

Dear Ms. Steward,

Thank you for the opportunity to comment on the draft interim Chemical Action Plan (CAP) for Per- and Poly-fluoroalkyl Substances (PFAS). However, due to the short timeline provided for review of the interim CAP we were unable to complete a detailed review of the document. As a result, the comments included here are limited and represent only an initial review by King County Water and Land Resources Division (WLRD) staff participating on the PFAS CAP Advisory Panel. King County will provide additional comments during the public review process for the draft interim PFAS CAP.

The King County Department of Natural Resources and Parks (DNRP) has a stake in the PFAS CAP through its government operations and the protection of public health, the environment, and the sustainable use of the natural resources. We appreciate your efforts to address the environmental and human health issues associated with PFAS.

Table 1. WLRD Staff CAP Advisory Panel Comments

General Comments:
We recommend that Ecology address all PFAS in the CAP, including, but not limited to: long-chain, short-chain, fluoropolymers, and precursors. There is an incomplete understanding of the science regarding many PFAS compounds, and we would like to ensure that the CAP includes a plan to evaluate and monitor legacy, as well as replacement PFAS compounds, which frequently include short-chain and fluoropolymer compounds.
Please ensure that the PFAS terminology is consistent throughout the document to minimize confusion. There is also some inconsistency in the level of detail and content between sections. Some sections and chapters seem to focus on PFOS/PFOA, while some seem to focus on long-chains.
We recommend that an “upstream” approach be used to address PFAS contamination to the extent possible. Addressing this issue at the source will help to limit the ratepayer and taxpayer cost burden for cleanup and removal of PFAS from various waste streams under the jurisdiction of municipal governments. For example, stormwater is the primary pollution conveyance for many organic compounds. However, stormwater treatment facilities are not designated for, and by and large have not been evaluated for toxic organic compound removal, including PFAS.
We would like the CAP to include a focus on addressing equity and social justice issues associated with exposure to PFAS. Communities that could be disproportionately impacted include subsistence fishers and low-income communities and sensitive populations like children, pregnant women, and the elderly. Subsistence fishers will be impacted through consumption of locally caught fish food containing PFAS (Ecology 2017). Some low-income communities may be impacted through a greater availability of fast food and limited access to grocery stores and fresh produce. Fast food, take-out, and other restaurants frequently use food containers or wrappers that contain PFAS to repel grease. These same communities may also be impacted by a disproportionate use of legacy products that may contain PFAS compounds that have been phased out of production since. Since these communities tend to have fewer economic resources to purchase new products, they have the higher likelihood of reusing second-hand household items.
We recommend that the Economic Analysis being developed for the CAP describes how the actions described in the CAP balance the taxpayer, environmental, and social costs.

<p>We recommend that specific guidance for public messaging, policy actions, and plans for funding of monitoring and research be included in the CAP. These will ensure that the actions outlined in the CAP will be functional, enduring, and successful.</p>		
<p>Comments Specific to draft Interim CAP Text:</p>		
Section and Page No.	Text	Comment
Introduction, Page 2	“Interested parties: [Listed]”	Other King County agencies (Public Health Seattle-King County, Local Hazardous Waste Management) not listed
Health, p. 20, Table 3	“PFOS GM (range) 37.5 (6.7-515.0)” under “23 U.S. States & Washington, D.C.”	Not clear if range represents geometric means by state/locales or range of concentrations found in participants.
Health, p. 42	“The European Chemicals Agency (ECHA) concluded that there is insufficient data for the tumors observed in rats on the mode of action of PFOA to conclude that tumors are not relevant for humans.”	Confusing wording. Suggest revision to simplify text.
Health, p. 44	“Lubeck, West Virginia, Ohio”	Typo.
Health, p. 45	“As a result, PFAS chemicals were found in the Decatur Utilities biosolids, surface water, groundwater, and drinking water. PFOA was detected in 57 percent of surface waters near the fields. Four out of 19 (22 percent) private wells had PFOA concentrations above the EPA’s Health Advisory level of 0.07 µg/L.”	Not clear that biosolids was source of PFAS detections in public drinking water supply as it says in original ATSDR report.
Health, p. 56	“Department of Health reviewed fish data collected by Ecology in 2008 and 2016 and found that some fillet tissue levels exceeded provisional health-based screening levels (i.e., 23 µg/g and 8 µg/g for both the general population and high consumers, respectively).”	Please provide additional detail about how or when a fish consumption advisory would be issued. Please provide additional detail about the consumption rates used to generate the health-based screening levels. A figure in the Environment chapter displays these PFOS screening levels for the general population and high consumer, but they are not explained in the Health chapter.
Environment, Sediment section	“In 2012, Ecology collected sediment cores from three	Please clarify that they are age-dated sediment cores.

