

Chapter NR 507

APPENDIX I

BASELINE AND DETECTION MONITORING REQUIREMENTS

Table 1

DETECTION GROUNDWATER MONITORING FOR LANDFILLS
ACCEPTING MUNICIPAL SOLID WASTE¹

Waste Type	Detection Parameters ²	Frequency for All Wells	Frequency for Subtitle D Wells ⁴
Municipal solid waste	Alkalinity Chloride Field conductivity (at 25°C) Field pH Field temperature Groundwater elevation Hardness (Total, Ca + Mg)	Semi-annual	Semi-annual
	Volatile Organic Compounds (VOCs) ³	Annual	Semi-annual
Municipal solid waste combustor residue	Alkalinity Boron Cadmium Chloride Field conductivity (at 25°C) Field pH Field temperature Groundwater elevation Hardness (Total, Ca + Mg) Lead Selenium Sulfate	Semi-annual	Semi-annual

¹ The color, odor, and turbidity shall be recorded for all samples in accordance with ss. NR 507.17 (1) (b) and 507.26 (1), but do not need to be reported in electronic format.

² Additional parameters are required if other waste types are accepted at the landfill. See Table 2.

³ Refer to ch. NR 507 Appendix III for a list of the individual VOCs required.

⁴ The monitoring interval for Subtitle D Wells during the active life and proof of owner financial responsibility portion of the perpetual long-term care period shall be no less frequent than annual.

Table 1A
DETECTION GROUNDWATER MONITORING FOR
CCR WELLS AT CCR LANDFILLS¹

Waste Type	Detection Parameters ²	Monitoring Frequency
Coal combustion residuals	Alkalinity Boron Calcium Chloride Fluoride Field conductivity (at 25°C) Field pH Field temperature Groundwater elevation Hardness (Total, Ca + Mg) Total Dissolved Solids (TDS) Sulfate	Semi-annual

¹ The color, odor, and turbidity shall be recorded for all samples in accordance with ss. NR 507.17 (1) (b) and 507.26 (1), but do not need to be reported in electronic format.

² Groundwater samples collected at CCR wells shall be unfiltered.

Table 2**DETECTION GROUNDWATER MONITORING FOR LANDFILLS ACCEPTING WASTE TYPES OTHER THAN MUNICIPAL SOLID WASTE¹**

Waste Type	Detection Parameters	Frequency for All Wells
Paper mill sludge	Ammonia nitrogen Alkalinity Chloride Dissolved Organic Carbon (DOC) Field conductivity (at 25°C) Field pH Field temperature Groundwater elevation Hardness (Total, Ca + Mg) Nitrate + Nitrite (as N) Sulfate	Semi-annual
Fly or bottom ash ²	Alkalinity Boron Field conductivity (at 25°C) Field pH Field temperature Groundwater elevation Hardness (Total, Ca + Mg) Sulfate	Semi-annual
Foundry waste	Alkalinity Field conductivity (at 25°C) Field pH Field temperature Fluoride Groundwater elevation Hardness (Total, Ca + Mg) Sodium	Semi-annual
Demolition waste	Demolition monitoring requirements are listed in ch. NR 503	
Other solid waste	As specified in writing by the department	

¹ The color, odor, and turbidity shall be recorded for all samples in accordance with ss. NR 507.17 (1) (b) and 507.26 (1), but do not need to be reported in electronic format.

² Detection monitoring parameters apply to all wells monitoring CCR landfills that are not defined as CCR wells under s. NR 500.03 (26y).

Table 3

**BASELINE AND ASSESSMENT GROUNDWATER MONITORING
PUBLIC HEALTH AND WELFARE PARAMETERS¹**

All Wells	Additional Parameters for Subtitle D Wells	Additional Parameters for CCR Wells
Arsenic	Antimony	Antimony
Barium	Beryllium	Beryllium
Cadmium	Cobalt	Cobalt
Chromium	Nickel	Lithium
Copper	Thallium	Molybdenum
Fluoride	Vanadium	Thallium
Lead		Ra-226 and Ra-228, combined ²
Manganese		
Mercury		
Nitrate + Nitrite (as N)		
Selenium		
Silver		
Sulfate		
Zinc		

¹ The color, odor, and turbidity shall be recorded for all samples in accordance with ss. NR 507.17 (1) (b) and 507.26 (1), but do not need to be reported in electronic format.

