

18. Biosolids Regulations

18.1 Biosolids Definition

- Biosolids are treated solids produced as part of wastewater treatment
- Biosolids can be disposed or recycled beneficially
- Biosolids must meet standards established under Title 40 of the Code of Federal Regulations (CFR), Part 503.
- Grit and screenings are not considered as biosolids

18.2 Biosolids Use/Disposal Methods

1. Land application
 - This is the most commonly used biosolids management method and is referred as a "recycling" option.
 - This uses the organic and/or nutrient content of the biosolids to either condition and/or fertilize crops or other vegetation grown in the soil
 - Land application allows for the beneficial utilization of soil-enhancing constituents such as plant nutrients and organic matter in the biosolids
2. Surface disposal which requires availability of a large land which is lined with an impermeable material prior to the application of biosolids.
3. Incineration where the biosolids is burnt to ash. This method utilizes its organic content to limit the amount of external fuel required to incinerate.

18.3 Biosolids Regulations

- Part 503 rule applies to any person who applies biosolids to the land or fires biosolids in a biosolids incinerator, and to the owner/operator of a surface disposal site, or to any person who is a preparer or generator of biosolids for use, incineration, or disposal.
- Part 503 standard includes:
 1. General requirements
 2. Pollutant limits
 3. Management practices
 4. Operational standards, and
 5. Requirements for the frequency of monitoring, record-keeping, and reporting

40 CFR, Part 503 Pollutant Concentration Limits and Loading Rates for Land Application			
Pollutant	Ceiling Concentration Limit (mg/kg) ^a	Cumulative Loading Rate Limit (kg/ha) ^a	Pollutant Concentration Limit (mg/kg) ^a
Arsenic	75	41	41
Cadmium	85	39	39
Copper	4,300	1,500	1,500
Lead	840	300	300
Mercury	57	17	17
Molybdenum	75	-	-
Nickel	420	420	420
Selenium	100	100	100
Zinc	7,500	2,800	2,800
Applies to:	All biosolids that are land applied	Bulk biosolids ^b	Bulk or bagged ^b biosolids

^aDry weight basis.
^bBagged biosolids are sold or given away in a bag or container containing less than 56 kg (120 lb) of biosolids.

Table 5.1: Pollutant Concentration Limits and Loading Rates for Land Application

18.4 Title 40 CFR Part 503 Requirements

In order to land apply biosolids, each of the following three standards must be met.

18.4.1 Pollutant concentration limits

- The biosolids produced must have concentrations of the 10 heavy metals listed, lower than the Ceiling Concentration thresholds.
- Sewage sludge exceeding the ceiling concentration limit for even one of the regulated pollutants is not classified as biosolids and, hence, cannot be land applied.
- Biosolids with heavy metal concentrations at or below the limit specified in the Pollution Concentration thresholds are classified as "High Quality Biosolids"
- Biosolids meeting pollutant concentration limits are subject to fewer requirements than biosolids meeting ceiling concentration limits

18.4.2 Pathogen reduction

- Pathogens are disease causing organisms such as bacteria, viruses and parasites
- The treatment method used for treating wastewater solids must meet standards related to pathogen reduction
- Based upon the method used for treating wastewater solids, biosolids produced are classified as:

Class A Biosolids

- The biosolids produced using the methods and standards identified are free of measurable pathogens.
- There are no pathogen related site restrictions for the application of Class A biosolids - including use in home gardens and landscaping
- Processes to further reduce pathogens (PFRP) treatment, such as those involving high temperature, high pH with alkaline addition, drying, and composting, or their equivalent are most commonly used to demonstrate that biosolids meet Class A requirements

Class B Biosolids

- For Class B biosolids, pathogens have been reduced to levels that are unlikely to cause a threat to public health and the environment under specified use conditions.
- Processes to significantly reduce pathogens (**PSRP**), such as digestion, drying, heating, and high pH, or their equivalent are most commonly used to demonstrate that biosolids meet Class B requirements
- Site restrictions are imposed on the application of Class B biosolids to ensure minimizing the potential for human and animal contact with the biosolids until environmental factors reduce the pathogens to below detectable levels.

