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SL422

Florida Biosolids: Rules for Biosolids Classes[1]

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This article is part of a series entitled *Florida Biosolids*. The rest of the series can be found at http://edis.ifas.ufl.edu/topic_series_florida_biosolids.

Introduction and Purpose

Biosolids are the liquid, semisolid, and solid fractions of the treated waste stream from a domestic wastewater treatment facility (WWTF). Biosolids may also be known as "sewage sludge" or "domestic wastewater residuals." On August 29, 2010, the Florida Department of Environmental Protection (FDEP) formally adopted its new rule for the management of wastewater biosolids, Chapter 62-640, Florida Administrative Code (F.A.C. 2010). The new rule includes major revisions to the old management system, most notably requiring permits for land application sites and changing the term "Domestic Wastewater Residuals" to "Biosolids." This document reviews the definition of biosolids classes under the new regulation.

Terms

CFU	Colony forming unit; a rough estimate of the number of viable bacteria in a volume sample, typically per milliliter (ml).
Domestic wastewater treatment	The processing of wastewater discharges from residences, commercial, and public facilities.
MPN	Most probable number; the estimation of microbial populations through serial dilutions.
Pathogens	Disease-causing organisms; includes parasites, viruses, bacteria, and any other organisms that cause disease.
Septage	The material removed from onsite sewage treatment and disposal systems, commonly referred to as septic tanks, as an assumed mixture of wastewater, sludge, fatty materials, and human feces.
Sewage sludge	The solid fraction of a wastewater treatment stream during facility treatment.
Unstabilized solids	Organic materials in sewage sludge that have not been treated in either an aerobic or anaerobic treatment process.
Vectors	Organisms capable of transporting pathogens, including mosquitoes, flies, and rodents.

Applicability

The new Chapter 62-640 F.A.C. (rule) applies to the following:

- Domestic wastewater treatment facilities that generate, treat, or manage biosolids.

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- Biosolids management facilities that generate, treat, or manage biosolids.
- Appliers or distributors of biosolids or producers of biosolids-containing products.
- Application sites that receive biosolids.
- Septage management facilities treating more than 10,000 gallons (gal) per day monthly average daily flow or greater than 20,000 gal in a single day.
- Septage appliers and sites that receive septage from permitted facilities.
- Composting facilities that use biosolids and apply the compost to land or distribute and market the compost.
- Biosolids and biosolid products generated outside the state of Florida.

At the adoption of the rule in 2010, all land application sites, regardless of permit expiration date of the facilities using the sites, were to be permitted under this rule by January 1, 2013.

Intent of Chapter 62-640 F.A.C.

The intent of the new rule is to ensure the protection of public health and the environment through regulation by the FDEP of the use, management, and land application of biosolids.

History

The 1987 Clean Water Act (CWA) amendments set the requirement for regulations on biosolids. The regulations were formally adopted in 1993 by Title 40 of the Code of Federal Regulations (C.F.R.) Part 503-Standards for the Use or Disposal of Sewage Sludge (C.F.R. 1993). Part 503 was updated and adopted in 2007.

The state of Florida originally regulated biosolids under solid waste regulations adopted in 1984. The state adopted Chapter 62-640, F.A.C. in the early 1990s to bring its regulations into line with the CWA amendments. Chapter 62-640, F.A.C. was then revised and adopted in 1998 to better align with the revised Part 503. Further refinements to Chapter 62-640, F.A.C. were made in 2010.

Biosolids Classes

All biosolids applied to the land or distributed and marketed must be treated with a process designed to reduce pathogens and achieve vector attraction reduction (VAR) (F.A.C. 2010). Also, they must not exceed specific metal contaminant concentrations. Florida biosolids are assigned to one of three classes: Class B (least treated), Class A, and Class AA (highest treatment). The classes are based, in part, on the degree of pathogen reduction. Although all biosolids classes have been treated to substantially reduce pathogen indicators below levels characteristically found in manure, Classes A and AA biosolids have the least. Pathogen density reductions are calculated in numbers per unit mass of biosolids. Even class B biosolids contain pathogens at densities that are typically below public health and environmental threats. All three class designations must meet and adhere to specific pathogen reduction, vector attraction reduction (VAR) requirements, and metal contaminant limits, as described below.

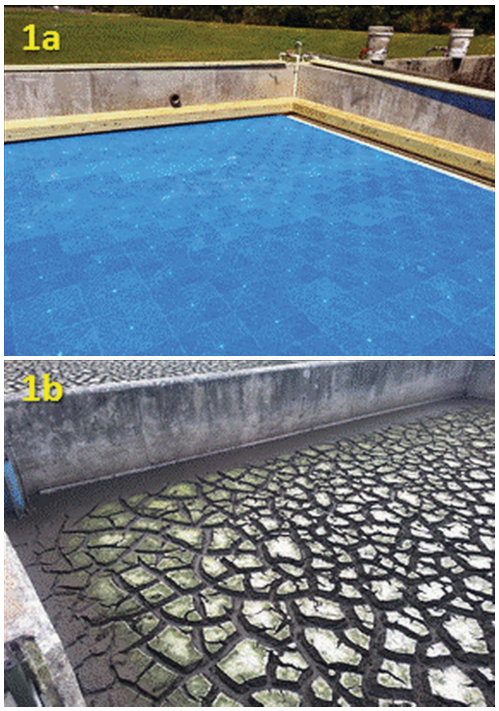

Figure 1. Clean tile bed for drying Class B biosolids (1a) and dried biosolids (1b).
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Pathogen Reduction

Table 1 lists three methods, called alternatives, for achieving a Class B biosolids designation with respect to pathogens, as defined by 40 C.F.R. Part 503.32(b) (Table 1). Table 2 presents five processes to significantly reduce pathogens (PSRP) (Table 2), in order to achieve a B classification under Alternative 2 in Table 1.

