

## Chapter NR 507

### ENVIRONMENTAL MONITORING FOR LANDFILLS

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**Note:** Corrections made under s. 13.93 (2m) (b) 7., Stats., Register, August, 1997, No. 500.

**NR 507.01 Purpose.** The purpose of this chapter is to help ensure that efficient, nuisance-free and environmentally acceptable solid waste management procedures are practiced in this state, to outline environmental monitoring requirements at solid waste facilities and to implement groundwater standards according to ch. NR 140 and ch. 160, Stats. This chapter is adopted under ch. 289, Stats. and s. 227.11, Stats.

**History:** Cr. Register, June, 1996, No. 486, eff. 7-1-96.

**NR 507.02 Applicability.** (1) Except as otherwise provided, this chapter governs all environmental monitoring for solid waste disposal facilities as defined by s. 289.01 (35), Stats., except hazardous waste facilities as defined in s. 291.01 (8), Stats., and regulated under chs. NR 600 to 690, and metallic mining operations as defined in s. 293.01 (9), Stats., and regulated under ch. NR 182.

(2) This chapter does not apply to the design, construction or operation of industrial wastewater facilities, sewerage systems and waterworks treating liquid wastes approved under s. 281.41, Stats., or permitted under ch. 283, Stats., nor to facilities used solely for the disposal of liquid municipal or industrial wastes which have been approved under s. 281.41, Stats., or permitted under ch. 283, Stats., except for facilities used for the disposal of solid waste.

(3) This chapter applies to the owners and operators of solid waste disposal facilities regulated under chs. NR 500 to 538.

**History:** Cr. Register, June, 1996, No. 486, eff. 7-1-96; am. (3), Register, December, 1997, No. 504, eff. 1-1-98.

**NR 507.03 Definitions.** The terms used in this chapter are defined in s. NR 500.03.

**History:** Cr. Register, June, 1996, No. 486, eff. 7-1-96.

**NR 507.04 General requirements for monitoring devices and geologic sampling.** The department may require an owner or operator of a solid waste disposal facility to install, sample and document environmental monitoring devices in accordance with this chapter. All monitoring devices shall be designed, installed, maintained and operated in accordance with the requirements of ss. NR 507.05 to 507.26, unless an alternate method is approved in writing by the department. All monitoring devices shall be constructed to minimize the potential for contaminants to enter the groundwater or to move from one major soil unit or rock formation to another. All monitoring devices shall be designed, located, installed and maintained so as to obtain reliable and representative information.

(1) **LOCATION.** The owner or operator shall submit, in writing, to the department for approval, the locations of all monitoring devices prior to installation, except for wells installed prior to a feasibility decision. The location and construction of any monitoring device installed prior to the feasibility decision may be submitted to the department for review and concurrence prior to installation.

(2) **FIELD DIRECTION.** A professional geologist or qualified technician who is directly supervised by a professional geologist shall observe and direct the drilling of all borings and the installation, development and abandonment of all wells. A professional geologist or qualified technician who is directly supervised by a professional geologist shall also conduct all in-field hydraulic conductivity tests and visually describe and classify all of the geologic samples.

(3) **PROTECTION.** All monitoring and sampling devices shall be sealed and locked to prevent contaminants from entering the monitoring device. All monitoring wells and gas probes shall have protective metal casings. All other monitoring devices shall be protected as necessary. The department may require additional protective devices such as a ring of brightly colored posts around any monitoring device. All leachate head wells shall be protected to prevent damage during facility operation.

(4) **LABELING.** All monitoring devices shall be clearly and permanently labeled on the outside of the monitoring device. At a minimum, the label shall include the device name and 3-digit identification number assigned to each well by the department.

(5) **ABANDONMENT.** For monitoring devices to be abandoned for any reason, an owner or operator shall contact the department. If monitoring devices are being replaced, they shall be properly abandoned in accordance with ss. NR 141.25 and 507.13.

(6) **DOCUMENTATION.** All activities required under ss. NR 507.05 to 507.13 shall be documented in accordance with ss. NR 141.23 and 507.14.

