

RESIDUALS MANAGEMENT PROGRAM

DEFINITIONS

Act means Act No. 451 of the Public Acts of 1994, as amended, being §324.101 et seq. of the Michigan Compiled Laws.

Aerobic digestion means the biochemical decomposition of organic matter in biosolids into carbon dioxide and water by microorganisms in the presence of air.

Agricultural land means land on which a food crop, a feed crop, or a fiber crop is grown. The term includes range land and land used as pasture.

Agronomic rate means the calculated biosolids application rate (dry weight basis) which provides the amount of plant available nitrogen (PAN) needed by the crop or vegetation grown on the land; which minimizes the amount of nitrogen that passes below the root zone of the crop or vegetation grown; and which considers the amounts of phosphate (P₂O₅) and potash (K₂O) added by the biosolids as part of the total nutrient management plan.

Biosolids means solid, semisolid, or liquid residues generated during the treatment of sanitary sewage or domestic sewage in a treatment works. The term "biosolids" includes, but is not limited to, scum or solids removed in primary, secondary, or advanced wastewater treatment processes and a derivative of the removed scum or solids.

Bulk biosolids means biosolids that are not sold or given away in a bag or other container for application to a lawn or home garden.

Class A means biosolids that meet the requirement in R 323.2414(2)(b) and the requirements in R 323.2414(2)(c), (d), (e), (f), (g), or (h) with respect to pathogens.

Class B means biosolids that meet the requirements in R 323.2414 (3)(c), (d), or (e) with respect to pathogens.

Composite Sample is a number of proportional samples collected and mixed so as to be representative of the biosolids to be applied to land and soils that receive biosolids.

Cumulative pollutant loading rate (CPLR) means the maximum amount of an inorganic pollutant that can be applied to an area of land.

Daily Concentration is the sum of the concentrations of the individual samples of a parameter divided by the number of samples taken during any calendar day. If the parameter concentration in any sample is less than the method detection level, regard that value as the detection level when calculating the daily concentration, and indicate that the result is "less than" the value reported.

Department means the director of the department of environmental quality or his or her designee.

Derivative means a product for land application derived from biosolids that does not include solid waste or other waste regulated under the act. A derivative does not include materials or treatment chemicals, that is, lime or ferric chloride, integral to wastewater treatment and biosolids unit processes.

Distributor means a person who applies, markets, or distributes, except at retail, a derivative.

Domestic sewage means waste and wastewater from humans or household operations that is discharged to, or otherwise enters, a treatment works.

Dry weight basis means calculated on the basis of having been dried at 105 degrees Celsius until reaching a constant mass that is essentially 100% solids content.

Exceptional quality (EQ) means biosolids or a derivative that meets all of the following criteria: (i) Pollutant ceiling concentrations in R 323.2409(5)(a). (ii) Pollutant concentrations in R 323.2409(5)(c). (iii) One of the vector attraction reduction options in R 323.2415(4)(a) to (h) and one of the class A pathogen reduction alternatives in R 323.2414(2)(a).

Forest means a tract of land that is thick with trees and underbrush.

Generator means a person who generates biosolids that are applied to land.

Grab Sample is a single sample taken at neither a set time nor flow.

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Groundwater means water below the land surface in the saturated zone.

Incorporation means the blending of surface-applied biosolids into the soil so that a significant amount of the biosolids is not present on the land surface within 1 hour after land application.

Injection means the placement of biosolids below the land surface so that a significant amount of the biosolids is not present on the land surface within 1 hour after land application.

Land application means spraying or spreading biosolids onto the land surface, injecting biosolids below the land surface, or incorporating biosolids into the soil so that the biosolids can either condition the soil or fertilize crops or vegetation grown in the soil.

Land application plan means the process a generator uses to identify and select land application sites that are not included in a land application site list. At a minimum a plan shall include all of the following: (i) A description of the geographical area covered by the plan. (ii) Identification of the criteria used for site selection. (iii) A description of how the sites are managed.

Land with a low potential for public exposure means land that the public uses infrequently. The term includes, but is not limited to, agricultural land, forest land, and a reclamation site located in an unpopulated area, for example, a strip mine located in a rural area.

Land with a high potential for public exposure means land that the public uses frequently. The term includes, but is not limited to, a public contact site and a reclamation site located in a populated area, for example, a construction site located in a city.

Listed land application site means a site which has been approved by the DEQ and is used for biosolids land application by a generator.

Monthly Concentration is the sum of the daily concentrations determined during a reporting month (or 30 consecutive days), divided by the number of daily concentrations determined. If any daily concentration is less than the method detection level, regard that value as the detection level when calculating the monthly concentration, and indicate that the result is "less than" the value reported.

Permit means 1 of the following: (i) A national pollutant discharge elimination system (NPDES) permit that is issued by the DEQ under section 3112(1) of the act to control wastewater discharges to the surface waters and to manage biosolids. (ii) A permit that is issued by the DEQ under section 3112(1) of the act to control wastewater discharges to the groundwaters and to manage biosolids. (iii) A biosolids permit issued by the DEQ.

