

What are Biosolids? An Introduction to biosolids

Biosolids are the solid portion of wastewater that receives treatment at Wastewater Treatment Plants. Biosolids are highly treated, analyzed for contents, and carefully regulated by State agencies. Typically, biosolids account for less than one percent of the total volume of the wastewater flows. Biosolids contain plant nutrients and organic matter that can be returned to the soil for use in crop production. Through treatment processes, they are refined into a safe, stable, and valuable source of plant nutrients. Biosolids can be utilized as a fertilizer and soil amendment on agricultural land, public use land, forest lands, and mine reclamation sites. Depending on the treatment process, biosolids come in various forms such as, liquid, slurry, composted materials, or dried pellets.

Biosolids are not septage, industrial waste, or livestock manure.

Why use biosolids? – Beneficial use of a previous waste stream

A benefit to living in a civilized society is the technology and protections provided by environmental regulations for wastewater collection and treatment. During the treatment of municipal wastewater, solids must be removed in order to return the treated water portion back to the environment. The disposal and/or utilization of these solids can be accomplished in three primary ways: landfill, incineration, or land application.

Landfilling and incineration are less desirable (and more costly) for wastewater solids disposal compared to land application. The combination of leaching potential and diminishing capacity makes landfilling wastewater solids a less desirable long-term disposal solution. In addition, typical landfill disposal of solids is composed of 75% water. This means that this water must be hauled to landfill, greatly increasing the cost and carbon footprint for disposal. Incineration burns the moist solids, turning one solid waste stream into a potential air pollution stream and an ash waste stream to be landfilled. Incineration is highly energy intensive (greater carbon footprint), as sufficient fuel must be added to burn the solids and evaporate the associated water.

Instead of being merely a waste stream for disposal, these solids can be a valuable resource. They 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. Provided that the solids are treated for sustainable and responsible use, the desire would clearly be to utilize the nutrients and organic matter for crop production rather than to landfill or burn the solids. Additionally, use of biosolids allows for a reduction in the use of commercially produced fertilizers which are made from fossil fuels. In all, the use of biosolids can significantly reduce environmental impacts from previous waste disposal as well as the impacts from fertilizer production.

Differences between biosolids and sewage sludge

"Sewage sludge" refers to the solids that settle out in the wastewater treatment process, which contain pathogens and are unsafe for use if untreated. Biosolids are produced by treating sewage sludge to meet standards that allow it to be applied to the land as a fertilizer for crop production. Use as a fertilizer or soil amendment allows the nutrients and organic content in the biosolids to be recycled. The treatment process and land application are strictly regulated and monitored under a state permit. Biosolids have undergone biological, physical, and chemical treatments to reduce pathogens. The term biosolids refers to the final product from the treatment of sewage sludge, which is different from raw sewage sludge and from industrial sludge that may contain environmental pollutants.

Levels of treatment for biosolids

In Michigan, around 50% of the Wastewater Treatment Plants treat sewage sludge to a level to be considered biosolids for the purpose of land application. The level of treatment affects the options by which the biosolids can be land applied. By state and federal regulation, there are two main types of biosolids, Class A - Exceptional Quality, and Class B.

Most Wastewater Treatment Plants in Michigan produce Class B biosolids. However, the Great Lakes Water Authority – i.e. the Detroit Water Resource Recovery Facility (WRRF) makes Class A Exceptional Quality (EQ) biosolids “pellets” that are marketed as fertilizer. The additional treatment to produce this Class A EQ material allows for increased flexibility in application, compared to Class B biosolids.

The term “Class A Exceptional Quality” is used to describe biosolids meeting both Class A and Exceptional Quality standards for the level of pathogen reduction, stringent metal limits, and vector attraction standards, as specified in the EPA 40 Code of Federal Regulations (CFR) Part 503 Rule (Biosolids Rule). Vectors (flies, mosquitoes, rodents, birds, etc.) can transmit diseases directly to humans and play a specific role in the life cycle of pathogens as a host. Vector attraction reduction refers to processing which makes the biosolids less attractive to vectors thereby reducing the potential for transmitting diseases. Exceptional Quality biosolids products are similar to other agricultural and horticultural soil amendments, and suitable for surface application to crop fields.

Class B biosolids are treated to a point where they are safe to use as a fertilizer or soil amendment, with the use of site restrictions. Class B biosolids are often land applied in a liquid, slurry, or cake form, and are subsurface injected into topsoil or surface applied with incorporation. There are significant restrictions on soil conditions, season of application, precautions to protect groundwater and surface water, timeframe for incorporation into the soil, and public access to the land. In addition to these additional regulatory restrictions for use of Class B biosolids, land application also includes significant cost to haul water, resulting from the high moisture content in Class B biosolids.