**History:** Cr. Register, June, 1996, No. 486, eff. 7-1-96.

**NR 507.05 Soil and rock sampling.** All soil and rock samples collected from borings shall be collected and tested in accordance with this section unless otherwise approved in writing by the department.

(1) **SOIL SAMPLE COLLECTION.** Soil samples shall be collected in accordance with all of the following:

(a) Where conditions permit, soil samples shall be collected using undisturbed soil sampling techniques. Samples may not be composited for testing purposes.

(b) In fine-grained soil environments, continuous samples shall be collected from the land surface to at least 25 feet below

the anticipated, proposed or existing sub-base grade for the purpose of field classification. If a boring extends beyond 25 feet below the anticipated, proposed or existing sub-base grade, samples shall be collected from each major soil unit encountered and at maximum 5-foot intervals. If the boring is located outside the anticipated, proposed or existing limits of filling, the applicable sub-base grade is the elevation of the bottom of the anticipated, proposed or existing liner system nearest to the borehole.

(c) In coarse-grained soil environments, samples shall be collected from each major soil unit encountered and at maximum 5-foot intervals.

(d) At least one soil sample shall be collected at the depth of the well screen of any subsequently placed monitoring well. The soil sample collected at the depth of the well screen shall be analyzed for grain size distribution using mechanical and hydrometer methods and Atterberg limits, as appropriate for the particular soil type.

(e) All soil samples shall be retained until the department approves the report that included documentation of the soil sampling.

**(2) BEDROCK SAMPLE COLLECTION.** If a boring is extended 5 feet or more into bedrock, continuous core samples of the bedrock shall be taken and the rock properties including fracture frequency, rock quality designation, and percent recovery shall be determined. All bedrock core samples shall be retained until the department approves the report that included documentation of the boring. After the approval, the owner or operator shall notify the WGNHS that all bedrock cores and their corresponding boring logs are available for study and possible retention. If the owner or operator has not been contacted by the WGNHS within 45 days after contacting the WGNHS, the owner or operator may discard the bedrock cores.

**Note:** Wisconsin geological and natural history survey, 3817 mineral point road, Madison, Wisconsin 53705. Phone (608) 263-7387.

**(3) BORING LOG.** A boring log shall be submitted for each boring in accordance with s. NR 507.14. For replacement wells, soil and bedrock samples shall be collected in accordance with subs. (1) and (2) unless the department approves a preexisting boring log for a boring within 10 feet of the replacement well. The owner or operator may request an exemption to the 10 foot distance.

**History:** Cr. Register, June, 1996, No. 486, eff. 7-1-96.

**NR 507.06 Groundwater monitoring well design and installation.** All groundwater sampling devices shall be designed, located, installed and maintained so as to obtain reliable and representative information regarding aquifer characteristics, groundwater flow directions and chemical and physical characteristics of groundwater. All groundwater monitoring wells shall be designed and installed in accordance with ch. NR 141 and the requirements of this section unless an alternate method is approved in writing by the department.

**(1) DRILLING METHOD.** Drilling fluids may not be used for installing monitoring wells unless no reasonable alternative exists. If drilling fluids are used, the driller shall document the type of fluids used and the chemical constituents of the mixture. If water is used, the source of the water shall be identified and the water shall be analyzed for all detection groundwater monitoring parameters listed in Appendix I, Table 1, under municipal solid waste. The drilling method shall meet all of the following:

(a) Bedrock drilling shall be performed in accordance with s. NR 507.05 and ch. NR 141.

(b) Standard penetration tests shall be performed while drilling in soil. Soil drilling methods in fine grained soil environments shall allow the driller to obtain undisturbed soil samples. If a drilling method does not allow for standard penetration tests, then the shear strength of the recovered fine-grained soil samples shall be estimated and recorded in the field with a pocket penetrometer or vane shear.

(c) If the drilling method does not allow the required soil or rock sampling to be performed, a separate boring shall be drilled adjacent to the monitoring well to provide the necessary information.

