. The same applies to the chemical substances we manufacture – some substances are quite benign, and some are quite toxic. A range of chemical substances are used to manufacture things we use every day like food, clothes, computers, kitchen appliances, cars, houses, roads, trains, planes, hair dyes, beauty products, toothpaste, shampoo, flea rinse for our pets and many other things.

Given that everything in the world is made from chemicals, the presence or detection of a chemical in the environment does not equal an unacceptable risk to people or the environment. Risk assessment is used to determine if the amount of a chemical present in the environment could pose a risk to people or the environment. Assessing risk requires detailed consideration of how much of a chemical can reach a place where people or ecosystems can be exposed. This includes consideration of where and how a chemical is used along with whether it can escape into the environment and what happens to the chemical when it is released into the environment. Important considerations in understanding fate are the properties of a chemical e.g. whether it bioaccumulates, sticks to soil, can be taken up over human skin etc. Such assessments are also designed to be conservative (precautionary i.e. designed to overestimate risks). In the case of PFAS, it is acknowledged that even with the large amount of information about potential effects of PFAS in people or the environment that has been added over the last decade, it is still not particularly clear how these chemicals cause effects.

In Australia we have well established Government guidance on how to undertake a human health and environmental risk assessment. This guidance is not chemical specific, hence, is valid for all chemicals, including PFAS. There is no reason for PFAS to be treated any differently to other chemicals. In fact, it is our experience that treating PFAS differently to other chemicals can create practical, logistical, financial and risk communication issues. These issues can outweigh any positive effects and benefits that may be gained from applying an overly cautious approach to PFAS management.

Setting a drinking water guideline for PFOS at or below ambient concentrations and at (and below) commercially available laboratory limits of reporting indicates that whenever PFOS is detected in the environment, there are unacceptable risks to human health. Where there is strong evidence that this is the case, then such situations need to be acknowledged and addressed but where there is much discussion and disagreement about how a chemical causes toxic effects and at what doses such effects might be seen, then this is not a reasonable approach. It is important to note the extremely high concentrations used in the toxicity studies in laboratory animals before any effects are seen and to compare that with other chemicals to put toxicity reference values for PFAS into an appropriate context. These are just another class of chemicals, not something strange that has never been seen before.

Hence, we consider it is critically important to carefully consider the basis of the draft guidelines from NHMRC.

We appreciate the opportunity to provide these comments.

2 Summary of comments

Sections 3 to 10 of this submission provide detailed comments in relation to the draft NHMRC guidelines for PFAS.

Overall, a number of key issues have been identified, which are summarised as follows:

- The approach adopted by NHMRC to determine appropriate drinking water guidelines included commissioning detailed reviews form an independent consultant, with independent peer-review, however the NHMRC has been inconsistent in how the recommendations from these reviews have been adopted for each of the PFAS evaluated, specifically the recommendation for PFOS was ignored by NHMRC with no explanation (refer to **Sections 3 and 4** for further detail).
- A major issue has been identified with the toxicity reference value adopted for PFOS, which is relied on for deriving the drinking water guideline. We are concerned that the toxicity study and toxicity reference value chosen by NHMRC are not robust/relevant for use in setting guidelines (refer to **Section 6** for further detail).
- Another major issue with the proposed drinking water guideline for PFOS is the lack of consideration of people's current exposure to background sources of PFAS. Where background exposures are a significant proportion of the relevant toxicity reference value, the source allocation term included in the calculation needs to be carefully considered (refer to **Section 7** for further detail).
- There are a range of flow on impacts that would occur as a result of the NHMRC adopting a lower toxicity reference value, as proposed in the draft guideline. More specifically risk-based guidelines adopted for recreational water, soil, organic products and food would need to be revised. Such revisions would result in guidelines that are similar to or below ambient levels in the environment, which would mean that many waterways may no longer be suitable for recreational use, soil in many areas would not be suitable for residential purposes, organic products (such as biosolids, compost etc) would not be able to be used for any purpose (impacting on a circular economy), and existing food products may no longer be considered safe for consumption or export. Further many of the revised guidelines would not be able to be measured by commercial laboratories in Australia (refer to **Section 10** for further detail).
- Establishing a very low guideline for PFOS drinking water, and resultant impacts to other media (summarised above), would increase already elevated levels of concern, stress and anxiety regarding PFAS in the environment. The NHMRC needs to be very certain that the proposed drinking water guideline is supported by robust science and toxicity studies to justify such increased levels of concern, stress and anxiety in the community (refer to **Section 11** for further detail).

3 Approach adopted by NHMRC

It is our understanding that the NHMRC has responsibility for publishing guidance regarding protecting the quality of drinking water quality across Australia. State and territory health departments are then responsible for ensuring drinking water provided to communities complies with the published guidelines from NHMRC.

The NHMRC has published a large guidance document which provides this information which is regularly updated (under rolling revision). The document includes guidelines for many chemicals including PFAS. The most recent version of this document is:

- Australian Drinking Water Guidelines 6, Version 3.8 Updated September 2022, National Water Quality Management Strategy, National Health and Medical Research Council, National Resource Management Ministerial Council., Canberra.

As noted above, the existing guidelines for PFOS+PFHxS and PFOA in the current version of the NHRMC Drinking Water Guidelines (NHMRC 2011 updated 2022) are:

- PFOS+PFHxS = 0.07 µg/L
- PFOA = 0.56 µg/L.

These guidelines were first published by the Commonwealth Department of Health who made use of the findings of FSANZ in relation to toxicity reference values for use in developing such guidelines (FSANZ 2017a). These guidelines were then published in Version 1 of the PFAS National Environmental Management Plan (NEMP) in early 2018 (HEPA 2018), and officially included in the full version of the NHMRC Australian Drinking Water Guidelines later in 2018 (i.e. Version 3.5) (NHMRC 2011 updated 2018). This means Australia has had drinking water guidelines for these chemicals in force since 2018.

The NHMRC has been considering the relevant toxicological literature since 2023 via the use of an independent expert toxicologist from SLR Consulting. SLR Consulting was engaged as an independent expert to provide a range of information to the NHMRC. In the various reports they prepared, they provide a detailed review of the guidance provided by international bodies such as the United States Environmental Protection Agency (USEPA), US Agency for Toxic Substances and Disease Registry (ATSDR), the European Food Safety Authority (EFSA) and the World Health Organisation (WHO). NHMRC also engaged Professor Brian Priestley to undertake a review of the work by SLR Consulting.

Determining a toxicity reference value is the first step in calculating a drinking water guideline. Where toxicity can be assessed on the basis of a threshold, the toxicity reference value describes the amount of a chemical that a person can be exposed to daily via all potential exposure pathways without any effects – i.e. the “acceptable or tolerable” intake.

As noted above, it is important to remember that the world is made of chemicals. Everything we see and feel around us is made of chemicals and the target of chemicals management is to ensure that the levels of a chemical to which people may be exposed remain low and pose a negligible risk. It is on this basis that chemicals are assessed i.e. what levels can people be exposed to before adverse health effects are expected. This also means that just because a chemical is present in the environment or in the food we eat, it does not mean that adverse effects will occur (there must be enough of the chemical present to trigger adverse changes in our systems). This is why determining a toxicity reference value is such a key step in determining a drinking water guideline.

In line with normal practice for such reviews, SLR Consulting determined which toxicity studies were robust and appropriate for use in determining a toxicity reference value for each of the 4 PFAS. For these PFAS, the review resulted in classifying 2 to 4 studies as of appropriate quality for establishing a toxicity reference value. It was not possible to choose only 1 key study as even the most robust studies had issues. This means that there were multiple results describing the toxicity of

each of the PFAS and that those results could not be separated – they were all equally suitable for determining a toxicity reference value.

SLR Consulting then calculated toxicity reference values for each of the studies and endpoints that they considered relevant and robust and then they calculated drinking water guidelines using those toxicity reference values.

For PFOS, they calculated the following range of guidelines using the various key studies:

- 0.0034 µg/L
- 0.027 µg/L
- 0.077 µg/L
- 0.095 µg/L.

For PFOA, they calculated the following range of guidelines using the various key studies:

- 0.063 µg/L
- 0.075 µg/L
- 0.172 µg/L
- 0.111 µg/L
- 0.227 µg/L
- 0.402 µg/L
- 0.554 µg/L.

For PFHxS, they calculated the following range of guidelines using the various key studies:

- 0.0085 µg/L
- 0.034 µg/L.

For PFBS, they calculated the following range of guidelines using the various key studies:

- 2.939 µg/L
- 2.252 µg/L
- 1.041 µg/L.

SLR Consulting then made the following recommendation about which value to choose for the drinking water guideline for each of the PFAS based on their understanding of the details of each toxicity study:

- PFOS = 0.07 µg/L (i.e. retain current guideline for PFOS+PFHxS)
- PFHxS = 0.07 µg/L (i.e. retain water guideline for PFOS+PFHxS)
- PFOA = 0.2 µg/L (i.e. change from current guideline of 0.56 µg/L)
- PFBS = any value between 1 and 2.9 µg/L (no guideline currently exists).

The NHMRC, however, made different choices for each PFAS choosing the following guidelines:

- PFOS = 0.004 µg/L
- PFHxS = 0.03 µg/L
- PFOA = 0.2 µg/L
- PFBS = 1 µg/L.

The guideline for PFOS recommended by NHMRC is significantly different to that recommended by SLR Consulting.

In addition, it can be seen from the guidelines presented above that the NHMRC decided to choose:

- PFOS and PFBS: the lowest/most conservative guideline calculated by SLR Consulting
- PFHxS: the highest/least conservative guideline calculated by SLR Consulting
- PFOA: the guideline recommended by SLR Consulting.

So, the approach adopted by NHMRC is inconsistent between PFAS. Rationale for the approach adopted by NHMRC is not provided.

In addition to the above, it appears that the NHMRC has targeted the USEPA maximum contaminant limit (MCL) of 4 ng/L (0.004 µg/L) as the guideline for Australia. While this may not have actually occurred, it appears this way to the community and the media, in particular.

It is not normal practice for Australia to directly adopt US guidelines. In fact, for drinking water guidelines, NHMRC guidance indicates the following:

- Section 6.4 of the Australian Drinking Water Guidelines notes that the Australian guidelines take as their point of reference the WHO Guidelines for Drinking Water Quality – with variations from WHO values based on a different assumption about body weight (70 kg for Australia vs 60 kg for WHO) and a different assumption about negligible risk for genotoxic carcinogens ($1x10^{-6}$ for Australia vs $1x10^{-5}$ for WHO).
- Section 6.5 of the Australian Drinking Water Guidelines notes that there is a hierarchy to follow when choosing guidelines for chemicals that are not listed in the Australian Drinking Water Guidelines – that hierarchy places USEPA guidance as the 5th or 6th choice. Guidelines in WHO, New Zealand and Canada are all to be preferred above USEPA values.

4 Issues with the proposed toxicity reference value and guideline for PFOS

The toxicity reference value and drinking water guideline proposed by the NHMRC for PFOS is particularly problematic for the following reasons:

- The guideline proposed by NHMRC is different to that recommended by the independent expert engaged by NHMRC (SLR Consulting), without a stated rationale.
- SLR Consulting found the following:
    - SLR calculated the PFOS guideline using 4 different toxicity reference values
    - these 4 different values were based on different ways to interpret the data from 2 studies
    - SLR Consulting considered the data used to calculate these toxicity reference values as essentially equivalent in regard to quality of the study and relevance of the endpoint
    - SLR Consulting considered these values to all be protective of people's health as the differences were based on slightly different interpretations of the same data
    - this process (i.e. calculating the guideline value using multiple toxicity reference values) is commonly used when there are many studies available for a particular chemical and several studies cannot be excluded from consideration as the key study driving the assessment
    - when this is undertaken it is usually considered that all of the values calculated would be equally health protective and so any of the values in the range could be chosen

- SLR Consulting recommended leaving the drinking water guideline at the value as currently listed in the NHMRC guidelines as there was not robust evidence that it should be changed
- this advice has not been adopted by NHMRC but no rationale has been provided to explain the approach taken.

- There are many issues with the choice of endpoint for the calculation of the toxicity reference value chosen by NHMRC including the following (see discussion in **Section 2.3.2** of this letter for more information):
  - issues with the quality of the study
  - whether the endpoint chosen is actually adverse
  - how to determine the relevant dose for the endpoint based on statistical issues with the data.
- Lack of consideration of the large background exposure to PFOS that already exists in the Australian population, based on data from studies of PFAS in pooled blood samples which impacts on how a drinking water guideline should be calculated (see discussion in **Section 2.5** of this letter; this is an issue due to the proposed very low toxicity reference value).
- Currently, Australia has used a toxicity reference value of 20 ng/kg bw/day for calculating guidelines for drinking water, recreational water, soil, biosolids and food. If the toxicity reference value proposed by NHMRC for PFOS (i.e. 0.98 ng/kg bw/day) is formally adopted, then the implications for other types of guidelines are extremely significant and include:
  - lack of available analytical methods for measuring PFOS at relevant concentrations in most media
  - potential closure of swimming areas due to levels of PFOS above a revised recreational water guideline
  - significantly increased costs for contaminated sites investigations and remediation
  - background ambient soil and surface water concentrations in many locations already above the relevant guideline (i.e. identification of urban ambient concentrations of chemicals as “contaminated”, with associated management requirements and risk of property blight)
  - water authorities not able to comply with requirements for reuse of biosolids or treated wastewater meaning these materials will need to be disposed – this will impact on the potential for appropriate management of sewage in Australia
  - resource recovery for a range of other materials (compost, FOGO, etc etc) will no longer be permitted as the materials will never be able to comply with criteria based on the new toxicity reference value essentially shutting down any potential for a circular economy in Australia
  - foods (e.g. seafood, beef) not being able to demonstrate compliance with trigger points which raises questions about the safety of many food types in Australia and may have impacts on international trade
  - escalation in stress and anxiety felt by the community about PFAS, which is already at very high levels and noting that stress/anxiety have recognised adverse health effects.

While these issues may also be present in the draft guidelines for PFOA, PFHxS and PFBS, they have the most impact on the PFOS guideline, so this commentary has focused on the issues in the calculation of the draft drinking water guideline for PFOS.

More detailed discussion of these issues is provided in the following sections.

5 Derivation of the drinking water guideline

The draft NHMRC fact sheet lists the following information about the calculation of the drinking water guideline for PFOS:

- Benchmark dose (modelled) of 294 ng/kg bw/day from 28 day study in rats undertaken by the National Toxicology Program in the US – the modelling determined the dose that would result in a 10% change to the key endpoint (i.e. $BMDL_{10}$) (NTP 2022).
- Uncertainty factors applied to this $BMDL_{10}$ to generate the toxicity reference value were 10 fold for human variability, 3 fold for extrapolating from rats to people and 10 fold as the study was a very short term study compared to the toxicokinetics of these chemicals – giving a total uncertainty factor of 300.
- This gives a toxicity reference value of 294/300 = 0.98 ng/kg bw/day.
- This value was then used with the standard assumptions incorporated into the drinking water guidelines – a water ingestion rate of 2 L/day, a body weight of 70 kg and a source allocation to drinking water of 10%.

The calculation of the guideline value is, therefore:

$$\text{Drinking water guideline} = \frac{\text{Toxicity reference value } \left(\frac{294}{300}\right) \text{ x bodyweight x fraction allocated to dw}}{\text{daily water ingestion rate}}$$

$$\text{Drinking water guideline} = \frac{0.98 \text{ x } 70 \text{ x } 0.1}{2}$$

$$\text{Drinking water guideline} = 3.4 \text{ ng per L (rounded up to 4 ng per L)}$$

The main questions to address when considering the appropriateness of this assessment are:

- Is the endpoint adopted the most appropriate one, i.e. is the endpoint adverse? Is the study of appropriate quality? This is further discussed in **Section 6**.
- Are the uncertainty factors chosen comprehensive and appropriate? These appear toi be reasonable and no comments are provided.
- Is the allocation of 10% of the toxicity reference value from drinking water appropriate? This is further discussed in **Section 7**.

6 PFOS chosen endpoint

SLR Consulting identified several new studies about the toxicity of PFOS which they considered as key for this review:

- US National Toxicology Program (NTP 2022)
- Zhong et al. (2016) (Zhong et al. 2016).

These studies were in addition to the single key study previously adopted by Food Standards Australia and New Zealand (FSANZ) (and other agencies) in 2017 (Luebker et al. 2005).

NTP (2022) was the driver for the choices made by NHMRC.

This study was a 28-day study in rats. This is a common type of study undertaken by the NTP. These types of studies look at hundreds of different effects in the animals from mortality to minor

changes in blood chemistry when the rats are exposed to a chemical of interest. This agency is well qualified to undertake such studies.

SLR Consulting did review the way USEPA (and other agencies) assessed the quality of the relevant toxicity studies, however, they did not undertake an independent detailed review of the quality of this study. Instead, they relied on the fact that the USEPA determined that this was a high quality study. It is unclear if NMHRC has undertaken a detailed review of this study. A detailed review of NTP (2022) by enRiskS has identified a range of issues with this study in regard to the chosen endpoint from this study, including:

- The use of a short-duration study:
  - The study was only 28 days long which is considered too short for studies of persistent chemicals like PFAS. Other studies available in the literature have been undertaken for 2 years for rats and 6 months for monkeys – this is much more relevant for these chemicals. It is not clear why the short-term study was considered in preference to these other (longer) studies (noting the longer duration studies were not considered by NHMRC in this round of evaluation).
  - The key effects identified by NHMRC were not seen in the longer studies, so it is not clear that they could be considered to be relevant or adverse.
- Animal studies only identifying effects at very high doses:
  - The NTP study looked at many effects in rats but only a small number of effects were different in treated rats compared to control rats, and only at very high doses (>1,000,000 ng/kg bw/day). Such high concentrations are not environmentally relevant but are commonly used in such studies to actually see effects. Often such doses are required when chemicals cause general types of toxicity rather than toxicity via specific mechanisms such as inhibition of enzymes or interactions with receptors etc. The fact that such high doses were required in the study to see any effects potentially points to generalised toxicity rather than toxicity via a specific mechanism of importance.
  - The reason the toxicity reference value for people is so low based on this endpoint is not due to the dose that caused the endpoint effect but is due to the toxicokinetic considerations that have been incorporated in the calculation by the USEPA to convert from a dose in rats to a dose in people. These considerations have effectively resulted in a 1,000,000 fold factor (based on an exposure to 1,250,000 ng/kg bw/day where the relevant effects were seen in the rats compared to the toxicity reference value used of 0.98 ng/kg bw/day. For most chemicals, a default factor of 10 is applied to convert animal data to human equivalent data.
- Quality of the NTP study:
  - Review of the NTP study noted that equipment used in the experiment included Teflon – i.e. a source of PFAS. It is common practice in laboratories to remove all Teflon from studies wherever possible. In addition, a single round of chemical analysis was undertaken on the treatment solutions used in the experiment, even though the solutions were made up at the beginning of the experiment, accessed every day and stored for the whole study period potentially in contact with Teflon containing materials. Good data quality is an important aspect of ensuring robust data are used in guideline development.

- Analysis was not undertaken using the normal analytical method for environmental samples (i.e. LC/MS or LC/MS/MS) as per USEPA guidance. Instead, the analysis was undertaken using LC with either an ion chromatography detector or a UV spectrophotometer detector. This is because the concentrations required for this experiment were so extremely high that it was not necessary to use the sort of sensitive method required for low level environmental samples. Using these other types of detectors is not covered by the USEPA standard methods for analysis of PFOS (or other PFAS). It is not clear that these are appropriate, validated methods.

- Immunotoxicity endpoint:
  - Immunotoxicity was initially considered as a key endpoint for PFOS, PFHxS and PFBS by SLR Consulting and NHMRC.
  - This type of endpoint was determined to not be clinically relevant for PFOS, so a different key effect appears to have been adopted by NHMRC for the calculation of the guideline – changes in red blood cell production processes.
  - However, the same type of immunotoxicity endpoints remain as the key endpoints for PFHxS and PFBS without any explanation as to why such effects were not clinically relevant for PFOS but are relevant for PFHxS and PFBS i.e. the decision-making process is inconsistent between PFAS.
- Critical endpoint chosen:
  - For PFOS, the key endpoint chosen was related to changes in the production of red blood cells – the NTP authors decided that the level of this effect was minimal at all treatment levels where a change from the controls was noted – i.e. there was a likely flat, dose response relationship for this effect which makes statistical analysis difficult.
  - There is not a lot of information available as to the potential for this endpoint to actually be adverse. The NTP study reported that there was no overall change in the red blood cell count at any treatment level and no anaemia was reported. This may have been due to the length of the study but it could also be due to the observed changes in the production of red blood cells not being a particularly important effect as other processes address those observed changes automatically over time.
  - The statistical analysis of the data for PFOS was identified as problematic by SLR Consulting and Professor Brian Priestley:
    - there are 2 sets of values that can be used to indicate a negligible change in the effect of interest (i.e. the key value for use in calculating the toxicity reference value)
    - one value (NOAEL) comes from the actual observations in the study – the measured concentrations of PFOS in the blood when the rats were exposed at the dose that did not change red blood cell production
    - the other value (BMD_{10}) comes from a statistical calculation of what the concentration of PFOS in blood would be when there was a 10% change in the red blood cell production
    - using the BMD_{10} gives a drinking water guideline of 0.0034 µg/L and using the NOAEL gives a drinking water guideline of 0.077 µg/L i.e. a 20-fold difference
    - these 2 types of values should be similar as they are designed to be an estimate of the same thing – the dose that results in a negligible change in the parameter of interest. This significant difference indicates a likely issue

with the dose response relationship i.e. not a strong relationship and one impacted by variability.

Based on the above, the recommended guideline for PFOS should, therefore, have been 0.077 µg/L which is based on the NOAEL (i.e. same as recommended by SLR Consulting and Professor Brian Priestley; retain the existing value) as this is the value based on actual measured blood concentrations in animals where the change in red blood cell production did not occur.

These issues mean that we are concerned that the toxicity study and toxicity reference value chosen by NHMRC as the basis of the proposed drinking water guideline is not a robust value relevant for use in setting guidelines.

Issues with using non-robust data as critical endpoints

Australia has already had a situation where, in 2016, an inappropriate study/endpoint was included in the dataset used to calculate the water quality guideline for ecosystem protection (i.e. to protect aquatic organisms). This study was included the dataset as it was a multi generation study and it appeared to be of appropriate quality. However, the study was not undertaken in accordance with appropriate methods and there was no dose response relationship identified for any of the effects considered for the endpoints. It was, therefore, assumed that the lowest dose was the lowest observed effect level for use in the dataset.

The inclusion of this data point resulted in difficulties with the statistical analysis. The determined 99% species protection value was 0.00023 ng/L, which was around 1,000 times lower than the calculated 95% species protection value, instead of around 10 times lower as is the case for a range of other bioaccumulative chemicals. This very low 99% species protection value was then required to be used by several state regulators for contaminated sites assessment and surface water/groundwater assessment resulting in huge costs for investigation and remediation ($100 millions).

Detailed review of the paper of interest in 2016 (and since) indicated that there were many issues with the quality of that study and with the statistics for the guideline calculation, but these issues were not addressed in a timely manner nor has the guideline value for PFOS to protect aquatic organisms been finalised to this day.

Such technical issues should not be allowed to muddy the waters for yet another national guideline value.

7 Background exposures

Unlike many chemicals in Australia, biomonitoring information on background levels of PFAS in serum in the general population is available. The team of researchers at the Queensland Alliance for Environmental Health Sciences undertook biomonitoring of PFAS in serum for pooled blood samples taken from waste blood at pathology providers from early 2000s through to 2017 (Kärrman et al. 2006; Thompson et al. 2010; Toms, L-ML et al. 2009; Toms, LML et al. 2019; Toms, LML et al. 2014). The samples were pooled based on age and, for some monitoring events, urban versus regional patients.

Blood collected in 2002/2003 was reported to contain around 20 ng/mL of PFOS. Similar levels were reported in 2006/2007 although levels in women had decreased slightly (Kärrman et al. 2006;

Toms, L-ML et al. 2009). Levels of PFOS were also measured in 2008/2009, 2010/2011, 2013/2014 and 2015/2016. Levels in adults had decreased to around 10 ng/mL in 2008/2009 and 2010/2011. Levels in adults were around 4-8 ng/mL in 2013/2014 and 2015/2016 (Toms, LML et al. 2019; Toms, LML et al. 2014).

Figure 1 is taken from (Toms, LML et al. 2019) and it shows the changing concentrations of individual PFAS in pooled blood samples in Australia. These graphs show little change in PFHxS, a decrease for both PFOS and PFOA and an increase and then a decrease for PFNA over this time.

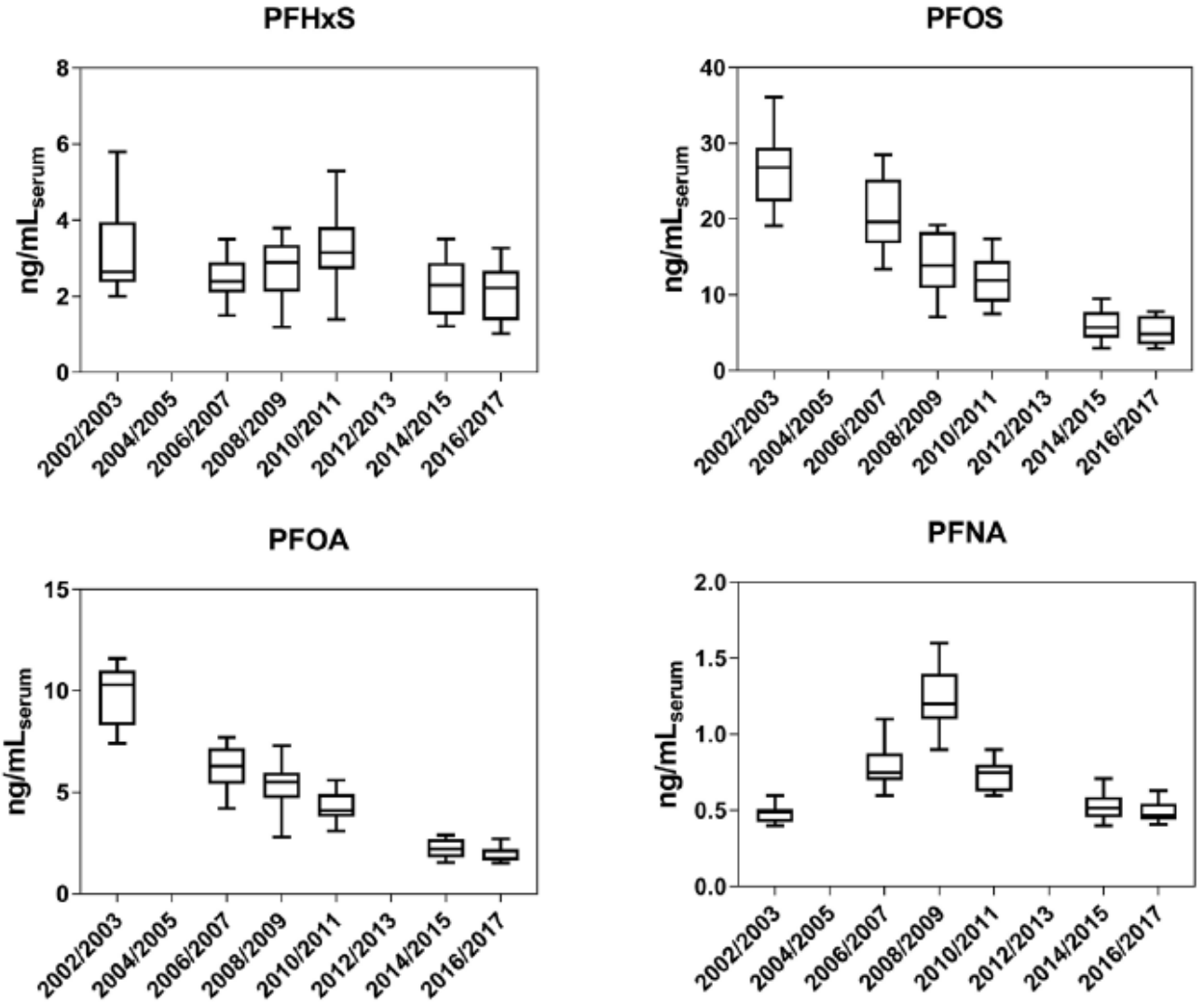


Figure 1: Changing serum concentrations in Australian population for key PFAS

These researchers calculated likely daily intakes for the various PFAS based on these serum concentrations (Thompson et al. 2010).

Using a simple pharmacokinetic model, they calculated intakes for PFOS and PFOA for the first 2 monitoring periods.

The calculation used the following equation:

Daily intake = Serum conc x volume of distribution (Vd) x elimination rate (kP)

Where the units for each parameter include:

Daily intake – ng/kg bw/day
Serum concentration – ng/mL
Volume of distribution (Vd) – mL/kg bw
Elimination rate (kP) – per day

This calculation is relevant at steady state. The researchers used an elimination rate of 0.0008 per day for PFOA and 0.0003 per day for PFOS based on serum half lives from occupational studies (2.3 years for PFOA and 5.4-5.9 years for PFOS). The volume of distribution used was 170 mL/kg bw for PFOA and 230 mL/kg bw for PFOS.

Using the same approach, estimated daily intakes have been calculated for all monitoring periods using the serum concentration data for the adult groupings (i.e. >16 years). The calculated intakes are listed in **Table 1**.

Table 1: Estimated daily intakes for PFOS and PFOA in the Australian population

Monitoring period	Serum PFOS (ng/mL)	PFOS Intake (ng/kg bw/day)	Serum PFOA (ng/mL)	PFOA Intake (ng/kg bw/day)
2002-2003[1]	13-30	1-2.3	5.8-9.9	0.6-1.3
2006-2007	13-29	1.1-2.2	4.2-7.7	0.6-1
2008-2009	5.3-19.2 (11.9 mean)	0.4-1.3 (0.8 mean)	2.8-7.3 (5.2 mean)	0.4-1 (0.7 mean)
2010-2011	4.4-17.4 (10.2 mean)	0.3-1.2 (0.7 mean)	3.1-6.5 (4.5 mean)	0.4-0.9 (0.6 mean)
2013-2014	8.7 mean/ 17.4 P95 averaged across adult groupings	0.6 (mean)/ 1.2 (P95)	2.3 mean/ 5.4 P95 averaged across adult groupings	0.3 (mean)/ 0.7 (P95)
2015-2016	5.2 mean/ 12.1 P95 averaged across adult groupings	0.4 (mean)/ 0.8 (P95)	2.0 mean/ 4.3 P95 averaged across adult groupings	0.3 (mean)/ 0.6 (P95)

Notes:

1 There was one pooled sample with a significantly elevated PFOS concentration (88 ng/mL) which gave an intake of 6.8 ng/kg bw/day. This value was considered an outlier by the researchers so has not been included in the data for this table.

These calculations indicate the following:

- PFOS – daily intake has ranged from 0.3-2.3 ng/kg bw/day since 2000
- PFOA – daily intake has ranged from 0.3-1 ng/kg bw/day since 2000.

Background exposure is likely to occur because these chemicals are used in a wide range of products present in homes and workplaces. These chemicals are present in water, stain and oil repellent, so they have been used in food packaging, furniture textiles, carpets, paints, outdoor clothing (hiking, skiing), cosmetics, personal care products, plastics etc. These many uses have resulted in widespread low levels throughout urban environments.

There is no organised national biomonitoring program in Australia. These biomonitoring data have been determined using limited numbers of pooled blood samples from limited parts of Australia. The studies have mostly accessed pooled blood from Queensland pathology providers. While these data are useful for this discussion, it is noted that these data do not result from a statistically designed study of the entire Australian population such as is undertaken in USA – the NHANES program. They do indicate, however, that Australians have a background intake of these chemicals that is

high enough that it should be considered (or at least discussed) when setting guidelines such as drinking water guidelines.

These measurements indicate that people in Australia have a background intake of PFOS around 0.8 ng/kg bw/day (high end value from most recent monitoring round). Comparing this background intake to the toxicity reference value used in the proposed NHMRC guidelines indicates that 80% of the proposed toxicity reference value is already taken up by these background exposures.

The normal calculation for drinking water guidelines in Australia allows 10% of the toxicity reference value to come from drinking water. This ensures protection of health for those who may be exposed to higher levels of the same chemical at work or at a contaminated site or due to other exposure pathways.

If people are already exposed to around 80% of the toxicity reference value, then some adjustment should have been made to the basic drinking water guideline calculation, but this has not occurred for PFOS, nor has it even been discussed in the NHMRC fact sheet.

It is noted, that if the current toxicity reference value is retained (as per SLR Consulting recommendation), then this background existing intake corresponds to around 5% of the toxicity reference value and there is no need to address this issue in the calculation of the drinking water guideline.