	freshwater lakes for analysis of 12 PFAAs and PFOSA”	
Uses, p. 10	“A conceptual model of the movement of oil into and out of Washington State is shown in Figure 2.”	Figure call out does not match.
Chemistry, p. 11	“Table X highlights some important PFAS classes, the associated R-groups that define each class, class abbreviations, and representative substances.”	Table callout way before (e.g. Table 4)?
Chemistry, General	N/A	Please provide clarification on the influence microbial digestion can have on PFAA formation. This seems to be a significant factor for wastewater treatment plants (Guerra et al. 2014) and potentially compost.
Biosolids, p.2	Background – 2nd paragraph	Please consider adding to this paragraph (maybe at end): “Sewage sludge undergoes microbial treatment at elevated temperature to meet the federal requirements for land application. Some biosolids may receive further processing with added carbon material (e.g. sawdust) to create a biosolids compost for non-agricultural use.”
Biosolids, p.2	Federal and State Regulation. “Under ‘503’ the solids generated by Wastewater treatment are termed ‘sewage sludge’”	Please clarify further that EPA uses the term “sewage sludge” generally by editing to: “Under the 503 Rule, all solids generated by wastewater treatment are termed ‘sewage sludge’ regardless of whether they meet standards for land application.” Also, follow up in the next paragraph on Washington State regulation that “Washington regulation differentiates between wastewater solids that meet the federal and state regulatory standards for land application, classified as ‘biosolids’, and those not meeting standards as ‘sewage sludge’”
Biosolids, p. 3	Assessment of Biosolids Risk, last paragraph	Please add that EPA is required to conduct biennial updates on an ongoing basis to the 503 Rule including addition

		of new chemicals that meet the minimum data requirements.
Biosolids, p. 3	“Washington residents are exposed to PFOS/PFOA from carpets, food packaging, surface coatings on textiles, GorTex fabric, ski wax, and wide variety of other sources.”	Emphasis seems to be on PFOS/PFOA, while other PFAS can also be used now that these are being phased out in U.S. There is a potential for PFOS/PFOA to still be in imports; however, we suggest the focus should be broader than just these two compounds.
Biosolids, p. 4	4 th paragraph, Comparison of NHANES data over time	This paragraph doesn’t seem to belong in the Biosolids section. Does this study somehow focus on biosolids exposure? Blood levels are integrative of all pathways. This seems more appropriate for the Health chapter.
Biosolids, p. 4	“Archived samples of biosolids from the EPA National Sewage Sludge Survey in 2001 were combined into 5 composite samples and analysis showed concentrations of PFOS at 403 +/- 127 ng/g, and PFOA at 34 +/- 22 ng/g.”	Text seems to interchangeably use biosolids and sewage sludge, which have different definitions in Washington State. Please clarify this terminology. Also, please include additional text in the intro to provide explanation of sewage sludge compared to biosolids and biosolids compost as they involve different levels of processing that could affect PFAS concentration and formation.
Biosolids, p. 5	Effects of biosolids land application	Data collection in Decatur is described and an EPA risk assessment is mentioned, but what was the outcome? Was the risk assessment completed? To get to a conclusion of low risk in the Biosolids Section there needs to be context of how these soil concentrations relate to human and/or ecological risk.
Biosolids, p. 7	“Given the data from PFOS/PFOA analysis of WWTP residuals outside of Washington it’s likely these compounds are present in biosolids generated in Washington State and that concentrations vary depending on WWTP.”	Could use this text as an opportunity to talk about Guerra et al. 2014 findings on different WWTP technologies and PFAS formation.
Biosolids, p. 7	“The phase-out of PFOS & PFOA by manufacturers along with the PFOS/PFOA data trends in Germany and	It would be helpful context to add that Venkatesan and Halden (2013) comparing these 2001 data to more recent results did not find a change (no

	locations worldwide suggest that concentrations of these chemicals are likely to be low and trending downward in Washington biosolids.”	decrease) in sewage sludge concentrations after the PFOS/PFOA phase out. This is a very large national dataset. The world study cited may be skewed compared to US data and sending the wrong message on status here. This paper also calculates mean loads of PFAS applied in U.S. – might be helpful to add. Does not mention concentrations of other PFAS, especially lower chain replacements. For example, we know lower chain replacements are making up greater portion of PFAS in wastewater effluent in WA. Also preferential leaching of short chain PFCAs (<C8) were observed in biosolids-amended soil cores at depths of 1.2 m or more (Sepulvado et al. 2011; Washington et al. 2010 as cited by Hamid and Li 2016).
Biosolids, p. 7	Last sentence.	Please clarify the statement that risks appear low since it is not supported by this section. The EPA Biosolids risk assessments did not assess PFAS. There is no discussion of effects to aquatic life or wildlife so this is unknown. At best, studies discussed are related to human exposure but the blood level study should be moved to Health chapter.
Ecotoxicology, p. 3 and p. 5	Table 1 and “long-chain PFAS tend to be both bioaccumulative and produce adverse toxicological effects to both upland and aquatic ecological receptors even at relatively low contaminant levels”	Information presented in this table seems to contradict information in subsequent sections, e.g. Long-chain PFAS. Also source seems dated (10+ years). May be best to generate new table with multiple sources (including updated) that matches information reported in subsequent sections.
Ecotoxicology, p. 3	“Conder et al., 2007”	Not listed as a reference.
Ecotoxicology, p. 6	“PFOS and longer chain PFCAs (> C8) bioaccumulate and persist in protein-rich compartments of fish and birds, and in marine mammal tissues, such as carcass, blood, and liver.”	Please mention PFAS compound concentrations in freshwater fish livers and osprey eggs in WA from Ecology’s 2016 sampling report (Ecology 2017).