Permitting authority means the DEQ.

Person means an individual, association, partnership, corporation, local unit, state or federal agency, or an agent or employee of any of the entities specified in this definition.

Person who prepares biosolids means either the person who generates biosolids during the treatment of domestic sewage or sanitary sewage in a treatment works or the person who derives a material from biosolids.

pH means the logarithm of the reciprocal of the hydrogen ion concentration measured at 25 degrees Celsius or measured at another temperature and then converted to an equivalent value at 25 degrees Celsius.

Pollutant means an organic substance, an inorganic substance, a combination of organic and inorganic substances, or a pathogenic organism that, after discharge and upon exposure, ingestion, inhalation, or assimilation into an organism either directly from the environment or indirectly by ingestion through the food chain, could, on the basis of information available to the administrator of EPA or the DEQ, cause death; disease; behavioral abnormalities; cancer; genetic mutations; physiological malfunctions, including malfunction in reproduction; or physical deformations in either organisms or offspring of the organisms.

Pollutant limit means a numerical value that describes the amount of a pollutant allowed per unit amount of biosolids, for example milligrams per kilogram of total solids; the amount of a pollutant that can be applied to a unit area of land, for example, kilograms per hectare or pounds per acre; or the volume of a material that can be applied to a unit area of land, for example, gallons per acre.

Public contact site means land that has a high potential for contact by the public. The term includes, but is not limited to, any of the following: (i) Public parks. (ii) Ball fields. (iii) Cemeteries. (iv) Plant nurseries. (v) Turf farms. (vi) Golf courses.

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Reclamation site means drastically disturbed land that is reclaimed using biosolids. The term includes, but is not limited to, strip mines and construction sites.

Residuals Management Program means a program that is required by a generator's permit and is developed in accordance with R 323.2403(3)(a) to (d).

Retail means EQ biosolids or an EQ derivative sold directly to the consumer or through retail establishments in bags or other containers that have a load capacity of 1 metric ton (2200 pounds) or less of biosolids.

Septage means either liquid or solid material that is removed from any of the following that receive only domestic sewage. (i) A septic tank. (ii) A cesspool. (iii) A portable toilet. (iv) A Type III marine sanitation device. (v) A similar treatment works.

Site means a contiguous tract of land to which biosolids or a derivative are land applied in accordance with the requirements in these rules.

Specific oxygen uptake rate (SOUR) means the mass of oxygen consumed per unit time per unit mass of total solids (dry weight basis) in biosolids.

Surface application means the spraying or spreading of biosolids or derivatives onto the land surface for use as a soil conditioner or as a nutrient source for plant growth.

Surface water means any of the following: (i) Lakes. (ii) Rivers. (iii) Streams. (iv) Wetlands. (v) All other watercourses. (vi) Waters within the jurisdiction of this state. (vii) The Great Lakes bordering this state.

Treatment of" or "to treat", with respect to biosolids, means the preparation of biosolids for final use or disposal. The term includes, but is not limited to, the thickening, stabilization, and dewatering of biosolids. The term does not include the storage of biosolids.

Treatment works means either a federally owned, publicly owned, or privately owned device or system used to treat, including recycling and reclaiming, either domestic sewage or sanitary sewage.

Total solids means the materials in biosolids that remain as residue when biosolids are dried at 103 to 105 degrees Celsius.

Vector attraction means the characteristic of biosolids that attracts rodents, flies, mosquitoes, or other organisms capable of transporting infectious agents.

Volatile solids means the amount of the total solids in biosolids lost when biosolids are combusted at 550 degrees Celsius in the presence of excess air.

Wetlands means areas that are inundated or saturated by surface water or groundwater at a frequency and duration to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

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Appendix C - Reporting / Record Keeping / Certification Requirements

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Appendix E - Agronomic Rate Calculations