It is important that these intakes get considered when establishing tolerable daily intakes and drinking water guidelines to ensure the drinking water guidelines are sufficiently protective, if the proposed toxicity reference value is to be adopted.

It is recommended that background exposures are more appropriately considered when calculating this guideline. More recent data on PFOS concentrations in the blood of Australians could also be useful to assist this process.

8 WHO drinking water guidelines

Given that the World Health Organisation drinking water guidelines are considered to be the point of reference for the Australian drinking water guidelines, it is important to consider the views of the WHO in regard to the toxicity of PFOS.

The WHO published a draft background document on PFOS and PFOA in drinking water in September 2022.

This document noted that PFOS and PFOA were regularly detected in Australian drinking water sources and that the highest reported concentrations were 16 ng/L for PFOS and 9.7 ng/L for PFOA in a study from 2011.

The findings of this document about the toxicity of these chemicals were summarised as follows:

Acknowledging the significant uncertainties and absence of consensus with identifying the critical health endpoint to calculate a HBGV and the rapidly evolving science, a pragmatic solution is therefore proposed for the derivation of provisional guideline values (pGVs).

Individual pGVs of 0.1 µg/L for PFOS and PFOA (i.e. 100 ng/L) are proposed and a combined pGV of 0.5 µg/L is proposed for total PFAS (i.e. 500 ng/L).

This approach has been widely criticised, and this draft document has been withdrawn from the WHO website. However, this acknowledgement of the difficulties in determining the toxicity of these chemicals is to be applauded.

The values chosen for these provisional guidelines are based on what is routinely achievable by the sort of water treatment technologies likely to be relevant/affordable for most water authorities which is a relevant matter to consider when determining drinking water guidelines.

This is an approach that could be considered by NHMRC when determining revised drinking water guidelines for PFAS. However, in this case, this approach should be clearly acknowledged in the documentation supporting the drinking water guidelines. i.e. if such an approach were adopted, it would not be appropriate to infer, imply or state that the drinking water guidelines were derived based on toxicity reference values.

9 Guidelines from other international organisations

There are a wide range of guidelines available from international organisations. The values vary considerably which shows that obtaining clarity from the toxicology literature for these chemicals is extremely difficult. **Attachment A** provides a summary of evaluations provided by IARC, USEPA and Europe. These evaluations do not demonstrate consensus in relation to the mechanism of action, relevant studies or the critical endpoints that are relevant for establishing such guidelines.

10 Impacts of changing the toxicity reference value on other Australian guidelines

10.1 Summary

It is anticipated that, should the proposed toxicity reference values be finalised as part of the review of the drinking water guideline, these toxicity reference values would then need to be used to update the following Australian guidelines:

- Recreational water quality guidelines (provided by NHMRC).
- Soil quality guidelines (provided by ASC NEPM and PFAS NEMP).
- Food quality guidelines (trigger points provided by FSANZ – particularly those for fish and meat).
- Biosolids guidelines (provided as draft values in version 3 of the PFAS NEMP).
- Landfill guidelines (provided in the PFAS NEMP).

The toxicity reference value for PFOS proposed by NHMRC is 20 times lower than the current toxicity reference value used to develop these guidelines. For PFOS, updating these guidelines would result in a 20 fold decrease due simply to the change in toxicity reference value as well as additional decreases depending on the choice made in regard to existing background exposure to PFOS.

Such a change will result in completely unworkable guidelines for soil in a residential setting as well as for various types of food.

The guidelines will be unworkable as no commercial laboratory will be able to provide appropriate limits of reporting (noting that a limit of reporting at a guideline value is not useful as it can be hard to accurately measure chemical concentrations around the value of the limit of reporting).

Should they try and update their methods to provide lower limits of reporting, the issue of background contamination in the laboratories and the equipment and consumables they use in the analysis will become problematic. This will have serious and wide-ranging implications as outlined below.

10.2 Recreational water guidelines

Adopting the proposed toxicity reference value for drinking water should trigger an update to the recreational water quality guidelines, given that NHMRC are the body responsible for these guidelines as well as the drinking water guidelines.

Currently, the recreational water quality guideline for PFOS+PFHxS is 2 µg/L and for PFOA is 10 µg/L (NHMRC 2019). Using the new reference doses/tolerable daily intakes and the same approach as used in the current guidelines, the following equation is relevant:

$$\text{Recreational water guideline} = \frac{\text{Reference dose x Days per year x Body weight x Source allocation}}{\text{Ingestion rate per year}}$$

Where:

Reference dose = relevant value from updated NHMRC fact sheet (ng/kg bw/day)
Days per year = 365 days per year (used to convert ingestion rate per day to per year)
Body weight = 70 kg (standard assumption used by NHMRC)
Source allocation = 10% (i.e. 0.1) (fraction of tolerable daily intake that can come from this exposure pathway) (standard assumption used by NHMRC)
Ingestion rate = 30 L per year (standard assumption used by NHMRC)

Table 2 shows the existing and proposed recreational water guidelines for PFAS.

Table 2: Updated recreational water guidelines

Chemical	Current (µg/L)	Updated (µg/L)
PFOS	2	0.085 (i.e. 85 ng/L)
PFHxS		0.85 (i.e. 850 ng/L)
PFOA	10	5.5 (i.e. 5,500 ng/L)

Applying a recreational water guideline of 0.085 µg/L for PFOS will have significant implications for the acceptability of recreational use at some locations.

For example, enRiskS is aware that concentrations of PFOS in marine water in Port Phillip Bay (off the southeastern suburbs of Melbourne, Victoria) are in the range 0.086 to 0.37 µg/L. Many Victorians use Port Phillip Bay for recreational activities, including swimming, every day of the year (and often despite pollution warnings from EPA Victoria on days following heavy rainfall). A revised recreational water quality guideline of 0.085 µg/L for PFOS would communicate to Victorians that it is unsafe to swim in their major marine waterway.

10.3 Soil guidelines

Adopting the proposed toxicity reference value for drinking water should also trigger an update to the soil quality guidelines in the PFAS NEMP (HEPA 2020). These guidelines are protective of human health and use the approach from the ASC NEPM (National Environment Protection (Assessment of Site Contamination) Measure (NEPC 1999 amended 2013a, 1999 amended 2013b). i.e. are generally consistent with the HILs published in the ASC NEPM.

Currently, the HILs for soil for low-density residential land use are 10 µg/kg for PFOS+PFHxS and 100 µg/kg for PFOA (0.01 mg/kg and 0.1 mg/kg respectively).

Using the HIL Calculator (supplied as part of the ASC NEPM) as well as the assumptions built into the current soil quality guidelines in the PFAS NEMP and the proposed TDI for PFOS, the health investigation level for low density residential land use would change from 10 µg/kg to 0.5 µg/kg for PFOS (or PFOS+PFHxS) i.e. 0.0005 mg/kg.

Table 3 shows the existing and proposed soil quality guidelines for these chemicals in relation to low density residential land use only.

Table 3: Updated soil quality guidelines for low density residential land use

Chemical	Current (µg/kg)	Updated (µg/kg)
PFOS	10	2
PFHxS		3
PFOA	100	100

The updated value listed here is still based on assuming 20% of the toxicity reference value can come from contact with soil and consumption of home grown backyard produce. If 10% of that toxicity reference value is allocated to drinking water (and another 10% is allocated to recreational water), then there is very little left to allocate to exposure via soil. This aspect (i.e. existing background will need to be carefully considered in preparation of any update to this soil guideline.

If the allocation to the soil at a specific site is changed from 20% to 10% (i.e. background changes from 80% to 90%), then the soil guideline (HIL-A) changes to 1 µg/kg (0.001 mg/kg) for PFOS (or PFOS+PFHxS). The current commercially available limit of reporting for PFOS in soil is 0.2 µg/kg (0.0002 mg/kg). As noted above, a guideline close to or at the commercially available limit of reporting is not useful as it can be hard to be confident whether the chemical of interest is actually present or not.

Analytical methods for PFOS in soil may be able to reach this level using trace approaches and the latest most sophisticated equipment for some sites/media. However, this stringent limit of reporting is not routinely provided and would require additional costs. It is also noted that soil in many locations, particularly in urban areas, already has concentrations of PFOS in soil at or around this level.

This change will have significant cost implications for many contaminated land investigations and management. Costs will be higher due to:

- increased analytical costs to reach these more stringent concentrations (more labour-intensive methods and, potentially, more sophisticated equipment)
- increased sampling/analysis costs to ensure adequate sampling to characterise background levels in soil to show a site is or is not different to the whole region (i.e. more samples)
- increased issues with ensuring cross contamination does not occur
- increased remediation costs if regulators or auditors require clean up to reach HIL-A levels even if the site is not a source site for contamination by these chemicals (i.e. if clean-up of sites that just have background levels is required)
- increased costs associated with the off-site disposal of soil to landfill, as landfill guidelines are also expected to decrease in value.

For many sites, the source of contamination by these chemicals is regional and diffuse that apply equally to all the soil in the vicinity of the site being investigated as well at the site being investigated. A specific site should not be required to clean up such contamination where activities at that site did not introduce these chemicals (i.e. site is not source), especially given that the next rain event will wash these chemicals from one site back onto the specific site if clean up does not occur on all the sites in an area.

In addition, contaminated land regulations may trigger the identification of sites with ambient levels of PFAS as “contaminated”. This would be the case in Victoria, and where contamination is identified, the landowner then has a Duty to Manage the identified contamination. Issues such as property blight (decrease in property values) are also relevant.

This will also move resources away from risk issues that may be of more concern, as well as causing stress and anxiety (with recognised adverse health effects) for affected people (of which they are expected to be many). Costs for major projects would also be expected to increase and more soil would need to be sent to landfill (noting that Australia is currently working towards diverting soil from landfill).

The following specific examples from Victoria are provided:

- In Victoria, fill material is classified as soil with concentrations of PFOS of 2 µg/kg. (https://www.epa.vic.gov.au/about-epa/publications/1828-3-waste-disposal-categories). Fill material (i.e. compliant with this value) can be used without restriction in Victoria. However, soil classified as fill material would not meet the revised HIL-A value.
- The revised HIL-A value would be more stringent (i.e. lower) than the ambient concentrations reported by EPA Victoria in Publication 2049 (https://www.epa.vic.gov.au/about-epa/publications/2049-report-on-pfas-in-the-environment). A snapshot of Table 3 from this publication is provided as **Figure 2** (i.e. ambient concentrations across Victoria already exceed the revised HIL-A value).

EPA has conducted two ambient sampling campaigns to date (see further details in publications: Sardiña et al. 2019; EPA publication 1879: Emerging contaminants assessment 2019–20: Summary of results). As a summary of our findings, here we present ambient concentrations and detection frequency for the three main PFAS compounds in riparian soil, freshwater and sediments in Victoria based on land-use class (Table 3).

Table 3. Ambient concentrations and detection frequency for PFOS, PFHxS, and PFOA in riparian soil*, freshwaters and sediments in Victoria according to land-use classes

		PFOS			PFHxS			PFOA		
Matrix and Tier 2 land-use classes	n	Range		Detected (%)	Range		Detected (%)	Range		Detected (%)
RIPARIAN SOIL		mg/kg			mg/kg			mg/kg		
Remote-ambient	5	<0.002	<0.002	0	<0.001	<0.001	0	<0.001	<0.001	0
Agricultural-ambient	16	<0.002	0.003	12	<0.001	<0.001	0	<0.001	<0.001	0
Urban-ambient	42	<0.002	0.029	23	<0.001	0.001	1	<0.001	<0.001	0
Mixed-ambient	24	<0.002	0.016	21	<0.001	<0.001	0	<0.001	<0.001	0
FRESHWATER		µg/L			µg/L			µg/L		
Remote-ambient	5	<0.0002	0.0002	20	<0.0002	<0.0002	0	<0.0005	<0.0005	0
Agricultural-ambient	16	<0.0002	0.009	75	<0.0002	0.004	69	<0.0005	0.023	62
Urban-ambient	42	0.0007	0.081	100	0.0005	0.044	100	0.0005	0.036	100
Mixed-ambient	24	<0.0002	0.048	87	<0.0002	0.037	83	<0.0005	0.006	71
SEDIMENT		mg/kg			mg/kg			mg/kg		
Remote-ambient	5	<0.002	<0.002	0	<0.001	<0.001	0	<0.001	<0.001	0
Agricultural-ambient	16	<0.002	0.005	19	<0.001	<0.001	0	<0.001	0.001	6
Urban-ambient	41	<0.002	0.039	27	<0.001	0.001	2	<0.001	<0.001	0
Mixed-ambient	24	<0.002	0.005	21	<0.001	0.001	4	<0.001	<0.001	0

*Note: Soil samples were collected adjacent to freshwater sampling locations (Sardina et al 2019) and are therefore called 'riparian soils'. Riparian soil land-use was based on the land-use classification of the freshwater location.

Figure 2: Ambient soil, freshwater and sediment concentrations of PFAS in Victoria

- PFOS was reported in many soil samples collected from the project areas for 2 major Victorian infrastructure projects in which enRiskS has been involved. One of these projects was in north-east Melbourne and PFOS concentrations of up to 60 µg/kg were detected in soil. The other project was in south-east Melbourne and PFOS concentrations of up to 38 µg/kg were reported in soil. No major sources of PFAS were reported in these project areas i.e. these levels have arisen from diffuse sources. These values are well in excess of the revised HIL-A guidelines discussed above.
- Soil and sediment along the Bremer River and Warrill Creek floodplains in Queensland, or in parks where surface water was used for irrigation, reported detectable PFOS+PFHxS concentrations in the range 4 to 590 µg/kg. This included on private property and in public parks. While some of these concentrations are obviously associated with RAAF Base Amberley, these data illustrate the extent of the issue with identifying very low concentrations of PFOS as contamination that may have potential for risks to human health.

10.4 Food guidelines

FSANZ has provided trigger points for PFOS+PFHxS and PFOA for the main food groupings to assist contaminated land investigations. These values use the existing toxicity reference values and assume 100% of the toxicity reference value comes from each of the food types (i.e. 100% of the toxicity reference value comes from eating fish with 5.2 µg/kg PFOS+PFHxS where a child who weighs 19 kg eats 73 g per day of such fish every day of the year and 100% of the toxicity reference value also is taken in by a child who weighs 19 kg eating 108 g of meat containing 3.5 µg/kg PFOS+PFHxS every day of the year).

Both the existing trigger points and the updated values using the proposed NHMRC toxicity reference values are as listed in **Table 4**.

Table 4: FSANZ trigger points (FSANZ 2017b) and calculated updated trigger points

Criteria Type	PFOS+PFHxS (µg/kg)			PFOA (µg/kg)	
	Current	Updated – PFOS	Updated – PFHxS	Current	Updated
Finfish	5.2	0.3	2.6	41	2
Fish liver	280	3.7	38	2,240	112
Crustaceans/Molluscs	65	3.1	32	520	26
Meat	3.5	0.2	1.8	28	1.4
Milk	0.4	0.02	0.2	2.8	0.1
Honey	33	1.6	16	264	13
Offal	96	1.3	13	765	38
Eggs	11	0.5	5.3	85	4.3
Fruit	0.6	0.03	0.3	5.1	0.3
Vegetables	1.1	0.05	0.5	8.8	0.4

Many of these updated values are well below available limits of reporting from the most reputable commercial laboratories in Australia. The National Measurement Institute offers a limit of reporting of around 0.3 µg/kg while other laboratories offer a limit of reporting for food samples of around 1 µg/kg.

It would, therefore, not actually be possible to measure PFOS to demonstrate compliance with the trigger points for vegetables, fruit and milk.

The trigger points for PFOS in fish, meat and eggs are essentially the same as the best limits of reporting currently available in Australia (i.e. at NMI). While it might be possible to target these concentrations, it is very difficult to get robust, reliable results at the limit of reporting especially at such low limits of reporting (refer to **Section 10.5** for further details).

We recall well the disaster for the NSW fishing commercial communities that was widely published in the media in 2016 when PFOS contamination around RAAF Williamtown site was identified[1]. Commercial fishing activities were impacted based on the current toxicity reference value for PFOS in Australia. If the draft toxicity reference value proposed by NHMRC is adopted, we would expect similar adverse impacts in many more locations.

Recreational fishing advisories for PFOS are already in place in many waterways in Australia, and much data are available from PFAS investigations at nearby source sites. This includes data for ambient concentrations of PFOS in fish (i.e. upstream of the source sites). These data indicate ambient PFOS concentrations in fish as follows:

- samples collected from 6 km upstream of HMAS Cairns (location BIO04; the upstream reference site) reported detectable concentrations of PFOS in edible fish were in the range 0.3 to 3.5 µg/kg[2]
- samples collected from the upstream reference site in the Bremer River for RAAF Base Amberley PFAS investigation (in Queensland), reported concentrations in edible fish (catfish) were around 18 µg/kg (PFOS concentrations in surface water at this location were reported at 0.24 µg/L (i.e. 240 ng/L). The source of these concentrations in this reference locations was not likely to be RAAF Base Amberley)[3]
- samples collected from the upstream reference site in Warrill Creek for RAAF Base Amberley PFAS investigation reported detectable concentrations in edible fish of 0.6 to 3.5 µg/kg.

Except for catfish from the Bremer River, the above concentrations of PFOS reported in edible fish at upstream reference locations are below the current trigger point of 5.2 µg/kg but well above a potential updated trigger value of 0.3 µg/kg (PFOS was also not detected in some samples). The reported concentrations of PFOS in catfish in the Bremer River illustrate the complexity of undertaking human health risk assessments when they are many sources of PFAS to the environment. These assessments will become more complex again where trigger levels for foodstuffs are reduced.

Studies of ambient PFOS concentrations in fish in areas unrelated to contaminated land investigations have also been undertaken by some state regulators, particularly in Queensland (Baddiley et al. 2020). The Queensland study found that PFOS concentrations in fish in the Caboolture River were in the range 2 to 39 µg/kg and in fish in the Brisbane River concentrations of PFOS were in the range 0.3 to 120 µg/kg.

If the PFOS toxicity reference value as proposed by NHMRC were to be adopted, recreational fishing advisories would also need to be expanded. The map below[4] shows the current fishing

[1] https://www.abc.net.au/news/2016-08-31/flow-on-effect-of-williamtown-contamination-fishing-ban/7798196
[2] https://www.defence.gov.au/about/locations-property/pfas/pfas-management-sites/hmas-cairns
[3] https://www.defence.gov.au/about/locations-property/pfas/pfas-management-sites/raaf-base-amberley
[4] https://www.defence.gov.au/sites/default/files/2024-08/RAAFBaseAmberleyCommunityConsultationSessionPostersAugust2024.pdf

advisories in place downstream of RAAF Base Amberley and emphasises the complexity of such advisories when multiple sources of PFAS are present.

In relation to beef, some data have been collected in studies in Victoria but there is a lack of data on PFOS in livestock in other states and territories. Such studies are often perceived as having potential to raise international trade concerns. This adds complexities to, and creates uncertainty in, human health and ecological risk assessments for PFAS in livestock products as modelling uptake of these chemicals is used instead of measured values. However, this also emphasises the sensitivity of this issue. As noted above, the updated trigger levels for beef presented in **Table 4** are at the lowest commercially available limits of reporting. Setting a drinking water guideline that is overly health protective and creates issues for Australia's recreational and commercial food supply is not considered appropriate.

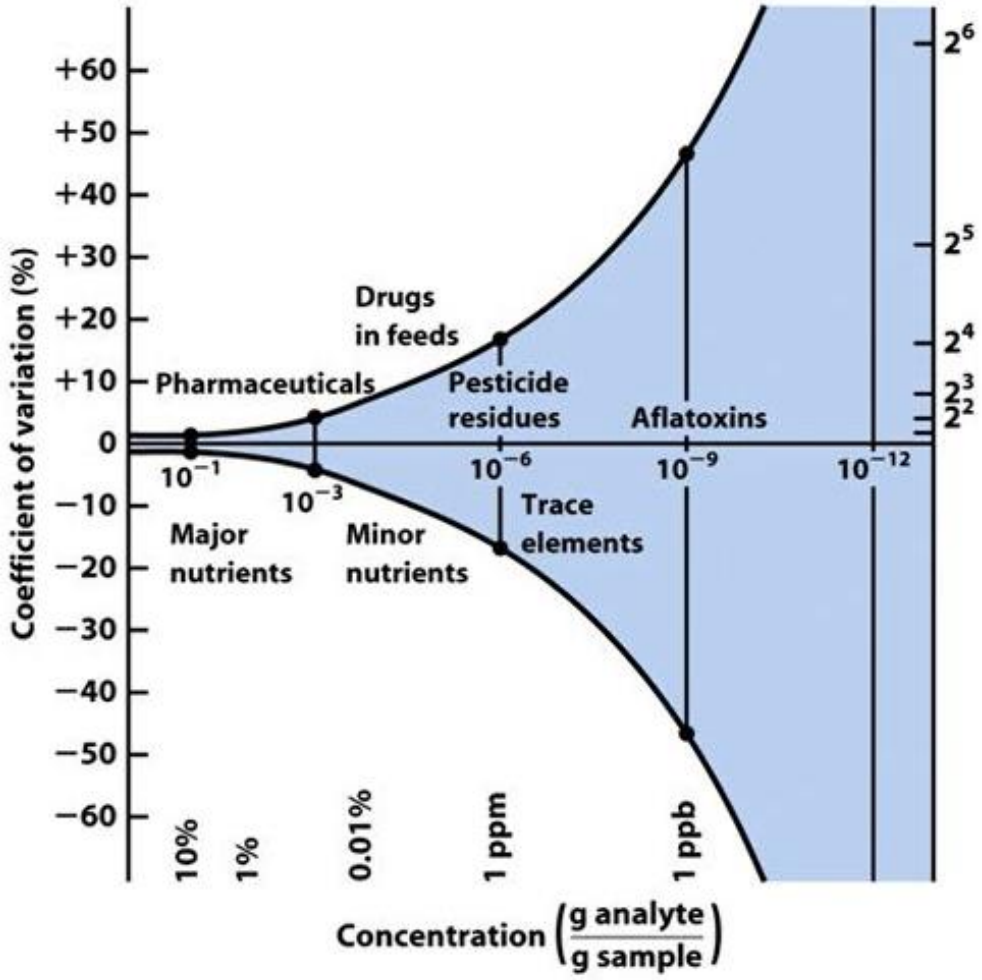
10.5 Sampling issues and cross contamination

There are a range of other issues that become apparent when updated guidelines at or below existing ambient PFAS concentrations and/or at or below limits of reporting currently offered by Australian laboratories are considered (as would be the case if the existing guidelines are updated with the toxicity reference value for PFOS proposed by the NHMRC).

Such issues include:

- Guidelines close to (or less than) the commercially achievable laboratory limits of reporting create issues in regard to the ability to demonstrate compliance.

- It is a well known characteristic of analytical methods that uncertainty/ measurement error increases as the concentration of a chemical in the sample of interest approaches the limit of reporting and as the limit of reporting gets smaller. This was identified by a US Food and Drug Authority statistician/analyst in 1980 – W. Horwitz. A figure to illustrate the concept is called the Horwitz Trumpet as shown in figure below.



It can be seen in this figure that, at concentrations around 1 ppb (i.e. 1 mg/kg), the coefficient of variation is around 50%. At concentrations around 1 ppt (i.e. µg/kg), the coefficient of variation is well in excess of 60%. This means the actual concentration in a sample could be ±100% of the reported value. This makes it very difficult to reliably monitor and demonstrate compliance with such strict guideline values.

- In addition to the potential size of measurement error, it is also important that guidelines are sufficiently above a relevant limit of reporting so that it can be demonstrated that a sample is in compliance with a guideline value or not. Often it is mentioned that a limit of reporting around 10 times lower than the relevant guideline value.
- Pushing limits of reporting lower and lower also drives up costs of analysis as the effort to achieve lower limits of reporting increases significantly.

- Laboratories are already having issues with background concentrations of PFAS in the laboratory building and equipment and consumables used in PFAS analysis such as solvents. These background levels are impacting on their ability to achieve current best practice LORs.
- When attempting to drive limits of reporting lower, the potential for matrix effects in some environmental samples (e.g. water with sediment, tannins or high concentrations of non-PFAS chemicals) and in foodstuffs is significant. There are already matrix effects in some samples that limit the limits of reporting that can be applied. This will get worse when attempting to achieve even lower limits of reporting.
- Collecting samples that are appropriate to achieve extremely stringent limits of reporting is also problematic. Australia already has extensive guidance on equipment, materials and foodstuffs that should not be used or present in the field during sampling for PFAS. This is to limit the potential for cross contamination of samples. For example, the guidance suggests that staff undertaking sampling must only wear clothing made of natural fibres that has been washed multiple times prior to going into the field to collect samples for PFAS analysis. There are a range of other quite extreme requirements. It is not clear how much further we can practically go in relation to minimising sources of PFAS in our everyday items that may cross contaminate samples. The lower the guidelines and the limits of reporting, the more important minimising cross contamination becomes and the more difficult it becomes to eliminate/control. For example, will it be expected that field staff will not use sunscreen as this may contain PFAS which may contaminate samples? How does this fit in with broader occupational health and safety protocols in relation to protection from the sun – a risk with a much more robust evidence base.

Setting a drinking water guideline that is overly health protective, and creates other practical issues is not considered appropriate.

10.6 Issues for our circular economy

PFAS risk issues, or perceived PFAS risk issues, are already impacting on Australia's ability to move towards a circular economy, particularly in relation to the use of compost, FOGO and biosolids. This is particularly the case in Queensland, where regulators have long held the view that "any PFAS is bad PFAS" and the only PFAS concentration allowable in the environment is "zero" (which, as an aside, is not scientifically valid).

Should the toxicity reference values proposed by NHMRC in the draft drinking water guidelines be finalised as is and then used to derive guideline values for materials such as compost, FOGO and biosolids, this would bring the rest of Australia in line with the approach adopted by Queensland to date[5]. **This would effectively end any potential for beneficial reuse of these products and would require all of these materials to be disposed to landfill instead.**

5 https://wmrr.asn.au/common/Uploaded%20files/Submissions/QLD/2023/Qld%20PFAS%20Organics%20Joint%20Letter%2030102023.pdf

The key risk issues in relation to the beneficial reuse of these materials is the estimated uptake of these chemicals into foodstuffs following the use of these materials in an agricultural setting or when growing home-grown produce (refer to **Section 2.6.4** for updated trigger points for foodstuffs).

The reuse of other recycled materials such as recycled aggregates would also become problematic e.g. the revised HIL-A value would be at the current PFAS guidelines for fill material in Victoria (refer to **Section 2.6.3**).

Disposal of these materials to landfill not only removes all benefits to society but is in opposition to Australia's agreed policy to divert 80% of waste from landfill by 2030.[6]

Setting a drinking water guideline that is overly health protective and significantly impacts on Australia's plan for a circular economy is not considered appropriate.

11 Community anxiety and stress

enRiskS has been involved in many community activities relating to PFAS risk issues as well as risk issues associated with other chemicals (talking to the communities about risks from chemicals in the environment is a core part of our business). This has included meetings with individual landowners e.g. with properties around Department of Defence sites, meetings with small groups of people to discuss proposed waste to energy facilities and attendance at larger walk in sessions associated with PFAS risk issues for major infrastructure projects.

During these activities, we have observed firsthand the high levels of stress and anxiety that PFAS risk issues can create. We have encountered people that were in tears, people that were angry/aggressive (yelling) and people that were sincerely afraid for their own health or the health of their children. In most cases, the relevant PFOS concentrations were those we would consider to be ambient concentrations in Australia and concentrations that are unlikely to be sufficient to cause health effects.

Parts of the media have targeted stories (and series of stories) on the "forever" nature of these chemicals and the potential for health effects of these chemicals without explaining the science correctly or in detail. This has increased the levels of stress and anxiety in people who may be living in areas where investigations are occurring, or even in areas where PFAs is detected in drinking water supplies. Stress and anxiety are known to cause health effects, so these media stories are actually generating health effects, but those effects are completely unrelated to the presence (or not) of PFAS. Journalists need to take their responsibilities seriously – including checking out all sides of a story especially when they do not have sufficient training or qualifications to properly evaluate what they are being told by the experts they speak too.

As noted, chronic or extreme stress and anxiety can result in adverse health effects that are independent of chemical concentrations[7]. Hence, it is critical that we clearly communicate the following to the community:

- what we know about the toxicity of PFAS to humans (and what we don't know)

[6] https://wastemanagementreview.com.au/australia-faces-a-residual-waste-dilemma/
[7] https://www.healthdirect.gov.au/stress

- that we have methods documented in national guidance from government authorities that allow assessment of risks to human health from chemicals based on the state of knowledge
- that we have all been exposed to ambient PFAS concentrations in our environment, as well as through our use of consumer products, for many years
- that the presence of a chemical in the environment does not mean the chemical will cause an unacceptable health risk – *dose makes the poison*
- that we take a precautionary approach to the management of chemicals in Australia
- that we need to balance this precautionary approach to ensure we are health protective, without being misleading and adding adverse health impacts to society.

It is also important to note that our experience is that the generally public can understand the basic principles of toxicology and risk assessment if adequate explanation is provided in the right language and at the right level. This can take time but, if successful, allows the community to understand the issues and form their own view on potential risks. This in turn removes the negative impacts that are commonly associated with involuntary risks, and often has a calming and empowering effect.

Where we have experienced examples of community anger and stress, it has generally been because of one or more of the following:

- lack of any community engagement and consultation, or rushed/inadequate engagement and consultation
- lack of adequate guidance, or conflicting guidance, from regulators
- inflammatory media reporting on PFAS risk issues
- inappropriate actions from individuals or companies that were politically and/or financially motivated (e.g. inflating PFAS risk issues to create community concern by one tenderer for a major project).

Setting a drinking water guideline that is overly health protective from a chemical toxicity perspective but actually results in adverse health effects from stress and anxiety is not considered appropriate.

We consider that NHMRC, as the Australian government's leading expert on health, has a critical role to play in assisting the Australian community to understand PFAS risk issues (and risks from other chemicals), and to not over inflate PFAS risk issues.

We also consider it is critical that NHMRC emphasise that our environment is made of chemicals, and PFAS risk issues require consideration and management similar to many other chemicals in our environment. One way that NHMRC can do this is to ensure that the drinking water guideline factsheets for PFAS are a similar length to the factsheets for all other chemicals. A chemical with a factsheet of many pages is automatically seen to be more important than a chemical with a factsheet of 2-3 pages.

12 Closure

Thank you for the opportunity to provide comment on the draft NHMRC guidelines. We would be happy to discuss any aspect of this submission in further detail, if required.

Yours sincerely,

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Attachment A: International guidelines

A1 IARC classifications

In December 2023, IARC published a short news article in The Lancet Oncology about their updated classification for PFOA and their new classification for PFOS (Zahm et al. 2024). The article is 2 pages long and provides only a very short description of the work to assess the potential for these chemicals to cause cancer. The team that looked at these chemicals included 30 scientists from 11 countries including Professor Jack Ng from the Queensland Alliance for Environmental Health Sciences.

Information about the documentation

The full assessment for these 2 chemicals is to be published in Monograph Volume 135, however, even though it is almost a year later, this volume has not yet been published.

The short summary of the assessment of chemicals included in Volume 134 was published in The Lancet Oncology in July 2023. It is not clear at what time the full assessment was published on the website (i.e. Volume 134) but, looking at the following webpage (https://www.iarc.who.int/featured-news/aspartame-hazard-and-risk-assessment-results-released), it is possible it was quite quickly after publication of the short summary. The short summary of the assessment of chemicals included in Volume 133 was published in The Lancet Oncology in March 2023. It is not clear at what time the full assessment was published on the website (i.e. Volume 133) but the volume is available on the site and is dated 2024. Both Volume 133 and 134 have been available for most of 2024 (based on personal experience).

Hence, there appears to be a delay in the release of Monograph Volume 135 (almost a year has passed after initial publication of the short summary). There is no information on the IARC website about whether there is a delay in the release of the full assessment, and if so, the reasons.

Mechanistic information

One thing that is clear in this short summary from IARC and in the information provided by the USEPA is that both PFOS and PFOA are not genotoxic carcinogens which is a critical point when considering the potential carcinogenic effects for these chemicals.

In 2016, IARC published guidance about the key characteristics that chemicals have if they are likely to be carcinogens (Smith et al. 2016). These characteristics are:

- is electrophilic/or metabolically activated
- is genotoxic
- alters DNA repair or causes genomic instability
- induces epigenetic alterations
- induces oxidative stress
- induces chronic inflammation
- is immunosuppressive
- modulates receptor-mediated effects
- alters cell proliferation, cell death or nutrient supply
- cause immortalisation.