² The maximum contaminant level (MCL) for combined radium is 5 pCi/L under s. NR 809.50 (1) (a).

Table 4
DETECTION LEACHATE MONITORING
FOR ALL LANDFILLS^{1,2}

Municipal Solid Waste and Municipal Solid Waste Combustor Residue	Paper Mill Sludge	Fly or Bottom Ash	Foundry Waste
The volume of the leachate removed shall be recorded at least monthly and reported to the department semi-annually.			
Leachate head levels shall be sampled quarterly and reported to the department semi-annually, unless otherwise required by s. NR 507.21 (3) (b).			
Semi-Annual Monitoring Parameters			
Biological Oxygen Demand (BOD ₅) Field conductivity (at 25°C) Field pH Alkalinity Cadmium Chloride Hardness (Total, Ca + Mg) Iron Lead Manganese Mercury Ammonia nitrogen Total Kjeldahl nitrogen Sodium Sulfate Total suspended solids VOCs ³ Other parameters specified by waste type in this table if accepted at the landfill	BOD ₅ Field conductivity (at 25°C) Field pH Alkalinity Cadmium Chloride Hardness (Total, Ca + Mg) Iron Lead Manganese Mercury Ammonia nitrogen Total Kjeldahl nitrogen Sodium Sulfate Total Organic Carbon (TOC) Total suspended solids VOCs ³	BOD ₅ Field conductivity (at 25°C) Field pH Alkalinity Boron Cadmium Chloride Hardness (Total, Ca + Mg) Iron Lead Manganese Mercury Selenium Total suspended solids Additional Parameters for CCR Landfills Antimony Beryllium Cobalt Fluoride Lithium Molybdenum Ra ²²⁶ and Ra ²²⁸ combined Sulfate Thallium	BOD ₅ Field conductivity (at 25°C) Field pH Alkalinity Cadmium Chloride Fluoride Hardness (Total, Ca + Mg) Iron Lead Manganese Mercury Sodium Sulfate Total suspended solids VOCs ³
Annual Monitoring Parameters			
Semivolatile Organic Compounds (SVOCs ⁴)	SVOCs ⁴	SVOCs ⁴	SVOCs ⁴

1 Leachate monitoring for other solid waste not included in this table may be done as specified by the department in writing.

2 Leachate samples may not be filtered. The color, odor, and turbidity shall also be recorded for all samples in accordance with ss. NR 507.17 (1) (b) and 507.26 (1), but do not need to be reported in electronic format.

3 Refer to ch. NR 507 Appendix III for a list of the individual VOCs required.

4 Refer to ch. NR 507 Appendix IV for a list of the individual SVOCs required.

Table 4A**LEACHATE RECIRCULATION MONITORING¹**

Monitoring Point Type	Parameters	Monitoring and Reporting Frequency
Leachate collection system (per leachate drainage basin for liquid mass balance)	Volume of leachate extracted Volume of leachate recirculated Precipitation	Record monthly ²
Leachate head well	Depth of leachate ³ Elevation, leachate head	Monitor monthly in each leachate drainage basin where recirculation has been implemented Report semi-annually
Leachate collection tank or sump	BOD ⁴ Ammonia nitrogen Field pH Field conductivity (at 25°C) Alkalinity Hardness (Total, Ca + Mg)	Monitor quarterly Report semi-annually
	VOCs ⁵	Monitor and report semi-annually
Gas collection system (per leachate drainage basin)	Gas volume extracted (1,000 cu ft./month)	Monitor monthly Report semi-annually (continues 3 years after recirculation)
Gas extraction well	Percent open interval (gas well screen) ⁴ Depth of leachate ⁶	Monitor and report annually

¹ Leachate samples may not be filtered. The color, odor, and turbidity shall also be recorded for all samples in accordance with ss. NR 507.17 (1) (b) and 507.26 (1), but do not need to be reported in electronic format.

² Report annually in annual report. Not reported in electronic format.

³ Measurement of leachate head on the liner, in feet.