Appendix F - Notification Requirements / Sample Public Notification Letter

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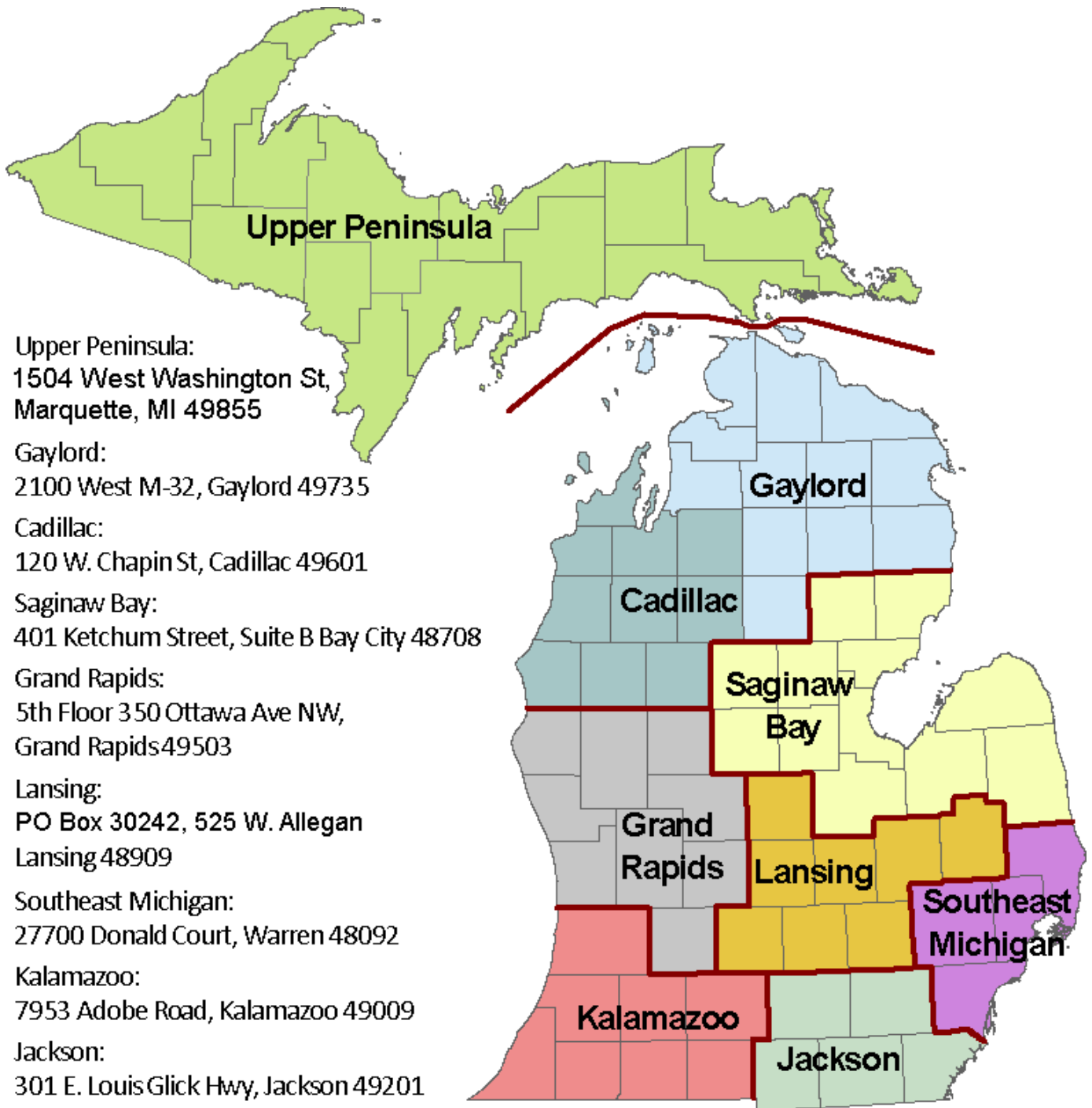
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Appendix A

Water Resources Division District Office Addresses and County Jurisdictions

<u>DEQ DISTRICT OFFICES</u>	<u>TELEPHONE # FAX #</u>	<u>COUNTY JURISDICTIONS</u>		
CADILLAC DISTRICT OFFICE 120 WEST CHAPIN STREET CADILLAC, MI 49601-2158	231-775-3960	BENZIE GRAND TRAVERSE KALKASKA LAKE LEELANAU	MANISTEE MASON MISSAUKEE OSCEOLA WEXFORD	
GAYLORD FIELD OFFICE 2100 WEST M-32 GAYLORD, MI 49735-9282	989-731-4920	ALCONA ALPENA ANTRIM CHARLEVOIX CHEBOYGAN CRAWFORD	EMMET MONTMORENCY OSCODA OTSEGO PRESQUE ISLE ROSCOMMON	
SOUTHEAST MICHIGAN DISTRICT OFFICE 27700 DONALD COURT WARREN, MI 48092-2793	586-753-3700	MACOMB OAKLAND ST. CLAIR WAYNE		
GRAND RAPIDS DISTRICT OFFICE STATE OFFICE BUILDING, 5TH FLOOR 350 OTTAWA N.W. UNIT 10 GRAND RAPIDS, MI 49503-2341	616-356-0500	BARRY IONIA KENT MECOSTA MONTCALM MUSKEGON	NEWAYGO OCEANA OTTAWA	
JACKSON DISTRICT OFFICE 301 EAST LOUIS GLICK HIGHWAY JACKSON, MI 49201-1556	517-780-7690	HILLSDALE JACKSON LENAWEE MONROE WASHTENAW		
UPPER PENINSULA DISTRICT OFFICE 1504 WEST WASHINGTON STREET MARQUETTE, MI 49855	906-228-4853	ALGER BARAGA CHIPPEWA DELTA DICKINSON GOGEBIC	HOUGHTON IRON KEWEENAW LUCE MARQUETTE MACKINAC	MENOMINEE ONTONAGON SCHOOLCRAFT
KALAMAZOO DISTRICT OFFICE 7953 ADOBE ROAD KALAMAZOO, MI 49009	269-567-3500	ALLEGAN BERRIEN BRANCH CALHOUN CASS KALAMAZOO	ST. JOSEPH VAN BUREN	
SAGINAW BAY DISTRICT OFFICE 401 KETCHUM STREET, SUITE B BAY CITY, MI 48706-5430	989-894-6200	ARENAC BAY CLARE GLADWIN HURON IOSCO	ISABELLA MIDLAND OGEMAW SAGINAW SANILAC TUSCOLA	
LANSING DISTRICT OFFICE 525 WEST ALLEGAN STREET, 1S LANSING, MI 48933-7742	517-284-6651	CLINTON EATON GENESEE GRATIOT INGHAM LAPEER	LIVINGSTON SHIAWASSEE	