While this appears to be a helpful approach to ensuring that chemicals that could cause cancer are appropriately classified, there is much discussion in the literature about the difficulties in applying this approach without consideration of the potency of a chemical to cause some of these changes. Potency is not normally considered by IARC.

Where chemicals are genotoxic, there is confidence that they should be treated as carcinogens. However, for some of the other characteristics, there are good examples of chemicals that have some of these characteristics but do not cause cancer and examples of chemicals that do not have any of these characteristics but have been found to cause cancer.

Regardless, IARC has indicated in the summary article that the strong evidence for these chemicals is from the mechanistic information which is their terminology as to whether a chemical has any of the key characteristics listed above.

The characteristics which both PFOS and PFOA appear to have are:

- they can cause oxidative stress
- they are immunosuppressive
- they may induce epigenetic alterations.

The discussion in the short article, however, does not provide any information on the potency of these chemicals to cause these issues. Consideration of potency and exposure is not commonly included in IARC assessments as the approach is a hazard assessment – i.e. the assessment looks at whether there is evidence (at any dose/concentration) that these chemicals could cause cancer.

This is an important point to note because sometimes the evidence for cancer used in IARC assessments requires exposure at concentrations/doses that would never occur for people because of the way a chemical is used. Consideration of the risk that cancer could occur should include an evaluation of the likely exposure concentrations/doses.

Until Monograph Volume 135 is available in full, it is not possible to appropriately consider the strength of the evidence in regard to the risk of cancer for PFOS and PFOA.

A2 USEPA drinking water guidelines

The final USEPA drinking water guidelines (USEPA 2024a, 2024b, 2024c) for PFOS and PFOA are based on IARC's classification of these chemicals as carcinogens (Zahm et al. 2024). They are based on a policy approach to guideline setting for genotoxic carcinogens rather than using a specific calculation based on toxicology data to be health protective.

None of the mechanistic information on which the IARC classifications are based indicate these chemicals are genotoxic. These chemicals would be considered threshold carcinogens under USEPA guidance.

For chemicals that are genotoxic, it is normal practice in the USA to set a maximum contaminant limit goal (MCLG) of zero and a maximum contaminant limit (MCL) at the limit of reporting considered to be sensitive but routinely achievable. This is because it is assumed genotoxic carcinogens may have impacts on DNA even at very low concentrations (i.e. it is assumed there is no threshold), whereas chemicals that act via a threshold do not have adverse effects if exposure remains below the threshold.

The US does not normally use the same approach for determining the MCLG and MCL for threshold carcinogens. Hence, it appears the US has not followed their own normal approach when setting these drinking water guidelines for PFOS and PFOA.

This is in contrast to the approach adopted by the USEPA in 2022 when they released draft drinking water guidelines for these 2 chemicals (USEPA 2022a, 2022b). These draft guidelines were based on threshold effects – primarily ones related to immune system effects. The assessments

recommended drinking water guidelines of 0.02 ng/L for PFOS and 0.004 ng/L for PFOA. These values are 200 and 1,000 fold lower/more stringent than the values published as finals by USEPA.

The reference doses/tolerable daily intakes used to calculate the 2022 draft drinking water guidelines from 2022 were:

- 0.0079 ng/kg bw/day for PFOS (compared to 0.98 ng/kg bw/day for PFOS in the proposed NHMRC guidelines)
- 0.0015 ng/kg bw/day for PFOA (compared to 65 ng/kg bw/day for PFOA in the proposed NHMRC guidelines).

These values were not adopted as the basis of the actual promulgated drinking water guidelines for the US. The USEPA acknowledged a range of practical issues that made adoption of these draft values highly problematic. Such issues included that there were no analytical methods that could achieve measurements at these levels, background levels were already well in excess of these values and effects that would be expected based on this understanding of the nature of these chemicals were not seen in the population at large. A wide range of other issues were raised in comments on the draft determination.

As described above, the policy choice based on carcinogen classification was then determined to be the most appropriate approach to adopt.

Potential issues related to the practicalities of analysis have been noted in some discussions in the literature. Previous rounds of monitoring in drinking water in the US used limits of reporting of 20-40 ng/L for these chemicals but the most recent round of relevant monitoring did use the 4 ng/L limit of reporting. The data from this most recent round of monitoring were not available in April 2024 when USEPA published the MCLs for PFOS and PFOA, so it is not clear how many laboratories were able to achieve this limit of reporting. It is noted that laboratory equipment manufacturers are indicating that routine achievement of a limit of reporting of 4 ng/L may need updated expensive equipment.

A3 European guidelines

A3.1 General

There are 2 areas where European agencies have determined guidelines for PFAS relevant to human health:

- European Council, DIRECTIVE (EU) 2020/2184 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 December 2020 on the quality of water intended for human consumption (EC 2020).
- EFSA has determined a tolerable weekly intake for use in evaluating the presence of PFAS in food (EFSA Panel on Contaminants in the Food Chain et al. 2020).

The most relevant one for this submission is the drinking water guideline – i.e. EC (2020).

A3.2 Drinking water

Drinking water guidelines that apply across the EU for PFAS are:

- PFAS total = 0.5 µg/L (it is still to be determined what PFAS should be summed for this parameter, so it is not in use at this time).

- Sum of PFAS = 0.1 µg/L (this value applies to the sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFNA, PFDA, PFUnDA, PFDoDA, PFTrDA, PFTeDA, PFBS, PFPeS, PFHxS, PFHpS, PFOS, PFNS, PFDS, PFUnDS, PFDoDS, PFTrDS).

The second guideline is 100 ng/L.

A detailed description of how this value was calculated has not been found but it appears that the recommendations from WHO have been adopted.

Using the same approach as NHMRC, a toxicity reference value can be calculated.

The relevant equation from NHMRC is:

$$\text{drinking water guideline} = \frac{\text{tolerable daily intake x body weight x source allocation}}{\text{ingestion rate}}$$

Which can be rearranged as follows:

$$\text{tolerable daily intake} = \frac{\text{ingestion rate x drinking water guideline}}{\text{body weight x source allocation}}$$

$$\text{tolerable daily intake} = \frac{\text{2 litres per day x 100 ng/L}}{\text{70 kg x 0.1}}$$

$$\text{tolerable daily intake} = 29 \text{ ng/kg bw/day}$$

This value is 30 times higher than the NHMRC proposed value for PFOS of 0.98 ng/kg bw/day.

It is applied to the full set of PFAS as listed (i.e. PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFNA, PFDA, PFUnDA, PFDoDA, PFTrDA, PFTeDA, PFBS, PFPeS, PFHxS, PFHpS, PFOS, PFNS, PFDS, PFUnDS, PFDoDS, PFTrDS). If the main (or only) PFAS reported in a drinking water source is PFOS, this value is still designed to be protective of human health.

A3.3 Food

EFSA undertook a separate evaluation of the toxicity of these chemicals and derived a different tolerable daily intake for use in assessing exposure via food. They also derived a value to be applied to the sum of several PFAS. The EFSA value is to be used to assess these chemicals in food based on the sum of PFOS, PFOA, PFHxS and PFNA.

EFSA has recommended a toxicity reference value based on weekly exposures of 4.4 ng/kg bw/week be applied to the sum of PFOS, PFOA, PFHxS and PFNA. This equates to a toxicity reference value based on daily exposures of 0.6 ng/kg bw/day. This value is based on data for immune systems effects which have been questioned as to their clinical relevance.

NO.	CONSULTATION SUBMISSION
38	**EPIC ENVIRONMENTAL PTY LTD** *Development of guidance* The adoption of uncertainty factors in the derivation of PFOA (30) , PFOS (300), PFHxS (300), and PFBS (300) appears to be in line with Appendix A of Planning and Decision Framework for Chemical Incident Consequence Management (FEMA 2022). The uncertainty factors for PFOS, PFHxS, and PFBS specifically account for limitations in the available information/data (i.e. study duration, limited studies) at the time of guideline derivation, which result in a higher level of conservatism (comparatively to PFOA) in the application of the uncertainty factor. This, coupled with the conservative nature in the point of departures adopted (at least for PFOS), have resulted in the derivation of potentially over-conservative guideline values for PFOS, PFHxS, and PFBS. Given the order of magnitude difference between the uncertainty factors of PFOA and PFOS/PFHxS/PFBS, is there an avenue for further consideration to available data (new/emerging) to be integrated into the guideline derivations to reduce the levels of uncertainty and have a consistent approach across all PFAS compounds? *Implementation or application* Epic Environmental (Epic) is supportive of the revision of the guidelines considering current scientific evidence, and in the interest of the protection of human health through ensuring safe drinking water supply. As discussed in Section 1.1 (Guiding Principles) of the Australian Drinking Water Guidelines, ensuring drinking water is safe and of suitable quality requires the application of a considered risk management approach. The guidance notes the challenges between a lack of action which can seriously compromise public health, and excessive caution which can result in significant social and economic consequences. Review of the consultation documentation appears to indicate that, overall a conservative approach has been adopted with the aim to reduce exposure to PFAS as much as possible. As previously noted, further action to manage risks associated with PFAS exposure is supported, however to balance this, we have included below an example of one of our existing projects to highlight potential social and economic consequences. We have a number of additional sites which have similar considerations and would be happy to discuss these further as required. Other Considerations In addition to the information discussed above, it is requested that consideration also be given to the following aspects: 1. Clear guidance on expectations for achieving compliance with the proposed guidelines noting that a number of sites will require completion of additional investigations to re-establish the extent of impacts and understand risks in consideration of the proposed guidelines. 2. Given that there is currently no commitment towards funding arrangements liaison with regulatory bodies will be critical to ensuring that appropriate processes are established to enable industry to adapt to the proposed changes. 3. Each state currently operates under differing regulatory frameworks, and the proposed changes are likely to have a significant impact based on current policy and regulatory frameworks. One example would be the Queensland Environmental Management Register (EMR) and Contaminated Land Register (CLR) which is a government administered register of contaminated sites. The general policy implies that where a lot on plan is identified to be contaminated above human health guideline criteria, the site is required to be recorded on the EMR, with sites requiring action to prevent environmental harm and protect human health included on the CLR. It is anticipated that the proposed drinking water criteria would result in hundreds of thousands of properties throughout Queensland being eligible for inclusion on the EMR, with sites currently included on the EMR having the potential to be moved to the CLR due to the requirement to take action to protect human health. The challenge arises where EMR listed land is used for residential or sensitive uses, noting that only land not included on the EMR is considered suitable for unrestricted land uses, including Land Use A (Residential with garden/accessible soil; childcare centres, preschools, and primary schools with access to soil) and sensitive uses listed in Schedule 24 of the Queensland Planning Regulation 2017. *Fact Sheet*

NO.	CONSULTATION SUBMISSION
	Can further articulation of the levels of conservatism associated with the guideline derivation be added.
39	**FRIENDS OF THE EARTH AUSTRALIA** *Development of guidance* • The NHMRC should adopt the same guideline levels for PFAS chemicals as were set by the US EPA in April 2024, • The NHMRC should co-ordinate a national PFAS drinking water survey, • The NHMRC should recommend widespread testing for Trifluroacetic Acid in Australian drinking water supplies, • The NMHRC should update drinking water guidelines for a range of fluorinated pesticides in the Australian Drinking Water Guidelines, • The NHMRC should prioritise investigation of the following PFAS chemicals: PFHxA, PFPeA, PFHpA and 6:2 FTS, • The NHMRC should further investigate the health consequences of PFAS contamination of water supplies in Ayr, Svensson Heights, Bundaberg, the Blue Mountains (Blackheath, Medlow Bath and Katoomba) and Jervis Bay, • The NHMRC should co-ordinate a national wide survey into the past use of PFAS fire fighting foam used in vehicle, building and bush fires in domestic water supplies across Australia. *Implementation or application* The draft guidance should implement the same guidelines levels as proposed by the UE EPA in 2024. The NHMRC should also allow submissions to be attached to the submission process *Fact Sheet* FoE has compiled a list of 950 reported PFAS detections in Australian water supplies. The data provided by on the NHMRC draft Fact Sheet does not appear to be comprehensive and underplay key detections and communities that have faced chronic PFAS contamination. The NHMRC should contact local councils and water authorities to obtain the most up to date PFAS monitoring data. The highest 100 detections FoE has found can be found at this link: https://www.foe.org.au/pfas_chemicals_in_australian_drinking_water_a_summary eg PFOA has been detected up to 890ng/L at Glenmore Water Treatment Plant at Rockhampton (see Rockhampton Drinking Water Quality Plan 2022/23) PFOS has been frequently detected in a number of communities >70ng/L. These include Williamtown, Ayr, Norfolk Island, Oakey, Katherine/Uralla. PFHxS has also been detected in a number of communities at Williamtown, Jervis Bay (untreated), Svennson Heights, Bundaberg and Ayr. Residents at Svensson Heights were drinking water with PFHxS and PFOS at 180ng/L in 2018 and probably for many years before this. It is not likely that the Drinking Water Guidelines for PFOS and PFOA will be changed without FSANZ changing the current tolerable daily intake of PFOS from 20ng/kg/bw/day and PFOA from 160ng/kg/bw/day. According to the 2017 ADWG's "FSANZ concluded that available human epidemiology data are not suitable to support the derivation of TDI for PFOS or PFOA, which is consistent with the findings of other regulatory agencies. Therefore, FSANZ has recommended TDIs based on extensive toxicological databases in laboratory animals" FSANZ base their PFOS TDI calculation on: • For PFOS, the TDI is 20 ng/kg bw/day on the basis of decreased parental and offspring body weight gain in a reproductive toxicity study in rats. Pharmacokinetic modelling was applied to the serum concentrations at the no observed adverse effect level (NOAEL) to calculate the human equivalent dose (HED). An uncertainty factor of 30 was applied to the HED, which comprised a factor of 3 to account for inter-species differences in toxicodynamics and a factor of 10 for intra-species differences in the human population. Likewise, FSANZ base their PFOA TDI on: • For PFOA, FSANZ has recommended a TDI of 160 ng/kg bw/day on the basis of a NOAEL for fetal toxicity in a developmental and reproductive study in mice. Pharmacokinetic modelling was applied to the serum

NO.	CONSULTATION SUBMISSION
	concentrations at the NOAEL to calculate the HED. An uncertainty factor of 30 was applied to the HED, which comprised a factor of 3 to account for inter-species differences in toxicodynamics and a factor of 10 for intra-species differences in the human population. However, the US EPA in their Human Health Toxicity Assessments for PFOA and PFOS found many more issues with these chemicals than FSANZ did in 2017: xxi "Overall, the available evidence indicates that PFOA exposure is likely to cause hepatic, immunological, cardiovascular, and developmental effects in humans, given sufficient exposure conditions (e.g., at measured levels in humans as low as 1.1 to 5.2 ng/mL and at administered doses in animals as low as 0.3 to 1.0 mg/kg/day)." xxi "Overall, the available evidence indicates that PFOS exposure is likely to cause hepatic, immunological, cardiovascular, and developmental effects in humans given sufficient exposure conditions (e.g., at measured levels in humans as low as 0.57 to 5.0 ng/mL and at administered doses in animals as low as 0.0017 to 0.4 mg/kg/day)." How will the NHMRC change the PFAS guidelines, without FSANZ also changing their current TDI calculations? Can changes to the Drinking Water Guidelines, only proceed with FSANZ also lowering the current TDI's for the suggested PFAS chemicals? Breaches of Existing ADWG Guidelines for Raw and reticulated water in Australia have probably impacted ~150,000* people. (*note that PFOA above ADWG's was detected at Glenmore Water Treatment Plant Rockhampton in 2022/23. This substantially increases the potential impacts and extent of PFAS contamination greater than existing drinking water guidelines). Most PFAS detections have been in short term duration, however for a number of communities the PFAS pollution was likely to have been ongoing for years. These 'chronically' impacted communities include: Williamtown, Ayr, Norfolk Island, Oakey, Katherine/Uralla, Svensson Heights, Katoomba, Blackheath and Jervis Bay. There are many others likely to be impacted in the future as testing is expanded. Acute breaches for PFOS >70ng/L have also occurred at Proserpine (2018) Acute breaches for PFHxS >70ng/L have also occurred at Wangaratta (2018) Acute breaches for PFOA >560ng/L have also occurred at Rockhampton (2022/23) Breaching Proposed 2025 ADWG PFAS Guidelines would total ~1,100,000 people (This number is substantially increased with detections of PFAS in raw water supplying Canberra, Geelong, north west Sydney, Rockhampton and Newcastle) Breaches to proposed guideline levels have occurred mainly on a short term duration and in raw water. Recent detections in the Blue Mountains in the water supplies for Katoomba and Blackheath indicate chronic contamination of PFOS and PFHxS for some time above proposed guidelines levels. Acute short term breaches for PFOS >4ng/L have occurred at Batchelor (NT) 2020/21, Bathurst (NSW) 2017 + 2020, Rottnest Island (WA) 2022/23, Googong Dam, Canberra (ACT) 2021, Corin Dam, Canberra (ACT) 2016, Glenunga (SA) 2010, Moorabool WTP (Vic) 2018, 2021, 2022, Tarcutta (NSW) 2024, Wahgunyah (Vic) 2018, Yarrawonga (Vic) 2018, Gellibrand (Vic) 2018, Pine Creek (NT) 2020/21, North Richmond WFP (NSW) (2019), Grahamstown WFP (NSW) 2017, Home Hill (Qld) 2013/20, Quakers Hill (NSW) 2010, Nelson Bay WTP 2017, Lorne (Vic) 2018, Teesdale (Vic) 2018, Marruben (WA) 2010, Bungendore (NSW), Gundagai (2010), Briagalong (Vic), Rockhampton (Qld) and Sale (Vic) 2018. Acute short term breaches for PFHxS >30ng/L have occurred at Seaspray (Vic). Acute short term breaches for PFOA >200ng/L appear to have been reported at Oakey, Katherine and Jervis Bay. In terms of treatment Sydney Water testing at North Richmond Water Filtration plant in 2019, indicated levels of PFOS are essentially the same as level leaving the Filtration Plant, highlighting the likelihood that the water treatment method employed at the facility did not remove PFOS. A PFOS drinking water guideline of 0.07µg/L led to some complacency among water companies that levels as low as 0.004µg/L were 'safe'. The average PFOS level in drinking water in 2019 at North Richmond Filtration Plant was 0.0038µg/L, PFHxS 0.0035µg/L and PFOA 0.0029µg/L Detections at North Richmond in 2024 appear to be lower than in 2019, with average PFOS levels 0.00152µg/L, PFHxS 0.0029µg/L and PFOA 0.0008µg/L. Was the use of Granular Activated Carbon initiated at North Richmond WFP in 2022 and has this resulted in a decrease of PFAS chemicals at North Richmond? Has GAC led to decreases for PFOS and PFOA, but has been less successful for PFHxS? *NHMRC Statement* FoE supports the proposed levels for PFOS 4ng/L.

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	FoE believes that the guidelines levels for PFHxS 30ng/L and PFOA 200ng/L should be aligned to the US EPA's guideline levels. The NHMRC's proposed PFHxS guideline is 3 times higher than the US guideline and the proposed PFOA guideline is 50 times higher than the US guideline. There doesn't appear to be an adequate explanation why Australia has proposed a different approach. The proposed NHMRC PFOA guideline appears to be based on cancer risk whilst ignoring hepatic, immunological, cardiovascular, and developmental effects in humans which the US EPA used to determine their guideline level. The NHRMC should also provide recommendations concerning PFAS from Teflon coated appliances, such as quiet kettles and PFAS leaching into HDPE containers, many of which can be used to carry drinking water. In terms of monitoring: The NHMRC should recommend a national wide survey into the past use of PFAS fire fighting foam used in vehicle, building and bush fires in domestic water supplies across Australia. This problem has recently surfaced in the Blue Mountains where a vehicle crash fire in the 1990's had fire fighting foam applied. It is thought that this was the source of the contamination of water supplies that wasn't detected until 2024. Likewise, the use of biosolids and recycled water in domestic water supplies also needs to be included in terms of monitoring. Recent PFAS detections at Bathurst for example could be a result of biosolid application in the domestic water supply. Despite guideline levels being scientifically approved on a national level, there was some doubt in health and water bureaucracies that PFAS was a problem at all (see below). SA Water Daily Incidents and Hazards Summary Report Page 8 Wed 01 Nov 2017 ""Drinking Water PFAS was discussed at the enHealth regulators group. Utilities are being urged not to sample for PFAS unless a risk assessment identifies a credible potential source, e.g. PFAS use in catchment. DHA recommends that SA Water adopt this approach and only consider PFAS testing where a risk assessment has shown a need for testing."" This SA Water document released under FoI shows that from May 15 2017 the SA Department of Health, with advice from enHealth did not think that SA Water should test for PFAS chemicals as they believed that the risks were low due to their water supply catchments being located away from known pollution sources. This SA Health decision probably also included water released from waste water treatment plants and biosolids which have been found elsewhere as being highly polluted with PFAS chemicals. The document also fails to acknowledge communities relying on bore water which may have high risk activities such as fire stations located in or near groundwater recharge areas. SA Water only tested key reservoirs for PFAS in 2024 and still have not presented any testing data concerning smaller, more 'at risk' water supply catchments in South Australia.
40	**ORGANISATION RESPONSE 21** Permission not given to publish.
41	**GEOSYNTEC CONSULTANTS AND EXXONMOBIL AUSTRALIA** *Fact Sheet* Geosyntec Consultants (Geosyntec) and ExxonMobil Australia are pleased to have the opportunity to provide comments on the National Health and Medical Research Council's (NHMRC) Draft PFAS Fact Sheet. Out comments focus on NHMRC's interpretation of the toxicological literature and subsequent derivation of health-based guideline values for drinking water (Drinking Water Guidelines, DWGs) for perfluorooctanoic acid (PFOA), perfluorooctane sulfonic acid (PFOS), perfluorohexane sulfonic acid (PFHxS), and perfluorobutane sulfonic acid (PFBS). NHMRC calculated DWGs in a manner consistent with typical regulatory practices using default exposure parameters (e.g., drinking water volume consumed per day, adult body weight, etc.) and PFAS-specific Tolerable Daily Intake (TDI) values (also known as "Acceptable Daily Intake" or "Reference Doses"). TDI values were selected from reviewing toxicological studies on PFAS (in this case, controlled laboratory studies in which rodents were exposed to PFAS). A review of the toxicological literature was performed for NHMRC by a consulting firm, SLR Consulting Australia. The review is provided in two separate SLR technical documents (referred to collectively as the "SLR Review" below) that are available on the NHMRC website. Our comments focus on the selected TDI values for PFOA, PFOS, and PFBS. We have no comments on the TDI value selected for PFHxS. The toxicological endpoint associated with the NHMRC PFHxS TDI (effects of PFHxS on thyroid hormone) is currently viewed as a relevant toxicological endpoint by the regulatory and scientific community.

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	Additionally, the PFHxS TDI value selected by NHMRC is reasonable given the toxicological study from which the TDI value is derived, and the value is consistent with TDIs selected by other regulatory agencies. The remainder of our comments is organized by comments on TDI values (and subsequently calculated DWG values) for PFOA, PFOS, and PFBS. PFOA In the SLR Review, the toxicological endpoints considered for the PFOA TDI value included effects on the pancreas and liver. SLR reviewed a key toxicological study using rats exposed to PFOA, as well as the United States Environmental Protection Agency (USEPA) review of that study. The SLR Review concluded that the neoplastic pancreatic effects in rats were "unlikely to be relevant to humans". For example, the PFOA mode of action for the development of the pancreatic tumors following exposure to PFOA is activation of the peroxisome proliferator-activated receptor alpha (PPARα), a pathway that is robust in rats but does not occur to the same extent in humans (Klaunig JE, Hocevar BA, Kamendulis LM. 2012. Mode of Action analysis of perfluorooctanoic acid (PFOA) tumorigenicity and Human Relevance. Reprod Toxicol. Jul, 33(4):410-418. https://doi.org/10.1016/j.reprotox.2011.10.014), thus, it is uncertain if these effects would occur in a human pancreas. Additionally, the histological type of tumor observed in the rats is distinctly different from pancreatic tumors observed in humans. The SLR Review did note that one study (an "in vitro" study using cells instead of animals) may support pancreatic effects through modes of action other than the PPARα pathway. However, results from a single in vitro study, that has not been replicated in vivo with animals, does not provide strong support for a non-PPARα mode of action that would indicate the pancreatic effects are relevant to humans. The SLR Review also evaluated adverse effects of PFOA on the liver (non-neoplastic hepatic necrosis) and noted that this endpoint is also of uncertain relevance to humans (because the effects are also mediated by PPARα). SLR concluded that the currently available information is insufficient to rule out relevancy of the effects to humans. It is notable that the SLR Review (Table 6-4 of the Addendum document) used both endpoints, neoplastic pancreatic effects and non-neoplastic hepatic necrosis, in deriving TDI values (65 and 115 nanograms per kilogram body weight per day (ng/kg bw*d), respectively) and DWGs (227 and 402 nanograms per liter (ng/L), respectively). NHMRC selected the lower (more conservative value) associated with neoplastic pancreatic effects, despite the uncertainties on this endpoint noted by SLR, rounding the PFOA DWG to 200 ng/L. However, we agree with SLR that the non-neoplastic hepatic necrosis is a less uncertain endpoint and recommend that it should serve as the basis for a TDI and DWG for PFOA. As such, we recommend that NHMRC set the PFOA DWG at 400 ng/L, not 200 ng/L. PFOS In the SLR Review, the toxicological endpoint selected for the PFOS TDI value focused on extramedullary haematopoiesis in the spleen. SLR reviewed a key toxicological study using rats exposed to PFOS, as well as the USEPA review of that study. In the study, 20 rats were not exposed to PFOS (control) and 100 additional rats were exposed to five dose levels of PFOS (20 rats per dose). Half of the rats in each group were male and half were female. Based on the incidence of adverse effects (extramedullary haematopoiesis) observed in the study, USEPA evaluated the data separately by sex to identify a PFOS exposure dose that could be used to derive a TDI value. Exposure dose, as measured in this study, was the concentration of PFOS measured in the plasma of the rats. Using the data for females, EPA applied a non-linear dose-response regression model to the incidence and exposure data and identified a benchmark dose of 2.3 milligrams per liter (mg/L), representing an exposure level at which no effects would be expected. However, the non-linear dose-response regression model applied to this data (shown in Figure E-18 of USEPA's review document on PFOS (United States Environmental Protection Agency (USEPA). 2024. Final Human Health Toxicity Assessment for Perfluorooctane Sulfonic Acid (PFOS) and Related Salts. EPA Document No. 815R24007. April. https://www.epa.gov/system/files/documents/2024-04/main_final-toxicity-assessment-for-pfos_2024-04-09-refs-formatted_508c.pdf)) is a poor fit to the data, resulting in significant uncertainty in the 2.3 mg/L benchmark dose that was derived using the model. Actual measurements in the toxicological study confirmed that rats with much higher PFOS in their plasma (i.e., 52 mg/L for males and 67 mg/L for females) exhibited no statistically detectable differences in incidence rates for extramedullary haematopoiesis compared to the control rats. These No Observable Adverse Effect Level (NOAEL) dose values are much more robust and scientifically defensive values to use for the TDI values than the modelled benchmark dose level. It is notable that the SLR Review (Table 5-2 of the Addendum document) used both the 2.3 mg/L and 52 mg/L dose values in deriving TDI values (0.97 and 22 ng/kg bw*d, respectively) and DWGs (3.4 and 77 ng/L, respectively).

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	Importantly, SLR noted that the 52 mg/L NOAEL-based dose was "considered to be associated with a lower degree of uncertainty" compared to the USEPA's model-derived value. The subsequent DWG value derived using the 52 mg/L NOAEL-based dose was 77 ng/L, comparable to the other two primary DWGs (70 and 95 ng/L) calculated using other toxicological endpoints in the SLR Review. Despite the technical recommendations by SLR and similarity to the other DWGs, NHMRC selected the lower, more conservate and uncertain USEPA model-derived dose value for their recommended DWG of 3.4 ng/L (which was subsequently rounded to 4 ng/L). We support SLR's original technical evaluation that the measured NOAEL-based dose is a more robust value for calculation of TDI and DWG values for PFOS. As such, we recommend that NHMRC set the PFOS DWG value at 77 ng/L, not 4 ng/L. PFBS In the SLR Review, the toxicological endpoint selected for the PFBS TDI focused on effects on thyroid hormone (T4) levels. SLR reviewed a key toxicological study using rats exposed to PFBS, as well as reviews of that study by other regulatory agencies. In the study, rats were exposed to no PFBS (control) and three different dose levels of PFBS. Exposure dose, as measured in this study, was the nominal mass of PFBS provided on a daily basis. As noted in the SLR Review, the rats in the lowest dose (50 milligrams per kilogram body weight per day (mg/kg bw*d)) did not exhibit statistically detectable differences in thyroid hormone levels from the control rats. Thus, 50 mg/kg bw*d would be the "no effect" NOAEL dose. As reviewed by SLR, several regulatory agencies applied non-linear dose-response regression modelling to calculate benchmark dose levels ranging from 22 to 28 mg/kg bw*d, and the lower value (22 mg/kg bw*d) was used by SLR to calculate a TDI of 316 ng/kg bw*d and subsequent DWG of 1,107 ng/L (rounded to 1,000 ng/L by NHMRC). There is no technical justification for applying dose-response models to generate a benchmark dose for the rat study. The nominal 50 mg/kg bw*d NOAEL dose is a robust and defensible "no effect" value to use for TDI and DWG generation (730 ng/kg bw*d and 2,500 ng/L, respectively). As such, we recommend that NHMRC set the PFBS DWG value at 2,500 ng/L, not 1,000 ng/L.
42	**GHD** *Development of guidance* The overall approach is robust but could be refined by revisiting uncertainty factors, especially the 10x factor for short-term studies. For PFOS, where a modified benchmark dose (BMD) is used to adjust for steady-state conditions, the application of a subchronic study uncertainty factor appears redundant. A more nuanced consideration of uncertainty in these cases would strengthen the scientific basis of the guidance and improve its practical application. A more vigorous, long-term study to reduce uncertainty in PFAS guideline values may be the more cost effective mean of addressing public health with scientific rigor. If the guideline value is set lower by a factor of 10 than potentially needed the additional cost burdens especially for local councils and water suppliers could be substantial and should to be quantified. *Implementation or application* The implementation of the draft guidance may have broader implications beyond drinking water, particularly for other uses like recreational water, food production, and biosolids management. Adopting stricter PFAS criteria could disproportionately impact regional and smaller councils/utilities, where costs of compliance and access to adequate funding and appropriate infrastructure are significant barriers. For example, biosolids applications would face stricter limits than those proposed in the NEMP 3 draft, making reuse in agriculture difficult. Clear strategies to mitigate these challenges, especially for smaller and regional councils, are essential. A defined monitoring period would help assess the infrastructure funding required to upgrade facilities, providing a baseline for PFAS levels and allowing councils to estimate the cost of responses if stricter limits are set. It would also offer a practical opportunity to benchmark and plan for long-term compliance. *Fact Sheet* The fact sheet could attempt to quantify PFAS exposure in drinking water relative to other sources (e.g., food, consumer products) to help the public understand overall risk.

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	It could also acknowledge the particular challenges faced by smaller and regional councils. Community members in these areas are often the ones asking the most questions about water quality, including concerns about fluoride or implementation of potable recycled water (PRW). These communities tend to have more limited access to resources, which can make implementing new guidelines more difficult. *NHMRC Statement* The draft NHMRC Statement on PFAS in drinking water could benefit from additional clarity in the following areas: - The absence of a defined monitoring period, such as that established by the US EPA, makes the path forward somewhat ambiguous and difficult to plan for (e.g. understanding the funding requirements to potentially upgrade infrastructure). - Providing guidance on laboratories equipped for PFAS analysis and monitoring, especially for regional and remote councils, would be valuable. - Greater emphasis on the challenges of laboratory access, sampling logistics, and measurement uncertainty in remote areas is essential, particularly when guidelines are set near the limit of quantification. - Guidance on how to effectively communicate PFAS-related risks to the public could be helpful; in particular taking into account the varied nature of water consumers across the country (smaller and regional councils and remote communities would significantly benefit).
43	**GUAM WATER AUTHORITY** *Development of guidance* The best toxicological data available should be used - no guideline should be madr on a hunch or a guess. The toxicological effect on the most sensitive population segment needs to be quantified in comparison with the effects on the general population. Protecting the most sensitive population should be the objective when practical. (Alternatives for sensitive populations may have to be provided when the needs of that segment are unobtainable.) *Implementation or application* Best or most effective methods may need research. Best available/verified methods need clear publication.
44	**INDIVIDUAL RESPONSE 20** *Development of guidance* PFOA should at least be equal or lower than the WHO recommendation. Australia should be leading the way on public health not falling behind international recommendations. I've personally had thyroid cancer, my doctor said it was extremely rare in people of my age and gender. He said it's likely I've been affected by some sort of contaminant. It would be good to avoid cancer. When people undertake risk assessments like this they tend to isolate the risk. It seems to me that environmental contaminants are much more complex because the affect is cumulative when you factor in other contaminants. This is so important to get right because our fertility rate is sinking to a really concerning level. The flow on from this is not good for our future prospects. *Implementation or application* Transparent public knowledge about what actual levels are in their drinking water.
45	**INDIVIDUAL RESPONSE 21** *Implementation or application* The safe levels should be zero, water shouldn't be contaminated at all. The thresholds don't consider everyone, they're probably based on a white man, what about women? What about children? What about babies? What about animals? What about people who have sensitivities? The only safe level is zero. *Fact Sheet, NHMRC Statement* The only safe level is zero.