The Class A designation uses treatments to reduce pathogens below detectable levels at the time of biosolids disposal or use, while also meeting at least one VAR requirement. To meet Class A or AA designations, biosolids must be treated by at least one of the alternatives for pathogen reduction presented in Table 3. Title 40 C.F.R. Part 503.32 lists six alternatives, but Florida did not adopt Alternative 4.

Table 1. Class B Pathogen reduction requirements.

Alternative	Description
1—Monitoring of indicator organisms	Fecal coliform density of seven samples collected over two weeks (suggested sampling time). The geometric mean of the seven samples must be less than 2 million MPN or CFU per gram of total solids.
2— Biosolids treated with a Process to Significantly Reduce Pathogens (PSRP)	Biosolids are treated by one of the five PSRPs (Table 2).
3—Biosolids treated in a process equivalent to a PSRP	Biosolids may be treated by a method equivalent to a PSRP, as approved by the U.S. Environmental Protection Agency.

Table 2. Processes to significantly reduce pathogens (PSRPs).

Pathogen Treatment Process	Description
Aerobic Digestion	Aerobic conditions maintained in sewage sludge through agitation with air or oxygen. Digestion is to maintain a specific mean cell residence time (MCRT) at a specific temperature, between 40 days at 20 degrees (º) Celsius (C) and 60 days at 15ºC.
Air Drying	Drying sewage sludge on sand beds or basin (paved or unpaved) for a minimum of three months provided that at least two months' ambient temperature is above freezing (0°C).
Anaerobic Digestion	Anaerobic (absence of air) conditions maintained in sewage sludge. Digestion is to maintain a specific MCRT at a specific temperature, between 15 days at 35ºC–55ºC and 60 days at 20ºC.
Composting	Biosolids composting via within-vessel, static aerated pile, or windrow composting to raise the temperature to 40°C or greater for five days and greater than 55°C for four hours during the five days.
Lime Stabilization	The addition of lime to maintain a pH of 12 for at least two contact hours.

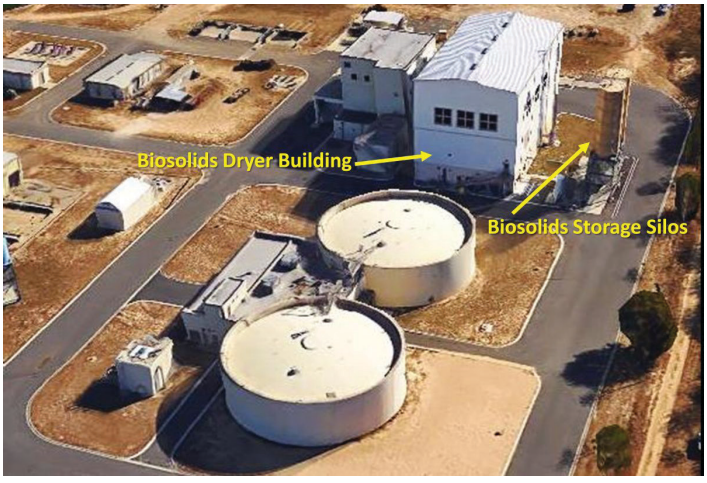

Figure 2. Class AA biosolids dryer and storage facilities, Tallahassee, FL. Credits: Map data ©2015: Google, DigitalGlobe

Processes to further reduce pathogens (PFRP) are considered equivalent options for consistently reducing pathogens below detection limits (Table 4). As described by the US Environmental Protection Agency (EPA), a PFRP must reduce enteric (intestinal) viruses to below 1 plaque forming unit (PFU) per 4 grams of total solids (dry weight basis) and reduce the density of viable helminth ova (parasitic worm eggs) to below 1 per 4 grams of total solids (dry weight basis). In Florida, potential new treatment processes may be reviewed for PFRP equivalency through the federal Pathogen Equivalency Committee (PEC).

Table 3. Class A and AA pathogen reduction alternatives.

Alternative	Description
1	Thermally treated biosolids.
2	High pH and temperature.
3	Biosolids treated in other processes (must achieve the below detection limit criteria for indicator organisms).
4*	Biosolids treated in unknown processes: demonstration of the process is unnecessary. Density of pathogens at the time the biosolids are used or disposed of or are prepared for sale/giveaway for application to the land must be less than one plague-forming unit per 4 grams of total solids.
5	Biosolids treated by a PFRP (Table 4).
6	Biosolids treated in a process equivalent to a PFRP, as approved by EPA.
* Florida did not adopt Alternative 4	

Table 4. Processes to further reduce pathogens (PFRPs).