Ecotoxicology, p. 9	“High PFS concentrations have been detected in dolphin plasma and tissue samples in which PFOS, C8 and C10 – PFCAs predominated in most matrices.”	Please check consistency through CAP text on terminology used for PFAS, seems to switch around in some places. Please be consistent with terms outlined to minimize confusion.
Ecotoxicology, p. 9	“Biomagnification of PFOS along the marine food chain showed shorthorn sculpin < ringed seal < polar bear.”	This is inconsistent with information in Table 1, which shows PFOS as “possibly biomagnification.”
Ecotoxicology, p. 10	“A study was performed exploring the induction of liver tumors in Wistar rats for several chemicals, including PFOA”	Should be spelled “Wistar.”
Ecotoxicology, p. 10	“This study indicated that PFOA caused a 24-fold increase in the peroxisomal β -oxidation of fatty acids, but only about a 2-fold increase in catalase activity.”	Is this compared to the reference/control population?
Regulations, p. 2	“Summary of PFAS Regulations, Guidance and Requirement” Table	Please provide explanations of abbreviations used in table e.g. SDWA, TSCA, FD&C, etc.
Regulations, p. 2, Summary of PFAS Regulations, Guidance and Requirement Table	“Health advisory” under Washington	Please clarify that this is for drinking water.
Regulations, p. 2, Summary of PFAS Regulations, Guidance and Requirement Table	“ $\mu\text{g}/\text{L}$ ”	For all units, please either add media for clarity. For example, “ $\mu\text{g}/\text{L}$ in drinking water” or “ mg/Kg in residential (or industrial) soils.” Also consistency of units as much as possible would be easier for reader. In the table and subsequent sections for example, it seems to switch between “70 ppt” and “0.70 $\mu\text{g}/\text{L}$ ”. “Ppt” is ambiguous and can mean parts per thousand or parts per trillion depending on context and has not been defined previously in text.
Regulations, p. 2, Summary of PFAS Regulations, Guidance and Requirement Table	“Persistent waste”	Please cite WAC or similar legislation to legally define what this is.
Regulations, p. 2, Summary of PFAS	Limit or Requirement	Many of values in this category are unclear and need additional clarification, e.g. “Notification”, “Storage

Regulations, Guidance and Requirement Table		handling”, “Reporting required”. “Restrictions” need additional clarification whether these are restricted in manufacturing, import, disposal, etc.
Regulations, p. 2, Summary of PFAS Regulations, Guidance and Requirement Table	“Risk limits” under Minnesota	Please clarify that these are for drinking water.
Regulations, p. 3, Summary of PFAS Regulations, Guidance and Requirement Table	“Consumption limit” under Wisconsin	Please report what consumption limits are.
Regulations, p. 3, Summary of PFAS Regulations, Guidance and Requirement Table	“US – TSCA”	Please change to TSCA (Toxic Substances Control Act).
Regulations, p. 5	“At this time, we don’t know enough to predict the drinking water that will produce health effects in people.”	Think this was intended to say “At this time, we don’t know enough to estimate a concentration in drinking water that will avoid health effects in people.”
Regulations, p. 6	“Dangerous Waste”	Recommend this section go into more detail on Ecology’s plans for cleanup levels as detailed by Jim Pendowski on 8/30/17.
Regulations, p. 8	“This recommendation has not been accepted by the NJ Department of Environmental Protection for rulemaking.”	Recommendation has since been accepted. See reference to press release (NJDEP 2017).
Regulations, p. 10	“There are protective concentration levels for 16 PFAS in the March 2017 Tier 1 levels for soil and groundwater.”	What are protective concentrations? How were they derived? What were assumptions used for calculations? The section does not seem to have parallel structure compared to other sections where this type of information is also shown.
Regulations, p. 10	“Toxic Substances Control Act”	Please include abbreviation in introduction since “TSCA” is used in rest of section and document.
Regulations, p. 11	“PFAS Significant New Use Rule”	Please add a definition for “LCPFAC.”
Regulations, p. 11	“In 2000, EPA adopted a new rule requiring manufacturers and importers to notify at least 90 days before commencing the manufacture	Year cited in text disagrees with table that says 2002.