⁴ Refer to s. NR 506.07 (4r).

⁵ Refer to ch. NR 507 Appendix III for a list of the individual VOCs required.

⁶ Vertical measurement of liquid in gas extraction well, in feet.

Table 5
DETECTION LYSIMETER MONITORING
FOR ALL LANDFILLS^{1,2}

Municipal Solid Waste	Municipal Solid Waste Combustor Residue	Paper Mill Sludge	Fly or Bottom Ash	Foundry Waste
The volumes of lysimeter fluid removed shall be recorded at least monthly and reported to the department semi-annually.				
Semi-annual Monitoring Parameters				
Field conductivity (at 25°C) Field pH Alkalinity Hardness (Total, Ca + Mg) Chloride Total Kjeldahl nitrogen Sodium Sulfate Other parameters specified by waste type in this table if accepted at the landfill	Field conductivity (at 25°C) Field pH Alkalinity Cadmium Hardness (Total, Ca + Mg) Chloride Lead Total Kjeldahl nitrogen Sodium Sulfate	Field conductivity (at 25°C) Field pH Alkalinity Hardness (Total, Ca + Mg) Chloride Total Kjeldahl nitrogen Sodium Sulfate TOC	Field conductivity (at 25°C) Field pH Alkalinity Boron Hardness (Total, Ca + Mg) Chloride Total Kjeldahl nitrogen Sulfate	Field conductivity (at 25°C) Field pH Alkalinity Hardness (Total, Ca + Mg) Chloride Fluoride Total Kjeldahl nitrogen Sulfate
Annual Monitoring Parameters				
VOCs ³	VOCs ³	VOCs ³	VOCs ³	VOCs ³

¹ Lysimeter monitoring for landfills accepting waste not included in this table shall be done as specified by the department in writing.

² Lysimeter samples may not be filtered. When only small sampling volumes are obtained, VOC analysis shall take precedence. The color, odor, and turbidity shall also be recorded for all samples in accordance with ss. NR 507.17 (1) (b) and 507.26 (1), but do not need to be reported in electronic format.

³ Refer to ch. NR 507 Appendix III for a list of the individual VOCs required.

Table 6
GAS MONITORING FOR LANDFILLS ACCEPTING MUNICIPAL SOLID WASTE

Monitoring Point Type	Parameters	Monitoring and Reporting Frequency
Gas extraction well ¹	Header pressure (inches of water) Well head pressure (inches of water) Gas temperature (deg. F) Carbon dioxide (volume %) Methane (volume %) Oxygen (volume %) Gas flow rate (SCFM) Balance Gas (volume %)	Monitor monthly Report semi-annually
	Percent open interval (gas well screen) ² Depth of leachate ³	Monitor and report annually
Blower / Compressor ⁴	Header pressure (inches of water) Gas temperature (deg. F) Carbon dioxide (volume %) Methane (volume %) Oxygen (volume %) Gas flow rate (SCFM) Balance gas (volume %) Gas volume extracted (1,000 cu ft./month)	Monitor monthly Report semi-annually
	Total reduced sulfur (ppmv as S) VOCs	Monitor and report annually
Gas monitoring well (gas probe)	Methane (volume %) Oxygen (volume %)	Monitor and report quarterly ⁵
Site conditions	Ground conditions ⁶ Ambient air temperature (deg. F) Barometric pressure (mm of Hg) Trend in barometric pressure	Monitor and report in conjunction with each gas probe monitoring event

¹ The monitoring program for a temporary vertical or horizontal gas extraction well shall be the same as for a permanent vertical gas extraction well. The intended use, design, and monitoring for a temporary well shall be included in the landfill's plan of operation.

² Refer to s. NR 506.07 (4r).

³ Vertical measurement of liquid in gas extraction well, in feet.

⁴ Monitoring points may be shared with other licensed landfills at a facility; however, at a minimum each licensed landfill shall include a point where landfill gas quality and flow rate parameters are monitored and reported to evaluate gas collection from each licensed landfill separately.

⁵ The monitoring interval for gas monitoring wells during the active life and proof of owner financial responsibility portion of the perpetual long-term care period shall be no less frequent than quarterly.

⁶ Note whether the ground is frozen, wet, or dry.