PFRP	Description
Composting	Temperature maintained at 55°C or greater for: • 3 days for within-vessel or static aerated pile composting methods. • 15 days or longer for windrow composting method with at least five windrow turnings during that time.
Heat Drying	Biosolids are dried by contact with hot gases to 10% or less moisture content by exceeding 80°C in biosolids or in the wet bulb temperature of the gas in contact with sludge leaving the dryer.
Heat Treatment	Biosolids temperature is maintained at 180°C or greater for a minimum of 30 minutes.
Thermophilic Aerobic Digestion	A mean cell residence time (MCRT) of 10 days at 55°C to 60°C while sludge is agitated with air or oxygen to maintain aerobic conditions.
Beta Ray Irradiation	Biosolids are irradiated with beta rays from an accelerator at dosages of at least 1.0 megarad at 20°C.
Gamma Ray Irradiation	Biosolids are irradiated with gamma rays from certain isotopes, such as cobalt-60 or cesium-137, at dosages of at least 1.0 megarad at 20°C.
Pasteurization	Biosolids temperature is maintained at 70°C for a minimum of 30 minutes.

Vector Attraction Reduction

The purpose of VAR is to reduce the likelihood of a vector contacting biosolids and harboring or transferring pathogens. The VAR is typically implemented in conjunction with pathogen reduction. Biosolids must meet one of the vector attraction reduction requirements of 40 C.F.R. Part 503.33(b) (1) through (10) for Class A or B biosolids and of 40 C.F.R. Part 503.33(b) (1) through (8) for Class AA biosolids (Table 5). These vector attraction reduction requirements reduce the potential for pathogen regrowth.

Table 5. Vector attraction reduction requirements.

Option	Requirement
1	Minimum of 38% percent reduction in volatile solids content.
2	For anaerobically digested biosolids, demonstrate vector attraction reduction with an additional 40-day period of anaerobic digestion in a bench-scale unit at 30°C–37°C.
3	For aerobically digested biosolids, demonstrate vector attraction reduction with an additional 30-day period of aerobic digestion in a bench-scale unit at 20°C.
4	Meet a specific oxygen uptake rate at 20°C equal to or less than 1.5 milligrams of oxygen per hour per gram of aerobically digested biosolids (dry-weight basis).
5	Use aerobic processes at greater than 40°C for 14 days or longer, with an average temperature greater than 45°C.
6	Alkali addition to raise the pH to 12 or higher for 2 hours with a pH of 11.5 or higher for an additional 22 hours, without the addition of more alkaline material.
7	Dry biosolids with no unstabilized solids to at least 75% solids, prior to mixing with other materials.
8	Dry biosolids with unstabilized solids to at least 90% solids, prior to mixing with other materials.
9*	Inject biosolids beneath the soil surface. For Class A, biosolids must be injected within eight hours after discharge from the pathogen-reducing process.
10*	Incorporate biosolids into the soil within six hours of application on the land. For Class A, biosolids must be incorporated within eight hours after discharge from the pathogen-reducing process.
*Options 9 and 10 are not applicable for Class AA biosolids.	

Metal Contaminants

In addition to meeting the pathogen and VAR requirements, all biosolids (Class B, A, AA) must not exceed the single sample element concentrations given in Chapter 62-640.700(5)(a), F.A.C. (Table 6). In addition, Class AA biosolids must not exceed the monthly average element concentrations given in Chapter 62-640.700(5)(b), F.A.C (Table 7).

In addition, Class AA biosolids must not exceed the monthly average element concentrations given in Chapter 62-640.700(5)(b), F.A.C. (Table 7).

Table 6. Ceiling concentrations given on a dry mass basis.

Element	Single Sample Concentration (milligrams per kilogram, mg/kg)
Arsenic	75
Cadmium	85
Copper	4,300
Lead	840
Mercury	57
Molybdenum	75
Nickel	420
Selenium	100
Zinc	7,500

Table 7. Class AA contaminant concentration thresholds given on a dry mass basis.

Element	Monthly Average Concentration (mg/kg)
Arsenic	41
Cadmium	39
Copper	1,500
Lead	300
Mercury	17
Nickel	420
Selenium	100
Zinc	2,800

Summary

Biosolids are the liquid, semisolid, and solid fractions of the treated waste stream from a domestic waste water treatment facility. Florida biosolids are classified, in terms of potential pathogens and metal contaminant concentration reductions from least to greatest, as Class B, A, or AA, respectively. On August 29, 2010, FDEP formally adopted its rule for the management of wastewater biosolids (also known as domestic wastewater residuals or sewage sludge) in Chapter 62-640, F.A.C. (2010). The permitting deadline for biosolids land application sites was January 1, 2013. The revised regulations aim to improve site management and accountability in order to better protect public safety and the environment. The part 503 rule continues to act as a safeguard against biosolids misuse while allowing the return of organic matter and essential plant nutrients to the soil.

Further Reading

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