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Water Resources Division District Boundaries with County Divisions



Appendix B

Industrial Pretreatment Program

The industrial Pretreatment Program (IPP) regulates industrial discharges to publicly owned treatment works (POTWs). Requirements for an IPP are placed in a POTW's NPDES permit when it is determined that they receive non-domestic wastewater which: may cause pass-through; may interfere with POTW operations; or are subject to categorical pretreatment standards. The IPP regulates the discharge of pollutants from industrial users to public sanitary sewers and wastewater treatment plants to protect the environment and the infrastructure. The DEQ has assisted 102 local units of government with the development and implementation of formal IPPs.

In 1983, the U.S. EPA formally delegated the State of Michigan to implement the IPP. Regulations governing the program are contained in 40 CFR Part 403, and R 323.2301 – R 323.2317 of the Michigan Administrative Code. Industry specific technology based treatment requirements are contained in 40 CFR Parts 405-471.

Communities with pretreatment programs are divided into two categories:

- Federal IPPs – Those POTWs with a design flow greater than 5 million gallons per day (MGD).
- Michigan IPPs – Those POTWs with a design flow equal to or less than 5 MGD.

While both programs are similar, MIPPs have been provided some regulatory relief from certain Federal requirements including: No requirement for whole effluent testing with the permit application if design flow is under 1 MGD; RCRA notification to users is not required; only categorical industrial users must be published if in significant noncompliance; slug control plan evaluations are not required; and local limits do not have to be re-evaluated with the permit applications.

Program oversight is conducted by both the Pretreatment and Biosolids Unit of the Program Support Section and WRD's District Staff. Oversight activities include audits (generally performed by PBU), pretreatment compliance inspections (PCIs), and PCI recons. Inspections are scheduled to correspond to the reissuance of the NPDES permits, which are based on a watershed (basin year) approach. Program submittals include sewer use ordinances, interjurisdictional agreements, enforcement response plans, local limits and procedures for program implementation. The Director has delegated all IPP decisions, including final program approvals and modifications to the WRD District Supervisors (Executive Order 1991-31 Delegation Letter, Letter No.: WD-31-07).

Local limits for toxic pollutants are reviewed by District staff for completeness then forwarded to the pretreatment staff of the PBU. The PBU determines the maximum amount of pollutants that would be discharged if the proposed local limits were imposed. These are compared to existing NPDES limits, or if not limited theoretical Water Quality Based Effluent limits generated by GLEAS. PBU forwards their recommendations to the District Supervisor. To the extent that NPDES permit limits become more restrictive due to the Great Lakes Initiative (GLI), local limits may need to become more stringent to reduce the amount of pollutants discharged to the POTW by industrial users.

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Appendix C

Michigan Part 24 Rules Summary -Reporting / Recordkeeping Requirements:

R 323.2416 Reporting:

- (2) **Each biosolids generator and distributor shall annually report to the DEQ for each fiscal year, the number of dry tons of biosolids it generated or the number of dry tons of biosolids in derivatives it distributed that were applied to land in the state of Michigan in the state fiscal year. A biosolids generator located in the state of Michigan that land applies outside the state of Michigan will be assessed only an administrative fee and a fee for biosolids that are land applied in the state of Michigan. The report is due 30 days after the end of the state fiscal year.**
- (3) A generator or distributor that land applied biosolids or a derivative to land within the state at any time during the previous state fiscal year shall report to the DEQ the information required in Record Keeping Requirements, R 323.2413 (3) to (8), except R 323.2413 (6) (b), (7) (b), and (8) (b), on or before October 30. **See summary of record keeping requirements**

(Optional) Submittal of the Biosolids Recycling Sheets (formerly sludge disposal sheets) with the annual report for each land application site used during the previous state fiscal year will help meet the record keeping requirements contained in R 323.2413 (f) (g) and (h). An electronic or hardcopy version of this form can be obtained on the DEQ's Biosolids web page or by contacting the appropriate District Office listed in Appendix A.