**(2) BOREHOLE ABANDONMENT.** If any borehole is deeper than the well to be placed in it, the portions of the borehole below the well screen shall be properly sealed in accordance with ss. NR 507.08 and 141.25 (2) (d).

**(3) IN-FIELD HYDRAULIC CONDUCTIVITY TEST.** An in-field test shall be conducted on each well to determine the in-situ hydraulic conductivity. The test shall be of long enough duration and include sufficient data to provide a representative estimate of the actual hydraulic conductivity.

**History:** Cr. Register, June, 1996, No. 486, eff. 7-1-96.

**NR 507.07 Groundwater monitoring well development.** All groundwater monitoring wells shall be properly developed following installation in accordance with s. NR 141.21 and this section. To determine the effectiveness of the development, a sample shall be taken from the well within 24 hours of completion of development and analyzed for total suspended solids. Additional purging is not required prior to taking the sample. If drilling fluids were used during well construction, the sample shall also be tested for COD.

**History:** Cr. Register, June, 1996, No. 486, eff. 7-1-96.

**NR 507.08 Boring and well abandonment.** All monitoring wells and boreholes shall be abandoned in accordance with s. NR 141.25 and this section.

**(1) TIMELINE.** All boreholes not instrumented with a well shall be abandoned immediately after completion of drilling and soil sampling.

**(2) ABANDONMENT OF WATER SUPPLY WELLS.** Water supply wells which are required to be abandoned shall be abandoned and documented in accordance with s. NR 812.26.

**History:** Cr. Register, June, 1996, No. 486, eff. 7-1-96.

**NR 507.09 Leachate head well design and installation.** All leachate head wells required under s. NR 504.09 (2) (i) shall be located, designed and installed so as to obtain reliable and representative information regarding the leachate head levels within the landfill. Leachate head wells in landfills with a composite liner shall be designed with risers on the sideslopes. Landfills with a clay liner shall use a vertical leachate head well design. All leachate headwells shall be documented in accordance with s. NR 507.14 (1) and (5) (a).

**History:** Cr. Register, June, 1996, No. 486, eff. 7-1-96.

**NR 507.10 Collection basin lysimeter design and installation.** All collection basin lysimeters required under s. NR 504.06 (5) (u) shall be located, designed and installed so as to obtain reliable and representative information regarding movement of liquid through the landfill liner. All collection basin lysimeters shall be documented in accordance with s. NR 507.14 (1) and (5) (a).

**History:** Cr. Register, June, 1996, No. 486, eff. 7-1-96.

**NR 507.11 Gas monitoring well design and installation.** All gas monitoring wells shall be designed, installed and documented in accordance with ss. NR 507.04, 507.05, 507.06 (1) and (2) and 507.14 and the requirements of this section unless the department approves alternate methods in writing. All gas monitoring wells shall be designed, located, installed and maintained so as to obtain reliable and representative information regarding soil conditions and gas concentrations.

**(1) TIMING OF INSTALLATION.** Where gas monitoring is required, gas monitoring wells shall be installed at the same time that adjacent areas of the landfill liner are constructed.

**(2) DESIGN.** All gas monitoring wells shall be constructed with a shut-off valve to prevent the escape of gas from the sam-

pling device and minimize the amount of inflow of air from the atmosphere.

**(3) LOCATION.** All gas monitoring wells shall meet both of the following:

(a) Wells shall extend to the maximum depth of waste or to the low seasonal groundwater level whichever is encountered first. The screened length shall extend from 5 feet below ground surface to the bottom of the well.

(b) Wells shall be located within 150 feet of the edge of waste unless otherwise approved by the department.

**History:** Cr. Register, June, 1996, No. 486, eff. 7-1-96.

**NR 507.12 Other monitoring device design and installation.** The department may require other monitoring devices based on an evaluation of the potential for environmental impacts and the risk those impacts pose to human health and the environment.

