Alliance for Telomer Chemistry Stewardship

January 22, 2021

Ms. Irina Makarow
Washington State Department of Ecology
Hazardous Waste & Toxics Reduction Program
300 Desmond Drive SE
Lacey, WA 98503
Submitted via: http://hwtr.ecology.commentinput.com/?id=j4eJD

Dear Ms. Makarow:

The Alliance for Telomer Chemistry Stewardship (ATCS) appreciates this opportunity to provide comments on Washington State's draft Per- and Polyfluoroalkyl Substances (PFAS) Chemical Action Plan (CAP). ATCS is a global organization that advocates on behalf of C6 fluorotelomer-based products. Our members are leading manufacturers of fluorotelomers in North America, Europe and Japan. Our mission is to promote the responsible production, use and management of fluorotelomers, while also advocating for a sound science- and risk-based approach to regulation.

We understand the important issues facing Washington regarding elevated levels of certain PFAS found in multiple locations in the state. Further, we appreciate the significant efforts the departments of Ecology and Health have put into drafting CAP. As Washington continues with these efforts, it is crucial that the state pursue a science- and risk-based approach grounded in a thorough understanding of the broad family of PFAS in order to develop a set of final recommendations that will address these issues in an appropriate and effective manner.

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Thank you for your consideration and please let me know if we can provide any additional information or answer any questions regarding comments.

Sincerely,

Shawn Swearingen
Director, Alliance for Telomer Chemistry Stewardship

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PFAS can withstand high temperatures and survive highly corrosive environments. They are used in the manufacture of coatings, surface treatments, and specialty chemicals in cookware, carpets, food packaging, clothing, cosmetics, and other common consumer products. PFAS also have many industrial applications and are an active ingredient in certain types of firefighting foams (aqueous film-forming foams, or AFFF). PFAS coatings resist oil, grease, and water.

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Appendix 1. Chemistry

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Perfluoroethers or polyethers can also be used (as illustrated in Section 1.4.5 below) as polymer processing aids.

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The current generation fluorotelomer-based AFFF products are shorter perfluorinated chains, such as the 6:2 fluorotelomer sulfonamide alkylbetaine (6:2 FTAB, Figure 20) (Wang et al., 2013).

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Please change to Polymer Polymerization Aids
1.4.5 Polymer processing aids

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This statement is an overstatement of the OECD List publication that notes 4730 compounds compiled in a list. Nowhere in that publication, or anywhere else, is it substantiated that there are thousands of compounds in commerce and in use. Please revise accordingly, there are thousands of different PFAS in use.

Appendix 3 Sources & Uses
Pages 159-160.
For the reader and general audience, it would be helpful to reflect more current data in Tables 28 and 29 which would reflect current products in commerce versus all historical legacy products.
CAP draft: Using the process developed by EPA, recent product testing study data are added to the 2009 data (Guo et al., 2009; Fujii, 2013; Herzke et al., 2012; Kotthoff, 2015; Liu et al., 2015). Tables 28 and 29 list the top ten products for the sum of PFCA and FTOH/fluorotelomer sulfonate (FTS). Supplement 1 to this appendix provides estimates for more product testing data. The amount of PFAS in the typical home from each product will not directly correlate with exposure. Some PFAS such as fluoropolymers in non-stick cookware have been shown to be stable

Appendix 4 Fate & Transport
Page 203.
Monomer is a broad term and can have many meanings. Please define here so that the reader clearly understands what the CAP document means. It is not usually used in the context shown here in the document. All PFAS monomers are either perfluoroalkyl acids (PFAAs) or perfluoroalkyl acid (PFAA) precursors.

Page 203.
It should be noted that there is both published work as well as work presented at scientific conferences that do indicate the t ½ for precursor transformation to vary from hours/days to months to hundreds of years to thousands of years.
It is believed that all PFAA precursors will transform to PFAAs, with a timeframe that could range from hours to hundreds of years.
Page 205.
The structure for 8:2 FTOH is incorrect as it shows a ketonic structure. Please correct.
Figure 26. Examples of precursor aerobic biotransformation to PFAAs with half-lives (as described in Section 4.1).

Page 209.
We would ask the CAP authors to please check the reference citing 15000 years as a t ½ for biodegradation. What is often cited is 1200-1400 years in the Russell et al publications.
However, this finding is still unsettled, due to alternate reports using different methods, which show a half-life of approximately 15,000 years for fluorotelomer-based polymers (Russell, Berti, Szostek & Buck, 2008; Russell, Wang, Berti, Szostek & Buck, 2010).