R 323.2413 Record Keeping:

- (1) A generator shall keep records for a minimum of 5 years unless a longer period is specified by the permitting authority.
- (2) A person who generates bulk biosolids or bulk derivatives, including a generator out of state shall keep the following records available for inspection and copying.
- (a) Site information, of each application site, which includes the following:
 - (i) Plat map
 - (ii) Soil survey map, if available
 - (iii) Name and address of property owner and farm operator if different from owner
 - (iv) Latitude and Longitude
 - (b) Written consent from the property owner and the farm operator if different from owner.
 - (c) Written agreement between the generator and the farmer not to apply biosolids from other sources or septage to a listed land application site.
 - (d) Biosolids analysis parameters listed in table 1 R 323.2409 at the frequency of analysis stated in table 7 of R 323.2412.
 - (e) Soil fertility test results for each site.
 - (f) Summary of all application activity, including:
 - (i) Site identification
 - (ii) Biosolids analysis
 - (iii) Total acres on the site
 - (iv) Acres used
 - (v) Application rate in dry tons per acre
 - (vi) Each nutrient required to be monitored in pounds per acre
 - (vii) Each pollutant listed in table 3, in pounds per acre
 - (g) If biosolids have been applied that exceed table three limits than the generator shall keep records documenting the cumulative loading for life.
 - (h) An annual summary, including the following:
 - (i) Biosolids volume generated
 - (ii) Total dry tons applied
 - (iii) Total dry tons disposed of by other methods
 - (iv) Total acres used
 - (v) Sites that received biosolids application subject to table 2 of R 323.2409 (5) (b).

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Part 24 Rules Certification Requirement Citations

- Class A - person who derives R 323.2413(4)(b)
- Class A - person who prepares R 323.2413(5)(a)(ii)
- Class A - person who applies R 323.2413(5)(b)(ii)
- Class B - person who prepares R 323.2413(6)(a)(ii)
- Class B - person who applies R 323.2413(6)(b)(i)
- CPLR - person who prepares R 323.2413(7)(a)(ii)
- CPLR - person who applies R 323.2413(7)(b)(vi) for site information and R 323.2413(7)(b)(viii) for management practices
- Class B - person who applies R 323.2413(7)(b)(x) for site restrictions
- Class B - person who applies R 323.2413(7)(b)(xii) for injection or incorporation to meet VAR
- APLR - person who prepares R 323.2413(8)(c)

A person who prepares can be either a generator or a person who derives a material from biosolids.

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40 CFR Part 503 -Reporting / Recordkeeping / Certification Responsibilities

TYPE OF BIOSOLIDS	RECORDS THAT MUST BE KEPT	PERSON RESPONSIBLE		RECORDS TO REPORT
		PREPARER	APPLIER	
EQ Biosolids	Pollutant Concentrations	X		X
	Pathogen reduction certification and description	X		X
	Vector attraction reduction certification and description	X		X
PC Biosolids	Pollutant Concentrations	X		X
	Management practice certification and description		X	
	Site restriction certification and description (where Class B pathogen requirements are met)		X	
	Pathogen reduction certification and description	X		X
	Vector attraction reduction certification and description	X	*X	X
CPLR Biosolids	Pollutant Concentrations	X		X
	Pathogen reduction certification and description	X		X
	Management practice certification and description		X	
	Site restriction certification and description (where Class B pathogen requirements are met)		X	
	Pathogen reduction certification and description	X		X
	Vector attraction reduction certification and description	X	or *X	X
	Other information: Certification and description of information gathered (from previous applier, landowner, or permitting authority re: existing CPLR at site from previous biosolids applications) <i>Site location</i> <i>Number of hectares</i> <i>Amount of biosolids applied</i> <i>Cumulative amount of pollutant applied (including previous amounts)</i> <i>Date of application</i>		X	**X
APLR Biosolids Retail/sold or given away	Pollutant Concentrations	X		X
	Management practice certification and description	X	or X	X
	Pathogen reduction certification and description	X		X
	Vector attraction reduction certification and description	X		X
	The AWBAR for the biosolids	X		X

*(The preparer certifies and describes vector attraction reduction methods other than injection and incorporation of biosolids into the soil. The applier certifies when incorporating or injecting)

** (Some information reported when 90% or more of CPLRs is reached at a site)

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Appendix D

Landowner Agreements

Rule 323.2413(2)(b) and (c) requires written consent from the property owner and the farm operator to apply biosolids and a written agreement not to apply biosolids from other sources or septage to a listed land application site. Beyond these requirements, comprehensive formal agreements with participating landowners covering other aspects of land application are not required by statute or rule, however the DEQ recommends that they be developed with each participating landowner. Formal agreements make clear that the owner and/or operator of the land is aware of and agrees with the restrictions that are included in the Part 24 rules. Past failures to make sure that all parties are aware of their responsibilities have resulted in confusion and in extreme cases, settlements negotiated to avoid litigation.

The agreement should identify the biosolids generator, the application contractor (if used) the landowner, the farm operator (if different from the landowner), the lands on the property that will be involved, and the crops to be grown.

The agreement should also make clear that agents of the generator, federal, state and local regulatory staff might access the land for the purpose of inspecting the site, applying biosolids, obtaining soil samples, and testing.

The agreement should make sure that the land owner and farm operator understand that the biosolids must be applied in accordance with requirements of the Part 24 Rules and the federal Part 503 requirements. The owner and operator must understand that certain site management criteria must be met for proper utilization of biosolids.