	or import using 13 PFAS (40 CFR 721.9582).”	
Regulations, p. 12	“Safe Drinking Water Act” Section	Because EPA's Health Advisory is the basis for many state limits the federal limits/basis should be presented before state rules citing it. Please move this entire section up.
Regulations, p. 13	“three restricted PFAS”	Please clarify whether these are the same ones phased out by EPA or different.
Regulations, p. 14	“Participating companies agreed to reduce PFOA, precursor chemicals that can break down into PFOA, and related higher homologue chemicals by 95% no later than 2010 and to work toward eliminating these chemicals from facility emissions and in product content entirely by 2015.”	Please clarify if this goal was achieved and why or why it was not.
Regulations, p. 16	“PFOS in surface freshwater at 0.00065 µg/l, based on the potential for secondary poisoning in humans due to fish consumption.”	Please indicate the fish consumption rate this was based on? A summary of other calculation assumptions would be helpful to provide context.
Regulations, p. 16	“In 2011, production, supply and use of firefighting foam with PFOS is banned....Acceptable uses of PFOS include: firefighting foam.”	Seems to provide contradictory information within a few sentences. Talks about banning the use of PFOS in firefighting foam and then lists it as an acceptable use. Not clear if this is a reversal of a previous decision or if there is a distinction that needs to be made. Please clarify this text.
Regulations, p. 17	“The import, manufacture, use, sale and offer for sale of a product, if PFOA, LC-PFCAs, and/or PFOS are incidentally present.”	Please clarify what concentration threshold is considered incidentally present vs. intentionally present.
Regulations, p. 18	“The blood level standard set by the German scientists would correspond to a limit for PFOA in drinking water of 0.0019 µg/L – 36 times lower than the EPA lifetime health advisory.”	Please clarify derivation of 36 times lower drinking water value. Not cited in original source.

<p>Regulations, p. 19</p>	<p>“The Netherlands National Institute for Public Health and the Environment has calculated a maximum permissible concentration for PFOS of 0.65 ng/L (0.00065 µg/L) for fresh water (based on consumption of fish by humans as the most critical route). This value is based on a consumption of 115 grams of fish per day.”</p>	<p>What bioconcentration/ bioaccumulation factor was used and how was it derived? Please clarify this text.</p>
<p>Regulations, p. 20</p>	<p>“In 2007, the United Kingdom Drinking Water Inspectorate issued guidance for concentrations of PFOA and PFOS in drinking water and revised the guidance in 2009. The United Kingdom Tier 2 health guidance value is 0.3 µg/L for PFOA and PFOS.”</p>	<p>Please explain difference between tiers.</p>

References Cited

Ecology. 2017. Survey of Per- and Poly-fluoroalkyl Substances (PFAS) in Rivers and Lakes, 2016. Environmental Assessment Program, Olympia, WA. Publication No. 17-03-021.

Guerra, P., M. Kim, L. Kinsman, T. Ng, M. Alaei, S.A. Smyth. 2014. Parameters affecting the formation of perfluoroalkyl acids during wastewater treatment. *Journal of Hazardous Materials* 272 (2014) 148–154.

Hamid, H. and L.Y. Li. 2016. Role of wastewater treatment plant in environmental cycling of poly- and perfluoroalkyl substances. *Ecocycles* 2(2) 43-53.

NJDEP (New Jersey Dept. of Environmental Protection). 2017. Christie Administration takes action to enhance protection of New Jersey's drinking water. Press Release 17/P104. 1 November 2017. http://www.nj.gov/dep/newsrel/2017/17_0104.htm.

Sepulvado, Jennifer G., Andrea C. Blaine, Lakhwinder S. Hundal, and Christopher P. Higgins. 2011. "Occurrence and Fate of Perfluorochemicals in Soil Following the Land Application of Municipal Biosolids." *Environmental Science & Technology* 45 (19): 8106-8112. <http://dx.doi.org/10.1021/es103903d>.

Venkatesan, A. and R. Halden. 2013. National inventory of perfluoroalkyl substances in archived U.S. biosolids from the 2001 EPA National Sewage Sludge Survey. *Journal of Hazardous Materials* (252-253): 413-418.

Washington, John W., Hoon Yoo, J. Jackson Ellington, Thomas M. Jenkins, and E. Laurence Libelo. 2010. "Concentrations, Distribution, and Persistence of Perfluoroalkylates in Sludge-Applied Soils Near Decatur, Alabama, USA." *Environmental Science & Technology* 44 (22): 8390-8396. <http://dx.doi.org/10.1021/es1003846>.