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Re: Proposed ADEC Amendments to 18 AAC 75 – Setting Cleanup Levels for PFAS

Dear Review Board,

We represent water quality professionals who treat the wastewater from homes and businesses and organics recyclers who compost residential and commercial green wastes – with the ultimate goal of recycling nutrients and organic matter from biosolids and other organic residuals back to farmland, gardens, and soils. We are writing as a collective to commend the Alaska Department of Environmental Conservation (ADEC) for your continued work on protecting and cleaning up Alaska's soils.

We are concerned about the proposed ADEC Amendments to 18 AAC 75 – Setting Cleanup Levels for PFAS. Our members and stakeholders are involved in soil health and management through recycling of organic residuals (i.e. biosolids, composts, septage, and manures) and wastewaters. We work with farmers, gardeners, and other landowners to sustainably improve land and grow crops (feed, food, turf, trees, and native ecosystems).

We appreciate this opportunity to offer the following comments for consideration.

While we appreciate ADEC's interest in establishing soil cleanup standards, in particular for industrially contaminated sites, we are concerned about the potential for unintended consequences that will significantly impact our members in Alaska and other municipalities and businesses. In particular, ADEC's proposed (and current) migration to groundwater soil cleanup standard for five of the six PFAS are inappropriate and indefensible based on current scientific knowledge and are unmeasurable, and, thus, untenable. We recommend that ADEC eliminate the migration to groundwater pathway soil cleanup values for the five PFAS chemicals other

than PFBS, including the current values already in place for PFOA and PFOS in Table B1 of 18 AAC 75.[1]

Current knowledge and understanding of PFAS dictate a more careful, targeted approach to regulation. Most states are taking this targeted approach, recognizing that the high levels of uncertainty and the ubiquitous dispersion of several PFAS chemicals in the environment in many matrices and their unusual chemical characteristics make the regulation of these chemicals particularly challenging. Most states are properly focused on:

- Investigating and mitigating drinking water impacts;
- Investigating and mitigating industrial, military, and fire-fighting sites where levels of PFOA and PFOS in particular are very high in soils, groundwaters, and surface water due to historical contamination (these sites pose the greatest potential risks); and/or
- Reducing uses and discharges of PFOA and PFOS in particular; the phase-out of these two PFAS has already resulted in significant reduction of any potential risk in the general population.

A few states have set soil cleanup standards based on direct exposures by ingestion and dermal contact. And U.S. EPA also set direct exposure standards as part of their 2009 residential soil screening guidance values for PFOS at 6mg/kg and PFOA at 16 mg/kg. We support ADEC for the proposed direct exposure standards in the proposed regulation.

However, very few states have begun attempts to set migration to groundwater soil or materials standards, and they have already retreated, recognizing the challenges, uncertainties, and potential unintended consequences:

- In 2017, New York DEC began testing soils and organic residuals (e.g. biosolids and paper mill residuals) applied to soils, to see if they could establish screening levels for PFOA and PFOS in those matrices. After conducting some leaching experiments, they backed away from the project and have not set any clear standards, because of the difficulties presented by these unique chemicals.[2]
- In 2017, Maine DEP initiated rulemaking that included setting a screening value for PFOA and PFOS in materials that are placed on soils for non-agronomic purposes (e.g. dredgings, fill). The proposed values were obtained by running routine models using default values, similar to how ADEC came up with its migration to groundwater soil cleanup values. Maine DEP's initial proposed values were untenably low, and, after receiving comments, they landed on the still-somewhat-arbitrary and indefensible screening levels of 2.5 ppb for PFOA and 5.2 ppb for PFOS. And Maine DEP has clarified

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[1] Perfluoroheptanoic Acid (PFHpA): proposed migration to groundwater = .00024 mg/kg
Perfluorohexane Sulfonic Acid (PFHxS): - 0.00029 mg/kg
Perfluorononanoic Acid (PFNA): 0.00041 mg/kg
Perfluorooctane Sulfonic Acid (PFOS): 0.00053 mg/kg Currently 0.0030 mg/kg
Perfluorooctanoic Acid (PFOA): 0.00029 mg/kg Currently 0.0017 mg/kg

[2] In the end, NY DEC did apply their evaluation of leaching to one particular permit for a composting facility that accepts paper mill residuals. For that one permit, the permittee is required to screen paper mill residuals against a screening value of 72 ug/kg (ppb) for PFOA & PFOS.

that these are only initial screening values, not compliance standards. If they are exceeded, it only triggers further risk analysis. Maine DEP is stating that they will not apply them to agronomic residuals, such as biosolids, manures, and other residuals.