We recommend that the following requirements of the Part 24 Rules be considered when drafting up agreements:

- A landowner shall not harvest food crops that have harvested parts which touch the biosolids/soil mixture and which are totally above the land surface for 14 months after biosolids are applied.
- A landowner shall not harvest food crops that have harvested parts below the surface of the land for 20 months after biosolids are applied if the biosolids remain on the land surface for 4 months or longer before incorporation into the soil.
- A landowner shall not harvest food crops that have harvested parts below the surface of the land for 38 months after biosolids are applied if the biosolids remain on the land surface for less than 4 months before incorporation into the soil.
- A landowner shall not harvest food crops, feed crops, and fiber crops for 30 days after biosolids are applied.
- A landowner shall not graze animals on the land for 30 days after biosolids are applied.
- A land owner shall not harvest turf grown on land where biosolids are applied for 1 year after biosolids are applied if the harvested turf is placed on either land that has a high potential for public exposure or a lawn, unless otherwise specified by the permitting authority.
- A landowner shall restrict public access to land that has a high potential for public exposure for 1 year after biosolids are applied.

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Landowner Agreements, Appendix D, (cont.)

- A landowner shall restrict public access to land with a low potential for public exposure for 30 days after biosolids are applied.

The generator could agree to furnish the farmer with the amount of nutrients applied so that the farmer can adjust their fertilizer usage accordingly.

Agreements should consider transfer or sale of the property, where a new owner might want to change the use or cropping of the land. Restrictions on cropping or public access may interfere with new plans until the appropriate amount of time has passed. It is the responsibility of the generator to ensure that the site restrictions are maintained regardless if the property is transferred or sold and a formal agreement is a good method to help maintain that control.

The generator may wish to make clear that they do not guarantee specific quantities or delivery dates of biosolids, or crop yields.

It is recommended that an attorney review the draft landowner agreement before it is implemented.

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Appendix E

Worksheet 1 Calculations for Determining PAN Mineralized From Residual Organic N Applied as Sewage Sludge in Previous Years

Residual N from previously-applied sewage sludge that will be mineralized and released as plant-available N (PAN) must be accounted for as part of the overall budget for PAN, when determining the agronomic N rate for sewage sludge (i.e., Worksheet 2). This residual N credit can be estimated for some sites using soil nitrate tests, but more commonly the PAN credit is estimated by multiplying a mineralization factor (K_{min}) times the amount of sludge organic N (Org-N) still remaining in the soil one and two years after sludge has been applied.

Instructions: Complete a separate chart for each year that sewage sludge was previously-applied. Studies and experience have shown that any residual sludge Org-N remaining 2-3 years after application will not contribute significantly to PAN normally mineralized from soil organic matter decomposition. Therefore, calculating PAN credits beyond the third year is usually not necessary. To determine total mineralized Org-N released as PAN, sum the values under Mineralized Org-N (Column D) for the "Growing Season Year" for which you are planning a new sludge application to estimate the residual N credit for sludge applications the previous two years.

A. Year of Growing Season ¹	B. Starting Org-N ² (lb/acre)	C. Mineralization Rate ³ (K_{min})	D. Mineralized Org-N ⁴ or PAN (lb/acre)	E. Org-N Remaining ⁵ (lb/acre)
0-1 (sludge applied)				
1-2 (one year later)				
2-3 (two years later)				

¹Begin with the growing season (i.e., year the crop will be grown) for which sewage sludge was applied and continue two more years (i.e., two more growing seasons).

²For the first year, this equals the percent Org-N in the sludge times the rate of application. For years 1-2 and 2-3, this quantity equals the amount of Org-N remaining from the previous year (i.e., column E).

³The mineralization rate is the fraction of sludge Org-N expected to be released as PAN for the year being calculated. Example mineralization rates can be found in Table 7-7.

⁴Multiply column C times column B and round to the nearest whole pound.

⁵Subtract column D from column B and round to the nearest whole pound.

Table 7-7. Estimated mineralization rates (K_{min}) for different sewage sludges (from Sommers et al, 1981).

Time After Sewage Sludge Application (Years)	Fraction (K_{min})* of Organic N Mineralized from the Following Stages:			
	Unstabilized Primary and Waste	Aerobically Digested	Anaerobically Digested	Composted
0-1	0.40	0.30	0.20	0.10
1-2	0.20	0.15	0.10	0.05
2-3	0.10	0.08	0.05	-†
3-4	0.05	0.04		

* Fraction of the sludge organic N (Org-N) initially applied, or remaining in the soil, that will be mineralized during the time interval shown. K_{min} values are provided as examples only and may be quite different for different sewage sludges, soils, and climates. Therefore, site-specific data, or the best judgement of individuals familiar with N dynamics in the soil-plant system, should always be used in preference to these suggested K_{min} values.

† Once the mineralization rate becomes less than 3% (i.e., 0.03), no net gain of PAN above that normally obtained from the mineralization of soil organic matter is expected. Therefore, additional credits for residual sludge N do not need to be calculated.

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Example

Assume that anaerobically digested sewage sludge with 2.5% Org-N (dry weight basis) was applied at a rate of 3 ton/acre for the 1996 growing season. For the 1997 growing season, 2 ton/acre of a sludge containing 3.0% Org-N was applied to the same site. For the 1998 growing season, you want to calculate the amount of PAN that will be mineralized from the sludge Org-N applied in the previous 2 years.