Page 212.
It may be helpful to the reader to qualify what is meant by "large source" as AFFF use is very localized and is currently only used to fight high hazard Class B fires. In addition, almost all testing and training with AFFF has been discontinued in the US and elsewhere.
Firefighting using AFFF represents a large source of release of water-based PFAS mixtures into the environment through runoff into surface and migration to groundwater, as discussed in Appendix 3: Sources and uses, Section 3.2.

Appendix 7. Health
Page 293.
We ask Ecology to consider noting that potential exposure sources vary greatly. Food and/or drinking water may be the primary sources depending on location in the US and elsewhere. This can vary greatly depending on the locale.

"People can be exposed to PFAS from contaminated drinking water, other dietary sources, indoor dust and air that contain PFAS from consumer products, and use of consumer products that contain PFAS. Although it has been difficult to assess which sources contribute the most to human exposure, studies identify food and drinking water as the likely main routes of non-occupational exposure."

Page 302.
As has been noted before we ask Ecology to recognize that there are not thousands of PFAS in commerce as implied here but likely hundreds of compounds. We believe this is an overstatement and an unneeded exaggeration. Please remember that the OECD list of 4730 compounds is just that – a list of compounds with no commercial relevance noted. Sources of uncertainty in assessing hazard. We still know very little about the potential toxicity of thousands of individual PFAS.

Page 303.
We do agree about the uncertainly of how animal studies translate to humans. While they may guide us, absolute translations of effects for risk assessments are often not possible.
Toxicokinetic models of internal dose help us extrapolate from animal results to humans, but some of the inputs—like human clearance rates for different life stages, gender, and level of exposure—are uncertain. The mechanisms of action underlying adverse effects observed are only partly understood. This adds to uncertainty about which outcomes in test animals are most relevant to human risk assessment and which animal models are best suited to investigating outcomes observed in human studies.

Page 305.
Same comments as made earlier on the "thousands of PFAS".
It is important to acknowledge that we have limited ability to measure and identify human exposures to PFAS. There are thousands of PFAS compounds, but only about a dozen have been regularly measured in blood serum of people (CDC – NHANES, 2019; Olsen et al., 2017).

Page 306.
Thank you for including the t ½ values for comparison purposes. A couple points should be noted. First, the t ½ for PFOA is usually cited in the 3-4 year period by most all literature accounts. It is puzzling to see the citation here, especially the 0.3 year t ½.
On PFHxA - while we do acknowledge the Russell et al work as one of the few literature studies on PFHxA, this work was not a formal t ½ study. Most citations note a 28-32 day range.
Mean and median estimates that are most relevant to environmental exposures are provided below. • PFOA: 0.3 to 3.9 years (Li et al., 2018). • PFOS: 3.3 to 4.6 years (Li et al., 2018; Olsen et al., 2007). • PFNA: 2.5 to 4.3 years (Zhang et al., 2013). • PFHxS: 5.3 to 7.1 years (Li et al., 2018). • PFHxA: 32 days (Russell et al., 2013). • PFBS: 27 days (Olsen et al., 2009). • PFBA: 72 hours (Chang et al., 2008)

Page 342.
It would be helpful for Ecology to call out what testing they do believe is needed for each of these compounds. PFHxA for example has a significant body of published testing literature available.
Further toxicity testing on other PFAS that occur in drinking water and human serum (especially PFHpA, PFHxA, PFBA, 6:2 FTS, and PFDA)

Page 352.
It is unclear why this PFBA reference is included in the PFHxA section of comments. The TABLE from the SAW report is included here and shows PFHxA is 400,000 ppt. Please correct paragraph.
The health-based value for subchronic or chronic intake of PFBA from Michigan Science Advisory Workgroup (SAW) is 83,000 ng/kg-day (SAW, 2019).

Summary Table of Drinking Water Health-Based Values
Specific
PFAS
Drinking Water Health based Value
Chemical Abstract
Services Registry
Number (CASRN)
PFNA 6 ng/L (ppt) 375-95-1
PFOA 8 ng/L (ppt) 335-67-1
PFHxA 400,000 ng/L (ppt) 307-24-4
PFOS 16 ng/L (ppt) 1763-23-1
PFHxS 51 ng/L (ppt) 355-46-4
PFBS 420 ng/L (ppt) 375-73-5
GenX 370 ng/L (ppt) 13252-13-6

Page 352.
For completeness it might be helpful for the reader if Ecology included the conclusions from this Luz work and the companion Anderson et al paper which provides a genuine RfD for PFHxA.
Limited human evidence has been reported (Luz et al., 2019).

Appendix 9 – Regulation
Page 429
In June of 2020, EPA revised its regulations to add the 172 PFAS substances subject to TRI reporting by virtue of the 2020 NDAA. See (85 Fed Reg 37354). Separately, in 2019, EPA also issued an advance notice of proposed rulemaking to add further to the list of PFAS substances subject to reporting for TRI (See 84 Fed Reg 66369).