**History:** Cr. Register, June, 1996, No. 486, eff. 7-1-96.

**NR 507.13 Inspections and replacement devices.**

The facility owner or operator shall inspect at least annually all monitoring devices installed for field investigations conducted under this chapter. Sampling personnel shall inspect all monitoring devices each time the device is sampled or a water level elevation is measured. If for any reason a monitoring device is damaged, provides a conduit to the subsurface or otherwise fails to function properly, the facility owner or operator shall notify the department in writing within 10 days after discovery. The device shall be repaired if possible. If the device cannot be repaired, it shall be properly abandoned and replaced within 60 days unless otherwise approved in writing by the department. Replacement and abandonment of groundwater monitoring wells shall be in accordance with ch. NR 141 and this chapter. If the device is replaced, the replacement device shall be given the same number as the device it replaced followed by the letter "R" to indicate it is a replacement, unless otherwise approved in writing by the department. An additional "R" shall be added each time the device is replaced.

**History:** Cr. Register, June, 1996, No. 486, eff. 7-1-96.

**NR 507.14 Documentation of monitoring devices and geologic sampling.**

All well construction and abandonment, well development, and boring advancement and abandonment activities shall be documented and reported to the department in accordance with s. NR 141.23 and this section. These activities shall be documented in all major plan submittals including initial site reports, feasibility reports, plans of operation, construction documentation or environmental contamination assessment reports. If no plan is being prepared at the time of these activities, documentation of the activities shall be submitted to the department within 60 days after the activities.

**(1) WELL LOCATION.** Documentation of all well locations shall be done in accordance with s. NR 141.065.

**(2) SOIL AND BEDROCK DESCRIPTION.** Documentation of soils and bedrock shall include all of the following:

(a) A description of each major soil sample unit including its structure, mottling, voids, layering, lenses and geologic origin and visual classification according to the unified soil classification system.

(b) A description of any continuous bedrock core samples including percent recovery, RQD and fracture frequency.

**(3) BORING LOGS.** Boring logs shall include all of the following:

(a) Elevations of land surface and bottom of boring, corrected to national geodetic survey datum.

(b) If the boring is converted to a well, the water level at the time of drilling, date of water level measurement and a well construction diagram on the boring log.

**(4) BORING AND WELL ABANDONMENT DOCUMENTATION.** Documentation of the abandonment of wells and borings shall include all of the following:

(a) If the well is a public or private water supply well, any forms required under ss. NR 812.22 and 812.26, such as well abandonment report form 3300-5.

(b) Updated forms previously submitted to the department such as the groundwater monitoring well information form, to reflect the current condition of the monitoring system.

**(5) FORMS.** Documentation of activities performed under this chapter shall be submitted on the most recent version of the department forms listed in this subsection and included in Appendix V, and be completed as instructed. All the information on the forms and instructions in Appendix V shall be provided on the appropriate form included in Appendix V. The department may approve replicate forms generated by the facility owner or operator for use in submitting the required information. The forms include:

(a) Groundwater monitoring well information form 4400-89, for use whenever monitoring points are added or removed from the monitoring system, including water supply wells. Within 6 months following July 1, 1996, all owners and operators of solid waste landfills where monitoring is required shall submit a completed form which includes the current condition of all existing and former monitoring points and whether the well is a Subtitle D well. Following this submittal of the form, future submittals may contain only the changes to the monitoring network being documented.

(b) Groundwater monitoring inventory form 3300-67 for all water supply wells.

(c) Monitoring well construction form 4400-113A.

(d) Monitoring well development form 4400-113B.

(e) Well/drillhole/borehole abandonment form 3300-5B.

(f) Soil boring log information form 4400-122.

**(6) MISCELLANEOUS.** The owner or operator shall document raw data and calculated results of in-situ hydraulic conductivity tests, water level measurements and dates, computations of well yield, if determined and any changes in well construction, casing elevation and other features subsequent to drilling.

**Note:** Copies of these forms may be obtained from the department of natural resources, bureau of waste management, 101 South Webster Street, Natural Resources Building, PO Box 7921, Madison, Wisconsin 53707-7921.