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46	**HUNTER WATER CORPORATION** *Development of guidance* Hunter Water supports the evidence, and risk-based approach to regulatory and policy development that underpins the Australian Drinking Water Guidelines. *Implementation or application* Hunter Water is committed to supplying high-quality safe drinking water that complies with the Australian Drinking Water Guidelines (ADWG). Any ADWG changes will require Hunter Water to review its operations to ensure continued compliance. Hunter Water will work with its regulators and stakeholders on the implementation of the finalised PFAS guidance in the ADWG. *Fact Sheet* The draft PFAS Fact Sheet includes the following "While it is acknowledged that other species of PFAS may be present in Australian drinking water supplies, the following information on health considerations is provided for PFOA, PFOS, PFHxS, PFBS and GenX chemicals. Information on other PFAS will be reviewed as further evidence becomes available". There is no mention of PFNA in the draft PFAS Fact Sheet, presumably because NHMRC's scope was (as outlined in the NHMRC Statement) based on the US EPA's PFAS health advisories proposed at the time of commencing the NHMRC review. Given US EPA has since released their maximum contaminant levels (MCLs) which include an MCL for PFNA, it would be good to understand whether NHMRC is planning to review the available literature for PFNA and may develop a guideline value for this compound in the ADWG in the near future. Hunter Water supports the use of a rigorous scientific process for the development of guideline values for drinking water in Australia and therefore supports the decision by NHMRC not to utilise an unpublished study without peer review to derive a guideline value for GenX chemicals at this stage. *NHMRC Statement* The NHMRC Statement also includes the following "Given the public interest in PFAS and the need for broader understanding of the risks from PFAS in drinking water, we suggest that water providers regularly share information with the community on the current risks in their catchment and the findings from background testing". Hunter Water strongly supports the transparent reporting of PFAS data to the community. We have been monitoring our water supply for PFAS since 2016 and we report all PFAS detections from our verification monitoring program on our website. We also provide a summary of our raw water and treated water PFAS data. Hunter Water has a complex source supply system that includes a number of different sources and catchments. We suggest that providing a summarised data set of raw water at the water treatment plant would be appropriate to ensure transparency. Background data sets are more appropriate for operational decision making and do not accurately represent the risk to public health and may be misinterpreted by the community. Hunter Water also recommends State and Federal governments and regulators prioritise source control measures and other opportunities to reduce PFAS inputs to the environment. Source control is an effective way to manage the risk of future contamination of ecosystems and water supplies.
47	**INDIVIDUAL RESPONSE 22** *Development of guidance* The draft is research-driven and carefully considers the most recent research for both animal models and epidemiology. Furthermore, it builds on the 2018 expert review of PFAS (https://www.health.gov.au/resources/publications/expert-health-panel-for-pfas-report?language=en) and the 2021 updated review of the effect of PFAS on the immune system (https://www.foodstandards.gov.au/sites/default/files/2024-01/PFAS%20and%20Immunomodulatory%20Review%20and%20Update%202021.pdf). The review appropriately considers biologically relevant points for health-related effects (eg it uses measured rather than modeled critical endpoints and uses the internationally validated Hazard Index approach to considering hazards) (https://www.sciencedirect.com/science/article/pii/S2468202023000037). It also considers the guidelines in the context of the Australian population's exposure to PFAS from other sources and current measured drinking water levels.

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	The draft guidelines note that different jurisdictions place different weights on animal and human evidence. Nonetheless, the draft guidelines are consistent with other jurisdictional approaches. Current PFOS+ PFHxS 70 ng/L PFOA 560 ng/L New PFOS 4 ng/L PFHxS 30 ng/L PFOA 200 ng/L US PFOS 4 ng/L PFHxS 10 ng/L PFOA 4 ng/L EU PFOS 100 ng/L PFHxS 100 ng/L PFOA 100 ng/L* *EU rules specify that total PFAS must not exceed 500 ng/L *Implementation or application* The implementation will require more analytic resources for some water regulatory entities (eg the splitting of PFOS+ PFHxS into PFOS and PFHxS separately) and regulation of the lower PFOS level may have more resource implications for some water catchments in terms of removal of PFAS from drinkable water, but as most Australian water supplies are already well below these levels it should not be a major impost. *Fact Sheet* The draft fact sheet is clear and provides accessible information about the changes and their health implications. Also, what the implications are for the public with a reticulated water supply is clearly stated. *NHMRC Statement* The draft NHMRC Statement on PFAS in drinking water quite clearly states up front what the proposed guidance is (and that is based on lifetime exposure), and what is being examined and regulated. It also clearly states how drinking water exposure relates to total exposure and places the approaches to the safety studies for the proposed guidelines in an international context. The studies considered are articulated and exclusions supported. It also makes clear that the guidelines err on the side of caution.
48	**INDIVIDUAL RESPONSE 23** *Development of guidance* To align the guideline with the US regulation ignores the reality of PFAS contamination difference between Australia and US, such as the background contamination by PFAS and PFAS in the blood of the residents. PFAS enter human body are not only from drinking water, but also from food and contact. A low background PFAS contamination in Australia means less PFAS intake from other sources. Hence, when regulating the level of PFAS in the water, it should also consider the overall intake of PFAS. It is ridiculous to align the values with US, which would more like to make crisis if the public find most (maybe all) the drinking water could not make the standard. With LOR from ALS 25 ng/L, the analytical costing is $150 per sample. It is hard to image the cost to monitor the level of 4 ng/L. *Implementation or application* It will raise the drinking water price and might lead to social crisis. *Fact Sheet* It is not necessary to be that low.
49	**INDIVIDUAL RESPONSE 24** *Development of guidance* The approach taken was unnecessary l, given that stringent US guidelines could have been adopted in full. It seems that the guidelines that are proposed have been developed to be easily achievable by water treatment organisations rather than global best practice. *Implementation or application* The draft guidance should be discarded in favour of adopting more stringent guidelines as applied in the US. NHMRC have some a disservice to the Australian people by adopting less stringent guidelines based purely upon the fact that

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	insufficient long term data is available to "justify" categorically that no amount of PFAS is safe. The only responsible course of action is to set extremely low safe limits, as adopted by the US, to safeguard our population.
50	**INDIVIDUAL RESPONSE 25** *Development of guidance* Level of scope is not effective for a risk based approach to the problem. Scope should be expanded include a large range of contaminants of potential concern. Those compounds already considered to be health-affecting, with established guidelines in other jurisdictions and nations should be included with precedence. *Implementation or application* While I support the "threshold" based assessment used to determine acceptable levels, the scope should be expanded to contain a larger range of contaminants of potential concern and should draw on existing research (eg GenX etc) *NHMRC Statement* Select methods of PFAS/PFAS etc water sampling to endorse and include a reference or link to sampling and analysis methods on statement to ensure standardisation of data
51	**INDIVIDUAL RESPONSE 26** *Fact Sheet* We should be doing everything possible to remove ALL PFAS derivatives from drinking water and increasing prosecution for those that pollute the table water and other watercourses. *NHMRC Statement* I had no idea PFAS was found in our drinking water, that is a terrifying thought and one that many aren't aware of, therefore, residents are being blindly poisoned. More should be done to protect our natural environment, these chemicals should be banned from our continent period.
52	**INDIVIDUAL RESPONSE 27** *Development of guidance* I have had personal experience with PFAS contaminated ground water on property bought 4 years ago. I have done a lot of research both in the USA and here in Australia, particularly in Victoria and NSW where the authorities seem to have been pressured into recognizing the impact of these " for-ever " group of chemicals on human and animal health. Our water contamination comes from the CS Energy owned Callide Power Station near Biloela in Central Queensland. They were required to provide clean water for households affected and after a lot of negotiation, they have done so for our place. However, because the Federal and State Departments of Agriculture do not yet accept that there are health and market implications for cattle and beef, we cannot get clean water for our cattle. Consequently we have made the decision last year to sell our entire Braford Cattle Stud after seeing an increase in mortalities after having operated that stud for 50 years. Please look at all the evidence available world wide and impliment the proposed new allowable level for humans and consider the effect on domestic and native animals and fish. *Implementation or application* I strongly support the proposed new guidelines and hope earnestly that consideration is given to the effect on domestic and native animals and aquatic creatures. I understand the actual wide use of the chemicals in the past but for future human health and the food we consume, anything your deliberations can do to encourage the relevant authorities to act on this issue would be very much appreciated.
53	**INDIVIDUAL RESPONSE 28** *Development of guidance* You're not doing nearly enough, the human race is facing a worldwide fertility crisis and we meet the standard for a species in danger of extinction despite there being 8 billion of us, due to these chemicals that have been allowed in our environment. Mass infertility amongst men, lower testosterone, lower sperm count and lower sperm mobility and I can imagine it's just as bad for women,

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	These xeno-estrogens including phalates, PFAS, BPA and all the derivatives have been allowed to accumulate in our world and now are in our testicles and brains. It's horrific and dystopian and I don't see any situation where this doesn't get worse. Not to mention there's significant correlation between these chemicals and metabolic disorders, obesity, neurodevelopment disorders such as Autism and ADHD. Basically you need a Time Machine and go back to the 1950s and stop petro-chemicals from ever become mass produced. *Implementation or application* The mg per ml need to be essentially zero for all these substances, you need to implement reverse osmosis in all drinking water. It'll probably cost the government billions so I don't see that happening. *Fact Sheet* You need basically pay for more scientific testing cause plastic manufacturers can essentially get away with saying that there's no definitive proof or peer reviewed studies that plastic derivatives do anything to the human body. *NHMRC Statement* You need to scare people, you need to make it very apparent to the people of this country that we are facing a threat that will undoubtedly impact their children's health and grand children's health, most people won't care about future generations so you need to appeal to there selfishness. Tell men the facts, the real truth that there sons are in all likelihood are going to have smaller and misshaped genitals as they go through puberty, less testosterone and and not be able get a woman pregnant, you need to appeal to there ego and literally strike fear into them. I'm not joking, this is so devastating and I essentially have no faith that anything is going to change. Plastic and chemical manufacturers will fight all of this to keep there profits and they will not accept any blame unless they are sued into oblivion. They poisoned all of us and the government allowed them to.

Every Queensland community deserves to be a liveable one

22 November 2024

National Health and Medical Research Council
Environmental Health Section
GP Box 1421
Canberra ACT 2601

Via email: water@nhmrc.gov.au

To whom it may concern,

RE: LGAQ Submission on Australian Drinking Water Guidelines – Public Consultation on Draft guidance for Per- and Polyfluoroalkyl Substances (PFAS)

The LGAQ welcomes the opportunity to provide feedback to the National Health and Medical Research Council (NHMRC) on the draft guidance for Per- and Polyfluoroalkyl Substances (PFAS) under the Australian Drinking Water Guidelines (ADWG), that was released for public consultation in October 2024.

The LGAQ is the peak body for local government in Queensland, advising, supporting and representing local councils since 1896, enabling them to improve their operations and strengthen relationships with their communities. The LGAQ does this by connecting councils to people and places; supporting their drive to innovate and improve service delivery through smart services and sustainable solutions; and providing them with the means to achieve community, professional and political excellence.

In reviewing the draft **PFAS Fact Sheet**, and the **NHMRC Statement on PFAS in Drinking Water**, the LGAQ understands the NHMRC seeks to update the health-based guideline values and list potential recommended levels for several PFAS, with the updated advice expected to be finalised and published in April 2025.

Specifically, the LGAQ notes the revised values propose a reduction in the current health-based guidelines for PFAS including PFOA, PFOS, and PFHxS, in addition to assigning guideline values for PFBS and GenX chemicals that currently do not have guideline values.

The LGAQ does not have the in-house technical expertise to comment on the methodology for the analysis and evaluation of the technical data to derive the proposed values and therefore, cannot comment on the specific values in this submission.

Notwithstanding, the review of PFAS levels overall is of considerable interest to Queensland councils.

Local government is responsible for providing safe drinking water to communities throughout Queensland.

They do this while navigating a challenging financial environment as evidenced by the latest Queensland Audit Office report into local government finances, which found 48 out of Queensland's 77 councils are at moderate to high risk of not being financially sustainable.[1]

On top of this, councils are shouldering a cost-shifting burden placed on them by other levels of government, and through market failure. Research launched by the LGAQ in January 2024 into the current state of cost-shifting to Queensland councils from other levels of government and the private sector shows that this has increased from $47 million a year in 2001/2002 to $360 million in 2021/2022.[2]

[1] QAO Financial Audit report - Local government 2023 (Report 8: 2023-24)
[2] LGAQ Cost Shifting Research (2024)

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As the level of government that is funded the least – earning around three cents in every dollar of taxation revenue compared to 80 cents for the Federal Government and almost 17 cents for the State – councils cannot continue to shoulder further cost and responsibility burdens from others.

The potential impact of emerging contaminants – and specifically PFAS – on the water and wastewater industry is of significant concern to councils given the risks and costs associated with the need to update equipment and processes to keep up with new information and the escalating financial risk associated with being expected to meet stronger regulatory compliance requirements.

For example, in the wastewater treatment sector, regulation of PFAS is more significantly advanced and the cost of alternative biosolid disposal and treatment augmentation alone is potentially significant. In Queensland's wastewater sector alone, that cost is estimated at $13.2 billion in capital improvements and $145 million per annum in operating costs, based on analysis undertaken by Urban Utilities and Queensland Water Directorate (*qldwater*) in 2023[3].

Councils therefore have a strong interest in ensuring the regulatory framework and subsequent guidance documents that govern the delivery of water services are robust, practical and in keeping with the interests of protecting the public health of the communities they represent, and that adequate funding is made available to councils to make necessary adjustments to meet higher standards.

In recognition of the importance of source control of PFAS to the community, Queensland councils passed resolution #49 at the 2024 LGAQ Annual Conference calling for a ban on the importation and use of PFAS-group chemicals by the end of 2026:

> ***Resolution #49 (2024) - Ban the importation and use of products containing PFAS-group chemicals:*** *That the LGAQ calls on the State and Federal governments to ban the importation and use of products containing PFAS-group chemicals by the end of 2026, including products not covered by the Industrial Chemicals Environmental Management Standard (cosmetics, personal care products, food packaging, clothing) rather than requiring local government water service providers to upgrade treatment technology to protect community health and the environment from these chemicals.*

This resolution was passed by Queensland councils in recognition of the increasing burden being placed on them, and their ratepayers, to deal with the end result of the use of these chemicals despite being passive receivers.

In recent years, local governments have also passed the following resolutions in relation to PFAS, and these continue to be ongoing advocacy priorities for the LGAQ:

- ***Resolution #87 (2023) - Indemnity for Local Government from liability for the release of PFAS:*** *That the LGAQ calls on the State Government to implement legislation indemnifying water and sewerage service providers from liability associated with the release of PFAS to potable and receiving waters, including stormwater as the industry are passive receivers of these substances and there are no viable technologies to remove these substances from water and sewerage systems cost effectively.*

- ***Resolution #34 (2021) – PFAS Affected Land:*** *That the LGAQ calls on the Federal and State Governments to:*
    - *Establish a consistent national approach to the management of development related PFAS risks, informed by the Department of Defence's on-going investigations and monitoring; and*

[3] Urban Utilities PFAS NEMP 3.0 Submission Response February 2023

- *Establish a co-ordinated advisory authority for land- owners/residents/business owners about safe practices on PFAS affected land once developed.*

- ***Resolution #36 (2020) – PFAS Contamination Issues Arising from Historical Operations of Fire Stations:*** *That the LGAQ lobby the State Government to take the lead in resolving any known issues of PFAS contamination that arises from the historical operations of fire stations ports, airports and other infrastructure. If contamination related to these historical operations is found in soil or water, the State is to address the contamination and its management.*

The LGAQ has prepared specific feedback relating to the draft PFAS Fact Sheet and NHMRC Statement in **Attachment 1** and makes the following three recommendations for the consideration of the NHMRC in finalising the draft guidance material:

- **Recommendation 1:** The LGAQ recommends the Federal Government ensures that any changes to PFAS guidelines are accompanied by adequate funding to address cost impacts on water and wastewater service providers, including local government.
- **Recommendation 2:** The LGAQ recommends the Federal and State governments work collaboratively and in partnership with local government, to ensure a pragmatic and phased transition approach to the introduction of any new standards relating to PFAS.
- **Recommendation 3:** The LGAQ recommends the Federal and State governments take a coordinated and consistent approach to PFAS exposure standards across industries and sectors.
- **Recommendation 4:** The LGAQ recommends the Federal and State governments take a leadership role in addressing PFAS concerns, and ensure no cost shifting onto local governments, by:
    - Introducing a ban on the importation and use of products containing PFAS-group chemicals by the end of 2026, and
    - Addressing known issues of PFAS contamination arising from the historical operations of fire stations ports, airports and other infrastructure.

The LGAQ is aware that *qldwater* have provided a detailed technical submission on the draft guidance, including local government case studies on operational impacts, and supports the consideration of the *qldwater* submission by the NHMRC.

If you have any questions about any element of this submission, please contact [redacted]

Yours sincerely,

[redacted]

Attachment 1 – Specific Feedback regarding draft PFAS Fact Sheet and NHMRC Statement on PFAS in Drinking Water

Topic	Specific Feedback
Scope of draft guidance	Although the draft guidance relates specifically to health-based guidelines for drinking water, the individually derived values from other sources (e.g., food, environmental), should be reviewed collectively to understand the full exposure of a person to PFAS in their lifetime to set appropriate limits for all potential exposure pathways. Review of these independently from one another results in having different health-based guidelines and raises concerns for the cumulative effects of PFAS exposure.
Revised PFAS values	The LGAQ acknowledges that the technical data and subsequent proposed guideline values are drawn from evidence, based on protecting consumers from the long-term health effects of PFAS exposure. This does not consider how broadly or significantly drinking water service providers will be impacted by introducing new guideline values. The costs from failing to address the broader issue of PFAS contamination continue to mount up and cannot be borne by local governments alone. Ownership of the issue, which has implications Australia-wide, must first be acknowledged by all levels of government, and strong commitments and actions taken to address the issue at the source. All Australian governments are parties to the National PFAS Position Statement that supports transitioning away from the use of chemicals that cause irreversible or long-term contamination of the environment. The proposed introduction of new PFAS (PFBS and GenX chemicals) into the ADWG, demonstrates the root cause is not being appropriately addressed as banned PFAS such as PFOA are merely being replaced by other compounds that continue to put consumers at risk. Stopping the manufacture and importation of products containing PFAS will contribute to reducing the number of exposure pathways and safeguarding the long-term goal of avoiding further accumulation of these compounds within the environment.
Applicability to local government	The introduction of revised guidelines on PFAS levels in drinking water has clear applicability to local government service provision. The ADWG is considered the best-practice framework that local government is encouraged to adopt when developing Drinking Water Quality Management Plans (DWQMP). The LGAQ understands that councils as water service providers are expected to regularly update their DWQMP to ensure their continued commitment to achieving industry best practice. The potential impact of emerging contaminants and specifically PFAS on the water and sewerage industry is a significant risk to water service providers and councils. The publication of revised health-based guidelines must, therefore, consider the implications this may have on councils through the necessary updates to their current DWQMPs, and consequential operational and capital investment in testing, equipment and infrastructure.

	As the level of government that is funded the least—earning around three cents in every dollar of taxation revenue compared to 80 cents for the Federal Government and almost 17 cents for the State—councils cannot continue to shoulder further cost and responsibility burdens from others and be expected to deliver more for less. The LGAQ would, therefore, like to see implementation of the new guidelines undertaken in a pragmatic co-ordinated and fair approach over time in consultation with the sector considering two key principles: 1. PFAS control at source 2. Recognition that local government are passive receivers of PFAS and not the source of contamination and should be adequately funded to remove PFAS from water supplies if upgrades become necessary to implement higher standards
Responsibility for historical contamination	The contamination of source water, and groundwater in particular, by PFAS as a result of historical mismanagement of industrial products such as firefighting foams containing PFAS, continues to fall on councils to address. The State Government PFAS Contamination Protocol states that where a site has legacy stocks and/or elevated PFAS levels and the original user cannot be readily identified or held responsible for investigating and managing potential pollution, the current owner/controller is the responsible entity for that site. The draft guidance outlines in alarming detail, the level of PFAS contamination to groundwater sources. In the interests of protecting the long-term health effects of exposure to PFAS, the use of groundwater for private use (e.g., drinking, cultivation) should be further addressed in areas of high exposure, through a requirement for polluters to be identified and be required to remediate contaminated ground water supplies. Local governments should not be responsible for dealing with historical contamination. The State Government as environmental regulator should take the lead in resolving any known issues of PFAS contamination that arises from the historical operations of fire stations, ports, airports and other infrastructure. Where the original source of contamination is unknown, councils should be adequately funded to undertake any necessary remediation including in removing PFAS from drinking water supply under the new guideline values.

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55	**INDIVIDUAL RESPONSE 29** *Development of guidance* I think no level of PFAS in water is safe and the manufacturers of these chemicals should be forced under the law to clean up the contamination they have caused. *Implementation or application* I hope the strictest Guidelines are implemented without any delay. There should also be guidelines for manufacturers of water tanks and water pipes, plumbing material because perhaps PFAS have also been used in these items. Info on PFAS contamination should be made public in real time.
56	**INDIVIDUAL RESPONSE 30** *Development of guidance* I believe not enough has been done to highlight long term implications of consumption of PFAS/PFOS. There have been countless studies undertaken which highlight that exposure to these chemicals is cumulative, can persist in the host or environment for thousands of years, and is carcinogenic and directly causes cancer. Stop paying "scientists" money to fake the real consequences of these chemicals and follow suit of many other developed countries in advising that there is no safe level of exposure. Who is going to put their hand up and take responsibility for these guidelines when someone finally has the courage to stand up and reveal the truth and government bodies start back tracking on this advice. *NHMRC Statement* How can you justify changing PFAS from 70ng/L to 0.2 µg/L? A statement on your website says that: "As PFAS persist in humans and the environment, it is recommended that human exposure is minimised as a precaution." Wouldn't this mean a guideline of 0ng/L is more appropriate, why risk any exposure if you know that it persists in humans. It appears that you're massaging the science to work in your favour. It does cause cancer and there's plenty of evidence to prove it yet you're claiming it's conflicting. How can you continue to deceive the public when the World Health Organisation declared PFOA, a type of PFAS, a category one human carcinogen in 2023.
57	**INDIVIDUAL RESPONSE 31** *Development of guidance, implementation or application, Fact Sheet* Altough I am grateful that the PFAS limits are finally proposed to be reduced, I believe that this reduction does not go far enough and that the Australian PFAS drinking water limits should fully align with the US - I do not believe that 200ng/l and 30ng/l for PFOA and PFHxS are safe for the long term use of the general population. I also think that the proposed guidelines don't include enough PFAS types. International organisations have serious health concerns about a much wider range of PFAS than those subject to Australian guidelines.
58	**INDIVIDUAL RESPONSE 32** *Development of guidance* We need to adopt the same US standards at 4, not 200. We also need to remove fluoride from the water. *Implementation or application* We deserve good quality drinking water. It's a basic human right. Who wants their children getting cancer..

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	Fact Sheet Lower the PFAS to near 0.
59	**INDIVIDUAL RESPONSE 33** *Development of guidance, Implementation or application, NHMRC Statement* I'm relieved that these limits are being revised and have been lowered from the limits set in 2018. However it concerns me that the proposed limit for PFOA and PFHxS is so many times higher than what the US has determined to be acceptable. Why can't we match the limits they've set, and when will limits be imposed for other forever chemicals? This is a good start, but needs to be an ongoing process. We also need to be banning the import of any products (like cosmetics) that contain forever chemicals.
60	**MIDCOAST COUNCIL** *Development of guidance* Pros: • The guidance appears to be based on a rigorous evidence-based process. • It builds confidence to have all available studies considered. Identifying lower quality work with justification for exclusion from further consideration may also build confidence in the process. • It is worthwhile reinforcing that Australian guideline development is based on evidence and consideration of risk. This may help distance the current work from the perception that some international jurisdictions are employing more political, knee-jerk management of emerging contaminants. • The overall approach also appears to conceptually resemble that employed to develop thresholds for other health-based targets in the guidelines. Cons: • Future work is identified as a result of the limits of current data which is good (e.g. GenX). However, the NHMRC need to ensure that they meet this expectation in the future now it is being set during the current work. The introduction of prescribed triggers for future work (if available) may build confidence with stakeholders that future review is a firm commitment. • While the consideration of differing thresholds is justified, it remains to be seen if interest groups may leverage this to create some uncertainty around new requirements. *Implementation or application* • As identified, the implementation of new guideline values may take considerable time. The current lead-time for capital projects, including required approvals, can easily exceed five years or more for even simple upgrades. This is without considering the financial sustainability issues currently faced by smaller regional water utilities and councils. • The adoption of any new analyte will require a proportional increase in laboratory analysis capacity. This may have significant impacts on regional water utilities and councils who are already facing difficulty in engaging suitable service providers. • It would assist water providers to have suitable education resources available to manage customer expectation as new guidelines are introduced. Particularly if a scheme is found to exceed a new threshold. *Fact Sheet* Pros: • The level of detail provided appears to align with the technical nature of the target audience. Good commentary is provided around justification for the proposed thresholds. • As above, it builds confidence to have all available studies considered. • It is good to have future potential contaminants such as GenX mentioned as this may reinforce the iterative nature of guideline review. Cons: • The suggestion that the new PFAS guidelines are not designed as a pass/fail may be difficult to articulate to consumers. Typical experience addressing consumer concerns around the safety of reticulated water is if the water is 'safe' or not, not 'how safe'. • Commentary around alternate water supplies/additional treatment options is brief and possibly an oversimplification. Any project adding additional treatment or alternate water sources to a reticulated water

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	scheme is complicated and reliant on significant investment. Suggesting that water providers may be 'unwilling' is not reflective of the realities faced by regional organisations. Financial sustainability, climate change, lack of alternate water supplies and ever-increasing regulation are all barriers. As such it is not an unwillingness to adopt change, but more a capacity to. • It may not be helpful to make even brief mention of premise-based treatment. While effectiveness is questioned in the text, there are a vast number of organisations promoting unregulated and untested devices. The preferred message would be that water is safe, or it is not. *NHMRC Statement* • There is benefit in highlighting the proportion of potential PFAS exposure from water supplies. This context is important when communicating potential risks with water consumers. • A focus on source control in the event of PFAS levels above threshold is consistent with the 'catchment to tap' philosophy applied to other water quality issues. • It is positive to build the expectation that implementation of the new guidelines will take time. • Due to the legacy nature of PFAS contamination sources it is appropriate to propose that ongoing monitoring be risk based. This will hopefully prevent over monitoring of water catchments found to be below environmental threshold levels.
61	**NATIONAL CENTRE FOR EPIDEMIOLOGY AND POPULATION HEALTH (NCEPH)** *Development of guidance* Public health advice for PFAS in Australia, the European Union, and the United States is largely consistent in the way that the potential health effects associated with human exposure to PFAS are reported. However, approaches to establish critical health endpoints on which to base human health-based guidance values for PFAS are different, as highlighted by the Evidence Evaluations for Australian Drinking Water Guidelines Chemical Fact Sheets – PFOS, PFHxS, PFOA, PFBS, and GenX Chemicals (hereafter referred to as the Evidence Evaluations). We acknowledge the substantial work undertaken to review evidence of the potential human health effects associated with PFAS to develop new human health-based guidance values in Australia. However, the Evidence Evaluation is difficult to interpret. It is unclear what evidence has been included (or excluded) from the evaluation and why. Further justification for the methodology for the Evidence Evaluations is required, specifically: the selection of sources for the targeted screening of existing health-based guidance; study selection procedures; and restriction of evidence to existing health-based guidance only. The search strategy appears to include European countries in the targeted screening of existing health-based guidance through the inclusion of the European Food Safety Authority (EFSA). However, we note the specific inclusion of the Dutch National Institute for Public Health and the Environment (RIVM) and the German Bundesinstitut für Risikobewertung (BfR – Federal Institute for Risk Assessment), and the exclusion of other key European jurisdictions. The following European agencies were not included in the search strategy: the Swedish Chemicals Agency (KEMI); the German Environment Agency (Umweltbundesamt); the Danish Environmental Protection Agency; and the Norwegian Food Safety Authority (Mattilsynet). We also note that sources from the following countries were not included in the targeted screening of existing health-based guidance, despite drinking water guidelines for PFAS; New Zealand; Japan; Korea; and China. It is important to clarify countries and/or agencies that were not included in the review due to exclusion from the search strategy, versus countries for which health-based guidance values were not established to inform drinking water guidelines for PFAS. Furthermore, we note study selection procedures for the evidence review were not conducted following current best practice guidelines i.e., duplicate search and screening by two independent reviewers. It is unclear why the search strategy was restricted to evidence of existing health-based guidance only and did not include other peer-reviewed published literature on exposure to and the health effects of PFAS, particularly due to the noted limitations in the availability of human epidemiological evidence used as justification for the selection of non-human critical health endpoints to establish the human health-based guidance values. We identified 99 reviews, including systematic reviews, meta-analyses, and scoping reviews, published between February 2017 (following the literature search for the ANU PFAS Health Study Systematic Review, 2018) and December

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	2023 that reported on the evidence of human health effects associated with PFAS. These reviews represent the extensive range of scientific publications that have reported associations between health effects and PFAS in recent years. We note that many represent a re-evaluation of previous key or pivotal studies, and do not capture up-to-date published information for exposure to and the health effects of PFAS due to search strategy periods. However, without the inclusion of systematic reviews (or other peer-reviewed sources) published in recent years, the Evidence Evaluations do not necessarily represent the scientific evidence base for human epidemiological information on PFAS. For example, public health advice and peer-reviewed literature show inconsistent conclusions on the effects of PFAS on several human biomarkers. This includes inconsistent findings relating to the association of human exposure to PFAS and changes in thyroid hormones, identified as critical health endpoints to establish the human health-based guidance values for PFAS in Australia. We note that the evidence for the effect of PFAS on changes in thyroid hormones is not adequately discussed in conjunction with the toxicological evidence. In relation to the evidence on the effect of PFAS on bone marrow, we note there is published evidence of associations between blood serum PFAS concentrations and adverse effects on human skeletal tissue e.g., lower bone marrow density. However, it is important to note these associations may not be causative in humans e.g., the result of epidemiological study bias, such as uncontrolled confounding. We note that the evidence for the effect of PFAS on human skeletal tissue is not adequately discussed in conjunction with the toxicological evidence. *Implementation or application* These new guidelines may have implications for the identification of communities at risk of higher exposure to PFAS. It will be important to communicate the risk of exposure to PFAS and the potential human health effects to potentially impacted communities, along with any associated uncertainty. We note a growing concern about exposure to PFAS in the general population of Australia, based on both national and international studies and media reporting. Proper communication of risk to balance the risks and benefits is vital, as communities may become overly concerned about even small amounts of PFAS in water. In the ANU PFAS Health Study, participants from PFAS Management Areas reported higher levels of psychological distress than those of comparison communities. Notably, higher levels of psychological distress were observed in participants who used bore water on their properties in PFAS Management Areas. PFAS-impacted communities need clear, concise and timely information. Uncertainty or lack of information on the precautionary measures to limit exposure to PFAS and the financial costs associated with the precautionary measures were key barriers to residents changing their water use and local produce consumption following notification of potential exposure to PFAS through environmental contamination. Participants indicated that they would like greater transparency and support in their interactions with government representatives. *Fact Sheet* The draft PFAS Fact Sheet summarises proposed updates to the human health-based guidance values for PFAS in Australia and associated threshold limits for PFAS in drinking water sources, based on evidence of human exposure to PFAS through drinking water and other sources in Australia and the current state of evidence of the human health impacts of PFAS. Given the substantial public interest in human exposure to PFAS in Australia, we suggest the development of a plain language summary for the draft PFAS Fact Sheet to communicate the proposed changes and updated evidence on human health to the Australian public, including communities impacted by PFAS contamination e.g., Australian Government Department of Defence PFAS Management Areas. In relation to the extracts related to the PFAS Health Study from the draft PFAS Fact Sheet, we have identified several inaccuracies. The ANU PFAS Health Study examined exposure to and the human health effects of PFAS in three Australian communities impacted by environmental contamination. The levels of exposure to PFOS and PFHxS were higher than in comparison areas, but lower than in international communities impacted by similar environmental contamination. The draft PFAS Fact Sheet should follow similar or the same wording to describe the epidemiological study accurately e.g., “high” is a nonspecific term that should be reconsidered in the following extracts: “... examining the potential health effects from high levels of PFAS exposure in three Australian communities”; and “It should be noted that the rates of cancers examined in the ANU PFAS Health Study (i.e. results from communities exposed to high levels of PFAS)...”.