Who regulates biosolids in Michigan? EPA, MDEQ, and MDARD regulations

In Michigan, the Michigan Department of Environmental Quality (MDEQ) is the primary regulatory agency for Wastewater Treatment Plants and the land application of biosolids. The MDEQ biosolids program is governed by Part 24 Biosolids Rules of Part 31, Water Resources Protection, of the Natural Resources and Environmental Protection Act (NREPA). In addition to the Part 24 rules, each generator of biosolids must have an approved Residuals Management Program (RMP) which is specific to that generator’s treatment and land application processes. The regulations in place clearly define how the generator achieves the biosolid classification, where the materials may be applied, and the process to designate sites for land application. The rules for the biosolids program in Michigan were developed from the EPA 40 CFR Part 503 Rule. Generators maintain regular reporting to MDEQ regarding biosolids laboratory analysis, to ensure continued compliance with the classification of biosolids.

Class A EQ fertilizer may be registered as a fertilizer with the Michigan Department of Agriculture and Rural Development (MDARD), specifically if these biosolids will be marketed with guaranteed nutrient analysis. The MDARD registration involves additional inspections and testing regarding nutrient guarantee and other parameters.

Where can biosolids be applied? MDEQ land application program and rules

Biosolids are to be applied only on sites meeting the requirements of the MDEQ Part 24 rules and the specific RMP for that generator. These regulations describe the soil type, slope, maximum biosolid loading, and setbacks from existing structures. Additional requirements for application may include seasonal application restrictions, required incorporation, and other factors to protect water quality and health of the community.

Concerns and responses regarding use of biosolids

Pathogens

Sewage sludge inherently has a large amount of pathogens present which makes it unsuitable for applications to land without treatment. To allow land application, the sludge is treated by a variety of methods to reduce pathogens. This treatment may include heating, drying, raising pH, composting, digestion (anaerobic or aerobic) or other approved methods. The pathogen reduction steps have known effective operational parameters, therefore the EPA and MDEQ have established acceptable processes for specific treatment methods. Additionally, MDEQ has established timelines for harvest after land application to reduce the risk of crop contamination. Each generator is required to demonstrate how they meet the pathogen reduction requirements either by lab testing or maintaining minimal required operational parameters while treating the biosolids, for compliance and management practices.

Pests

The organic nature of biosolids will attract pests, if left untreated. Much like pathogen reduction, there are several acceptable methods for reducing the attraction to pests (vector attraction reduction). These methods include raising pH, drying to a required point, subsurface injection, or other approved methods. The vector attraction reduction steps also have known effectiveness periods, therefore the MDEQ has established acceptable time periods for land application for a specific treatment method. Each generator reports regularly steps taken for vector attraction reduction for compliance and management practices.

Metals content

Biosolids will likely have trace metals content, due to the nature of the municipal wastewater stream to the Wastewater Treatment Plant. Background levels of these same metals are also present in natural soils and some are essential for metabolic processes in plants and animals. The EPA has defined conservative concentration limits on these metals within biosolids, with MDEQ adopting the same limits. These limits are set to a point that can be detectable through analysis, but are significantly below thresholds that could pose hazards to the most at risk populations. Each generator reports regularly the metals content in their biosolids. Compared to commercial fertilizers, biosolids are thoroughly regulated regarding constituents other than the nutrient guarantees.

Odor

MDEQ, MDARD, and the biosolid generators work together to provide responses and corrective actions as needed for nuisance odor complaints. The majority of substances used as fertilizers and soil amendments, whether manure, commercial fertilizers, or biosolids, will have an associated odor. Regarding biosolids in particular, this associated odor can vary widely depending on the process used to treat the biosolids. Often these odors are “earthy” or “musty.” For Class A EQ pellets, there is often a “metallic” smell. This is due to the dry nature of the pellets and iron added at the Water Resource Recovery Facility for phosphorus removal. Microbial action breaking down biosolids in the soil may produce associated odors as well. While MDEQ rules for land application should address most odor concerns, the potential for associated nuisance odors may be further reduced by following practices outlined in the MWEA’s “Land Application of Biosolids in Michigan: Management Recommendations.”