18.4.3 Vector attraction reduction

- Vector reduction standards are for preventing transmission of pathogens via rodents, birds, and insects from the land applied biosolids.
- The vector reduction rule requirements are based on the following two approaches:
 1. Specifying organic matter decomposition processes viz., digestion and alkaline addition to mitigate vector attraction
 2. Biosolids sub-surface injection or incorporation within six hours so soil microbes out-competes/eliminates pathogens
- A minimum of 38% volatile solids reduction as part of the solids treatment process is a more common method of demonstrating compliance with vector attraction reduction requirements

For biosolids to qualify for Exceptional Quality (EQ) Standards - the application of which is almost unrestricted, it must meet all three of the following:

1. Pollutant concentration limits
2. Class A requirements
3. Vector attraction reduction standards

BIOSOLIDS REGULATIONS		REQUIREMENTS FOR LAND APPLICATION OF BIOSOLIDS	
Pollution Concentration Standards		Pathogen Reduction Standards	
Minimum Standard	For High Quality Biosolids	Pathogens are disease causing organisms such as bacteria, viruses and parasites	Part 503 applies to any person who applies biosolids to the land or fixes biosolids in a biosolids incinerator, and to the owner/operator of a surface disposal site, or to any person who is a preparer of biosolids for use, incineration, or disposal.
From Table 1 Part 503.13	From Table 3 Part 503.13	Class A	Subpart A: General Provisions Subpart B: Land Application Subpart C: Surface Application Subpart D: Pathogen & Vector Subpart E: Incineration
Pollutant	Ceiling Concentration Limits for All Biosolids Applied to Land (milligrams per kilogram)	Pollutant Concentration Limits for EQ and PC Biosolids (milligrams per kilogram)	No site restriction for land application
Arsenic	75	41	Site restriction when applied to land
Cadmium	85	39	
Copper	4300	1500	
Lead	840	300	
Mercury	57	17	
Molybdenum	75	N/A	
Nickel	420	420	
Selenium	100	36	
Zinc	7500	2800	
Process to Further Reduce Pathogens (PFRP) - App B 40 CFR Part 503		Required of all biosolids irrespective of pathogen class	
Meet one of the following alternatives		Meet one of the following alternatives	
Alternative 1: Thermally treated biosolids pH-high temperature process		Alternative 1: Monitoring of indicator organisms fecal coliform < 2000 MPN/gm	
Alternative 2: Biosolids treated in a high pH-high temperature process		Alternative 2: Biosolids treated in a PFRP process equivalent to TSPRP	
Alternative 3: Biosolids treated in other processes which reduce enteric viruses and viable helminth ova.		Alternative 3: Biosolids treated in a PFRP process equivalent to a PFRP	
Alternative 4: Biosolids treated in Unknown processes. Biosolids must be tested for pathogens.		Alternative 4: Biosolids treated in a PFRP process equivalent to a PFRP	
Alternative 5: Biosolids treated in a PFRP process equivalent to a PFRP		Process to Significantly Reduce Pathogens (PSRP) - App B 40 CFR Part 503	
Alternative 6: Biosolids treated in a process equivalent to a PFRP		1. Aerobic digestion 2. Air drying 3. Anaerobic digestion 4. Composting 5. Lime stabilization	
For each of the alternatives above meet the following requirements		1. Meet 38% reduction in volatile solids content 2. Demonstrate vector attraction reduction with additional anaerobic digestion in a bench scale unit. 3. Demonstrate vector attraction reduction with additional aerobic digestion in a bench scale unit. 4. Meet specific oxygen uptake rate for aerobically digested biosolids 5. Use aerobic processes at greater than 40 deg. C for 14 days or longer 6. Alkaline addition under specified conditions 7. Dry biosolids with no unstabilized solids to atleast 75 percent solids 8. Dry biosolids with unstabilized solids to atleast 90% solids 9. Infect biosolids beneath soil surface 10. Incorporate biosolids into the soil within 6 hours of application to or placement on the land 11. Cover biosolids placed on a surface disposal site with soil or other material at the end of each operating day 12. Alkaline treatment of domestic seepage to pH 12 or above for 30 minutes without adding more alkaline material	
Fecal Coliform <1000 MPN/gm Salmonella < 3 MPN/gm OR OR No viable enteric viruses & helminth ova		Options for Meeting Vector Reduction	
For a biosolids to qualify for EQ (Exceptional Quality Standards) it must meet all three of the following:		1. Pollutant concentration limits 2. Class A requirements 3. Vector attraction reduction standards	
EQ biosolids are virtually unrestricted			