Page 431
On July 31, 2020, FDA announced a voluntary agreement with manufacturers to phase out the distribution in commerce of several short-chain PFAS compounds for use in food packaging by the end of 2023. (See https://www.fda.gov/food/cfsan-constituent-updates/fda-announces-voluntary-phase-out-industry-certain-pfas-used-food-packaging)

Appendix 10 – Economic Analysis
Page 452
The Draft CAP correctly notes that facilities will incur significant capital costs to replace AFFF, since application and mixing equipment and infrastructure designed for use with AFFF are generally not suitable for non-fluorine firefighting agents and will have to be replaced or retrofitted

Page 453
When assessing the economic impact of replacing PFAS-containing carpeting with non-PFAS carpeting, Ecology should consider the increased durability provided by PFAS treatments. Because of their superior stain resistance and soil release properties, PFAS treatments prolong the useful life of carpeting – and other, similar, articles -- thereby allowing for less frequent replacement (and the generation of less waste) and concomitant cost savings.

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Please change to Polymer Polymerization Aids
1.4.5 Polymer processing aids

Page 105.
This statement is an overstatement of the OECD List publication that notes 4730 compounds compiled in a list. Nowhere in that publication, or anywhere else, is it substantiated that there are thousands of compounds in commerce and in use. Please revise accordingly, there are thousands of different PFAS in use.

<u>Appendix 3 Sources & Uses</u>
Pages 159-160.
For the reader and general audience, it would be helpful to reflect more current data in Tables 28 and 29 which would reflect current products in commerce versus all historical legacy products.
CAP draft: Using the process developed by EPA, recent product testing study data are added to the 2009 data (Guo et al., 2009; Fujii, 2013; Herzke et al., 2012; Kotthoff, 2015; Liu et al., 2015). Tables 28 and 29 list the top ten products for the sum of PFCA and FTOH/fluorotelomer sulfonate (FTS). Supplement 1 to this appendix provides estimates for more product testing data. The amount of PFAS in the typical home from each product will not directly correlate with exposure. Some PFAS such as fluoropolymers in non-stick cookware have been shown to be stable

<u>Appendix 4 Fate & Transport</u>
Page 203.
Monomer is a broad term and can have many meanings. Please define here so that the reader clearly understands what the CAP document means. It is not usually used in the context shown here in the document. All PFAS monomers are either perfluoroalkyl acids (PFAAs) or perfluoroalkyl acid (PFAA) precursors.

Page 203.
It should be noted that there is both published work as well as work presented at scientific conferences that do indicate the t ½ for precursor transformation to vary from hours/days to months to hundreds of years to thousands of years.
It is believed that all PFAA precursors will transform to PFAAs, with a timeframe that could range from hours to hundreds of years.
Page 205.
The structure for 8:2 FTOH is incorrect as it shows a ketonic structure. Please correct.
Figure 26. Examples of precursor aerobic biotransformation to PFAAs with half-lives (as described in Section 4.1).

Page 209.
We would ask the CAP authors to please check the reference citing 15000 years as a t ½ for biodegradation. What is often cited is 1200-1400 years in the Russell et al publications.
However, this finding is still unsettled, due to alternate reports using different methods, which show a half-life of approximately 15,000 years for fluorotelomer-based polymers (Russell, Berti, Szostek & Buck, 2008; Russell, Wang, Berti, Szostek & Buck, 2010).

Page 212.
It may be helpful to the reader to qualify what is meant by "large source" as AFFF use is very localized and is currently only used to fight high hazard Class B fires. In addition, almost all testing and training with AFFF has been discontinued in the US and elsewhere.
Firefighting using AFFF represents a large source of release of water-based PFAS mixtures into the environment through runoff into surface and migration to groundwater, as discussed in Appendix 3: Sources and uses, Section 3.2.

<u>Appendix 7. Health</u>
Page 293.
We ask Ecology to consider noting that potential exposure sources vary greatly. Food and/or drinking water may be the primary sources depending on location in the US and elsewhere. This can vary greatly depending on the locale.

"People can be exposed to PFAS from contaminated drinking water, other dietary sources, indoor dust and air that contain PFAS from consumer products, and use of consumer products that contain PFAS. Although it has been difficult to assess which sources contribute the most to human exposure, studies identify food and drinking water as the likely main routes of non-occupational exposure."

Page 302.
As has been noted before we ask Ecology to recognize that there are not thousands of PFAS in commerce as implied here but likely hundreds of compounds. We believe this is an overstatement and an unneeded exaggeration. Please remember that the OECD list of 4730 compounds is just that – a list of compounds with no commercial relevance noted. Sources of uncertainty in assessing hazard. We still know very little about the potential toxicity of thousands of individual PFAS.