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	We further suggest that it is important to note that associations identified in the ANU PFAS Health Study Blood Serum Study and Cross-sectional Survey were not consistently observed across the three exposed communities, however, the results were consistent with previous literature, in relation to the following extract: "but the evidence for other adverse effects was limited and inconsistent and did not establish conclusive links between PFAS and adverse health outcomes". Again, the draft PFAS Fact Sheet should follow similar or the same wording to describe the epidemiological study accurately. We note that the ANU PFAS Health Study identified small but apparent associations between prostate, larynx, kidney, and lung cancers and living in individual communities, but not in all communities. The ANU PFAS Health Study Data Linkage Study specifically investigated the association between residence in a PFAS Management Area and adverse human health outcomes, including rates of cancers. Finally, there are inaccuracies in the language to describe the association between kidney and testicular cancer from the ANU PFAS Health Study Systematic Review. We concluded that for kidney and testicular there was limited evidence, and for all other cancers evidence was inconclusive or inconsistent. We suggest the use of consistent language to describe associations and causation throughout the draft PFAS Fact Sheet. *NHMRC Statement* As per our earlier response, we suggest the development of a plain language summary for the draft NHMRC Statement on PFAS in drinking water to communicate the proposed changes and updated evidence on human health to the Australian public, including communities impacted by PFAS contamination. Due to the potential for the new guidelines to have implications for the identification of communities at risk of higher exposure to PFAS, we suggest further clarification on the estimated risk of exposure to PFAS in drinking water in areas affected by environmental contamination. We suggest that the following statement on estimates exposure could be the same as included in the draft PFAS Fact Sheet, as below. Current statement in draft NHMRC Statement on PFAS in drinking water – "Exposure to PFOS and PFOA from drinking water has been previously estimated to be approximately 2-3% of total PFAS exposure in areas with low levels of contamination" Expanded statement for draft NHMRC Statement on PFAS in drinking water, as in draft PFAS Fact Sheet – "Estimates of exposure to PFOS and PFOA via drinking water in 2011 ranged from 2-3% for a non-exposed community (i.e. not impacted by a point source) up to an estimated maximum of 22% and 24% respectively from contaminated water supplies".
62	**INDIVIDUAL RESPONSE 34** *Development of guidance* The logic surrounding providing no restriction on GenX chemicals does not put people and environments first. Given what we have learned about the rest of the family of chemicals, a case like GenX where evidence-base is not yet solid should entail proactive restriction of the chemical to ensure safety beyond doubt to then be loosened if needed. If after comprehensive testing the chemical is considered safe by our current standards and there is significant benefit to having the chemical in our water, it is then that loosening of the restriction could be considered. The order is reversed. This is a larger issue around restrictions - why do we need evidence of harm to restrict a chemical in our drinking water, is the potential to harm not enough? Why do we allow it in the water until we can gather enough evidence to ban it? The reactive nature of restriction by government needs changing. Government should be proactive. Government should be able to read between the lines, consider the historical lessons of contaminants passed, e.g. lead and asbestos, to put forth proactive bans of emergent/poorly-researched chemicals, especially in a resource as high impact as our drinking water. *Implementation or application, Fact Sheet* It is fantastic that the testing will become tighter on these chemicals. But, it is not an exhaustive list of all the chemicals that have potential to cause unknown harm to people and environment in Australia's drinking water, there

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	are so many more. It does not address the broader problem of microplastics. Chemicals of unknown harm should be proactively restricted as the first step, and then the draft guidance, should be formulated afterward, to confirm or repeal the rationale of the proactive restriction. I really appreciate the thoroughness of government Fact Sheets like this - when I do my research as a consumer or as a citizen in relation to other health matters like asthma, air quality, etc, these fact sheets are a guiding light. The issue is that the order in which action is taken and research is conducted in our systems of regulation provides no assurance to citizens that health is a priority. *NHMRC Statement* Companies need to be held to account for the potential risk their activity ensues, not just confirmed liability after the damage is done. The statement should highlight the role of companies in manufacturing products that create this pollution in our drinking water, especially those who take that risk frivolously without societal benefit. Fire-fighting purposes was fair enough when we didn't know any better - non-stick pans are not a good enough reason.
63	**INDIVIDUAL RESPONSE 35** *Development of guidance, Implementation or application* NHMRC Water Quality Advisory Committee National Health and Medical Research Council GPO Box 1421 Canberra ACT 2601 To the committee, RE: NHMRC Review of PFAS in Australian drinking water I am a Professor of Chemistry at RMIT University. I have conducted scientific research on trace levels of pollutants in the environment for over twenty years. The focus of my work is to enhance environmental safety through science. This letter is written in a private capacity and not as part of my role at RMIT, although it is hard to separate the two in this case as it is my work that gives me the experience and background to respond to the guidelines. Nevertheless, the views outlined in this letter are purely my opinion and do not represent those of my employer. In terms of possible conflicts of interest, I note here that: i) I was personally asked to comment to the media on the proposed guidelines by [redacted] Director of Environmental Health at the NHMRC, when they were released in October (which I did). ii) I have previously worked with [redacted] a member of the Water Quality Advisory Committee. iii) I have received funds from the Environment Protection Authority Victoria and various Australian Water utilities for research into environmental pollution, including PFAS. I also note that my response is not as detailed as it might have been due to the concise timeline for comment on the proposed guidelines. I urge the committee to provide more time for public comment on import guidelines like this, which can have important intended and unintended ramifications. Public concern about PFAS comes from films like 'Dark Waters' and documentaries like 'How to Poison a Planet'. This has led some communities exposed to PFAS to launch class actions. PFAS have featured in the Australian media due to reports of their presence (albeit at very, low ng/L concentrations) in the environment and their perceived health effects and resistance to degradation. However, public perception of the risk associated with PFAS does not always align with our evolving scientific understanding and data on the subject. Discussion about toxicity is futile without considering dose and context; this is often missing from public debate on PFAS. The literature on PFAS (eco)toxicity is also inconsistent for several reasons, including the concentrations and types of PFAS studied and the variety of tests used to assess their effects. Indeed, the NHMRC relied on laboratory toxicology

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	data for the recent draft water quality guidelines, considering the existing human evidence was not robust enough for the task, yet still set very conservative guidelines. Given the above points, I would like to comment on several aspects of the process that led to the publication of the proposed guidelines. Firstly, the NHMRC paid external consultants (SLR consulting) to review the literature on PFAS toxicity and report back. After much detailed work, as far as I can see, the consultants recommended, and provided substantial evidence for, not changing the existing guidelines. The Water Quality Advisory Committee then decided to ignore this advice with an explanation primarily based on one study from the USA. I am unclear as to why the committee spent what I assume was a fair amount of public money for a detailed review of the evidence and then basically ignored the advice it received without thoroughly explaining what it thought was the problem with said advice. I acknowledge that a brief explanation was provided for each proposed guideline value, but not much detail was given. It is thus unclear how the final decision was made. A pertinent example is the PFOS guideline value. It is unclear why more emphasis was placed on the Benchmark Dose Level rather than the No Observed Adverse Effect Level, especially considering the significant differences between these values and their impact on the resulting drinking water guideline for PFOS. I am also concerned about the uncertainty factors used in the guidelines. Based on the information in the draft fact sheet and administrative report, the specific basis for the uncertainty factors applied should be clarified. This is essential because the uncertainty factors significantly impact the resultant guideline values. Indeed, the uncertainty factors appear to substantially influence the resultant guideline values more than any differences between the studies (toxicological endpoints) selected for input as acceptable daily intake. I believe the proposed four ng/L limit for Perfluorooctanesulfonic acid (PFOS) is overly conservative. Four ng/L is about the current limit of analytical technology for water, which means that if you measure PFOS in a sample, you are in breach of the guidelines. This could cause significant concern for local communities, who understandably think they are in danger when the risk is low to zero. In addition, while we can probably measure this level in drinking water, which is a relatively uncomplicated sample matrix, I do not think we could say the same for biosolids or soil. The committee may rightly point out that the proposed guidelines are only intended for water, but this ignores the fact that drinking water guidelines are often used to derive other guidelines, such as for groundwater or soil. We have already seen several newspapers incorrectly assigning drinking water guidelines to source waters and claiming the water in reservoirs had failed the guidelines. This is not the case, but it has caused a lot of undue stress for local communities. Indeed, some dams in New South Wales were shut off in August 2024 due to the mere presence of PFAS contamination, not because of any proven risk. The presence of PFAS in water does not necessarily mean the water is toxic enough to cause harm. The dose makes the poison; everything is toxic at the right amount, even water itself. One might argue, 'Why not make the risk zero completely?' But this is impossible to achieve for PFAS as it is for anything else in life. There is risk in everything we do; for example, if I drive to work, I might crash, or if I go for a swim, I might drown. Both are low risks, but not zero. Risk is relative, and I feel this nuance is missing from the guidelines. I accept that effective management of PFAS environmental contamination requires a robust regulatory approach. Management of PFAS contamination is, however, complex. This is because it spans jurisdictions (the most affected areas are often defence sites and airports located on Commonwealth land, which are outside the control of state government) and because it can be unclear who holds ultimate responsibility for PFAS pollution. For example, water utilities are responsible for wastewater discharge to the environment, but PFAS in wastewater generally comes from industries within their catchment, not the water utility itself. Resolution of 'legacy' pollution issues can also be complicated, e.g. if the original polluter is no longer present. In the case of drinking water, the issue of how to fund any necessary treatment upgrades must also be addressed. If the current proposals, especially for PFOS, are taken up, who would pay for the massive infrastructure investment that would likely be needed to meet those guidelines? Consumers will likely bear the cost, which will hit smaller and regional communities hardest. This is the opposite of the 'polluter pays' principle, in which the polluter bears the clean-up cost. By setting such a low amount as the guideline value, the committee will likely indirectly affect the water bills of many of the most vulnerable people in our society. I would urge them to consider this. "We aren't even sure if the major source of PFAS exposure to most people is water. If this is the case, spending millions to go from an incredibly small amount

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	to an even smaller amount would not be money well spent and would not improve health outcomes. We would, in short, waste a lot of time and money if we enforce limits that are not fit for their intended purpose. Finally, I would like to thank the committee for the opportunity to comment on these guidelines. I appreciate that establishing any water quality guideline is complex, and no guideline will please everyone. My comments are intended only to provide insights and feedback on aspects the committee may not have previously considered before they finalise the revised guidelines. Yours sincerely
64	**INDIVIDUAL RESPONSE 36** Permission not given to publish.
65	**INDIVIDUAL RESPONSE 37** *Development of guidance* I object to all chemicals (asbestos, acid, chlorine, aluminium, fluoride, PFAS and any other chemical) in our water supply. *Implementation or application* Any chemicals in our water supply is a risk that should be avoided. *Fact Sheet* No chemicals should be in our water supply
66	**INDIVIDUAL RESPONSE 38** Permission not given to publish.
67	**INDIVIDUAL RESPONSE 39** *Implementation or application* The proposed guidelines are almost in line with US EPA guidelines for drinking water for PFAS. They should be implemented.

Public Health Association of Australia submission on the National Health and Medical Research Centre Australian Drinking Water Guidelines public consultation

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22 November 2024

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Public Health Association
AUSTRALIA

The **Public Health Association of Australia** (PHAA) is Australia's peak body on public health. We advocate for the health and well-being of all individuals in Australia.

We believe that health is a human right, a vital resource for everyday life, and a key factor in sustainability. The health status of all people is impacted by the social, commercial, cultural, political, environmental and economic determinants of health. Specific focus on these determinants is necessary to reduce the root causes of poor health and disease. These determinants underpin the strategic direction of PHAA. Our focus is not just on Australian residents and citizens, but extends to our regional neighbours. We see our well-being as connected to the global community, including those people fleeing violence and poverty, and seeking refuge and asylum in Australia.

Our mission is to promote better health outcomes through increased knowledge, better access and equity, evidence informed policy and effective population-based practice in public health.

Our vision is for a healthy population, a healthy nation and a healthy world, with all people living in an equitable society, underpinned by a well-functioning ecosystem and a healthy environment.

Traditional custodians - we acknowledge the traditional custodians of the lands on which we live and work. We pay respect to Aboriginal and Torres Strait Islander elders past, present and emerging and extend that respect to all other Aboriginal and Torres Strait Islander people.

Introduction

PHAA welcomes the opportunity to respond to the NHMRC Australian Drinking Water Guidelines public consultation. Primary Prevention is central to PHAA's position on harmful chemical exposure to the environment and to humans. If a chemical can harm human or environmental health, precautionary measures should be taken to prevent or limit its use, particularly when there is scientific uncertainty regarding the product's health impact. Precautionary measures can include banning the use or importation of certain chemicals.

Broadly, PHAA recommends a transition towards safe alternatives to harmful chemicals, including a rapid phase-out of the most hazardous chemicals on the market. PHAA supports industrial and agricultural chemical limitation, regulation, biomonitoring and transparent sharing of exposures and contaminations. In this submission, PHAA will address:

- Our support for the revised guidelines concerning PFAS levels in drinking water supply.
- The psychosocial and psychological harms caused by polluting incidents or the threat of pollution must be acknowledged and addressed, just as physical health harms are.
- Community participation must be meaningfully engaged through the HIA process, and through the collection, monitoring and sharing of chemical exposure data.
- The need to ensure safe and unpolluted waterways to support healthy people and ecosystems.

PHAA Response to the NHMRC Australian Drinking Water Guidelines public consultation

PFAS health risk in context

Per- and polyfluoroalkyl substances (PFAS) are a category of chemicals used in products such as firefighting foam and non-stick cookware.[1] PFAS chemicals are known as 'forever chemicals' as they do not degrade easily in the environment;[1] polluting the atmosphere, water and soil throughout its lifecycle.[2] They are so prevalent that they can be found in the blood of almost the entire human population.[3]

However, PHAA does not have concerns with the proposed revised health-based guideline values for PFAS chemicals in the drinking water supply, we support further limiting the acceptable level of PFAS chemicals.

In Australia, research on aquatic animals including platypus, dolphins and little penguins have shown bioaccumulation of PFAS chemicals, with particular harm occurring to their livers.[4–7] The health effects of PFAS pollution on marine life depends on several factors, such as type of PFAS,[8] and typically include alterations in gene expression RNA processing, protein turnover, lipid and energy metabolism,[9] and an altered function of the immune system and liver.[10]

For human health, PHAA acknowledges that the most common concern regarding PFAS chemicals are their carcinogenicity. WHO specification of PFAS carcinogenicity based on animal testing and mechanistic analysis recognised that causality of cancer in humans by PFOA is not clear from present evidence.[11] Moreover, the highest human exposure to these substances and the possibility of cancer involves the PFAS *manufacturing* process,[12] impacting both workers and the local community.[13] As PFAS manufacturing does not take place in Australia, the main risk driver of human exposure is absent.

Currently, while there is no available evidence of a burden of ill-health within Australia attributable to PFAS in water or elsewhere, a precautionary approach to PFAS is advisable. Exposure should be limited as much as is feasible.

PHAA is also concerned regarding the community's anxiety regarding exposure to PFAS and that this also requires attention.

The combined social cost of contamination events and chemical pollution remediation should receive greater consideration. **PHAA recommends** that the use of harmful chemicals should be limited and reduced and a transition towards safer alternatives to keep our ecosystems and our people safe from unnecessary scares or exposures must be actively supported; that any regulations, where necessary, need to account for the cumulative impacts of chemicals on human and ecosystem health;[15] and that Local and State governments should not fund the remediation of industry induced pollution.

Improving community management

Industries producing or using harmful (or potentially harmful) chemicals should only do so after a rigorous independent Health Impact Assessment (HIA), with community participation throughout the HIA process.

Communities within proximity to and/or are employed by industry producing/using harmful chemicals (e.g. farming) are at risk of both pollutants being released over time and a singular polluting incident. [16,17] These communities often face high rates of chronic disease and lack of access to health care.[16,17]

Community members who have experienced major pollution events have reported significant impacts on their mental and physical health.[17–19] Psychological stress, such as fear of disease or of income loss due to illness, can exacerbate physiological issues including fatigue, and cardiovascular disease.[17–19] Psychosocial impacts can result from fear of unknown health risks, such as cancer, and they can be heightened by a distrust of institutional responses and perceptions of betrayal and unfairness.[17–19] Whether it is PFAS or other harmful chemicals, communities should be able to feel safe and be safe from pollutants.

HIAs are one means to prevent harm and engage with the community on new development or upgrade projects that may expose populations to pollutants. HIAs judge the potential health effects of proposed projects on a population to inform decision-makers about issues, alternatives and improvement.[17] However, effective community engagement and oversight is often neglected.[17] Effective community engagement in the HIA process needs to include community-based participation (with independent expertise to support them) from question identification through to monitoring, assessment, interpretation of results and planning for any consequent action.[17]

Regardless of a development's identified level of harm, it is important to acknowledge a burden of concern that is undoubtedly experienced by proximal communities and the wider community.[17] This psychosocial impact on the community is often an underestimated factor in the risk assessment.

Health risk assessments can be complemented by psychosocial impact assessments which identify and acknowledge broad concerns within a clearly defined scope, specified with input from the affected community.[17–19] As well as assessing the risk of community exposure to environmental pollutants, the perception of risk and associated psychological distress are essential considerations and can inform a response should an incident occur.[17]

HIAs should also need to account for accumulative impacts and the health benefits of a biodiverse environment with functioning ecosystems, given the interconnected relationship between human and ecosystem health.[15]

PHAA advocates for effective community participation throughout the HIA, risk assessment and management of pollutant scenarios (with independent expertise to support them). [17]

Another opportunity to improve community participation in risk assessment is through improved information sharing and monitoring of chemical exposures.

Currently, Australia has no surveillance system to measure or monitor chemical body burden or health related outcomes arising from exposures.[17,20] Chemical residues have limited monitoring and chemical emissions are monitored through ad hoc programs to detect pesticides in waterways, soil and other environments.[17,21] Environmental monitoring and reporting of chemicals of concern to human health needs to be enhanced, particularly in communities where there is a higher risk of exposure.[17]

The Government should establish national human biomonitoring of industrial chemical residues and exposure with a continuous funding stream similar to the chemical body burden monitoring programs in Europe, USA and Canada.[17] A comprehensive national monitoring database would assist in identifying exposure trends over time and by geographical regions, and enable detection of populations that may have increased exposure and risk of adverse effects.[17] For more, see Exposure to Pollutants and Human Health.

The Government should also establish a national domestic produce pesticide residue monitoring program prioritising high risk agricultural zones and water catchments in line with the EU, USA and Canadian government-led systems.[22,23] Such a program would be an extension of resources and outputs of the National Residue Survey, the Australia Total Diet Study, and other industry residue monitoring programs such as FreshTest. The national domestic residue monitoring program would not only benefit assessments of the effects on human health, but also that of ecosystem health and water safety. For more, see Improving Australian Chemical Regulation for Human Health.

Community, non-governmental organisations and consumer/user groups should have easy access to real time and understandable information from both the biomonitoring and pesticide residue monitoring programs.[17] This level of data collection and transparency can help build community trust in regulators and governments and is fundamental to the establishment of good risk assessment and risk management.[23]

To support these monitoring programs and grow community trust, government and civil society public health agencies need to be guaranteed, by legislation, to have a leadership role across government in assessing and reviewing health risks to communities from pollutants and ensuring that regulatory actions taken by other agencies are sufficiently protective of health. To fulfil this function, adequate public health and toxicology expertise must be maintained in public health agencies.[17]

PHAA recommends the establishment of a national domestic produce pesticide residue monitoring program prioritising high risk agricultural zones and water catchments, as well as the establishment of national human biomonitoring of industrial chemical residues and exposure.

Clean and safe water for healthy people and healthy ecosystems

Access to clean drinking water is an internationally recognised human right, and one of our most basic needs. Yet in Australia, more than 400 regional or remote communities lack access to good quality drinking water.[24] Globally, limited access to safe water and to improved sanitation causes 1.4 million preventable deaths per year, of which more than 99% occur in low-income countries.[17,25]

Although the main disease risk associated with drinking water in poorer communities is due to well known viruses and bacteria, water pollution by heavy metals and pesticides also poses a risk to human health, particularly in marginalised communities.[17,25] For instance, people with low income are more likely to work in occupations with higher levels of chemical exposure, to live in more contaminated communities, and to not have access to a safe and managed water source.[17,26]

Children are uniquely vulnerable to the impacts of poor-quality drinking water and other environmental hazards. Some chemical contaminants may be passed onto children before they are born, through mothers ingesting chemicals prior to and during pregnancy, and while breastfeeding.[17,26] Protecting the health of children and young people and providing them with a safe, clean environment is essential for them to reach and maintain their full potential.[23]

Water must also be safe to support the ecosystem that relies upon it for life (including humans). The wellbeing of human beings is inextricably connected to that of the other beings with whom we share this planet and depends on well-functioning ecosystems that protect, provide, support and sustain/nourish us. Protecting and promoting the health of these other species, planetary biophysical systems and ecosystems are essential for humanity to exist, survive and flourish. Clean and safe water is vital for human, animal, and environmental survival and flourishing.[27] Yet chemical runoff is still one of the top three most significant pressures on the Great Barrier Reef's health.[28]

Australia's current system for monitoring and reducing chemical residues in the environment is insufficient, and better monitoring, management, and reporting of levels of chemicals in drinking water and the general water ways is needed.

To protect water, **PHAA recommends** the Government adhere to our commitment to the *Rio Declaration on Environment and Development* (1992) which states: "In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities".[23,29] In this context, precautionary measures should be taken when chemicals pose potential harm to human or environmental health, even in the absence of full certainty. Australia needs a comprehensive policy and an active regulatory framework that ensures all people have access to safe and clean drinking water, and that people and the environment are protected from the adverse effects of chemical pollution.[23]

To reduce chemical pollution, there should be an active transition towards safe alternatives to harmful chemicals, including a rapid phase-out of the most hazardous chemicals on the market as mandated by legislation and regulation.

Conclusion

PHAA supports the recommended guideline changes but would also like to take the opportunity to encourage the NHMRC to take a broader perspective on the impact of environmental chemicals on the health of the community. We are keen to ensure that the following points are highlighted:

- Australian industries must transition from using harmful chemicals to safer alternatives.
- The psychosocial and psychological harms caused by actual pollutant incidents or the threat of pollution must be acknowledged and addressed, just as physical health harms are.
- Community participation must be meaningfully engaged throughout the HIA process, and through the collection, monitoring and sharing of chemical exposure data.
- Transition towards safe alternatives to harmful chemicals, including a rapid phase-out of the most hazardous chemicals on the market as mandated by legislation and regulation.

Please do not hesitate to contact us should you require additional information or have any queries in relation to this submission.

[redacted]

22 November 2024

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Submission re: Australian Drinking Water Guidelines- Public Consultation on Draft Guidance for Per- and Polyfluoroalkyl Substances (PFAS)

Background

The Queensland Water Directorate (*qldwater*) is the central advisory and advocacy body, working with our members to provide safe, secure and sustainable urban water to Queensland communities.

In providing these essential services, the urban water sector owns and operates sewer lines, water and wastewater treatment plants, pumping stations, reservoirs, and a range of other critical water technologies/infrastructure. There are currently 370 water supply schemes and 265 sewage schemes across Queensland.

The Queensland sector is comprised of 75 service providers directly employing nearly 7,000 people. Of the 75 publicly owned water service providers, 66 are local councils outside of south-east Queensland. *qldwater* members include all council water service providers, the council owned statutory authorities in south-east Queensland and the two state-government owned statutory authorities.

Our members currently service 1,943,244 sewerage connections and 2,150,035 water connections (data from *qldwater's* Statewide Water Information System). These numbers are set to substantially increase with the current and projected population growth. As public good and essential service providers, our members share many objectives with the Queensland Government and maintain strong partnerships with several key agencies.

We welcome the opportunity to provide a submission to the National Health and Medical Research Council (NHMRC) on draft guidance on per- and polyfluoroalkyl substances (PFAS) as part of the Australian Drinking Water Guidelines (AWDG). *qldwater* provides this submission without prejudice to any submissions from our members or other urban water service providers.

Consultation approach

This submission is collated from a number of past consultation activities including industry events, webinars and personal interviews, as well as feedback from the *qldwater* Strategic Priorities Group and other reference groups. A specific consultation session was held on 31 October 2024 which was attended by more than 30 representatives from water service providers in Queensland.

Concerns for Queensland water service providers

Consultation with the urban water sector across Queensland has highlighted a range of issues, for which we invite the NHMRC to consider.

The additional level of protection provided by the proposed limits may not justify the cost of implementation specifically for the Australian context.

The Industrial Chemicals Environmental Management Standard (IChEMS) framework schedule listing of PFOA, PFOS and PFHxS (and their salts) which will come into effect in 2025 is often acclaimed as the means to control PFAS entry into the community. However, the limits for "unintentional" PFAS contamination for imported products are 25 µg/kg for PFOS, PFOA, PFHxS. This threshold is an order of magnitude higher than current proposed guideline values.

There is also a legitimate concern that as the regulation inevitably tightens, with more individual PFAS compounds being added to the guidelines, the very chemicals which are used to purify and treat drinking water to meet ADWG may themselves contain some PFAS at levels that while they do not trigger import restrictions, may contribute PFAS compounds to drinking water.

There is a very large cost associated with meeting the lower guideline values.

"NHMRC is aware that there are ongoing monitoring activities across the country. Publicly available information shows that most water supplies are below the proposed guideline values, but the existence of water supplies with higher PFAS levels cannot yet be ruled out."

It is the experience of *qldwater* that the extend of PFAS contamination in drinking water supplies is not known. In response to a request by Queensland Health voluntary surveillance of PFAS in drinking water schemes across Queensland was conducted in 2018-19. It is understood that that approximately half of the drinking water service providers in Queensland participated in that survey, and that PFAS was detected in several water supply schemes.

Consultation with *qldwater* members has indicated that many service providers have not tested their raw water for PFAS, and thus are unaware of the risk for PFAS in their raw water supplies. This may be particularly relevant for raw water sources that are surface water sources downstream of other communities (wastewater treatment plants), or in proximity to sites associated with past use of firefighting foams.

The immediate cost that will be borne by communities is the "cost to know", which is likely to fall on water service providers in Queensland.

The expectation is that while there are expected to be a small number of water supply schemes, for those that are impacted by PFAS, the implications may be severe (See Case Study 1 below).

Case study 1

PFAS was detected in groundwater in a regional Queensland town in a small regional local government (population < 20,000) area as part of monitoring by Queensland Health in 2018. Groundwater in an adjacent borefield has been used as a raw water supply for the town. Treatment of the town water supply consists solely of disinfection (chlorination).

The risks associated with this supply were mitigated by the sourcing alternative bore water supplies that are not impacted by PFAS contamination. The costs of establishing alternative water supply was

borne by the local government water service provider with support from the state. Expenses incurred to manage the issue (not including PFAS testing) are in excess of $650,000 relating to infrastructure improvements, consultant fees, labour and materials.

The Queensland Water Supply Regulator has required a program of testing of drinking water supply in the affected scheme, which has resulted in the testing of more than 500 samples for PFAS at an estimated cost of $280,000 (plus freight costs estimated at $180,000), to demonstrate compliance with the current Australian Drinking Water Guidelines.

PFAS continues to be detected in the raw water supplies at levels below the current ADWG values, but close to the proposed health-based guideline values. The limit of reporting for the testing was 5 ng/L, which is greater than the proposed health-based guideline value for PFOS.

The local government faces the possibility of needing to find an alternate water supply for the town in order to meet the proposed PFAS guideline values.

Implementation of the guidelines will be challenging for water service providers.

The NHMRC suggests:

> *"Water providers should have discussions with the relevant health authority and/or drinking water regulator on an appropriate implementation plan and how best to supply safe drinking water to communities where drinking water does not meet the new PFAS guideline values."*

And..

> *"As for all chemical guideline values, any detections of PFAS higher than the proposed guideline values should be viewed not as a pass/fail measure but should trigger an investigation of potential sources of contamination in case these can be managed to bring the water supply back under guideline values."*

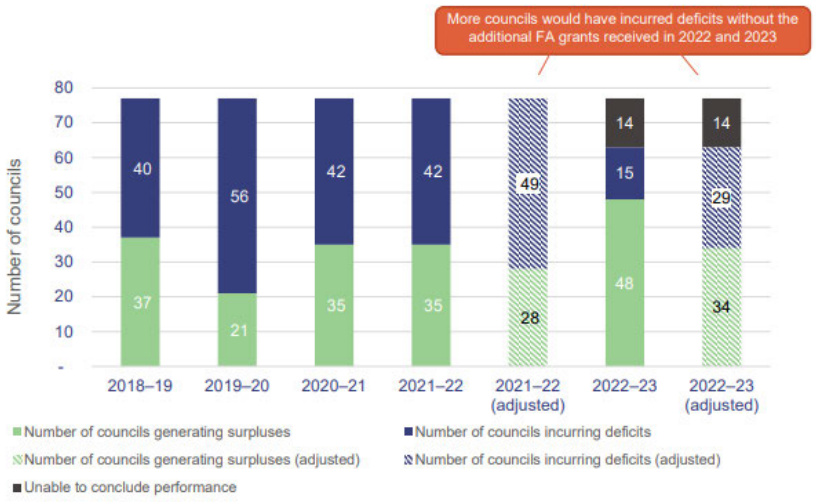
NHMRC has acknowledged that there is public interest in PFAS. Given this interest we believe it is unlikely that the jurisdictional water regulators will not immediately implement the proposed guideline values upon their publication in April 2025. We would therefore advise that the NHMNRC proposes a phase in plan for the proposed guideline values.

The Case Study 1 has highlighted the extreme level of conservatism that may be adopted by the Water Supply Regulator and the costs associated that have been borne by that community to demonstrate compliance with the current PFAS ADWG values.

Queensland communities cannot afford the additional cost burden.

In Queensland, most urban water providers (69 out of 73) are local councils. Queensland's local governments are already financially strained, with 29 Queensland councils incurring a deficit in the 2022-23 financial year (refer to Figure 5G[3]). It is *qldwater's* view that any additional financial strain placed on local governments will see the councils needing to further cut essential services (urban water) funding and/or further increase rates, thereby exacerbating the cost-of-living crisis.

Figure 5G
Number of councils generating operating surpluses and incurring deficits, and the effect of advance FA grants received each year – 2018–19 to 2022–23



Note: adjusted for 2021–22 and 2022–23 indicates operational results if councils received the same proportion of their FA grants as in 2020–21 and before.

Source: Compiled by the Queensland Audit Office from councils' certified financial statements available on 31 October 2023.

The high cost of managing PFAS in drinking water has been recognised in other jurisdictions. Recently the US EPA has announced that it is investing US$10 billion for the removal of PFAS and other emerging contaminants from water, consisting dominantly to assist with the installation of new infrastructure and treatment technologies to address PFAS in drinking water. A similar mechanism is required in Australia to help water service providers to meet the proposed guidance values.

It is unreasonable to expect compliance with a guideline value that cannot be measured in a reliable and repeatable manner.

"National Measurement Institute (NMI) proficiency testing of PFAS in water has indicated a wide range of measurement uncertainty (MU) between the laboratories. The wide range indicates that uncertainties should be considered carefully when reporting results. Laboratories should be reporting uncertainties in

[3] Queensland Audit Office, 2024, 'Financial Audit Report: Local Government 2023 (Report 8: 2023-24)', p. 34, <https://www.qao.qld.gov.au/sites/default/files/2024-01/Local%20government%202023%20%28Report%208%E2%80%93%202023%E2%80%9324%29_0.pdf>.

accordance with ISO 17025 (2018): General requirements of testing and calibration laboratories (NMI 2022).”

Testing proficiency at the detection limits required is not yet widespread as has been acknowledged by the NHMRC. It is counterproductive to set guidance that is beyond the capacity of routine analysis by commercial testing laboratories, even with NATA accreditation. As the guideline values approach the limits of reporting, the probability of false detections, and the resulting requirement for replicate samples and follow up testing increases, which will increase the testing (and associated cost) burden on service providers.