In 1996, the sludge Org-N applied = $\frac{2.5 \text{ lb Org-N}}{100 \text{ lb sludge}} \times \frac{3 \text{ ton sludge}}{\text{acre}} \times \frac{2000 \text{ lb sludge}}{\text{ton sludge}} = 150 \text{ lb Org-N/acre}$

In 1997, the sludge Org-N applied = $\frac{3.0 \text{ lb Org-N}}{100 \text{ lb sludge}} \times \frac{2 \text{ ton sludge}}{\text{acre}} \times \frac{2000 \text{ lb sludge}}{\text{ton sludge}} = 120 \text{ lb Org-N/acre}$

Use Worksheet 1 to calculate the PAN released during the 1998 growing season from the sludge applied in 1996 and 1997.

A. Year of Growing Season	B. Starting Org.N (lb/acre)	C. Mineralization Rate (K_{min})	D. Mineralized Org-N (lb/acre)	E. Org-N Remaining (lb/acre)
1996 Sludge Application				
0-1 (1986 Application)	150	0.20	30	120
1-2 (1987)	120	0.10	12	108
2-3 (1988)	108	0.05	5	103
1997 Sludge Application				
0-1 (1987 Application)	120	0.20	24	96
1-2 (1988)	96	0.10	10	86
2-3 (1989)	86	0.05	4	82

To determine the total amount of PAN mineralized in 1998 from sludge applied in 1996 and 1997, add the Mineralized Org-N (or PAN) value in the 1998 row under column D for each year's chart (i.e., 5 + 10 = 15 lb PAN/acre). Therefore, the total PAN, or mineralized Org-N, for the 1998 growing season from previous sludge applications equals 15 lb/acre.

F. Year of Growing Season	G. Starting Org.N (lb/acre)	H. Mineralization Rate (K_{min})	I. Mineralized Org-N (lb/acre)	J. Org-N Remaining (lb/acre)
_____ Sludge Application				
0-1 (____ Application)				
1-2 (____)				
2-3 (____)				
_____ Sludge Application				
0-1 (____ Application)				
1-2 (____)				
2-3 (____)				

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Worksheet 2

**Nitrogen Budget Sheet for Determining the Agronomic N Rate
for Sewage Sludge Applications**

Symbols and Abbreviations Used

- Org-N = Organic N content of the sewage sludge obtained from analytical testing and determined by subtracting (NO₃-N + NH₄-N) from total N, usually given in percent (%); the resulting concentration should be converted to lb/ton (dry weight basis).
- NH₄-N = Ammonium N content of the sewage sludge obtained from analytical testing and usually given in percent (%); then convert to lb/ton (d.w. basis).
- NO₃-N = Nitrate N content of the sewage sludge obtained from analytical testing and often given in mg/kg; then convert to lb/ton (d.w. basis).
- K_{min} = Mineralization rate for the sewage sludge expressed as a fraction of the sludge Org-N expected to be released as PAN for the year being calculated; example mineralization rates for different sewage sludges can be found in Table 7-7.
- K_{vol} = Volatilization factor for estimating the amount of NH₄-N remaining after loss to the atmosphere as ammonia and expressed as a fraction (e.g., if K_{vol} = 1.0, 100% of the NH₄-N is retained and contributes to PAN; if K_{vol} = 0.5, then (0.5 x NH₄-N Content) estimates the amount of NH₄-N contributing to PAN).
- PAN = Plant-available N which is determined by calculating: NO₃-N + K_{vol}(NH₄-N) + K_{min}(Org-N)

Helpful Conversions

mg/kg x 0.002 = lb/ton	lb/acre x 1.12 = kg/ha	(lb/ton) / 2 = kg/mt
% x 20 = lb/ton	ton/acre x 2.24 = mt/ha	(mt = metric ton = 1000 kg)

1. Total N requirement of crop to be grown
_____ lb/acre

(obtain information from Cooperative Extension Service agricultural agents, USDA-Natural Resource Conservation Service Conservationists, or other agronomy professionals).

- 2. Nitrogen provided from other N sources added or mineralized in the soil
 - a. N from a previous legume crop (legume credit) or green manure crop _____ lb/acre
 - b. N from supplemental fertilizers already, or expected to be added
_____ lb/acre
 - c. Estimate of available N from previous sludge applications (From Worksheet 1) _____ lb/acre
 - d. Estimate of available N from a previous manure application (obtain mineralization factors from land-grant university to calculate similarly as for previous sewage sludge applications).
 - e. Soil nitrate test of available N present in soil [this quantity can be substituted _____ lb/acre in place of (a + d + e), if test is conducted properly; do not use this test value if estimates for a, d and c are used]

Total N available from existing, expected, and planned sources of N (add a+b+c+d+e or b+c+f)

3. Loss of available N by denitrification, immobilization, or NH₄⁺ fixation
_____ lb/acre (check with state regulatory for regulatory for approval, before using this site-specific factor).