We are now concerned that ADEC is making a similar mistake. We recommend that ADEC eliminate the migration to groundwater pathway soil cleanup values for the five PFAS chemicals other than PFBS.

Here's why:

1. PFAS are so ubiquitous and much remains unknown about them. When setting standards, there is a tendency to over-apply uncertainty factors, resulting in unintended impacts, including impacts on municipalities and their materials management (waste management, wastewater management) programs.

Sampling data from several states[3] have found PFAS in soils and groundwaters around numerous landfills and other waste management sites. Even the smallest and least-impacted of these sites would require extensive cleanup if the ADEC proposed migration to groundwater standards were enforced on them.

Looking more specifically at the residuals our members deal with: many municipalities, including several in Alaska, such as Fairbanks, recycle wastewater solids – biosolids to soils in environmentally sound and publicly supported programs that benefit soils, landowners, the public, and the municipal facility ratepayers. Recent data from testing typical biosolids, composts, and other residuals around the nation – materials that are not impacted by industrial sources – show concentrations of PFAS that would preclude their use on soils if the proposed cleanup levels were adopted. The source of PFAS in these products is almost certainly household dust.

Here's a back-of-the-envelope calculation that would be of concern, for example, for the highly-successful and long-standing Fairbanks biosolids composting program. There are no data of which we are aware regarding the PFAS levels in Fairbanks compost, but we can use typical recent biosolids compost data for this illustration:

A NH biosolids compost (ug/kg or ppb):

PFOA 13
PFOS 8.7
PFNA 3.4
PFHxS 0.48
PFHpA 2.8
Total ~28 ppb of the five PFAS with untenably low migration to groundwater soil cleanup levels proposed by ADEC

[3] We know of data publicly available – much of it online – from MN, NH, and VT in particular.

Taking the highest level, which is for PFOA, and assuming a typical application rate of compost to soil of 10 dry tons/acre, which is tilled into the top 6" of soil and thus diluted by 200 times, will result in 0.65 ppb in the compost-amended soil. The proposed ADEC clean-up level is 0.41 ppb for PFOA.

Of course, the reality is that the leaching potential from this biosolids compost is not accurately estimated by the proposed ADEC value, and even multiple agronomic applications of Fairbanks or any other biosolids compost do not pose significant risk to groundwater - as we discuss below.

We have found that those calculating such PFAS standards in other states (e.g. Maine) are unaware of the real-world meaning of the results of their calculations. We surmise that the same is true for ADEC.

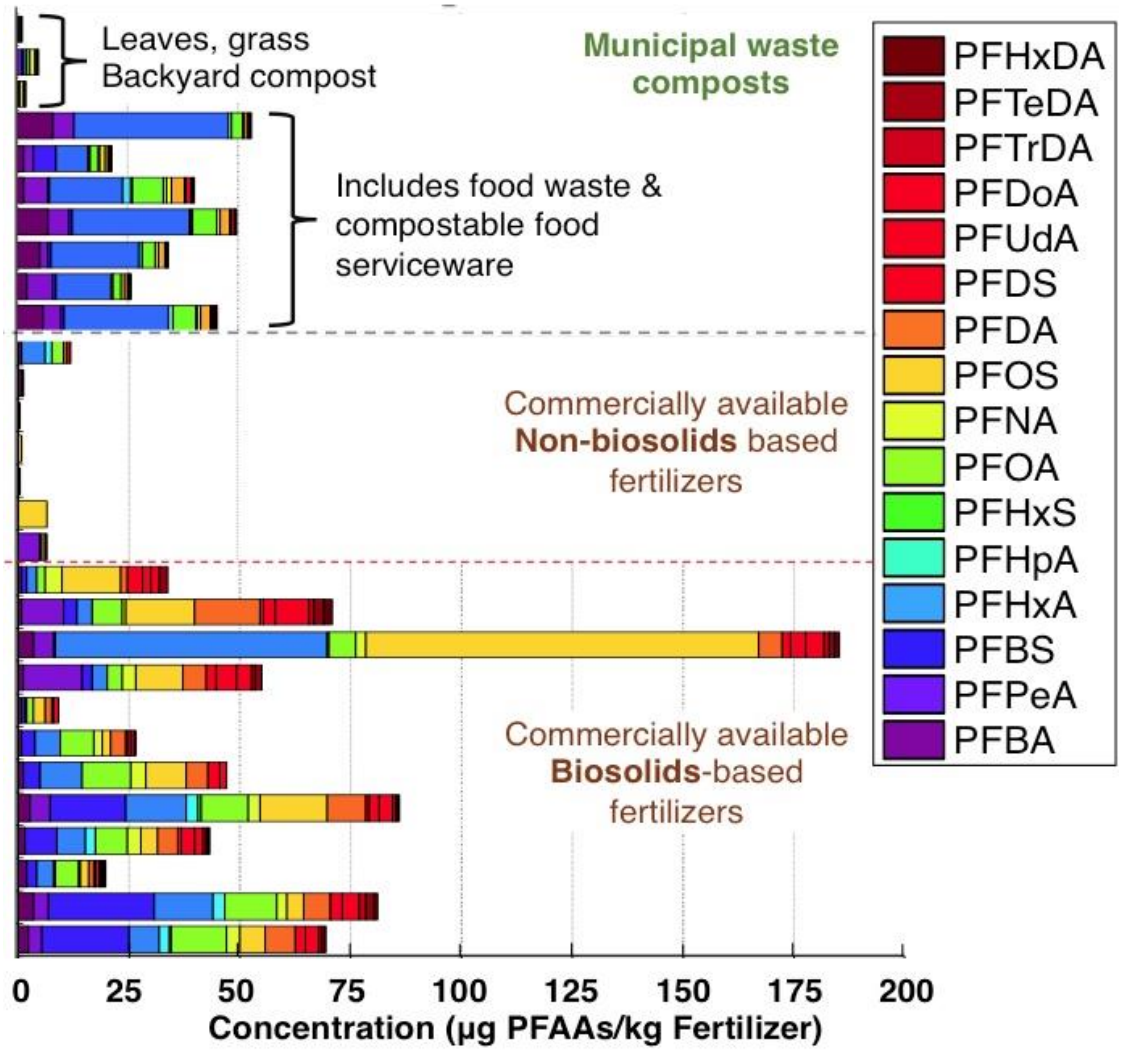

Figure 1
Kim Lazcano, R. and Lee, L. 2018. Data in publication, Purdue University.

Biosolids products are not the only soil amendments containing PFAS (see Figure 1). But biosolids products tend to convey higher levels of PFAS, because domestic wastewater carries PFAS from our homes and businesses. Recent data compiled by NEBRA show that levels in biosolids reflect the common uses of PFAS in our daily lives, where our human exposure is greatest. Back in the early 2000s, when PFOA and PFOS were in much greater use, levels of PFOS were in the hundreds of parts per billion (ppb) in a national survey of 2001 biosolids. Now they are at least an order of magnitude lower, because of the phase out of PFOS and PFOA.[4] The best way to mitigate exposures and impacts of those PFAS considered most concerning for public health and the environment is to phase them out of use. This also works to protect the quality of soils and the soil amendments, like biosolids, that are applied to soils.

2. Impacts could be significant to recycling and municipalities and businesses managing waste, wastewater, and biosolids.

Consider:

- As illustrated above, waste streams handled by municipalities will undoubtedly contain levels of PFAS above the proposed migration to groundwater soil cleanup levels – even wastes from purely domestic sources – because these chemicals have been ubiquitous in common products, some for decades.

- The change to "section 330, Interim Removal Actions, which allows the department to require a responsible party to provide alternative water if groundwater contamination exceeds cleanup levels," raises the question of whether or not ADEC will charge a municipal wastewater treatment facility or biosolids composting program as a responsible party. This could be a significant financial burden on Alaska's towns and cities. It would also result in the loss of a valuable resource for homeowners, businesses, and farmers who rely on biosolids and composts to help their farms and gardens.

- The fiscal evaluation included in the proposed regulation public notice is inadequate. Municipalities will be significantly impacted if the proposed values – or even values an order of magnitude higher – are finalized. For example, there is ample experience indicating that a treatment system for PFAS reduction in drinking water in a private residence costs on the order of $2,000. Installing a treatment system for a public drinking water well in Maine cost the public water system nearly $2 million. The state of New Hampshire reports that $40 million has been spent on PFAS investigation and mitigation over the past 2 years, both by the state and by responsible parties – major industrial facilities. Identified responsible parties will bear considerable costs in Alaska too. Understanding the ubiquitous nature of these contaminants, many states are

[4] Venkatesan, K., and Halden, R., 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, (2013), 413-418. NEBRA has ongoing data compilation of PFAS levels in recent biosolids and other residuals, available on request (info@nebiosolids.org).

properly focused only on charging responsible parties that are involved with the larger, more significant, direct industrial and military and fire-fighting related PFAS contaminated sites. ADEC will need to clarify how it intends to identify and categorize responsible parties. The brief statement in the ADEC proposal regarding potential municipal liability is insufficient: "Specifically, when a municipality is considered an RP or when there is a presence of PFAS above the adopted cleanup levels on municipal property. Facilities such as fire stations and water systems are more likely to be affected due to the nature of PFAS contamination."

3. The proposed soil cleanup standards are unmeasurable.

- There is no EPA approved method for PFAS in any matrix other than the Method 537 rev. 1.1 for drinking water. The Department of Defense specifies a particular isotope dilution method, but our understanding is that commercial laboratories are using their own modified Methods 537. And test results show considerable variation between different labs. The situation has improved over the past two years, but we believe that any test data for PFAS in any matrices other than drinking water, current or past, should be evaluated with some skepticism and should only be used for screening purposes and improving general understanding.

- Some commercial laboratories are claiming they can measure PFAS in solids (e.g. sediments, soils, residuals) at reporting limits as low as 0.2 ug/kg (ppb). These claims are highly suspect. Actual lab results often show detection limits in the 2 – 5 ppb range. In addition, the various methods being used by laboratories widely diverge. For example, Vermont DEC[5] conducted split sample tests comparing a DOD-preferred isotope dilution method (MLA 110) with one of the many "modified Method 537" methods (each lab has developed their own). When analyzing wastewater (a complex matrix, but not as complex as biosolids or soil), they found differences in the results from the two methods ranging from 10% - 200%. When analyzing wastewater solids, the range of difference between the methods went higher than 300%.

Thus, the proposed ADEC soil cleanup values for migration to groundwater are currently unmeasurable and unenforceable.

4. Data on PFAS are insufficient for modeling.

We applaud ADEC for relying on the U. S. EPA public health advisory screening level as the target drinking water and groundwater value for its risk evaluations of PFOA and PFOS. While there is ongoing debate amongst toxicologists about the appropriateness of that EPA number, it is the most thoroughly vetted number and incorporates a large amount of uncertainty about potential health impacts from PFAS. In comparison to the U. S. approach to PFAS, an expert

[5] Weston & Sampson, 2018. Wastewater Treatment Facility and Landfill Leachate PFAS Sampling Various Locations, Northern Vermont, Report to J. Schmelzer, VT DEC, May 3, 2018.

health panel in Australia stated that the "the Panel's advice to the Minister on this public health issue is that the evidence does not support any specific health or disease screening or other health interventions for highly exposed groups in Australia, except for research purposes.[6] This is obviously quite different from EPA's approach and that of the CDC's Agency for Toxic Substances & Disease Registry (ATSDR), whose 2018 report has been interpreted by some to mean that the drinking water standard should an order of magnitude lower than EPA's current 70 ppt.

We urge ADEC to consider the following:

- Summing the levels of 5 PFAS to meet the 70 ppt public health advisory (PHA) drinking water screening level is arbitrary. We know that other states are doing this for regulatory simplicity, tilting toward over-protection. But it is not based on good science[7].

- Any references in the ADEC documentation about this proposed regulation should not include anything about the toxicology or health impacts of PFOA and PFOS (and the other PFAS too). ADEC has chosen to use the EPA PHA value as an endpoint for modeling its soil cleanup standards. That PHA value has embedded in it all of the uncertainties and assumptions regarding health impacts and toxicology.

- Using the standard ADEC calculator and default values is inappropriate for PFAS chemicals.

    - The modeling and calculations used to derive the proposed migration to groundwater screening values have not been field-verified for any of the PFAS chemicals, and there is insufficient published research on soil leaching of PFAS to allow for robust understanding of the potential leaching risks.

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[6] Expert Health Panel for PFAS Report, 2018: http://www.health.gov.au/internet/main/publishing.nsf/Content/ohp-pfas-expert-panel.htm

[7] U. S. EPA has not included PFOA, PFOS, PFNA, PFHxS, and PFHpA in their RSL Composite Tables for good reason: robust data are not yet available. However, ADEC proposes numerous assumptions (ADEC Contaminated Sites Program - Procedures for Calculating Cleanup Levels, p. 19). While the molecular structures of the compounds are similar and somewhat similar biological activities can be assumed, other assumptions are not supported by evidence:

- The half-lives of the compounds vary in humans and often considerably between humans and test animals;
- Toxicities, while still the subject of debate, also vary considerably, and all necessary assumptions and conservative protective factors have already been integrated into the EPA RfDs and drinking water public health advisory level. ADEC should not add any additional uncertainty factors for toxicity when using EPA-established endpoints that have already included such uncertainty factors!
- There is little to no evidence of additive or synergistic health effects.

In short, the assumptions made by ADEC are not supported and the additive approach is for regulatory efficiency with a highly conservative tilt.

- Example: foc, the fraction of organic matter in soil, is assumed to be .1%. This does not apply to most soils (and thus is highly conservative and protective), and it is especially inappropriate when organic residuals (e.g. biosolids, composts, manures) are applied, as they contain high percentages of organic matter.

- Example: (Koc). As noted in the National Groundwater Association (NGWA) report: "Koc values for these PFAS may vary over several orders of magnitude depending on the site-specific geochemistry" (NGWT, 2017, *Groundwater and PFAS: State of Knowledge and Practice*, p. 4.6)[8]. ADEC used the default, EPA Koc values for PFOA and PFOS, which are at the low end of values reported in the literature.

We ran ADEC's online calculator, using alternative values for foc and Koc. The results are significantly different, with only these two changes:

PFAS Chemical	ADEC proposed M2G soil cleanup standard (ppb)	Alternative foc	Alternative Koc[9]	Resulting alternative M2G soil cleanup standard (ppb)
PFOA	0.291	2 %	316	35
PFOS	0.528	2 %	3470	370

These two factors – foc and Koc – are not the only ones that could reasonably be changed, resulting in higher, more reasonable and measurable migration to groundwater soil cleanup levels.

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[8] For Koc, the Department used U. S. EPA figures for PFOA and PFOS of 114.8 L/kg (2.06 log Koc) and 371.5 L/kg (2.57 log Koc), respectively. In comparison, Zareitabalad et al. (2013) noted lab sorption experiments that show "an average log K(oc) of approximately 2.8 for PFOA [631 L/kg] and 3.0 [1,000 L/kg] for PFOS." They found higher values in field experiments and noted: "Applying lab-based log K(oc) distribution coefficients can therefore result in a serious overestimation of PFC concentrations in water and in turn to an underestimation of the residence time of PFOA and PFOS in contaminated soils" (Perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS) in surface waters, sediments, soils and wastewater - A review on concentrations and distribution coefficients *Chemosphere:* 91(6):725-32). Most recently, in 2017, a paper cites ranges of Koc values of 83 – 389 L/kg (1.92 – 2.59 log Koc) for PFOA and 250 – 50,100 (2.4 – 4.7 log Koc) for PFOS (U. S. National Library of Medicine, 2017, Hazardous substances data bank). The fact is, knowledge regarding this one key modeling parameter is conflicted at this point. What seems to be known suggests that PFAS in biosolids and residuals may not leach as much as in other matrices, because:

- the Kocs depend on site-specific conditions,
- longer-chain PFAS (such as PFOA and PFOS) have higher sorption (an estimated 0.5 log Koc increase for each CF_2 group (Higgins and Luthy, 2006, *Env. Sci. & Tech*)),
- sludge has a higher Koc than sediments (Chen et al., 2012), and
- "organic rich soils retard movement of PFAS" (E. Houtz, 2017, Arcadis presentation to NEWMOA, May 8 – 10, 2017).

[9] Koc for sludges, as reported in Chen et al., 2012.

In addition, the rote model is arguably not appropriate for PFAS compounds because such models do not assess the ionic nature of PFAS in soil solution and the additional binding effects thus created.

In summary…

We strongly recommend removal from the proposed regulations of the five migration to groundwater soil cleanup standards for PFAS (leaving only PFBS, for which EPA has more appropriate data). And we recommend the removal of the current values already in place for PFOA and PFOS in Table B1 of 18 AAC 75. There is insufficient scientific understanding to model these five chemicals' leaching potential. Including screening levels here at this time could dramatically – and perhaps unintentionally – disrupt the agronomic utilization of biosolids and other residuals, a highly-valuable and successful recycling program. Every biosolids and most composts – even some certified organic composts – will exceed the proposed values. What does that mean for recycling of these materials?

If ADEC proceeds with including the six UCMR 3 PFAS chemicals in soil cleanup standards based on migration to groundwater, a clear exemption should be stated: "The soil cleanup screening values for migration to groundwater for PFAS chemicals are not appropriate for and shall not be applied to organic residuals and soil amendments added to soils, including composts, manures, and biosolids. PFAS contained in these organic residuals and soil amendments are affected by factors that were not assumed in the calculations from which were derived the migration to groundwater soil cleanup values listed here. Organic residuals and soil amendments – and any levels of organic matter greater than the .1% assumed in risk calculations – change the behavior of PFAS in the soil, significantly reducing their migration to groundwater."

PFOA and PFOS are already legacy issue compounds. These two most concerning and ubiquitous PFAS have been mostly phased out of use, and human blood serum levels are already down 60% or more.[10] How much Alaskans will spend on addressing small amounts in various matrices is an important policy issue. We urge ADEC to avoid disrupting other important environmental programs and policies with inadvertent impacts. The best way to address compounds used ubiquitously that become of concern is to phase them out of use. Over the years, our organizations and our members have assisted in promoting source reductions and phase-outs of other trace contaminants (e.g. triclosan, microbeads), because it is in our interest to ensure quality biosolids and residuals products.

Wastewater, biosolids, and other organic residuals are not sources of PFAS; they convey them from our daily lives. Municipalities and businesses that manage these resources can be affected by regulations of this family of chemicals, and we need to act judiciously in setting those regulations.

[10]Centers for Disease Control, National Health and Nutrition Examination Survey (NHANES), 2015

Thank you for your time and consideration of our concerns. We look forward to a continued dialogue with Alaska. Please feel free to contact us if you have any questions.

Yours truly,

Maile Lono-Batura, Executive Director

Northwest Biosolids

Northwest Biosolids is a 501(c)(6) non-profit professional association that works to advance wastewater management and environmental sustainability through the beneficial use of biosolids in the Pacific Northwest. Our member utilities manage biosolids for nearly eleven million residents and ratepayers across six states and provinces. Together, our membership continues to dedicate half of our annual budget to research biosolids end use options that include returning nutrient-rich biosolids back to soils. For the past 31 years, our biosolids network has leveraged our collective to ensure quality biosolids programs across the region. Please visit our website for more information on who we are and what we do: http://www.nwbiosolids.org

Ned Beecher, Executive Director

North East Biosolids & Residuals

NEBRA is a 501(c)(3) non-profit professional association advancing the environmentally sound and publicly supported recycling of biosolids and other organic residuals in New England, New York, and eastern Canada. NEBRA membership includes the environmental professionals and organizations that produce, treat, test, consult on, and manage most of the region's biosolids and other large volume recyclable organic residuals. NEBRA is funded by membership fees, donations, and project grants. Its Board of Directors are from CT, MA, ME, NH, VT, and Nova Scotia. NEBRA's financial statements and other information are open for public inspection during normal business hours. For more information: http://www.nebiosolids.org. Since January 2017, NEBRA has led efforts in the biosolids and wastewater management profession to understand the implications of PFAS contamination and regulation on municipal and private wastewater, biosolids, and residuals management programs.

Frank Franciosi, Executive Director

U.S. Composting Council

Established in 1990, the **US Composting Council (USCC)** is the only national organization in the United States dedicated to the development, expansion and promotion of the composting industry. The USCC achieves this mission by encouraging, supporting and performing compost related research, promoting best management practices, establishing standards, educating professionals and the public about the benefits of composting and compost utilization, enhancing compost product quality, and developing training materials for compost manufacturers and markets for compost products. USCC members include compost manufacturers, compost marketers, equipment manufacturers, product suppliers, academic institutions, public agencies, nonprofit groups and consulting/engineering firms. For more information: https://compostingcouncil.org/

Washington Organics Recycling Council

The Washington Organics Recycling Council (WORC) is a nonprofit 501(c)6 trade organization formed in response to demands for increased recycling of organic materials. Since 1991, WORC has been recognized as the statewide organization representing organic recyclers, and facilitates communication between the private and public sectors. WORC provides a unified statewide voice on many issues: research, education (through Operator Training, conferences, and other programs), product safety and standards, government regulations, environmental planning, trade, marketing, and public education and involvement. Its members are a diverse group that includes organic waste processors, government officials, vendors, consultants, educators, students, researchers, and private citizens. All firmly believe in and work to support the organic recycling industry in Washington State. The Council works closely with state and regional organizations, such as the Washington State Recycling Association and the Northwest Biosolids Management Association, to promote and encourage recycling of organic materials. WORC's Soils for Salmon initiative is changing building practices to protect and restore soil. Nationally, WORC coordinates with other state composting organizations and the US Composting Council. For more information: https://www.compostwashington.org/