Similarly, it is recognised that sampling of PFAS requires special attention to ensure that contamination of the samples with PFAS from external sources (sunscreen, inks, clothing) does not occur. The limits of detection are approaching or may already have reached the limits of practicality for routine sampling. There is the possibility for unintended consequences as a result of contamination considerations, for example, workers being unable to wear sunscreen during sampling and suffering unnecessary sun exposure.

There are water security implications of the proposed guideline values that must be considered.

Alternative supplies may be rendered unusable as raw water supplies. In times of drought the communities that are dependent on groundwater may be unable to meet the proposed limits. As groundwater levels drop due to reduced aquifer recharge in times of drought, PFAS affected groundwater may be concentrated beyond the capacity of local water supplies to meet guidelines.

The flexibility of water management operations may as be compromised, as outlined in Case Study 2.

In addition, recycled water (treated wastewater effluent) may be rendered unusable as an alternative supply to supplement drinking water.

Case study 2

The drinking water supply for a town in regional Queensland in a small regional local government area (population < 15,000) is comprised of bore water that is treated by disinfection (chlorinated), which is blended with treated water (coagulation, flocculation, clarification, filtration, chlorination) from a nearby dam. The blending of the water sources is used to manage the allocations from the two sources.

The bore water supply is critical to the town to maintain water quality in the event of climate-induced perturbations in the dam raw water supply (e.g. low dissolved oxygen, high manganese, harmful algal blooms).

PFAS has been detected in the bore water supply, but the supply to the network is maintained at levels below the current ADWG for PFAS. The cost of PFAS testing to demonstrate compliance with ADWG is more than $20,000 per sampling round, excluding sample freight costs.

Using existing arrangements, the town water supply will be unlikely to meet the proposed PFAS guidance values.

The dam water supply is currently fully allocated, which will limit the options for management switching to alternate supplies to reduce raw water PFAS levels. The local government may have to implement advanced treatment for the removal of PFAS to meet proposed PFAS guidance values, at an estimated cost of $5-6 million (~$1,200 per connection).

The broader implications of the proposed guidance values must be considered.

It is understood that changes to the guidelines for PFAS may have flow on consequences for other guideline values that are derived from health-based guideline values. For instance, the guideline values for PFAS in recreational waters, and livestock water and potentially even guideline values in the PFAS NEMP 3.0.

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70	**RAINFOREST RESERVES AUSTRALIA** *Development of guidance* The NHMRC's draft guidance on PFAS in drinking water marks a critical step toward managing the health risks posed by these persistent contaminants. However, the guidelines must be strengthened in terms of transparency, legislative compliance, adherence to health-based standards, and effective implementation. Summary of Recommendations: 1. Enhance public accessibility and engagement through simplified summaries and community forums. 2. Ensure legislative compliance by benchmarking against international standards and applying the precautionary principle transparently. 3. Justify health-based values scientifically, with consideration for lower, internationally recognized thresholds. 4. Outline clear roles and responsibilities for monitoring and response, ensuring robust implementation and accountability. 5. Periodically review drinking water additives like fluoride, to stay aligned with global public health discussions. By addressing these areas, NHMRC can improve public trust and ensure that the Australian Drinking Water Guidelines reflect both national health priorities and global best practices. *Implementation or application, Fact Sheet, NHMRC Statement* Submission on Australian Drinking Water Guidelines 2024: PFAS Draft Guidance Review Due Date: 22/11/2024 Author: [redacted], Rainforest Reserves Australia Introduction The presence of Per- and Polyfluoroalkyl Substances (PFAS) in drinking water has raised significant public health concerns due to their persistence in the environment, potential toxicity, and bioaccumulative nature. Recognizing the urgent need to update the Australian Drinking Water Guidelines (ADWG), the National Health and Medical Research Council (NHMRC) has released draft guidance specifically addressing PFAS compounds for public consultation. This submission reviews the NHMRC's proposed guidance, critically analysing key areas such as transparency, legislative compliance, health-based guideline values, implementation, and monitoring. Each section examines potential legislative implications, the impact of PFAS levels on public health, and the adequacy of the proposed measures. 1. Transparency and Public Consultation The NHMRC's public consultation process is intended to incorporate stakeholder input in updating the ADWG. However, the technical complexity of the draft guidance may hinder meaningful public participation. Although public involvement is essential for a credible review, the dense language and technical terminology in the draft guidelines could alienate non-expert stakeholders, potentially restricting feedback to a narrow group of specialists. Recommendations To improve transparency and inclusivity in the consultation process, the NHMRC should: • Provide Accessible Summaries: Offer non-technical summaries in various formats, such as infographics and short videos, that explain key changes, health implications, and environmental impacts in plain language. • Facilitate Community Engagement: Conduct community workshops or virtual forums to explain the proposed changes, address questions, and gather broader public feedback. Such initiatives would ensure a more representative range of perspectives, aligning with the government's commitment to open and transparent policy development. Failure to make the consultation process accessible risks excluding key community insights, which could undermine the credibility and public trust in the NHMRC's policy approach. 2. Legislative Compliance The NHMRC has a responsibility to align the ADWG with up-to-date scientific evidence and regulatory standards, as dictated by the National Health and Medical Research Council Act 1992 and the National Water Quality Management Strategy. The draft guidance aims to set new PFAS guideline values to protect public health. However, concerns remain regarding how well these guidelines comply with international standards and best practices.

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	In particular, there is a legislative mandate for the NHMRC to adopt the 'precautionary principle' in environmental health guidelines. This principle calls for proactive measures when public health risks are evident but scientific uncertainty persists. Currently, the draft PFAS guideline values are higher than those recommended by some international agencies, such as the U.S. Environmental Protection Agency (EPA), raising potential compliance concerns with the precautionary principle. Recommendations To ensure legislative compliance and public safety, the NHMRC should: • Conduct a Benchmarking Analysis: Compare the proposed PFAS values with those established by international health agencies, including the World Health Organization (WHO) and the U.S. EPA. This benchmarking would provide transparency and allow stakeholders to understand why certain standards were selected. • Clarify Application of the Precautionary Principle: Clearly articulate the rationale for any deviation from lower international standards, addressing potential legal and ethical implications if higher PFAS levels are permitted. This transparency is essential for public confidence and legislative accountability. 3. Health-Based Guideline Values The draft guidance proposes health-based values for key PFAS compounds, notably perfluorooctane sulfonic acid (PFOS) and perfluorooctanoic acid (PFOA). Although these values are lower than current Australian standards, they remain higher than those recommended by some international health bodies. The NHMRC has not provided adequate justification for these elevated values, raising questions about the adequacy of these limits in safeguarding public health. Exposure to PFAS is associated with serious health impacts, including developmental, immunological, and carcinogenic effects. Without a clear scientific rationale for adopting higher values or a comparative analysis with lower, internationally recognised standards, there is a risk of compromising public safety. Recommendations To ensure health protection, the NHMRC should: • Provide Scientific Justification: Present a clear, evidence-based rationale for the proposed PFAS values, especially where they exceed international recommendations. This justification should consider the full scope of health risks, with an emphasis on protecting vulnerable populations. • Consider Lower, Conservative Thresholds: Where scientific consensus favours more conservative PFAS limits, NHMRC should adopt these lower thresholds or provide strong reasons for not doing so. Aligning with international standards where possible would reflect best practices and strengthen public health protection. 4. Implementation and Monitoring Effective implementation of the ADWG requires a detailed plan for monitoring and regulatory enforcement. The draft guidelines currently lack a comprehensive implementation strategy, raising concerns about the consistency with which water authorities will monitor PFAS levels, communicate risks, and address non-compliance. Recommendations For robust and transparent implementation, the NHMRC should: • Define Roles and Responsibilities: Clearly outline the roles and responsibilities of each entity involved in implementing the guidelines, including water suppliers, state regulators, and local governments. Defined accountability would improve clarity and effectiveness. • Establish Monitoring Protocols: Specify monitoring frequencies, particularly in high-risk areas or sites with a history of PFAS contamination. Guidelines on reporting exceedances and remediating affected areas are essential for maintaining public trust. • Provide Guidance on Remediation: Ensure that areas with PFAS levels above recommended limits have access to guidance on remediation actions. Such provisions are critical for communities reliant on safe drinking water. 5. Chemicals in Drinking Water and Health Implications

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	A range of chemicals are commonly added to drinking water to maintain safety and quality, though some carry health implications that warrant close monitoring. Below is a list of commonly added chemicals, their intended functions, and associated health risks: 1. Chlorine: Disinfects water by killing pathogens. However, chlorine can form disinfection byproducts (DBPs) like trihalomethanes (THMs), linked to increased cancer risk and reproductive issues (CDC, 2023). 2. Chloramine: Combines chlorine with ammonia for disinfection. May cause respiratory issues and skin irritation in sensitive individuals (CDC, 2023). 3. Fluoride: Prevents tooth decay but can lead to dental and skeletal fluorosis if consumed in excess (CDC, 2023). 4. Aluminum Sulfate (Alum): Used as a coagulant, with high exposure potentially linked to neurological issues (CDC, 2023). 5. Ozone: Applied for disinfection, though may form bromate, a possible carcinogen, if bromide is present (CDC, 2023). 6. Polyphosphates: Control corrosion and scaling; excessive ingestion may impact calcium metabolism (CDC, 2023). 7. Activated Carbon: Removes organic compounds, taste, and odor, with minimal health risks (CDC, 2023). 8. Potassium Permanganate: Controls taste, odor, and removes metals; excessive exposure may irritate skin and respiratory system (CDC, 2023). 9. Sodium Hydroxide: Adjusts pH levels but can cause irritation if used in excess (CDC, 2023). 10. Copper Sulfate: Controls algae; high intake can cause gastrointestinal and liver issues (CDC, 2023). Given these chemicals' health implications, NHMRC should consider cumulative effects and potential interactions to fully assess drinking water quality risks. 6. Recent Developments in U.S. Fluoride Policy In the United States, public health policies on fluoride in drinking water have come under scrutiny. Recently, Robert F. Kennedy Jr. and others have advocated for removing fluoride, citing health risks such as dental fluorosis, skeletal fluorosis, and potential neurological effects. While the CDC and American Dental Association maintain that controlled fluoride levels are safe and beneficial, critics argue for re-evaluation based on emerging scientific evidence (Reuters, 2024). Australian Context In Australia, fluoride is added to drinking water as a dental health measure. However, given international debate, it may be prudent for NHMRC to periodically review fluoride's benefits and risks, ensuring the ADWG remains aligned with current scientific understanding and public health priorities. Conclusion The NHMRC's draft guidance on PFAS in drinking water marks a critical step toward managing the health risks posed by these persistent contaminants. However, the guidelines must be strengthened in terms of transparency, legislative compliance, adherence to health-based standards, and effective implementation. Summary of Recommendations: 1. Enhance public accessibility and engagement through simplified summaries and community forums. 2. Ensure legislative compliance by benchmarking against international standards and applying the precautionary principle transparently. 3. Justify health-based values scientifically, with consideration for lower, internationally recognized thresholds. 4. Outline clear roles and responsibilities for monitoring and response, ensuring robust implementation and accountability. 5. Periodically review drinking water additives like fluoride, to stay aligned with global public health discussions. By addressing these areas, NHMRC can improve public trust and ensure that the Australian Drinking Water Guidelines reflect both national health priorities and global best practices. References • CDC. (2023). Chemicals that can Contaminate Tap Water. Retrieved from Centres for Disease Control and Prevention. • CDC. (2023). Fluoride Benefits and Risks in Drinking Water. Retrieved from Centres for Disease Control and Prevention.

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	• NHMRC. (2024). Australian Drinking Water Guidelines: Public consultation now open. Retrieved from https://www.nhmrc.gov.au/about-us/news-centre/australian-drinking-water-guidelines-public-consultation-now-open • NHMRC. (2024). Australian Drinking Water Guidelines - Public Consultation on Draft Guidance for PFAS. Retrieved from https://consultations.nhmrc.gov.au/environmental-health/australian-drinking-water-guidelines-2024-pfas/ • Health. (2023). Fluoride in Drinking Water: Current Benefits and Concerns. Retrieved from Health. • Reuters. (2024). Column: Anti-Fluoride Push Grows in the U.S. as Legal Rulings Drive Debate. Retrieved from Reuters. • United States Environmental Protection Agency (EPA). (2022). Drinking Water Health Advisories for PFOA and PFOS. Retrieved from https://www.epa.gov/sdwa/drinking-water-health-advisories-pfoa-and-pfos
71	**INDIVIDUAL RESPONSE 40** Permission not given to publish.
72	**INDIVIDUAL RESPONSE 41** *Development of guidance* Overall approach seems thorough and helps build trust
73	**INDIVIDUAL RESPONSE 42** *Development of guidance* The advice below is quite outdated. With advances in LC-MS/MS technologies and laboratory techniques combined with the fact that the ""Gold"" standard of isotope dilution mass spectrometry is performed, the measurement uncertainty (MU) should be revised/updated in accordance with later NMI studies. In AQA 23-14 PFAS in Soil and Water, the MU for PFHxS was 6.5%, and for PFOS, the MU was 8.3%. Data for AQA 24-14 PFAS in Soil and Water is in draft and will be published in Q1 2025. A laboratory measurement uncertainty of +/- 20-30% was shown in water samples tested for PFOS and PFOA in the NMI's Proficiency Test Report AQA 16-06 PFOS/PFOA in Fish, Soil and Water (2016). Robust averages were calculated using the procedure set out in ISO13528:2015I. Reported or estimated uncertainties should be considered carefully when comparing results (NMI, 2016). *Fact Sheet* In light of my earlier comments on MU, the statement below is incorrect, IMHO. Yes, MU is important, and yes, clients should ask for MU, but you really should define MU very carefully; otherwise, there is a great chance for misinterpretation! National Measurement Institute (NMI) proficiency testing of PFAS in water has indicated a wide range of measurement uncertainty (MU) between the laboratories. The wide range indicates that uncertainties should be considered carefully when reporting results. Laboratories should be reporting uncertainties in accordance with ISO 17025 (2018): General requirements of testing and calibration laboratories (NMI 2022)
74	**INDIVIDUAL RESPONSE 43** Permission not given to publish.
75	**SAVE OUR SURROUNDINGS RIVERINA** *Development of guidance* There is a lack of consideration & determination of the inevitable serious/irreversible contamination risks for the most problematic Public Health & Safety disaster EVER that is being DELIBERATELY IGNORED - that of poisoning our essential, life-sustaining, FOOD producing land & vital Water Sources with Solar/Wind Electricity Generating Works &

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	Battery Energy Storage Systems due to Solar's numerous, toxic heavy metals including lead, toxic Bisphenol A shedding from Wind Turbine Blades & PFAS from Filthy, Fire Hazardous BESS. **Leaching Via Weak Spots in Solar Panels https://www.researchgate.net/publication/348883160_Leaching_via_Weak_Spots_in_Photovoltaic_Modules "Our long-term experiments clearly demonstrate that it is possible to leach out all, or at least a large amount, of the (toxic) elements from the photovoltaic modules. It is therefore not sufficient to carry out experiments just over 24 h and to conclude on the stability and environmental impact of photovoltaic modules." **Solar Realities - Physicist John Droz jr https://election-integrity.info/Energy/Solar_Energy_Concerns.pdf **Contamination from Industrialised Solar's Galvanised Steel Supports https://www.facebook.com/share/p/srbXaCbKgVXocgsm/?mibextid=xfxF2i **Unmasking the Toxic Truth - The Solar Panel Waste Story https://youtu.be/_Ck2dHfU3s?si=0WS5CYhuCb6hNvP0 **WIND TURBINES ARE A FAKE GREEN SCOURGE - SHEDDING TONNES OF MICROPLASTICS FROM WIND TURBINE BLADES (KNOWN AS 'LEADING EDGE EROSION') - AFTER ONLY A FEW YEARS OF OPERATION. **https://stopthesethings.com/category/bisphenol-a-wind-turbine-blades/ **Bisphenol A Pollution from Wind Turbines - Tim Smith 13/07/2023 "Bisphenol A is the most toxic substance we know' - Swedish Environmental Protection Agency https://docs.wind-watch.org/Bisphenol-A-Pollution-Wind-Turbines.pdf ** Will Bisphenol A be the PFOS of Wind Energy? https://www.zeeland.nl/sites/default/files/digitaalarchief/IB23_b50318e9.pdf **https://bergensia.com/bisphenol-a-in-wind-turbines-damages-human-fertility/es-human-fertility/ **The wind industry openly admits that any turbine will shed at least 60kg of microplastics per year into the atmosphere which will find their way into soil profiles and waterways. That would be the equivalent of about 50 tons of pure unadulterated BPA pollutants over the life of a typical 100-turbine wind farm (20 years) finding its way into catchments. Now think about that number and its consequences for the environment and farm produce! **GROUND WATER SUPPLIES MUDDIED BY PILE DRIVING FOR THE MASSIVE WIND TURBINE BASES. *Wind farm woes continue as Victorian turbines fail after only five years – www.cairnsnews.org - 11th April 2024 https://cairnsnews.org/2024/04/11/wind-farm-woes-continue-as-victorian-turbines-fail-after-only-five-years/ **'Forever chemicals' used in lithium ion batteries threaten environment, research finds | Lithium-ion batteries | The Guardian 14/7/24 https://www.theguardian.com/technology/article/2024/jul/14/forever-chemicals-lithium-ion-batteries-environment **Safety of Grid Scale Lithium-ion Battery Energy Storage Systems "The scale of Li-ion BESS energy storage envisioned at "mega scale" energy farms is unprecedented and requires urgent review. The explosion potential and the lack of engineering standards to prevent thermal runaway may put control of "battery fires" beyond the knowledge, experience and capabilities of local Fire and Rescue Services. BESS present special hazards to fire-fighters...." https://www.researchgate.net/publication/352158070_Safety_of_Grid_Scale_Lithium-ion_Battery_Energy_Storage_Systems **Grid Scale Batteries & Fire Risk https://static1.squarespace.com/static/656f411497ae14084ad8d03a/t/66fd2383b56dbc6906390297/1727865736681/Fannon-Batteries.pdf

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	**Gateway Energy Storage System Fire: Otay Mesa, CA - YouTube https://www.youtube.com/watch?v=A7UY4ioP4VQ It's not very clear what the approach is & who is actually setting the agenda. *Implementation or application* It needs to be fully transparent & guided by reputable, independent, peer reviewed expert research NOT Woke Ideological Nonsense! The Gov, Bureaucracy & Woke Bodies/Agencies have proven completely untrustworthy when it comes to the ECOCIDAL, Fake Green RenewaBULL Swindle! First & foremost there needs to be an IMMEDIATE MORATORIUM & INDEPENDENT FEDERAL INQUIRY/ROYAL COMMISSION REGARDING THE FAKE GREEN, TOXIC CONTAMINATING RENEWABULL SWINDLE AS THIS FRAUD IS NOT ONE BIT CLEAN OR SUSTAINABLE! ALL OF THIS JUNK IS ENVIRONMENTALLY DESTRUCTIVE & CREATING A MASSIVE TOXIC WASTE BURDEN - WITH TOXIC SOLAR PANELS, WIND TURBINE BLADES & FILTHY BESS A SERIOUS/IRREVERSIBLE PUBLIC HEALTH & SAFETY DISASTER FOR AUSTRALIANS - OUR LIFE SUSTAINING AIR, SOIL & WATER - DUE TO TOXIC PFAS - PFOS CONTAMINANTS SHEDDING & LEACHING SO EXTENSIVELY EVERYWHERE - INCLUDING IN OUR WATER-WAYS & AGRICULTURAL FOOD BOWLS! INCLUDING 'Forever Chemicals' - PFAS - PFOS - Bisphenol A shedding from Turbine Blades, PFAS from BESS, & Toxic Perfluorooctane sulphonate (PFOS) from Solar Panels. **Solar Realities - Physicist John Droz jr https://election-integrity.info/Energy/Solar_Energy_Concerns.pdf 'We know that these are some of the toxic (some carcinogenic) chemicals that have been identified as likely being in solar panels (click on the links to get an idea of what some of the adverse health consequences are): Per- and Polyfluoroalkyl Substances (PFAs) (also see here and here) Perfluorooctane sulphonate (PFOS) Polytetrafluoroethylene (PTFE) Fluorinated Ethylene (FEP) Cadmium Telluride Copper Indium Selenide Cadmium Gallium diselenide Copper Indium Gallium diselenide Silicon Tetrachloride Hexafluoroethane Polyvinyl Fluoride Also, here is a basic explanation of the silicon manufacturing part of solar panels. The following are some additional toxic chemicals that have been identified as possibly being involved in the fabrication of solar panels, which might end up in the finished product: Hydrogen chloride Silicon tetrachloride Hydrochloric acid Sulfuric acid Nitric acid Sulfuric acid Polycyclic aromatic hydrocarbons Formaldehyde Arsine gas Trichlorosilane gas Silane gas Sulfur dioxide Sulfur hexafluoride Sodium hydroxide Potassium hydroxide Lead ..... ** Will Bisphenol A be the PFOS of Wind Energy?

NO.	CONSULTATION SUBMISSION
	https://www.zeeland.nl/sites/default/files/digitaalarchief/IB23_b50318e9.pdf **https://docs.wind-watch.org/Bisphenol-A-Pollution-Wind-Turbines.pdf **(PDF) Accumulation of microplastics in edible tissues of livestock (cow and sheep) researchgate.net **https://stopthesethings.com/category/bisphenol-a-wind-turbine-blades/ **https://bergensia.com/bisphenol-a-in-wind-turbines-damages-human-fertility/es-human-fertility/ **Forever chemicals' used in lithium ion batteries threaten environment, research finds | Lithium-ion batteries | The Guardian 14/7/24 https://www.theguardian.com/technology/article/2024/jul/14/forever-chemicals-lithium-ion-batteries-environment **Safety of Grid Scale Lithium-ion Battery Energy Storage Systems "The scale of Li-ion BESS energy storage envisioned at "mega scale" energy farms is unprecedented and requires urgent review. The explosion potential and the lack of engineering standards to prevent thermal runaway may put control of "battery fires" beyond the knowledge, experience and capabilities of local Fire and Rescue Services. BESS present special hazards to fire-fighters...." https://www.researchgate.net/publication/352158070_Safety_of_Grid_Scale_Lithium-ion_Battery_Energy_Storage_Systems **Grid Scale Batteries & Fire Risk https://static1.squarespace.com/static/656f411497ae14084ad8d03a/t/66fd2383b56dbc6906390297/1727865736681/Fannon-Batteries.pdf *Fact Sheet* There is nothing specific mentioned at all that considers the specific FOREVER CHEMICAL contaminants leaching & shedding from the Devastating ECOCIDAL Industrialised Solar/Wind Electricity Generating Works & residual BESS impacts that are contaminating our limited, irreplaceable FOOD Resource Land & Vital Water Sources FOREVER! Who is Determining the Public Health & Safety Risks from these unethically imported CCP Slave Labour Supply Chain products - creating a TOTALLY UNREGULATED TOXIC CONTAMINATION DISASTER??!! HIGHLIGHT AWARENESS OF & THE NEED FOR AN IMMEDIATE MORATORIUM ON TOXIC CONTAMINATING SOLAR PANELS, WIND TURBINE BLADES & FILTHY, FIRE HAZARDOUS BESS. NHMRC Statement This needs to be more comprehensive - with more detail & stricter controls. Wagga Wagga already has a PFAS plume moving down the Murrumbidgee River - Wagga's Water Supply - as well as Toxic Heavy Metals leaching into Bomen's highly productive FOOD Bowl & waterways that flow into the Murrumbidgee River - with far more of this TOXIC JUNK PLANNED + DISASTROUSLY UNHEALTHY PFAS CAUSING FILTHY BIG BATTERIES & NOBODY CARES!! Include URGENT WARNINGS TO ALL COUNCILS HOSTING SOLAR/WIND ELECTRICITY GENERATING WORKS- - as they are ULTIMATELY RESPONSIBLE FOR ANY LAND/WATER CONTAMINATION/POLLUTION THAT WILL INEVITABLY BE CAUSED BY THESE PFAS - PFOS LEACHING/SHEDDING MONSTROSITIES UNDER THE POEO ACT.
76	**SENVERSA** *Development of guidance* _____ Technical basis of the health-based DWG for PFOS _____

NO.	CONSULTATION SUBMISSION
	The PFOS health-based DWG selected by the advisory committee is based on increased incidence of extramedullary haematopoiesis and bone marrow hypocellularity (NTP 2022), using the modelled serum BMDL10 derived by US EPA as the POD. This POD does not appear to be the most appropriate value on which to base a health-based DWG: • Both SLR and the independent expert (Dr Brian Priestly) identified that there were large discrepancies between the USEPA (2024) estimated BMDL from the NTP (2022) study data and the lowest experimental NOAEL in the study, and that the reasons for this are not known. The candidate DWG of 77 ng/L (based on the serum NOAEL) was therefore concluded by SLR to be of high confidence, while lower confidence was placed in the HBGV of 4 ng/L selected by the advisory committee (based on the BMDL). This was also recognised in the Administrative Report Evidence-to-Decision table, which acknowledged that the BMDL modelled by USEPA did not reconcile with experimental serum data (p. 40) and that higher confidence is placed in the HBGV of 77 ng/L derived using the experimental NOAEL (p. 47). • It is therefore unclear why the BMDL10 was selected as the POD, given that it is substantially lower than the concentrations at which no effect was observed. Specifically, the rationale for the advisory committee opinion that use of the BMDL was "a more statistically robust approach" than the NOAEL approach is not clear (p. 46 of Administrative Report), given the large discrepancy between measured and modelled data. • enHealth 2012 Environmental Health Risk Assessment Guidelines for assessing human health risks from Environmental Hazards states that a key benefit of benchmark dose modelling is that it "uses responses within or near the experimental range rather than relying on extrapolations to doses considerably below the experimental range" and that BMD values are commonly similar to NOAEL, or between NOAEL and LOAEL values (as might be logically expected). In this context, it is unclear how the selected BMDL10 (extrapolated far below the NOAEL) can be characterised as a meaningful or preferred POD. • Furthermore, while the endpoint is assessed to be relevant in humans, the clinical significance of the magnitude of change represented by the modelled BMDL10 is unclear. The DWG associated with the lowest level of uncertainty (77 ng/L, based on the NOAEL from NTP, 2022) therefore appears appropriate to be selected as the preferred value. This DWG is based on a POD at which effects were not observed, and is associated with a higher level of confidence than the BMDL10 from the same study. It is also similar to other candidate DWGs for PFOS identified in the SLR Addendum to PFAS Evidence Evaluation for Australian Drinking Water Guidelines Chemical Fact Sheets. The reason stated in the Administrative Report for not recommending this guideline option is that "a lower, more conservative guideline value for PFOS was available." However, as noted above the "lower, more conservative guideline value" also has lower confidence. This decision therefore prioritises conservatism over health evidence, which is inconsistent with other statements in the Evidence-to-Decision table: "the choice of a guideline option should balance the need for conservatism against the highest quality evidence..." (p. 41). It is also noted that the independent expert (Dr Brian Priestly) stated (p. 118 of Administrative Report): "It is not entirely clear how the different Benchmark doses (BMD) used for POD were calculated from the study data, but it appears that SLR essentially relied on values calculated by the USEPA in the case of PFOS, or by NTP, OEHHA for PFHxS and PFBS." This statement indicates that a full review of the BMDL modelling was not within SLR's contracted scope, and therefore that there may be technical issues with the BMDL modelling by USEPA. Given the significant implications of using the lower confidence BMDL10 as the POD (rather than the study NOAEL with higher confidence) for HBGV derivation, a clear understanding of whether the BMDL modelling is valid and robust is warranted. A more detailed and rigorous technical review of this modelling is considered warranted if the BMDL modelled by USEPA (2024) is to be used as the POD for establishing the PFOS HBGV. --- Additional considerations in the selected DWG for PFOS --- As discussed in the Administration Report, the selection of the DWG has considered additional factors beyond the health evidence profile.

NO.	CONSULTATION SUBMISSION
	The Administration Report presents a range of candidate DWG which are all characterised as "protective of public health for the general population, including groups that may be more sensitive (e.g. infants, children and pregnant women", and also indicates that the use of a study assessed as "high confidence" (i.e. NTP (2022) or Luebker et al. (2005)) is the preferred approach, and will be more acceptable to stakeholders. The report additionally indicates: "Lower guideline options are more conservative options compared to higher guideline values. However, the choice of guideline option should balance the need for conservatism against the highest quality evidence and whether the health endpoints under consideration (if using animal studies) are most relevant and critical to humans." On a technical basis alone, and noting that all candidate DWG are characterised as protective of public health, the DWG associated with the lowest level of uncertainty (77 ng/L, based on the NOAEL from NTP, 2022) therefore appears appropriate to be selected as the preferred value. However, the Administration Report highlights that selection of the DWG has considered not only the health evidence profile but also a number of other factors, including: • health benefits vs. harms: when adopting a DWG specifically, a more precautionary (more conservative) approach may be preferred to increase public confidence. "Lower guideline options are more conservative options compared to higher guideline values" (p. 41 of Administrative Report); • consumer and community values and preferences: there is potential for ongoing public concern "if Australian advice doesn't completely align with other international agencies that have adopted more conservative guideline values or used different critical health endpoints" (p. 42 of Administrative Report); • feasibility: all guideline options including the lowest option of 4 ng/L are assessed as feasible to achieve for public water supplies (p. 44 of Administrative Report). In this context, the rationale for selection of a DWG of 4 ng/L is acknowledged, and this rationale is considered broadly reasonable, because the selected value: a) is protective of public health; b) provides additional conservatism and a higher level of stakeholder confidence as it aligns with the USEPA MCL; c) is feasibly achieved in public drinking water supplies. However, there is value in more clearly documenting the manner in which these factors have influenced the selected DWG. This could include separate documentation of: • the recommended health-based guidance value and associated health-based DWG based on purely technical/risk-based considerations; and • a more stringent value which has been selected as the DWG taking into account additional precautionary, stakeholder and feasibility considerations. Providing transparency regarding the additional considerations that have fed into the selected DWG provides greater clarity regarding the health-based guideline values which are most appropriate on a technical basis. This in turn has impacts on the application of the health-based guideline values for pathways other than drinking water. For these pathways, the additional (non-technical) considerations which have fed into the DWG may not be applicable (see response to Question 10 for further commentary). *Implementation or application* The discussion of 'Resource Impacts' in the PFOS Evidence-to-Decision table (p. 55 of Administrative Report) considers only impacts on the water sector / water providers. It does not acknowledge impacts to other industries or stakeholders, including implications for risk assessment and management of PFAS-contaminated sites. While it is acknowledged that the intent of the review is specifically to develop DWG, the guidance as presented will have more broad implications on PFAS assessment, even if these consequences are unintended. Specifically, if

NO.	CONSULTATION SUBMISSION
	finalised, the proposed new HBGV for PFOS will represent the most contemporary and comprehensive review of PFOS toxicity by an Australian health authority. Therefore, in accordance with enHealth (2012) 'Guidelines for assessing human health risks from environmental hazards Health Risk Assessment' and the National Environment Protection (Assessment of Site Contamination) Measure (ASC NEMP) Schedule B4, the new HBGV will most likely immediately become the most appropriate to use in human health risk assessments of PFOS exposure via all environmental media and/or exposure pathways. Use of the FSANZ (2017) TDI would no longer be consistent with relevant risk assessment guidance because it would not be possible to demonstrate that it reflected the most recent body of knowledge and/or recommendations of the leading Australian health agency. Health risk assessment practitioners might therefore reasonably be expected by regulators, environmental auditors and other stakeholders to apply the new HBGV when assessing risks associated with other environmental media and exposure pathways, including dietary exposure, regardless of whether FSANZ or other agencies update their documents and criteria. It is noted that NHMRC's response to feedback received during targeted consultation stated 'The tolerable daily intake used by other agencies might not change as a result of the NHMRC review – this is up to the relevant agencies' (p. 91 of Administrative Report). While it is acknowledged that commenting on the broader use of the TDI is outside the scope of the review, it is nonetheless the case that for the reasons stated above, a newly published HBGV by NHMRC might immediately be expected to be broadly applied in environmental health risk assessment in accordance with enHealth and ASC NEPM guidance. Given the above, the assessment of 'Resource Impacts' should ideally consider that (as already pointed out in the targeted consultation feedback on p. 91 of the Administrative Report): • The proposed HBGV is essentially similar to the background exposure level in the Australian population indicated by pooled blood data, i.e. if the HBGV is considered appropriate, many Australians appear to be currently exposed above a level of potential health concern. • If the proposed HBGV is used to identify safe levels in some foods (particularly meat and fish), the resulting value would be below achievable limits of reporting, i.e. it may no longer be possible to conclude whether meat or fish consumed in Australia is safe to eat. • If the proposed HBGV is applied to derivation of soil or biosolids criteria for agricultural land uses (e.g. raising of livestock or produce for human consumption), many of the resulting values would be below laboratory LORs, i.e. it may no longer be possible to conclude that land is safe for livestock raising. Furthermore, PFAS are often detectable even in soils sampled from remote areas away from primary or secondary sources of contamination (Rankin et al.,2016. DOI: 10.1016/j.chemosphere.2016.06.109). As such, the approach may indicate that typical ambient levels throughout Australia are potentially unsafe, rendering land unsuitable for agriculture. • If the proposed HBGV is applied to derivation of Health Investigation Levels for soil, the resulting value for low-density residential land use may also indicate that typical ambient levels throughout Australia are potentially unsafe, rendering land unsuitable for unrestricted residential use. Such a situation is likely to not only have mental health and wellbeing impacts on communities (since it will not be possible to conclude whether community exposures are below the HBGV), but may also lead to a situation where consultants, risk assessors, environmental auditors and regulators will have no method of concluding what remediation or risk management is necessary for sites with PFAS contamination – other than requiring clean up to LORs and/or exposure controls even where identified PFAS is attributable to ambient conditions. If this outcome was supported by the available toxicological reviews and health evidence, then it would follow that (irrespective of these consequences) such an approach is required and warranted to protect public health, and the proposed PFOS HBGV should be adopted in conjunction with the development of practical solutions. However, as per our response to Question 9, the proposed PFOS HBGV was concluded by multiple experts (SLR and Dr Brian Priestly) to have lower confidence than an alternative candidate value based on the same toxicological study, but using the NOAEL as the point of departure, rather than the BMDL.