Page 303.
We do agree about the uncertainly of how animal studies translate to humans. While they may guide us, absolute translations of effects for risk assessments are often not possible.
Toxicokinetic models of internal dose help us extrapolate from animal results to humans, but some of the inputs—like human clearance rates for different life stages, gender, and level of exposure—are

uncertain. The mechanisms of action underlying adverse effects observed are only partly understood. This adds to uncertainty about which outcomes in test animals are most relevant to human risk assessment and which animal models are best suited to investigating outcomes observed in human studies.

Page 305.
Same comments as made earlier on the "thousands of PFAS".
It is important to acknowledge that we have limited ability to measure and identify human exposures to PFAS. There are thousands of PFAS compounds, but only about a dozen have been regularly measured in blood serum of people (CDC – NHANES, 2019; Olsen et al., 2017).

Page 306.
Thank you for including the t ½ values for comparison purposes. A couple points should be noted. First, the t ½ for PFOA is usually cited in the 3-4 year period by most all literature accounts. It is puzzling to see the citation here, especially the 0.3 year t ½.
On PFHxA - while we do acknowledge the Russell et al work as one of the few literature studies on PFHxA, this work was not a formal t ½ study. Most citations note a 28-32 day range.
Mean and median estimates that are most relevant to environmental exposures are provided below. • PFOA: 0.3 to 3.9 years (Li et al., 2018). • PFOS: 3.3 to 4.6 years (Li et al., 2018; Olsen et al., 2007). • PFNA: 2.5 to 4.3 years (Zhang et al., 2013). • PFHxS: 5.3 to 7.1 years (Li et al., 2018). • PFHxA: 32 days (Russell et al., 2013). • PFBS: 27 days (Olsen et al., 2009). • PFBA: 72 hours (Chang et al., 2008)

Page 342.
It would be helpful for Ecology to call out what testing they do believe is needed for each of these compounds. PFHxA for example has a significant body of published testing literature available.
Further toxicity testing on other PFAS that occur in drinking water and human serum (especially PFHpA, PFHxA, PFBA, 6:2 FTS, and PFDA)

Page 352.
It is unclear why this PFBA reference is included in the PFHxA section of comments. The TABLE from the SAW report is included here and shows PFHxA is 400,000 ppt. Please correct paragraph.
The health-based value for subchronic or chronic intake of PFBA from Michigan Science Advisory Workgroup (SAW) is 83,000 ng/kg-day (SAW, 2019).

Summary Table of Drinking Water Health-Based Values
Specific
PFAS
Drinking Water Health based Value
Chemical Abstract
Services Registry
Number (CASRN)
PFNA 6 ng/L (ppt) 375-95-1
PFOA 8 ng/L (ppt) 335-67-1
PFHxA 400,000 ng/L (ppt) 307-24-4
PFOS 16 ng/L (ppt) 1763-23-1
PFHxS 51 ng/L (ppt) 355-46-4
PFBS 420 ng/L (ppt) 375-73-5
GenX 370 ng/L (ppt) 13252-13-6

Page 352.
For completeness it might be helpful for the reader if Ecology included the conclusions from this Luz work and the companion Anderson et al paper which provides a genuine RfD for PFHxA.
Limited human evidence has been reported (Luz et al., 2019).

Appendix 9 – Regulation

Page 429
In June of 2020, EPA revised its regulations to add the 172 PFAS substances subject to TRI reporting by virtue of the 2020 NDAA. See (85 Fed Reg 37354). Separately, in 2019, EPA also issued an advance notice of proposed rulemaking to add further to the list of PFAS substances subject to reporting for TRI (See 84 Fed Reg 66369).

Page 431
On July 31, 2020, FDA announced a voluntary agreement with manufacturers to phase out the distribution in commerce of several short-chain PFAS compounds for use in food packaging by the end of 2023. (See https://www.fda.gov/food/cfsan-constituent-updates/fda-announces-voluntary-phase-out-industry-certain-pfas-used-food-packaging)

Appendix 10 – Economic Analysis

Page 452
The Draft CAP correctly notes that facilities will incur significant capital costs to replace AFFF, since application and mixing equipment and infrastructure designed for use with AFFF are generally not suitable for non-fluorine firefighting agents and will have to be replaced or retrofitted

Page 453
When assessing the economic impact of replacing PFAS-containing carpeting with non-PFAS carpeting, Ecology should consider the increased durability provided by PFAS treatments. Because of their superior stain resistance and soil release properties, PFAS treatments prolong the useful life of carpeting – and other, similar, articles -- thereby allowing for less frequent replacement (and the generation of less waste) and concomitant cost savings.