4. Calculate the adjusted fertilizer N requirement for the crop to be grown
_____ lb/acre

(subtract Total N for 2 from 1; amount for 3 can be added to this difference, only if 3 is approved for this additional adjustment).

5. Determine the PAN/dry ton for the sludge that will be applied
_____ lb/acre

[i.e., NO₃-N + K_{vol} (NH₄-N) + K_{min} (Org-N) = PAN]

6. Calculate the agronomic N rate of sewage sludge (Divide 4 by 5)
_____ lb/ton

7. Convert the rate of sewage sludge in dry tons/acre into gallons/acre, cubic yards/acre, or wet tons/acre, since the sludge will be applied to land as a liquid or as a wet cake material.

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Appendix F

Notification Requirements:

R323.2408

- (4)(a) A generator or distributor shall provide written notification not less than ten days before the initial land application. This notification shall be provided to the Water Resources Division district office, county health department, city, village, or township clerk in the jurisdiction of the land application site (See sample letter on Page 40). The notification shall include a cover letter comprised of the following:
- (i) The proposed land application activity
 - (ii) The site location by latitude and longitude
 - (iii) A plat map identifying the site
 - (iv) The name and address of the property owner
 - (v) The name and address of the farm operator if different than the owner
 - (vi) A record of biosolids monitoring information containing the following:
 - (A) The most current monitoring results of the following:
 - (1) Arsenic
 - (2) Cadmium
 - (3) Copper
 - (4) Lead
 - (5) Mercury
 - (6) Molybdenum
 - (7) Nickel
 - (8) Selenium
 - (9) Zinc
 - (B) Applicable limitations
 - (C) Name, address, and phone number of the generator or distributor
- (c) A person who prepares bulk biosolids that are applied to agricultural land, a forest, a public contact site, or a reclamation site, shall provide the person who applies the bulk biosolids with written notification of the concentration of the total nutrients, on a dry weight basis, in the bulk biosolids required to be monitored.
- (d) A person who prepares bulk biosolids and provides the bulk biosolids to another person who prepares or applies these biosolids shall provide them with the proper notice and necessary information to comply with requirements in this part
- (e) A person who applies bulk biosolids to the land shall provide the owner or leaseholder of the land on which the bulk biosolids are applied notice and necessary information to comply with all requirements in this part
- (f) A person who land applies bulk biosolids subject to the cumulative pollutant loading rate in R 323.2409(5) (b) shall provide written notice, before the initial application of bulk biosolids to a land application site by the applier, to the permitting authority for the state in which the bulk biosolids will be applied. The permitting authority shall retain, and provide access to, the notice. The notice shall include the following information:
- (i) The location, by latitude and longitude, of the land application site.
 - (ii) The name, address, telephone number, and national pollutant discharge elimination system (NPDES) permit number, if appropriate, of the person who will apply the bulk biosolids.

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Facility Letterhead

Date:

To: County Health Department/ Township Clerk
Address

Subject: Biosolids Application Notification

Generator is preparing to apply biosolids (sewage sludge) on land located in township name (See attached plat map), owned by Name/Address of Property owner and operator, if different. This notice is provided in accordance with Michigan Part 24 Biosolids Rules, to inform you of our activities within your area, and to give you a basic understanding of the fertilizer value of this material. Generator will provide you free of charge any additional information as needed including any record created in accordance with State rules pertaining to the actual biosolids application.

The following analytical data represents the average contents of the biosolids that will be applied in your area. The U.S. EPA has developed the maximum limits from over 20 years of research. These limits represent a *conservative* annual application rate and at no time shall biosolids be applied which exceed any of these maximum values.

Most Recent Biosolids Average Analysis in mg/kg (dry weight basis)

Constituent	<u>Concentration</u>	<u>Max. Allowable Concentration Limit</u>
Arsenic (As)		75
Cadmium (Cd)		85
Copper (Cu)		4300
Lead (Pb)		840
Mercury (Hg)		57
Molybdenum (Mo)		75
Nickel (Ni)		420
Selenium (Se)		100
Zinc (Zn)		7500
Nitrogen (N)		Ag Rate
Phosphorus (P)		Ag Rate
Potassium (K)		Ag Rate

Biosolids are the nutrient-rich organic materials produced during the biological and physical treatment of wastewater. The solids treated during this process produce a stabilized liquid or semi-solid material that contains nutrients required for crop growth, as well as organic matter to condition the soil. Treated biosolids contain the three primary crop nutrients: nitrogen, phosphorus, and potassium. They also contain nutrients that crops need in smaller amounts. These "micronutrients" are not commonly found in commercial fertilizers.

The DEQ's, Water Resources Division, regulates the land application of biosolids. The program is endorsed by the Michigan Department of Agriculture and Rural Development, Michigan State University, Michigan Farm Bureau, Michigan Water Environment Association, Michigan Municipal League, U.S. Environmental Protection Agency, U.S. Department of Agriculture, and the U.S. Food and Drug Administration.

For more information, contact: generator
Address:
Phone:
Fax: