PFAS in Biosolids

Madison Metropolitan Sewerage District

IMPORTANT FACTS

- Biosolids are produced as part of the wastewater treatment process. They are typically high in nutrients and can help stabilize soils. Land application of biosolids is the most beneficial, cost-effective way to handle this natural byproduct of the wastewater system. The alternative would be to place them in a landfill or incinerate them
- When biosolids are applied, residual components can leach into soil and groundwater. To the extent PFAS compounds are in biosolids they can enter groundwater from land-applied biosolids. t Many factors determine how much PFAS moves from biosolids to other media. Studies have shown that it is far less than the source material. The same is true for crop uptake.
- Crop uptake has been documented for sites where biosolids with PFAS were used as soil amendments.
- As an emerging contaminant, there is still much to learn about PFAS, and PFAS in biosolids but from the preliminary information available from other states, the PFAS in District biosolids is below levels of concern.
- The District is fully engaged in better understanding PFAS in wastewater and biosolids. We regularly conduct sampling and are working with partners to identify source reduction opportunities.

Are there PFAS in biosolids?

Wastewater treatment plants are not original sources of PFAS but receive these chemicals as manufacturers and consumers use them. Given the widespread use of PFAS in consumer and industrial products, a small but persistent amount of PFAS exists (called background levels) in wastewater and biosolids.

Firefighting foam and industrial sources are the most significant contributors of PFAS to the wastestream. The District has reviewed its service area and determined it contains no known original industrial manufacturers or users that would discharge high concentrations of PFAS to the treatment plant. In addition, the District does not accept wastewater from fire events that used PFAS-based firefighting foams.

Can the District remove PFAS from biosolids?

PFAS are complex, manmade compounds that are difficult to break down. At present, there are no cost-effective technologies to remove PFAS from wastewater and source reduction is the most effective means for reducing its presence in wastewater and biosolids.

What is the exposure risk of PFAS in biosolids?

Potential risk from PFAS exposure in biosolids is related to the amount of exposure or dose. For there to be a risk, one must have repeated exposures.

Safe standards for exposure to chemical compounds, such as PFAS, are determined by extensive evaluation of toxicity from scientific studies as well as the amount and frequency of exposure. PFAS impacts has been analyzed based on the ingestion of water or liquids. Due to limited exposure opportunities, the risk of exposure to PFAS in biosolids is signficantly low.

Can PFAS from biosolids get in groundwater?

PFAS can enter groundwater by leaching from PFAS-impacted soil or connections to surface water impacted by PFAS. PFAS can dissolve into rain or irrigation water and move into shallow groundwater away from the source with the direction of groundwater flow. Some PFAS will cling to organic matter in the aquifer. In addition, different PFAS compounds have different chemical bonds; PFAS compounds with shorter chains move more quickly than those with longer chains.

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The potential effects on groundwater or surface water depend on the amount and composition of the PFAS present in biosolids, soil properties, infiltration rate, and land application practice. (ITRC, 2020)

Can crops uptake PFAS from biosolids?

PFAS can be present in plants and crops if the soils that support the plant growth contain PFAS; rain water and irrigation water can also contribute PFAS to the soil. Uptake has been shown to occur in plants including grain crops, fruits and vegetables.

Southern Wisconsin's primary crops are corn, wheat, and soybeans. Plant uptake depends on various factors, including plant species, soil type, the concentration of PFAS in the soil or water, the type of PFAS, plant part, and other soil components, such as nutrient content. Organic matter in the soil has been found to pull PFAS out of the water in the soil, which will often limit the amount of PFAS available to be taken up by plants. Plants may more easily take up PFAS in irrigation water (or hydroponics) than PFAS in soils and biosolids. A recent review of soils in North America with no known PFAS point sources found background levels of PFOA from 0.059 to 1.84 ppb. The District found a range of 1.2-1.6 ppb in biosolids that are added to soils.

PFAS accumulation differs between plant species. PFAS accumulation tends to be higher in soybeans, followed by wheat, and then corn (among these three crops), possibly due to decreasing protein content (Costello & Lee 2020, Ghisi et al., 2019 and Liu et al., 2019)

What are other sources PFAS in the rural landscape?

PFAS can be found in household septic systems, and nearby industrial operations could impact water sources and in turn, private property. Additionally, PFAS has been associated with certain pesticide formulations. Rainwater and irrigation systems may also contribute PFAS to the rural landscape.

Are there alternatives to landspreading biosolids?

During the treatment of municipal wastewater, solids must be removed to return the treated water back to the environment. There are three ways to reuse or dispose of these solids: send them to the landfill, incinerate them, or apply them to the land. Landfilling and incineration are less desirable and significantly more expensive than land application.

The best way to handle biosolids is to reuse them, as they are a valuable resource. Biosolids contain essential nutrients for plant growth and soil fertility such as nitrogen, phosphorous, organic matter and micronutrients, including copper, iron, molybdenum, and zinc. This combination of nutrients, micronutrients, and organic matter provides fertilization and improves the soil's overall health.

Biosolids are valuable resource, containing essential nutrients and micronutrients for plant growth and soil fertility.

Additionally, biosolids allow farmers and landowners to reduce their use of commercial fertilizers, which are made from fossil fuels and may contain PFAS.

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In all, the beneficial reuse of biosolids has fewer environmental impacts than other disposal methods and commercial fertilizer use.

What is the District doing about PFAS?

The best way to reduce PFAS in wastewater and biosolids is source reduction to prevent it from entering the waste stream. Through our pretreatment program, we have a plan to educate and work with permittees to identify possible sources and reduce or eliminate those sources.

In addition, we are continuing a comprehensive sampling and analysis plan, regularly testing our wastewater and biosolids to monitor PFAS levels. Further, we are investigating the potential for PFAS levels in different biosolids products. As the District looks to the future of biosolids management, transitioning to a product that is desirable for users and the environment is always the goal.

PFAS is considered an emerging contaminant, and research is ongoing; PFAS in biosolids and wastewater has not been studied as extensively as other media. The District continues to keep abreast of new research and future regulations to further our shared interest in protecting public health and the environment and reduce PFAS through source reduction.

REFERENCES

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