**PFAS in Biosolids**

**IMPORTANT FACTS**
- PFAS can enter groundwater from land-applied biosolids, but there are many factors that determine how much PFAS moves from biosolids to other media, and studies have shown that it is far less than the source material. The same is true for crop uptake.
- Land application of biosolids is the most beneficial, cost-effective way to handle this natural byproduct of the wastewater system.
- Uptake by crops 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 and wastewater has not been studied as extensively as drinking water.
- The District is fully engaged in better understanding PFAS in wastewater and biosolids through sampling and analysis; studying its fate and transport; and engaging in source reduction and elimination.

**Are there PFAS in biosolids?**
Wastewater treatment plants are not original sources of PFAS but receivers of these chemicals as they are used by manufacturers and consumers. Given the widespread use of PFAS in consumer and industrial products, a small but persistent amount of PFAS normally exists (called background levels) in wastewater as well as biosolids.

Firefighting foam and industrial sources are the greatest contributors of PFAS to the wastestream. The District has reviewed its service area and has determined that it contains no known original industrial manufacturers or users of PFAS that would have the potential to 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.

**What is the risk of PFAS exposure in biosolids?**
Potential risk from PFAS exposure in biosolids is related to the amount of exposure or dose. In order for there to be risk, you 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. The analysis of PFAS impacts has been based on the ingestion of water or liquids. Due to limited exposure pathways, the risk of exposure to PFAS in biosolids is significantly less.

**Can the District remove PFAS from biosolids?**
Often called "forever chemicals," PFAS are complex, manmade compounds that are difficult to break down. There are currently no cost-effective means to remove PFAS from wastewater. The best way to eliminate PFAS from all water and in turn, biosolids, is to prevent it from entering the wastewater stream altogether.

**Can PFAS from biosolids get in my drinking water?**
Drinking water comes from groundwater or surface water. PFAS can be present in drinking water if the groundwater wells or surface water intakes draw from waters that have been impacted by PFAS.

**Can PFAS from biosolids get into the groundwater?**
PFAS can enter groundwater through leaching from PFAS-impacted soil or connections to surface water that is impacted by PFAS. PFAS dissolve into groundwater and move away from the source with the direction of ground-
Some PFAS will cling to organic matter in the aquifer. In addition, different PFAS compounds have different chemical bonds; those PFAS compounds with shorter chains will move more quickly than those with longer chains.

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

**Can my 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, 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. PFAS in irrigation water (or hydroponics) may be more easily taken up by plants than PFAS in soils and biosolids.

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 (Ghisi et al., 2019 and Liu et al., 2019)

**Are there other sources of PFAS in the rural landscape?**

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

**Does the District have alternatives to landspreading biosolids?**

During the treatment of municipal wastewater, solids must be removed in order to return the treated water portion back to the environment. There are three ways to reuse or dispose of these solids: send them to the landfill, incinerate them, or apply 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 important nutrients for plant growth and soil fertility such as nitrogen, phosphorous, and organic matter as well as essential micronutrients such as copper, iron, molybdenum, and zinc. This combination of nutrients, micronutrients, and organic matter not only provides fertilization, but improves the overall health of the soil.

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

In all, the use of biosolids can significantly reduce environmental impacts from previous waste disposal as well as the impacts from fertilizer production.

**What is the District doing about PFAS?**

The District is fully engaged in better understanding PFAS in the local waste stream and investigating options for PFAS source reduction.

The best way to reduce PFAS in wastewater and biosolids is to prevent it from entering the waste stream altogether. As part of our pretreatment program, we are creating a plan to educate and work with permittees to identify possible sources and reduce or eliminate those sources.

In addition, we have developed a comprehensive sampling and analysis plan with the assistance of a consultant. We will begin sampling and testing once the State of Wisconsin Department of Natural Resources certifies labs for testing PFAS compounds.

The District has also utilized a environmental consultant to assist us in understanding the fate and transport of these compounds within our treatment process and through biosolids land application operations. This information will help the District to ensure the sampling conducted is appropriate, answering the vital questions of presence or absence of PFAS, and provide context for the sampling results.

PFAS is considered an emerging contaminant and significant research is currently underway; PFAS in biosolids and wastewater has not been studied as extensively as other media. Therefore the understanding of specific components addressed above may change in the future. Updates will be provided as new information is attained.