Nutrient Runoff

Nutrient runoff is an environmental concern that is shared by agencies, the agricultural industry, local government and the general public. Biosolids have a very low risk of nutrient runoff due to the nutrients (nitrogen and phosphorus) being bound to the organic matrix within the biosolids; and as such, the biosolids and their nutrients are not easily dissolved in water. In fact, the nutrients are mainly accessed by the natural microbial processes within the soil. This results in the biosolids remaining in place on the field they were applied, with significantly lower risk of runoff than commercial fertilizers. Setbacks are required from multiple

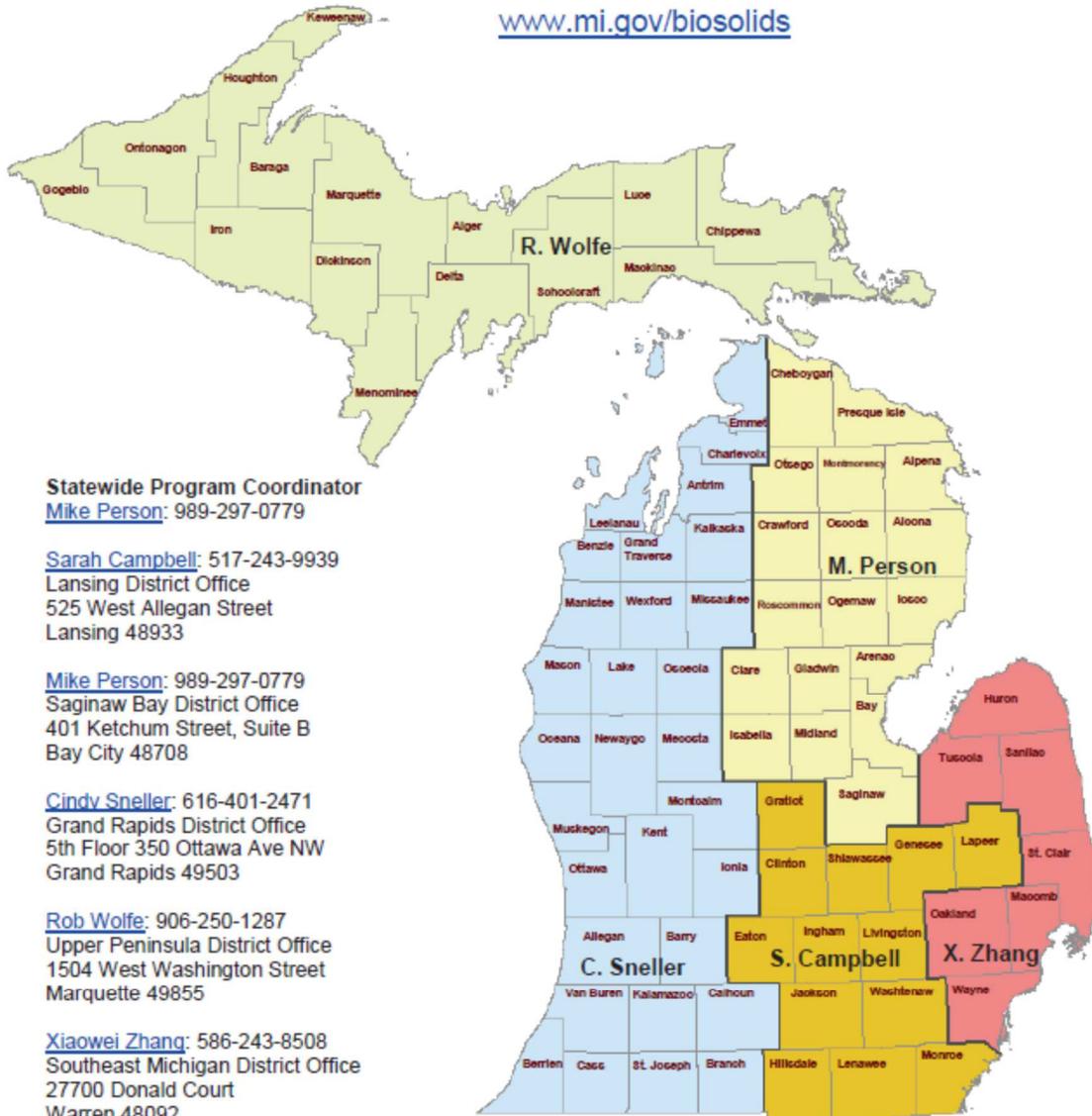
sensitive areas, such as surface water, wells, and homes. These setbacks are clearly defined in the Part 24 rules and are designed to reduce the risk of any off-site movement of biosolids from the field application sites.

Contacts for Further Information

Questions or concerns can be directed to the Biosolids generator, or to DEQ or MDARD:

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