NO.	CONSULTATION SUBMISSION
	Therefore, if the currently proposed DWG (i.e. for all assessed PFAS) are to be retained, we suggest that, as a minimum, clear guidance be provided in the Fact Sheet to clarify whether: a) the HBGVs on which the DWG are based are the preferred HBGVs based on the health evidence profile, and are therefore also relevant to be applied to assessment of other environmental media pathways; or b) the adopted approach to derive the DWG is based on additional considerations beyond the health evidence profile (which apply to drinking water exposure only); in this case there would be value in additionally recommending the HBGVs which would apply based on the health evidence profile alone. This would provide a clear and valuable alternative approach to be applied where these additional considerations do not apply (e.g. for other media/exposure pathways). Without a clear statement to this effect, there could be inconsistency in selection of HBGVs for use in PFAS risk assessments, and inconsistency in acceptance by regulators and/or environmental auditors (e.g. some practitioners may use the FSANZ TDIs for food consumption but the NHMRC HBGVs for water exposure – which is not a logical outcome or consistent with enHealth and ASC NEMP guidance, but seems to be suggested in the Administrative Report as a possible scenario). *Fact Sheet* The draft PFAS Fact Sheet (page 14, last bullet point) states that "The calculated value of 3.4 ng/L is rounded to a health-based guideline value of 4 ng/L as per the rounding conventions described in Chapter 6." The basis for rounding up is unclear, and warrants further clarification and/or correction, noting that Chapter 6 of the ADWG states that guideline values should be rounded to a single significant figure. This would result in a value of 3.4 ng/L rounding down to 3 ng/L, not up to 4 ng/L. If this decision has been made for harmonisation with the USEPA, this would ideally be transparently discussed. *NHMRC Statement* The draft NHMRC Statement on PFAS in drinking water, together with the Administration Report, refers to the drinking water guidelines as "Health-based guidance values". However, in the Evidence Evaluation documents, the term "Health-based guidance values" is used to refer to the acceptable intakes / TDI (in ng/kg/day) rather than the resulting drinking water guidelines (which are referred to as the "Health-based DWG"). It is suggested that consistent language be adopted across all documents, and that separate standard nomenclature is provided for DWG vs. acceptable intakes / TDI. This will allow for future clarity and disambiguation whenever these values are referenced.
77	**SHELLHARBOUR CITY COUNCIL** *Implementation or application* 1. Ensure there are adequate resources within the state government to identify contaminated sites, undertake testing, and identify management and improvement options 2. Clear communication between the responsible agencies, Local Government and the community including clear guidance on actions required if PFAS levels exceed safe standards. 3. Consideration should also be given to controls to restrict the ability for PFAS to be utilised in buildings, such as in air conditioning systems. Please note, the above statements reflect the views of Council staff, not necessarily those of our elected representatives.
78	**INDIVIDUAL RESPONSE 44** Permission not given to publish.

‘STOP PFAS’ Submission to the NHMRC

Australian Drinking Water Guidelines – Public Consultation on Draft Guidance for Per- and Polyfluoroalkyl Substances (PFAS)

I am writing a submission on behalf of the ‘Stop PFAS’ community group here in the Blue Mountains of NSW. As you may be aware, testing carried out by Sydney Water in June 2024 showed that our local drinking water has elevated levels of PFOS and PFHxS forever chemicals.

These current PFOS levels are more than double the recommended levels of 4 ng/L that were recently published by the NHMRC in their draft Australian Drinking Water Guidelines (ADWG).

The Sydney Water tests from June showed that PFAS levels in Blue Mountains tap water were 306 times higher than those in Warragamba Dam, which supplies tap water to Sydney. These elevated PFAS levels led to the closure of two local drinking water dams in the Blue Mountains.

This has caused significant concern in our community regarding how we came to be drinking PFAS-contaminated water over such a long period without knowing it.

Our experience in dealing with this PFAS issue in our local drinking water informs the following submission to the NHMRC.

1) CONCERN ABOUT INCORRECT DATA IN NHMRC’S RESEARCH AND FACT SHEET

We are concerned that the new draft guidelines would potentially allow the PFOA ‘forever chemical’ to be in Australian tap water at levels 50 times higher than what the United States considers safe under its National Primary Drinking Water Regulations (NPDWR).

In the NHMRC fact sheet on your web site, it states that

> *“PFOA has been detected at concentrations ranging from below detection to **9.7 ng/L** in Australian raw and/or reticulated drinking water supplies.”*[1]

Your PFOA figures here are not correct.

We are currently liaising with a mainstream newspaper on a story that will reveal that a major Australian city has PFOA in its drinking water at levels above 30 ng/L.

This is more than three times higher than the highest PFOA level stated by the NHMRC in its fact sheet. The raw water figures are even higher.

Our initial concern is this: If the NHMRC can be wrong on a basic PFAS fact like this, what else has NHMRC got wrong in its review of PFAS levels in Australian drinking water?

[1] https://consultations.nhmrc.gov.au/environmental-health/australian-drinking-water-guidelines-2024-pfas/supporting_documents/Draft%20Fact%20Sheet%20%20PFAS%20Public%20Consultation.pdf

These PFOA and PFOS figures were obtained through an FOI request. They have not been revealed publicly by the water entity involved. PFOS levels in the drinking water of this major city are also in excess of the draft ADWG.

If the water sector is not sharing this kind of information with the NHMRC for its PFAS review, what else might the water sector be withholding regarding PFAS chemicals in our water supply and our drinking water?

Did the water sector give incorrect data to the NHMRC in order to downplay the Australian public's exposure to PFOA and PFAS chemicals in their drinking water? This must be considered.

We would argue that this is a very good reason to reassess the proposed high level of 200 ng/L of PFOA in the draft AWDG. In our view, PFOA levels in Australian drinking water should match the 4 ng/L level introduced in the United States.

A SUMMARY OF OUR CONCERNS

The issue of PFAS contamination is a growing issue. Our lawyer informs us that in 2021, there were 170 locations listed on the PFAS chemicals map. Today in 2024, there are 1,152 locations listed on this map.[2]

This is a clear indication of why PFAS chemicals have been described as "the next asbestos."

Below is a summary of our key concerns:

2) MATCH THE AMERICAN SAFE LEVELS OF PFAS CHEMICALS IN DRINKING WATER

Back in April 2024, the Biden-Harris administration issued the first-ever national, legally enforceable drinking water standard to protect American communities from exposure to harmful PFAS chemicals.

This drew media and public attention to Australia's current drinking water guidelines, which allow far higher levels of PFAS forever chemicals in our tap water.

Chemical	Maximum Contaminant Level Goal (MCLG)	Maximum Contaminant Level (MCL)
PFOA	0	4.0 ppt
PFOS	0	4.0 ppt
PFNA	10 ppt	10 ppt
PFHxS	10 ppt	10 ppt
HFPO-DA (GenX chemicals)	10 ppt	10 ppt
Mixture of two or more: PFNA, PFHxS, HFPO-DA, and PFBS	Hazard Index of 1	Hazard Index of 1
Maximum Contaminant Level Goal (MCLG): The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety and are non-enforceable public health goals.		

As shown above, America's NPDWR offers more protection against PFAS forever chemicals than the new draft ADWG in the table below.

We believe the draft ADWG should align with America's NPDWR PFAS levels.

[2] https://pfas.australianmap.net

Chemical	Existing ADWG level	Draft updated level
PFOS	**70** ng/L or 70 parts per trillion (Less than 0.07 micrograms per litre of PFOS and PFHxS combined)	**4** ng/L (Less than 0.004 micrograms per litre)
PFHxS		**30** ng/L (Less than 0.03 micrograms per litre)
PFOA	**560** ng/L, or 560 parts per trillion (Less than 0.56 micrograms per litre)	**200** ng/L (Less than 0.2 micrograms per litre)
PFBS	-	**1000** ng/L (Less than 1.0 micrograms per litre)

There is strong evidence that PFAS exposure can cause cancer in laboratory animals. This evidence prompted the International Agency for Research on Cancer to classify certain PFAS as carcinogenic to humans on the basis that PFAS exposure may lead to an increased risk of certain types of cancers.[3]

The US Environmental Protection Agency (US EPA) cites peer-reviewed studies that show exposure to certain levels of PFAS may lead to other health impacts, including:

- Decreased fertility
- Developmental delays
- Increased cholesterol levels (this seems to be an issue in the Blue Mountains)
- Increased risk of obesity.[4]

We request that the final ADWG guidelines reflect the emerging body of scientific evidence pointing to the risks associated with PFAS exposure and align with the limits imposed by the United States.

3) FAILURE TO CONSULT THE US EPA

The US EPA has informed us in writing that the NHMRC did **not** approach it during its review of PFAS levels in Australian drinking water. The US EPA stated:

> ***"EPA has not liaised with Australia's National Health and Medical Research Council or any related entities regarding PFAS guidelines for drinking water."***

This lack of consultation is concerning. The US EPA further stated:

> *"EPA has used the best available peer reviewed science on PFAS to set national standards. The agency's support documents and related materials used to inform development of the PFAS drinking water regulation are available at https://www.regulations.gov/docket/EPA-HQ-OW-2022-0114/document. There are more than 2,100 of these materials, many of which are technical reports, peer reviewed manuscripts, and other technical information."*

Given their extensive research into the health impacts of PFAS chemicals in drinking water, why did the NHMRC not approach the US EPA during its review process?

If the US EPA claim is accurate, it causes significant concern that the NHMRC has not tapped into the knowledge and experience of a major American government agency on this PFAS issue.

Why did the NHMRC not directly consult with the US EPA on how they reached their decision on setting lower levels of PFAS chemicals for drinking water? Is this not a major oversight?

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[3] Source: International Agency for Research on Cancer "IARC Monographs evaluate the carcinogenicity of perfluoroocatanoic acid (PFOA) and perffluorooctanesulfonic acid (PFOS) https://www.iarc.who.int/news-events/iarc-monographs-evaluate-the-carcinogenicity-of-perfluorooctanoic-acid-pfoa-and-perfluorooctanesulfonic-acid-pfos/

[4] Source: US EPA "Our current understanding of the Human Health and Environmental Risks of PFAS https://www.epa.gov/pfas/our-current-understanding-human-health-and-environmental-risks-pfas

4) PFOS LEVELS

We would like to thank the NHMRC for recommending the level of 4 ng/L for PFOS in Australia's drinking water. We fully support this decision.

Currently, our drinking water in the Blue Mountains has PFOS levels more than double this 4 ng/L level (and at one point, four times higher). As such, a 4 ng/L recommendation for PFOS levels will lead to safer drinking water in the Blue Mountains.

5) PFOA LEVELS

Late last year, the PFOA chemical was classified as carcinogenic by the World Health Organisation. When the United States introduced its drinking water guidelines in March 2024, Australia allowed a level of 560 ng/L of PFOA in drinking water—140 times higher than the 4 ng/L American safe level. This 560 ng/L level is still considered "safe" in Australia today.

This 560 ng/L PFOA level is now seen as inadequate in Australia. **Our concern is that the draft figure of 200 ng/L will also be seen as inadequate if introduced without change.**

Under the new Australian guidelines, it's proposed that this PFOA 'forever chemical' will be allowed in tap water at levels 50 times higher than what the United States considers safe under its National Primary Drinking Water Regulations.

We strongly believe that Australia's drinking water should match the American PFOA level of 4 ng/L.

Additionally, we want to address the issue of removing PFOA chemicals at water filtration plants. Where PFOA chemicals are found in Australian drinking water, it is likely that PFOS chemicals will also be present at levels exceeding 4 ng/L.

It is our understanding that filtration equipment achieving this lower level for PFOS will also remove PFOA. If this is the case, why not set the allowable level of PFOA at 4 ng/L as well?

If PFOA is present in drinking water, PFOS will also likely be present at levels requiring remediation to meet the 4 ng/L level. **So why not have both chemicals set at 4 ng/L?**

6) PFHxS LEVELS

Under the new guidelines, it is proposed that PFHxS be allowed in Australian tap water at 30 ng/L, which is three times higher than the United States' safe level of 10 ng/L.

We strongly believe that Australian PFHxS levels should align with the American 10 ng/L level.

7) ULTIMATE GOAL

The proposed new Australian draft guidelines do not match the US EPA goal, which states:

> *"For PFOA and PFOS, EPA is setting a Maximum Contaminant Level Goal, a non-enforceable health-based goal, at zero."*

We believe that this health-based goal should also be set for all drinking water in Australia.

Could the NHMRC please consider adopting similar aspirational wording to encourage best practice on PFAS issues within the water sector?

Having dealt with Sydney Water and WaterNSW on our PFAS contamination, we believe this aspirational goal is sorely needed.

8) MAKING THE GUIDELINES LEGALLY ENFORCEABLE

It is our strong view that the Australian Drinking Water Guidelines should be updated to ensure that our PFAS levels are legally enforceable limits in line with the NPDWR.

9) LACK OF MANDATORY TESTING IN THE WATER SECTOR

Our strong view is that quality assurance programs required of drinking water suppliers should include mandatory monitoring for PFAS in all drinking water supplies—not just in areas where water entities perceive a risk of PFAS contamination.

In the Blue Mountains, our drinking water was wrongly not deemed to be at risk and was only tested after media pressure forced Sydney Water to conduct tests that revealed PFAS contamination.

It should also be mandatory to provide all PFAS levels in drinking water to the public, even if they are below the ADWG levels.

Our reasoning is as follows:

In 2000, the Australian Government was warned in writing by Charles Lauer of the US EPA about the dangers of PFOS in the environment and its risks to public health. Despite this, the implementation of PFAS testing in water supplies across Australia has been slow.

Testing has been carried out on an ad hoc basis, meaning the true extent of PFAS in drinking water remains unclear. It is likely worse than currently understood.

The NHMRC should adopt a precautionary principle and recommend mandatory testing of all drinking water supplies in Australia.

Here in the Blue Mountains, it appears we have been drinking elevated levels of PFOS since 1992. This was when a petrol tanker crashed and caught fire in Medlow Bath, near the Medlow Bath drinking water dam (now closed due to elevated PFOS levels).

Our research and TV footage proves that the foam used in this crash resulted in firefighting foam entering our local creek during the two hours that it took to extinguish the fire. This creek flows directly into our local drinking water dam, which is a short distance away.

We had to undertake our own water testing to check the levels of PFOS chemicals in running water adjacent to this crash site. As of a month ago, the levels of PFAS in this creek water heading to the nearby dam were as follows:

- PFOS level: 2,400 ppt
- PFHxS level: 980 ppt

Thirty-two years after the extensive use of firefighting foam at this crash site, PFAS chemicals continue to cause PFAS pollution in our community and our environment.

WaterNSW has informed us it will complete PFAS testing in this area by mid-2025. Could the NHMRC please consider recommending time limits for completing additional PFAS testing once contamination has been identified?

Given the slow pace at which WaterNSW is conducting PFAS testing, this recommendation seems necessary.

We also discovered that WaterNSW has failed to test sediment in the two drinking water dams that have been shut down due to elevated PFAS levels. Could the NHMRC consider recommending a standard national testing procedure for drinking water dams that includes sediment testing and testing at all dam levels?

Additionally, a standardised national testing procedure for PFAS chemicals in water filtration plants could be developed and adopted. Could the NHMRC also give this consideration?

10) MANDATORY DISCLOSURE

In the United States, water systems must legally conduct ongoing compliance monitoring and issue public notifications for any testing violations.

Why can't Australian water authorities also be subject to the same mandatory disclosure requirements?

Australia has ratified the Stockholm Convention, which binds it to Articles 9 and 10 to ensure communities have access to information about POPs chemicals and their effects on human health and the environment.

A major Australian capital city will fail to meet the new PFOS levels in the draft guidelines, yet there is currently no public awareness of PFAS pollution in that city. This reflects a lack of transparency in the Australian water sector when it comes to acknowledging PFAS-contaminated drinking water.

This lack of transparency is why we are calling for mandatory disclosure and testing.

11) NUMBER OF PFAS CHEMICALS BEING TESTED

There are approximately 9,000–14,000 PFAS chemicals in commercial use today, yet the NHMRC is only considering four for measurement: PFOS, PFHxS, PFOA, and PFBS.

Given the increasing prevalence of PFAS-related problems globally and locally, we believe water entities should be required to test for a broader range of PFAS chemicals, including short and ultrashort chain PFAS.

It is our understanding that Bathurst City Council has been testing for a wider range of PFAS chemicals (we have been told that they test for up to 30 PFAS chemicals). Why can't this wider testing approach be adopted nationwide?

Could the NHMRC please consider this issue in its final guidelines?

12) DURATION OF EXPOSURE TO PFAS IN DRINKING WATER

Our testing shows that firefighting foam used in a 1992 petrol tanker fire in Medlow Bath is still resulting in PFOS levels of 2,400 ppt and PFHxS levels of 980 ppt in the creek leading into our local dam.

WaterNSW has admitted that this creek is the focus of its PFAS investigation. It appears that our community has been exposed to PFAS-contaminated drinking water since 1992. It did not have to be this way.

In 2000, the US EPA warned the Australian Government that PFOS presented a serious hazard to human health and the environment.

Despite this warning, significant pressure from the Sydney Morning Herald was needed to prompt Sydney Water to test for PFAS in the Blue Mountains drinking water in June 2024.

Prior to this, Sydney Water conducted a "desktop analysis" and concluded there was no PFAS risk in our water supply. This analysis was clearly flawed. Earlier testing could have significantly reduced the number of years we were exposed to elevated PFAS levels.

Could the NHMRC simplify public explanations of what "lifetime exposure" means? Could NHMRC better explain this? Many people in our community are confused by this.

There is also concern that the exposure levels in the draft guidelines are not based on real-world scenarios.

13) RECOMMENDED APPROACHES TO HANDLING COMMUNITIES EXPOSED TO PFAS IN DRINKING WATER

It would be beneficial for the NHMRC to recommend a standard approach for water entities when engaging with communities affected by PFAS contamination in drinking water.

When PFAS was discovered in our drinking water, the NSW Government, Sydney Water, and WaterNSW significantly downplayed the issue.

Despite not knowing when the contamination began, the levels of PFAS exposure over decades, or how long the contamination persisted, these entities insisted that our tap water was safe and posed no health risk.

This reassurance is unrealistic given that testing only began in June 2024, while the contamination likely started in 1992. Authorities have no evidence to prove PFAS exposure was safe in the 1990s.

As PFAS testing expands, other communities may face similar situations. Communication with affected communities must improve. We continue to feel gaslit about the presence of PFAS in our drinking water.

The current ADWG is regularly cited by politicians and water entities to assert that our Blue Mountains drinking water is safe, despite PFOS levels exceeding draft guidelines and international standards.

This gaslighting is misleading, particularly given the decades we have unknowingly consumed PFAS-contaminated tap water.

Could the NHMRC consider this issue and recommend improved public communication strategies when PFAS contamination is detected?

14) RECOMMENDATIONS FOR COMMUNITY BLOOD TESTING IN PFAS AFFECTED COMMUNITIES?

Many in our community, myself included, have recently found that we have very high cholesterol levels. We are concerned this may be linked to decades of exposure to PFOS-contaminated tap water.

Our community also wants an investigation into whether PFAS contamination has contributed to higher-than-normal rates of PFAS-related cancers and other health issues.

Could the NHMRC recommend mandatory community blood testing in areas where PFAS is found in local drinking water supplies? This could significantly reduce the stress experienced by communities that are exposed to PFAS contamination of their drinking water – particularly when that exposure has taken place over a long period of time.

15) TIMELINE FOR RECTIFICATION?

It is not clear from the draft ADWG how much time water entities and authorities will have to rectify breaches of PFAS safe levels in their drinking water supplies.

A senior lawyer at a major water entity has privately informed me that they expect to have a five-year period to upgrade any water filtration plant required to eliminate excess PFAS pollution.

Is this the NHMRC's understanding of the situation? What is the NHMRC's position on how quickly water entities will need to act to reduce PFAS levels in drinking water to meet safe standards?

Will there be any national regulations to address situations where PFAS contamination is not resolved within a set period of time?

16) SOLUTIONS DATABASE

Will the NHMRC maintain a database of filtration technologies proven to remove PFAS chemicals from water filtration plants?

This could be particularly useful for regional water entities that lack the research and staffing resources of major city water entities.

17) REMUNERATION FOR PURCHASING WATER FILTRATION EQUIPMENT

Our community has endured PFAS-contaminated water for over 30 years, and we have received no guarantees from Sydney Water or the NSW Government about when our drinking water will return to below the 4 ng/L safe level for PFOS, as set out in the incoming ADWG.

We have been told to continue drinking the tap water on the basis that it is safe under the current guidelines, despite it being unsafe under the incoming guidelines.

As a result, many people in our community have been forced to purchase reverse osmosis filtration units, which can cost $1,000 or more. This has become a priority purchase for individuals with significant health conditions, many of whom cannot afford such expensive filtration equipment. Others have had to buy bottled water (our local supermarkets regularly have empty shelves in the bottled water aisle).

When a community discovers that its drinking water is contaminated with PFAS, can the NHMRC develop remuneration guidelines to assist those who have had to purchase costly water filtration units to remove PFAS chemicals?

In other industries, consumers are compensated when they do not receive the product or service they have paid for. Is there a reason why the water industry should be exempt from operating under similar principles?

18) THE ‘NOT MADE HERE’ ARGUMENT

There is an argument circulating in Australia that the US EPA adopted lower PFAS levels solely because PFAS was manufactured in the United States.

The claim suggests that, since Australia did not manufacture PFAS chemicals, we do not require the same strict safety levels for PFAS in drinking water.

This argument does not stand up to scrutiny.

PFAS chemicals affect individuals through drinking water similarly, regardless of whether they reside in America or Australia. It is now evident that PFAS chemicals can significantly impact the environment and human health, irrespective of their origin.

And the awareness of that impact grows as more tests show increasing levels of PFAS forever chemicals in our drinking water and environment.

Our discussions with the US EPA also indicate that their lower PFAS levels were developed purely on health grounds—to protect public health and reduce exposure to PFAS chemicals in American drinking water supplies.

In our view, there is no reason not to adopt the safer American guidelines with lower PFAS levels.

CONCLUSION

In conclusion, our Blue Mountains community believes that the current Australian Drinking Water Guidelines have exposed Australians to unsafe levels of PFAS chemicals.

Water companies and politicians have used the NHMRC's current PFAS guidelines to try and assure our communities that our drinking water is safe. Given that PFOS levels in our drinking water have been up to 4 times higher than the draft ADWG and the American guidelines, we do not accept that the current ADWG provided us with the protection that we required.

The authorities and the water entities have used the current ADWG as an excuse for inaction in dealing with the underlying issues of PFAS contamination of our drinking water.

We believe the NHMRC must ensure future guidelines do not lead to similar situations.

I want to put on the record our concern about NHMRC's alleged lack of engagement with the US EPA.

I was very concerned that an agency as big as the American EPA can review 2,100 PFAS related technical reports, peer reviewed manuscripts and other technical information and come away with a different view to NHMRC.

I do not understand why NHMRC believes that Australians are safe to drink tap water with PFOA at levels of 200 ng/L when Americans are now expected to drink tap water with only 4 ng/L of PFOA. There seems to be a very big difference in how NHMRC and the EPA are reviewing peer reviewed science on PFAS to set national standards.

If a glass of water was placed in front of an Australian with 4 ng/L of PFOA in it and they were asked to drink a glass of water with 200 ng/L of PFOA, Australians would demand the 4 ng/L glass of water. Why can't they have drinking water with that lower level like Americans are going to have?

As a community affected by PFAS, we strongly urge the NHMRC to adopt the American PFAS safe levels for Australia's Drinking Water Guidelines.

We do hope that you will be able to take our feedback into consideration.

With regards,

[redacted]

NO.	CONSULTATION SUBMISSION
80	**INDIVIDUAL RESPONSE 45** Permission not given to publish.
81	**SYDNEY KNITTING NANNAS** *Development of guidance* The guidelines were presented before sufficient comparison of USA standards and before sufficient research evidence with human samples. Also the overall approach does not address the problem that PFAS mixtures have been found to be more toxic than single compounds, suggesting higher danger and thus the need to address guideline levels for combination of these chemicals. *Implementation or application* The guidelines need to be accompanied by legal regulatory enforcement steps and improved water filtration plants for rectification of water with PFAS chemicals above the guidelines. *NHMRC Statement* SUBMISSION by Sydney Knitting Nannas to the National Health and Medical Research Council (NHMRC) on the draft guidelines for PFASs as part of the Australian Drinking Water Guidelines We are the Sydney Knitting Nannas, elder citizens who volunteer and work together to protect the land, water and air for future generations. Sydney Knitting Nannas want changes to the current Australian Drinking Water Guidelines. These guidelines are not providing us with safe water – these PFAS "forever chemicals" have currently been declared carcinogenic in America but are currently allowed in Australia's tap water. NHMRC is reviewing its 2018 Fact Sheet for per- and polyfluoroalkyl substances (PFAS) in the Australian Drinking Water Guidelines. This Fact Sheet has guideline values which indicate the amount of PFAS in drinking water that a person can consume on a daily basis over a lifetime without risk to health. The review is considering public submissions (due by 22/11/2024) to determine whether the current drinking water guidelines remain appropriate for Australia. It is expected that the new guidelines will be published in 2025. PFAS chemicals can be found in some stain-resistant carpet and fabric treatment, fire-fighting foam, non-stick cookware, food packaging, cosmetics, sunscreen, floor wax and Scotchguard. The health effects have been found through research to have cancer, bone-marrow, and thyroid health effects. (Blue Mountains Gazette 2/10/24 Upper House inquiry set; 23/10/24 Safer water limits; 13/11/24 Council seeking answers to PFAS). According to Jon Dee, NSW Australian of the Year 2010, environmentalist and founder of the Blue Mountains PFAS Action Group, Australia currently allows PFAS chemicals at 140 times the maximum level currently considered safe by the Environmental Protection Agency in the US. (Blue Mountains Gazette 2/10/24 Call to action over 'forever chemicals') Also Jon Dee states that - With the proposed new NHMRC drinking water guidelines, "Australia would allow the carcinogenic forever chemical PFOA in drinking water at 50 times the level the US will allow. Australia has also proposed a limit for the PFHxS forever chemical of 30 nanograms per litre, which is three times higher than the US standard of 10 nanograms per litre. The good news is Australia's allowable level of PFOS in drinking water would plunge to four nanograms per litre, in line with the US limit, and, Australia has also proposed a world-leading limit of 1000 nanograms per litre for PFBS, which is half the amount that US drinking water guidelines recommend." (J. Dee Blue Mountains PFAS Action Group Facebook page 21/10/24 9:24am) In addition, Jon Dee stated "The acceptable level of PFOA - which has been used in everything from floor waxes to firefighting foam and is linked to cancer - is proposed to drop from 560 nanograms per litre to 200 ng/L. The safe level of PFOS - for decades the key ingredient in Scotchgard and now linked to bone marrow problems - is set to be slashed from 70 ng/L to just 4 ng/L. PFBS which replaced PFOS as the key ingredient in Scotchgard and also affects the thyroid has gone from having no control to 1000 ng/L.

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	PFHxS which has also been used in firefighting foams and affects the thyroid is proposed to drop from 70 ng/L to 30 ng/L. The new guidelines come on the heels of a similar crackdown by the US Environmental Protection Agency which set even tighter controls than the proposed NHMRC levels." ((Blue Mountains Gazette 2/10/24 Call to action over 'forever chemicals'; 23/10/24 Safer water limits proposed; 30/10124 More PFAS tests), SMH (30/8/24; 31/8/24; 17/9/24), Canberra Times (30/8/24), ABC News (21/9/24), The Today Show, Channel 9 21/10/24 7:10am)) In light of this information, Sydney Knitting Nannas are submitting our recommendations as set out below in the table of PFAS Proposed Guidelines - PFAS Guideline Recommendations for Public Consultation PFAS and Health effects; NHMRC Current Guideline Recommendations; NHMRC Potential Guideline Recommendations for Public Consultation; Knitting Nannas' requested changes to proposed guidelines PFOA Cancer effects; Based on human health considerations, the concentration of PFOA in drinking water should not exceed 560ng/L; Based on human health considerations, the concentration of PFOA in drinking water should not exceed 200 ng/L; The proposed 200 ng/L is 50 times higher than the US limit. Change guideline to be in line with the current US Environmental Protection Agency limit. PFOS Bone marrow effects; Based on human health considerations, the sum of the concentrations of PFOS and PFHxS in drinking water should not exceed 70 ng/L; Based on human health considerations, the concentration of PFOS in drinking water should not exceed 4 ng/L; The proposed 4 ng/L is similar to the US EPA level and is considered favourably. PFHxS Thyroid effects; Based on human health considerations, the concentration of PFHxS in drinking water should not exceed 30 ng/L; The proposed 30 ng/L is 3 times higher than the US limit of 10 ng/L; Change guideline to be in line with the current US EPA limit. PFBS Thyroid effects; No health-based guideline value in the current Guidelines; Based on human health considerations, the concentration of PFBS in drinking water should not exceed 1000 ng/L; This is a world leading lower limit and is considered favourably as it is half the current amount that US EPA drinking water guidelines recommend. GenX chemicals No health-based guideline value in the current Guidelines; No health-based guideline value is considered necessary; No comment at this time. (partial source – NHMRC draft proposal Australian Drinking Water Guidelines for recommended lower levels of PFASs). In addition the Sydney Knitting Nannas are recommending that further research be undertaken to provide further drinking water guidelines which take into account the findings of recent research detailed below that states that combinations of PFAS chemicals produce an even higher risk to our health - A major concern not addressed by the proposed Australian PFAS limit guidelines is that PFAS mixtures have been found to be more toxic than single compounds, suggesting higher danger. This important recent research has been carried out by two very reputable research centres: the University of Buffalo USA and the Helmholtz Centre for Environmental Research in Germany. Diana Aga, co-author of this research with the University of Buffalo, partnered with the Helmholtz Centre for Environmental Research in Germany, highlights the need for change to these regulations. This study checked the neurotoxicity and cytotoxicity of PFAS compounds regularly found in water. She stated "Our point is that PFAS needs to be regulated as mixtures. The sum of those chemicals can present a danger, even if they are below the US Environmental Protection Agency's drinking-water limits of 4ppt (parts per trillion) for each. Hypothetically, if PFOA

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	and PFOS levels were present at 3ppt each, then the water would be considered safe by EPA standards. But the sum of each chemical's toxicity would probably make the water dangerously toxic." When researchers analysed the toxicity of biosolid samples collected from a municipal wastewater treatment plant, they found very high toxicities despite low concentrations of PFOA and other PFAS in the sample. "It was more toxic than what we predicted, not necessarily because of other PFAS, but other chemicals in biosolids that can cause toxicity," Aga said. Sydney Knitting Nannas submit that Australia's weak guidelines need to come in line with at least the current lower USA EPA's PFAS limits. Research has also revealed that a combination of these chemicals with others is dangerous. Further research and monitoring are needed. We welcome this review and given that new research is ongoing we suggest a timetable to review new guidelines into the future. We look forward to seeing new guidelines in place.
82	**TASWATER** *Development of guidance* TasWater supports the rolling review of the Australian Drinking Water Guidelines (ADWG) to incorporate the latest science to maintain high-quality drinking water and ensure public health. We value and respect the role of the National Health and Medical Research Council supported by the Water Quality Advisory Committee as the independent national authority on health-related drinking water interests, expressed through publishing the ADWG. The accompanying NHMRC CEO message was valuable to guide initial interpretation of the review, including "The most important takeaway from the work that NHMRC has undertaken is that from the available information, the risk from PFAS in drinking water is low for most Australians." The detailed evidence reviews and transparent outline of 'evidence to decision' in the Administrative Report, enables scrutiny and understanding of how guidance was reached. This is helpful for Australian and international audiences. The working relationship with the water sector, through the Water Services Association of Australia, helped convey to the public mutual interest of the water sector in public health outcomes. TasWater supports the public consultation phase to transparently test and refine analysis and provide information and evidence based on research to assist NHMRC finalise the guideline values. *Implementation or application* The guidance is silent on the timeline for implementation, reflecting that jurisdictional health regulators adopt the ADWG to regulate water utilities with an understanding of local context rather than a uniform approach being prescribed nationally. We suggest that greater clarity for stakeholders would arise if a statement of this responsibility was added. *Fact Sheet* The outcomes and rationale for reaching guideline values in the Fact Sheet would be more accessible to a wider audience if a summarised table was included, conveying the salient points in relation to evidence and key conclusions. Under General Description, note that PFAS can have hydrophilic as well as hydrophobic properties. Could the explanation of the proportionality factor be more fully explained on (pages 13 to 17), as it can appear counter-intuitive and difficult to explain why 10% (rather than say 20%) leads to a conservative guideline value. Under the section headed, 'Treatment of Drinking Water', we suggest as edit on page 4 as italicised below, to include the role of source control. This would be consistent with the Australian Government listing of PFOA, PFOS and PFHxS in the ICHEMS Schedule 7 effective 1 July 2025, and actions by others to substitute or reduce the use of PFAS. "A preventative approach, starting with source control, is the best way to manage risks of PFAS contamination of drinking water supplies and reduce the level of treatment needed."

NO.	CONSULTATION SUBMISSION
	Adding a comment that a single result should not be treated as a pass/fail, as mentioned in the NHMRC CEO message, would help maintain stakeholder and public confidence. This could be conveyed by adding a section, 'Indicator Value and Application in Practice' as is the format for many of the Fact Sheets. Under the section, 'Levels Detected in Australian Drinking Water' TasWater has also published it's PFAS data on our website, with results below detection limits. (https://www.taswater.com.au/news/water-quality/water-quality) *NHMRC Statement* As mentioned in response to question 11, adding a comment that a single result should not be treated as a pass/fail as mentioned in the NHMRC CEO message, would help maintain stakeholder and public confidence, even if this is consistent with usual practice. TasWater believes that effective source control with associated regulation of PFAS remain the most effective mechanism for the protection of public safety.
83	**INDIVIDUAL RESPONSE 46** *Development of guidance* I welcome more stringent and evidence-informed standards for PFAS in drinking water. *Implementation or application* Q: Are bottled water providers currently required to regularly analyze and report publicly on PFAS levels in their products? If No, going forward I recommend this should be a legal requirement for all water providers. *NHMRC Statement* I commend the NHMRC for increasing transparency and accountability of water providers, and public awareness of consumers.
84	**INDIVIDUAL RESPONSE 47** *Development of guidance* The approach in the Australian context is within a vacuum of our own qualifiable data. Feedback from Commonwealth entities in the Addendum also discount and/or undermine potential for PFAS contamination in our individual catchments. • Australia has yet to quantify the totality of the problem by identifying contaminated sites, extent of the magnitude and implications of the contamination for both public health risk and subsequent societal health cost burdens. • There are more & more contaminated sites being uncovered which has highlighted the precautionary principle, extensive monitoring and regulatory duty of care has been absence. • It is questionable how the guidelines will reduce risk of PFAS exposure to protect the public. The Draft will fail to achieve this for multiple reasons. NHMRC's Evidence-to-Decision review process is based on their selective determination of studies to prove evidence of causation as opposed to association. The Australian references quoted for FSANZ and enHealth is based on causation vs association. The Fact Sheet struggles to justify the lack of precautionary application to PFAS drinking water levels with the choice of health effect end points as opposed to more protective and precautionary levels adopted by other proactive countries. This leads to how chemical risk is applied for risk management to prevent risk exposures, e.g., FSANZ TDIs used as safe end points. I have previously challenged the FSANZ Board in February 2023 about TDI's with FSANZ providing a prompt response. https://communityovermining.org/uploads/1/3/5/9/135967230/fsanz-complaint_letter_to_board-20_02_2023.pdf https://communityovermining.org/uploads/1/3/5/9/135967230/response_letter_pfas_letter_to_fsanz_board.pdf Both Statement and Fact Sheet reveals risk assessment and science are not value neutral. • The PFAS fact sheet notes the many different references with SLR consultants' cherry picking the evidence to suit in the Australian context yet provide no credible Australian evidence.

NO.	CONSULTATION SUBMISSION
	• This is where conflicted research challenges independent research to achieve a certain outcome which is evident in the draft guideline levels for PFOA. P 7 Fact sheet - the default equation outlined by NHMRC for health-based information based on animal toxicity studies should be updated as the default assumption used in the Guidelines for adult average human body weight of 70 kg bw. In 2017-18, Vic Dept of Health had the average male and female as 5 kg heavier. https://www.health.vic.gov.au/your-health-report-of-the-chief-health-officer-victoria-2018/burden-of-disease/overweight-and This has remained stable in 2022 https://www.aihw.gov.au/reports/overweight-obesity/overweight-and-obesity/contents/overweight-and-obesity The higher consumption of food and water per kilogram body weight leads to a greater intake of PFAS ingested. P 2 NHMRC Statement - notes the observed effects of animal studies have been extrapolated to humans and used to derive health-based guideline values for drinking water. It is not clear how any framework in the absence of human epidemiology studies for Drinking Water Guidelines (DWGs) will assure safety for public health. Have concerns about the methodology to derive new HBGVs for drinking water with PFOA, in the Australian context, seemingly evaluated on two factors: 1. US derived cancer slope factor (CSF) are not derived consistent with Australia science policy. (Statement p2) 2. IARC found inconsistent findings of evidence for cancer in humans for PFOA (P8 fact sheet) This would be confusing for the uninformed public as it is just different risk assessment approaches between Australia and USA that USA can back up with strong mechanistic evidence, but Australia cannot. Both cannot be correct. Australia only has the ANU epidemiology study which is not credible and indefensible against a mountain of evidence from international research studies. IARC was able to support PFOA as a Group 1 carcinogen due to strong mechanistic evidence. Australia is either intentionally or unintentionally not using advanced science including quality epidemiology studies in the many PFAS hotspot areas around Australia. Experts do agree toxicity concerns increase with fluorinated chain length because long chain PFAS usually take longer to be excreted from the body due to their lower water solubility, higher affinity for serum proteins increasing their elimination time from plasma and tissue. Disturbingly, this means children are more at risk because children drink more water, eat more food and breathe more air per kilogram of body weight than adults which can increase their exposure to PFAS. https://www.epa.gov/pfas/our-current-understanding-human-health-and-environmental-risks-pfas#:~:text=What%20We%20Know%20about%20Health,blood%20pressure%20in%20pregnant%20women *Implementation or application* The current approach for PFAS management is 'bottom up', bit by bit, without urgency therefore, not precautionary and certainly not proactive. The Australian Government is now finding the PFAS contamination expansion extremely problematic to manage and appearing to be dismissive of the inherent risks and implications from the referenced material. Legally, you knew but didn't act while providing no authoritative containment and management leadership on a national level. What Australian research exists is manipulated while all risks default to FSANZ's Tolerable Daily Intake (TDI) as indefensible safe endpoints. NHMRC's Statement p2 - link to review reports for the Administrative Report and SLR Addendum to PFAS Evidence Evaluation for Australian Drinking Water gives me little reassurance much will change. • How are the water providers held accountable or resourced to monitor and identify potential and real time catchment sources of PFAS contamination. • There also needs to be a historic forensic evaluation of past uses of AFFF in each catchment. • Who is coordinating a national level comprehensive response for PFAS management accountability across all levels of government, all agencies and all Commonwealth entities because the current system is ad hoc, fragmented and not accountable.

NO.	CONSULTATION SUBMISSION
	• How will the NHMRC manage the conflict between water corporation's objective to provide safe drinking water while also overseeing significant volumes of PFAS laden domestic and industrial wastewater legally discharged into catchments via EPA approved licences upstream of drinking water take-off. The Draft Statement recommends site-specific, risk-based approach to monitoring chemicals in our drinking water catchments, then claims, the underpinning principle of this risk-based approach is to know-your-catchment and for water providers to be more transparent. Yet media is revealing more drinking water contaminations, and private PFAS water testing is uncovering higher PFAS levels in our reservoirs. This a total failure for reasons unknown to the public. We can only surmise a critical lack of resources to PFAS testing, data sharing and treatment are contributing to an increase in higher PFAS levels detected in our drinking water catchment. This is also an absolute failure in the Framework for Managing Drinking Water Quality. With implementation of the proposed changes to PFAS in drinking water subject to any new information which includes monitoring, it would be irresponsible if Australia still takes the same causation via association approach and continues the same lack of scientific health evidence. The NHMRC need to stop applying justifications for higher proposed DWGs as this gives no protection to the highly contaminated communities. It's discrimination of the minority population over the majority while proposing no other measures or interventions to reduce PFAS exposures. DWGs based on scientific evidence should be developed to protect people who are most vulnerable to the potentially harmful effects of known PFAS adverse health effects in the HUMAN context. New proposed levels should be enforceable. • PFOA should be lowered to 4 ng/L therefore a sum of PFAS can be derived • PFHxS to be lowered from 30 ng/L to 10 ng/L • HFPO-DA (GenX) to be given a health-based guideline value same as USA to 10 ng/L • A hazard index for two PFAS mixture or Sum of PFAS is needed • PFBS for a DWGV of 100 ng/L Publication of the final advice in April 2025 is acceptable but it should be noted that Federal and State policy and funding resourcing to water providers for PFAS treatment system updates should be viewed as a high priority. *Fact Sheet* The Fact Sheet needs to have an authoritive concensus and ability to predict the future environmental and human health cost burden of PFAS. I believe the NHMRC committee would agreed that Australia's understanding on the extent of PFAS contamination is slowly evolving and their inaction on dealing with PFAS at the point source is relatively non-existent. Rather than be reactive to a problem from multiple or, as yet, evidence of PFAS substances like GenX, a more proactive and protective action is to provide guideline values for the sum of multiple PFAS. After all, no need to reinvent what information already exists internationally. It is clear the NHMRC cannot apply the precautionary principle to adopt a PFAS mixture for the Sum of PFAS as it is based on the current higher Australian PFOA & PFOS DWGs. It is confusing for the public to read an apparent new concern for some short and long-chain PFAS, their precursors, including fluorotelomers, yet in the feedback section of the Administrative report the entities tasked with protecting public health has provided some irresponsibly ignorant comments. *NHMRC Statement* Page 1 of the Draft NHMRC Statement quantifies PFAS in commercial and industry products, yet little is known about their fate - they go somewhere. While the Statement poorly addresses a symptom of PFAS use and distribution, the sheer pervasive nature of PFAS in consumer products is unchecked with legacy contamination of long chain PFAS totally mismanaged by the Australian Government and relevant agencies.

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	The guideline values are calculated using a threshold approach. However, when considering international PFAS state of knowledge based on non-conflicted independent research and Australia's lack of PFAS scientific and health evidence, the NHMRC cannot say the proposed guidelines values are not expected to result in any significant risk to health over a lifetime of consumption. The Australian Government's communication messaging around PFAS health risks is misleading and dangerously outdated. Is the NHMRC aware of an online 2022 medical journal that slammed NHMRC for their confusing PFAS health messaging while praising other countries for their proactive advice and interventions to reduce PFAS exposures. It is confusing why both the draft PFAS fact sheet and draft NHMRC statement continue the poor health messaging. Official health communications are failing PFAS-contaminated communities https://ehjournal.biomedcentral.com/articles/10.1186/s12940-022-00857-9 For Australia to improve PFAS knowledge gaps more needs to be done around epidemiology studies in the many hotspot communities where the Department of Health can collate relevant health data. This includes upskilling health providers to identify evidence for health outcomes and conducting appropriate voluntary blood testing. More importantly, the PFAS Statement needs to authoritatively provide official proactive approaches for interventions and PFAS education about the risks of PFAS exposure and guide community and medical decisions.
85	**INDIVIDUAL RESPONSE 48** *Development of guidance* So well put together for all of us to have our say. Keep it up.

Australian Drinking Water Guidelines Public Consultation on Draft Guidance for Per- and Polyfluoroalkyl Substances (PFAS)

VEOLIA

9. Do you have any comments on the overall approach taken to develop the draft guidance?

(Required)

Yes

No

Please provide comments on the overall approach taken to develop the draft guidance

The draft guidance on per- and polyfluoroalkyl substances (PFAS) proposes health-related guideline values that differ from values adopted by regulatory bodies in other jurisdictions. While it is recognised that such values may vary across jurisdictions, the difference for perfluorooctanoic acid (PFOA) is significant. It differs notably from that of the United States Environmental Protection Agency. It also diverges from the approach established by the European Food Safety Authority (EFSA) in 2020. The EFSA considers the decreased immune response to vaccination as the most critical human health effect for four PFAS compounds in its assessments. Such differences in interpretation and methodology across jurisdictions are noteworthy for a water service provider such as Veolia, which operates in multiple countries. Veolia recognises that the National Health and Medical Research Council (NHMRC) is responsible for determining the most appropriate health-related guideline values for the Australian context based on its evaluation of the available scientific evidence.

Given that, historically, the *Australian Drinking Water Guidelines* (ADWG) has been in general alignment with the World Health Organization (WHO) *Guidelines for Drinking-Water Quality*, we suggest that the NHMRC considers delaying the finalisation of its PFAS guidance until the WHO completes its ongoing review of PFAS in drinking water. This would ensure consistency with international best practices and potentially avoid the need for further revisions in the near future.

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10. Do you have any comments about the implementation or application of the draft guidance?

(Required)

Yes

No

Please provide comments about the implementation or application of the draft guidance

With respect to the implementation of the draft guidance, the proposed PFAS health-related guideline values are likely to present treatment challenges for some Australian water suppliers. Water suppliers without an appreciable PFAS risk in the catchment may not need to alter their current practices. It is likely, however, that numerous water suppliers will need to implement additional treatment processes to meet the proposed health-related guideline values.

Most conventional water treatment processes are inadequate for PFAS treatment. Effective PFAS treatment typically requires processes such as granular activated carbon (GAC), ion exchange, or high-performance membrane filtration. These processes have different efficiency so they must be optimised or even combined for targeted PFAS treatment, as efficacy will vary depending on the specific PFAS compounds present and other water quality parameters such as dissolved organic carbon (DOC).

For water supplies that do not currently meet the proposed guideline values, consequential treatment upgrades are likely to involve substantial capital investment and time to implement, which needs to be considered. Water suppliers will also require time and resources to complete any necessary water quality monitoring and pilot treatment studies. Space constraints for any new treatment processes might also be a limitation. Ongoing plant operations are also likely to involve increased operational expenditure associated with media replacement, increased energy consumption, and the more complex management of treatment residuals. Carbon footprint may also be impacted (e.g. by media supply and transportation, and energy consumption).

The appropriate management of treatment residuals may impede the industry's ability to meet the proposed guideline values. Spent carbon will require reactivation (if possible) or proper disposal. Resins will also require proper disposal. The capacity of facilities to perform these functions within Australia is understood to be relatively limited. The management of membrane concentrate may also not be a viable option in some cases.

In addition to treatment challenges, the existing difficulties in sampling and result interpretation will persist. The current guideline values already necessitate, in practice, substantial restrictions on samplers' use of consumer products and the handling of samples and equipment. Despite such restrictions, sporadic, low-level PFAS detections may occur that may not accurately represent the supplied water. Recognition of these issues and the provision of related guidance would assist implementation. Additional guidance regarding the use and frequency of field and equipment blanks would also assist implementation.

It would assist implementation planning if the ADWG itself recognised that revisions potentially requiring enhanced operations or capital investment need not necessarily be implemented

instantaneously. The inclusion of guidance such as this, covering the proposed changes, would provide industry with greater certainty in implementation, including in relation to any consequential operational and treatment upgrade planning.

11. Do you have any specific comments on the draft PFAS Fact Sheet? (Required)

Yes

No

Please provide specific comments on the draft PFAS Fact Sheet

It would assist the industry's implementation of the proposed guideline values if the fact sheet, or an additional information sheet, could provide more detailed information on the effectiveness of available treatment processes for specific categories of PFAS compounds. This would assist water suppliers with selecting the most appropriate technologies for their specific PFAS risk, if required.

The fact sheet, or new information sheet, could also highlight the importance of characterising the PFAS "fingerprint" (the specific mix and concentrations of PFAS compounds present) in the source water, as this is critical for selecting the most appropriate treatment process.

Additional guidance on the interaction between DOC and PFAS treatment would be beneficial. The concentration of DOC in feedwater can significantly impact the efficacy of some PFAS treatment processes.

Finally, a table summarising the relationships between PFAS types, indicative treatment technologies for each type, the impact of DOC on each treatment type, and waste stream considerations for each technology would be a valuable addition.

Disclaimer: The information contained in this statement is based on the Veolia group's understanding and know-how of the scientific and technical fields discussed herein as of the time of publication. Statements that may be interpreted as predictive of future outcomes or performance should not be considered guarantees of such, but rather reasoned assessments of the possible evolution of the technologies described. As this document is based on the state of the Veolia group's scientific, technical, and regulatory knowledge at the time of its publication, the completeness and accuracy of the information contained herein cannot be guaranteed. Descriptions contained herein apply exclusively to those examples and/or to the general situations specifically referenced, and in no event should be considered to apply to specific scenarios without prior review and validation.

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22 November 2024

Submission – Draft PFAS Guideline Values for Drinking Water

VicWater is the peak industry association for the Victorian water sector and all 18 Victorian water corporations are our members. We support our members to be 'better together' by facilitating industry advocacy, collaboration and innovation to achieve better outcomes for customers and community.

VicWater welcomes the release of the draft updated Australian Drinking Water Guidelines (ADWG) on per- and polyfluoroalkyl substances (PFAS) in drinking water by the National Health and Medical Research Council (NHMRC).

VicWater fully endorses the submission from the Water Services Association of Australia (WSAA), representing the views of the national water industry.

In particular, our members support WSAA's recommendation that the NHMRC take into account the outcomes of the current review of the World Health Organisation (WHO) Guidelines for Drinking-water Quality, prior to releasing new ADWG PFAS guidelines. As noted by WSAA, the ADWG have been aligned with the WHO guidelines for a long time, and we believe this practice should be continued.

To discuss this submission further, please contact [redacted] VicWater ([redacted]).

Yours sincerely

[redacted]

WATER SERVICES
ASSOCIATION OF AUSTRALIA

22 November 2024

National Health and Medical Research Council
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SUBMISSION – DRAFT PFAS GUIDELINE VALUES FOR DRINKING WATER

The Water Services Association of Australia (WSAA) welcomes the release of the draft updated Australian Drinking Water Guidelines (ADWG) on per- and polyfluoroalkyl substances (PFAS) in drinking water by the National Health and Medical Research Council (NHMRC).

The draft guidelines propose health-protective levels for four PFAS:

- lower levels for the three types of PFAS in the current guidelines (PFOS, PFOA, PFHxS)
- a new level for an additional PFAS chemical – PFBS.

The water sector is committed to ensuring the provision of safe and secure drinking water to customers and communities. Water utilities did not create PFAS, but we are working to make sure it doesn't impact our customers. Most customers across Australia receive drinking water that complies with the current and draft ADWG PFAS guideline values. During and after the NHMRC review of the guidelines, water utilities will remain vigilant and continue to monitor water and share information with regulators, customers and the community.

The water sector fully supports the process used to set the draft PFAS guideline values, and WSAA provides the following feedback on finalising and implementing the guideline values:

- WSAA supports the rolling revision of the ADWG and we value and respect the role of NHMRC
- The draft PFAS guidelines represent the current evidence, however the NHMRC may like to consider the outcomes of the World Health Organization's review before finalising the guideline values
- WSAA would welcome more information about the proposed PFOS guideline value
- A Regulatory Impact Statement is essential to understand the impact of the guidelines
- NHMRC should emphasise its advice that the draft PFAS guidelines are not implemented as a pass/fail measure to avoid health regulators applying guideline levels as enforceable levels
- Water utilities need time to implement the change in guideline values
- The ADWG are used as the basis for other regulatory frameworks
- Drinking water is one part of the total exposure to PFAS
- Effective source control and associated regulation of PFAS remains the most effective mechanism for protection of public safety.

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WSAA supports the rolling revision of the ADWG and we value and respect the role of NHMRC

WSAA supports the rolling review of the Australian Drinking Water Guidelines to incorporate the latest science to maintain high-quality drinking water and ensure public health.

We value and respect the role of the NHMRC, supported by the Water Quality Advisory Committee, as the independent national authority on health-related drinking water guidelines, expressed through publishing the ADWG.

The detailed evidence reviews and transparent outline of 'evidence to decision' in the Administrative Report, enables transparency, scrutiny and understanding of how the draft guideline values were reached.

The draft PFAS guidelines represent the current evidence, however the NHMRC may like to consider the outcomes of the World Health Organization's review before finalising the guideline values

We recognise the draft guideline values are based on the best available current evidence. However, we note that the ADWG have, for a long time, been aligned with the World Health Organization (WHO) guidelines for drinking water quality with respect to risk management and disease burden. With the WHO currently revising its guidelines for PFAS in drinking water, we suggest the NHMRC consider how best to incorporate the WHO findings. One option would be to wait until the WHO PFAS guidelines are released before finalising the NHMRC PFAS guideline values, another option could be to issue interim guideline values.

WSAA would welcome more information about the proposed PFOS guideline value

From the SLR Consulting Australia report we understand that the high confidence evidence identified the concentration of PFOS in drinking water within a range of 4-77 ng/L as being protective of public health.[1] The outcomes of the expert review conducted by Adjunct Professor Priestly agreed with the approach proposed in the SLR Consulting Australia report of a PFOS guideline value more consistent with the current 70 ng/L value.[2] In addition, Professor Priestly commented on the conservative nature of the 300-fold uncertainty factor applied to the SLR proposed PFOS guideline value of 77 ng/L stating that it added further weight to the contention that the existing guideline value of 70 ng/L was suitably health-protective.[3]

WSAA would welcome more information to understand the reasons the NHMRC selected the lowest of the potential values when an alternative higher value (such as the mean value) would have achieved the same public health outcome. This is relevant to the public consideration of this guideline value, because we understand that based on experience in the USA the need to potentially intervene, and the resulting costs, dramatically climbs when the threshold is 4 ng/L compared to 10 ng/L.

A Regulatory Impact Statement is essential to understand the impact of the guidelines

[1] Addendum to PFAS Evidence Evaluation for ADWG Fact Sheets, SLR Consulting Australia for NHMRC, October 2024 Report (Executive Summary p.iv; Table 5-2 p.52).
[2] Administrative Report: Review of health-based guideline values for PFAS in the Australian Drinking Water Guidelines, NHMRC, October 2024 (p.123).
[3] Administrative Report: Review of health-based guideline values for PFAS in the Australian Drinking Water Guidelines, NHMRC, October 2024 (p.124).

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We recommend that a Regulatory Impact Statement (RIS) is undertaken to help assess the impact of implementing the draft PFAS guidelines. A RIS would provide an objective analysis of the costs and benefits of the draft PFAS guideline and would help to identify any unintended consequences that may arise. This information would be invaluable in informing the decision-making process and ensuring that the draft PFAS guidelines are effective and beneficial for all stakeholders.

The NHMRC plays an important role in the regulatory framework for drinking water quality. In practice, NHMRC set the regulatory policy (the guidelines) that state and territory health regulators adopt and implement. In our view, it is appropriate and efficient for the NHMRC to undertake, or to set the principles for health regulators to undertake, a RIS that covers the implementation of the draft PFAS guideline values.

We recognise that preparing a RIS requires time and resources, but we believe that it is good practice and a necessary step in ensuring that the regulation is in the best interests of all stakeholders. WSAA and our members are willing to assist in any way we can in the preparation of this statement.

NHMRC should emphasise its advice that the draft PFAS guidelines are not implemented as a pass/fail measure to avoid health regulators applying guideline levels as enforceable levels

As noted above, the NHMRC plays an important role in setting the regulatory policy that state and territory health regulators adopt and implement.

To support the successful implementation of the ADWG, the NHMRC should provide health regulators with clear information on the intended use and interpretation of the draft PFAS guideline values to ensure the guidelines are not misinterpreted and/or applied incorrectly.

We note that the draft PFAS guidelines indicate how much PFAS in drinking water a person can consume over a lifetime, without any increased risk to health. The NHMRC have stated that the draft guidelines are set within a wide margin of safety and are expected to be well below the level at which any negative effects could occur.

WSAA supports the NHMRC further emphasising its advice that the draft PFAS guidelines are not implemented as a pass/fail measure and instead should trigger an investigation:

> As for all chemical guideline values, any detections of PFAS higher than the proposed guideline values should be viewed not as a pass/fail measure but should trigger an investigation of potential sources of contamination in case these can be managed to bring the water supply back under guideline values.

We are concerned that some health regulators may apply the PFAS guideline levels as enforceable levels, effectively turning them into a pass/fail measure. To do so would undermine the intention of the guidelines and potentially reduce public confidence in drinking water.

We also recommend the NHMRC ensure their fact sheet and the tables containing PFAS guideline values, explicitly refer to the guideline values applying to drinking water delivered to customers to avoid any misunderstanding about PFAS found in raw water sources.

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Water utilities need time to implement the change in guideline values

Most customers across Australia receive drinking water that already complies with the current and draft PFAS guidelines.

The NHMRC has not proposed or recommended any timelines for when water utilities need to meet the new PFAS guidelines. Following the public consultation and the release of the final PFAS guideline values in April 2025, state and territory health agencies will need to determine the implementation timeline. While it is not normally the remit of the NHMRC or the ADWG, due to the long-term nature of chronic health guidelines and the community and media interest this issue, it is important that advice about a transition period is provided. If possible, this should include advice to state and territory health regulators to confirm that a transition period would not pose an unreasonable risk to public health. A transition period would address the need to collect data to understand the types and concentrations of PFAS in source water and for a limited number of utilities to implement management strategies to reduce the concentration to below the draft/new guidelines. As an example, in the USA, water utilities have been given three years (to 2027) to complete initial monitoring, and five years (to 2029) to implement solutions that reduce PFAS if monitoring shows that reduction is required. The exact transition timeframe should be developed in consultation with each state and territory's health regulator in consultation with water utilities.

Implementation of the draft guidelines will require effort and investment in sampling collection and analysis, and for a limited number of utilities, interventions to meet the draft PFAS guideline values. The impact of additional costs and effort is likely to be higher for small water utilities, and particularly those in regional and remote Australia, these communities may require funding and other support from all levels of government.

Consistent with the ADWG approach for all chemical contaminants, investigation into the potential sources of the PFAS contamination and characterisation of the type of contamination will be undertaken, and the best way to reduce the concentrations in the treated water determined. This could include taking the water supply offline, replacing or blending with alternative uncontaminated sources, or further treatment processes at water filtration plants, for example reverse osmosis, granular activated carbon, and ion exchange. These options all present additional costs for affected water utilities and their customers, in some cases where additional treatment or new water sources are needed these costs are likely to be significant. For example, we estimate a new 30 ML/d water treatment plant would cost $100-200m and a new 30 ML/d desalination plant would cost $300-400m depending on size, location, and a range of other factors. Where PFAS is removed with treatment, there would also be further costs associated with disposing of filters and waste.

In many circumstances the polluter pays principle applies, so that the party responsible for producing pollution is responsible for paying for the impact of the pollution. PFAS exposure comes from many sources of exposure, and accumulate over long periods of time, which makes it very difficult to prove that one particular source has caused the pollution. This means additional costs to meet PFAS guidelines will likely be paid for by customers, or by taxpayers (via state and territory investments).

Given the draft PFAS guideline values, water utilities are considering their testing regimes and liaising with their regulators to confirm suitability. As with other risks to water safety, the risks of PFAS will vary across different areas, so PFAS testing will vary across water utilities and locations. Based on information from our members, we expect all water utilities will face additional costs associated with the increased testing and monitoring required in response to the draft guidelines. The exact impact of

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this will depend on the number and nature of supplies each utility has and if PFAS levels are identified close to or above the draft guideline values.

Given that the PFOS draft guideline value is marginally above the limit of reporting commonly used by laboratories, water utilities will likely require more sensitive testing methods. Testing is carried out at specialised, accredited laboratories using extremely sophisticated methods, by combining liquid chromatography with tandem mass spectrometry (LC-MS-MS).

Water utilities need to avoid inadvertent contamination of water quality samples, which is more likely due to the pervasive nature of PFAS and the relatively low draft guideline values, especially for PFOS. To manage this risk, water utilities must follow a set of strict protocols to ensure there is no contamination during the collection, storage and analysis for PFAS compounds. For example, sample collectors should not wash their hair or wear makeup, perfume, insect repellent or sunscreen for a defined period. Specific types of containers and non-waterproof clothing must also be worn.

WSAA estimates the cost to collect, handle and analyse PFAS samples will increase by 30-100%, reflecting the more sensitive testing and analysis, and the strict testing protocols that are required to manage false positives.

The ADWG are used as the basis for other regulatory frameworks

The ADWG are foundational guidelines for other Australian, state, and territory guidelines that are then adopted and implemented by state and territory health and environmental regulators.

Guidelines for recreational water, non-potable water, recycled water, landfills and biosolids all refer to the ADWG in setting guideline values. For example, the 2008 Guidelines for Managing Risks in Recreational Water and 2019 Guidance on Per and Polyfluoroalkyl substances (PFAS) in Recreational Water, both refer to the ADWG in setting Health Based Guideline Values.

Changes to the ADWG PFAS guideline values will result in changes to PFAS guideline values in other regulatory frameworks. This is likely to result in further costs for water utilities, as well as local councils, waste managers and landowners, with costs higher when the threshold PFAS guideline value is lower.

Drinking water is one part of the total exposure to PFAS

We note that the NHMRC's finalisation of the draft guidelines precedes any updates to other water quality guidelines or the Food Standards Code. In the absence of other updated guidance, the ADWG PFAS guideline values may be applied in a way that is not intended.

We encourage the NHMRC and other Australian Government agencies, including Food Standards Australia New Zealand to take a coordinated approach to setting guideline values for PFAS across all exposure pathways. If possible, the NHMRC should collate and publish a summary of the best available current evidence on the human health risk from all exposure pathways.

PFAS chemicals have been used in hundreds of everyday household and industrial products. This includes sunscreens, cosmetics, clothing, carpet, non-stick cookware, paint, dental floss, food packaging, feminine hygiene products, fertilisers and pesticides used in agriculture. They have also been used in firefighting foam that has often been used to control petrol and diesel fires, and in training exercises at some airports and defence force bases.

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Exposure to PFAS can occur through many pathways including drinking tap water, consumer products, food packaging, air and dust. The draft PFAS guideline values assume that up to 10% of a person's exposure is from drinking water. At least 90% of PFAS exposure is estimated to come from sources other than drinking water. Importantly, the NHMRC indicated that the risk from PFAS in drinking water is low for most Australians.

Effective source control and associated regulation of PFAS remains the most effective mechanism for protection of public safety

WSAA supports ongoing efforts by all levels of government for effective source control.

Import and manufacture restrictions on PFAS, and appropriate controls on products containing PFAS, are key to limiting human exposure to PFAS in the environment, including our drinking water catchments.

The most effective way to limit PFAS in drinking water is to prevent contamination of catchments, and where legacy contamination exists, assessments should be undertaken to identify effective control measures (which could include site remediation, water treatment measures and/or source selection and blending).

The Australian Government has banned the manufacture and importation of the three PFAS chemicals of highest current concern into the country by 1 July 2025 – including products containing these PFAS. Action has also been taken to restrict or replace the use of firefighting foams containing PFAS in Australia. Governments and industry need to continue to work together to look at ways to identify and control PFAS at their source.
In closing, WSAA supports the public consultation process and appreciated the opportunity to provide input. If the outcome of the public consultation is that NHMRC decides to substantially deviate from the draft PFAS guideline values, we would appreciate the opportunity to provide further feedback prior to guideline finalisation.

To discuss our submission in more detail contact [redacted] at [redacted] or [redacted].

Kind Regards

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