**History:** Cr. Register, June, 1996, No. 486, eff. 7-1-96.

**NR 507.15 General requirements for environmental monitoring.**

**(1) ALL FACILITIES.** The department may require the owner or operator of any landfill, or any person who permits the use of property for that purpose, to conduct environmental monitoring in accordance with this chapter and with plans approved by the department. Environmental monitoring includes but is not limited to monitoring of groundwater, the unsaturated zone, leachate, lysimeter fluid, gas, gas condensate, surface water, public or private water supplies, air or other physical features. Monitoring procedures and results shall be documented and submitted to the department in accordance with ss. NR 507.14 and 507.26.

**(2) FACILITIES IN OPERATION ON OR AFTER OCTOBER 9, 1993.** The owner or operator of a landfill which accepted municipal solid waste on or after October 9, 1993, except facilities which received less than 100 tons per day on an annual basis and which ceased accepting solid waste prior to April 9, 1994, shall perform all of the following:

(a) Propose in the feasibility report for any new facility or expansion of an existing facility, a minimum of 4 groundwater monitoring wells to serve as Subtitle D wells. The department shall review the proposal and approve the proposed wells or choose alternative wells.

(b) Propose to the department a detection monitoring program, including baseline groundwater quality, leachate and lysimeter

monitoring and Subtitle D well locations, in accordance with s. NR 507.19 in a feasibility report or for existing facilities according to the following schedule:

1. For facilities licensed to receive greater than 500,000 cubic yards, the owner or operator shall submit the proposal for implementation within 60 days after July 1, 1996.

2. For facilities licensed to receive less than 500,000 cubic yards, the owner or operator shall submit the proposal for implementation by October 9, 1996.

(c) Implement a detection monitoring program in accordance with plans approved by the department and including assessment monitoring if necessary.

(d) Propose to the department a quarterly gas monitoring program in accordance with s. NR 507.22 for implementation within 60 days after July 1, 1996 at existing facilities or in a feasibility report.

(e) Implement a quarterly gas monitoring program in accordance with plans approved by the department.

**History:** Cr. Register, June, 1996, No. 486, eff. 7-1-96.

**NR 507.16 Sampling plan.** The owner or operator shall submit a sampling plan for all monitoring devices at the facility for approval as part of the feasibility report. The sampling plan shall be implemented as approved in writing by the department. The sampling plan shall follow procedures and methodologies specified by the department and shall comply with the requirements in s. NR 140.16.

**Note:** The department intends to periodically issue technical guidance relating to groundwater sampling procedures and methodologies. The guidelines are available from the department of natural resources, bureau of waste management, 101 South Webster Street, Natural Resources Building, PO Box 7921, Madison, Wisconsin 53707-7921.

(1) CONTENTS OF SAMPLING PLAN. At a minimum, the following information shall be included in the sampling plan:

(a) An 8 1/2 by 11 inch site map showing locations of all sample points and devices. An 11 by 17 inch site map may be included if clarity is compromised using the 8 1/2 by 11 inch size. Different symbols shall be used to differentiate types of monitoring devices such as groundwater monitoring wells, collection lysimeters and gas monitoring wells. Each sample point shall be labeled.

(b) A sample schedule, including all of the following:

1. The months that each sample point is to be sampled.
2. The sampling period, as designated by the department.
3. The list of parameters that are to be analyzed for in the sample from each monitoring device during each month that sampling occurs.

(c) Procedures for field measurements, including all of the following:

1. The order in which wells should be sampled if the groundwater has been impacted by regulated or other activities.

2. The procedures and type of equipment used to measure water level elevations.

3. The procedures and type of equipment used to measure temperature, pH, conductivity and procedures to determine turbidity, odor and color.

(d) Procedures for purging wells, including all of the following:

1. Procedures to purge wells prior to collecting samples.
2. Procedures for determining the volume of water to be removed from each well.
3. The type of equipment used to purge wells.
4. The rate of flow while purging, when applicable.
5. Procedures to clean purging equipment between wells.
6. The amount of time required between purging and sampling.

(e) Procedures for obtaining samples from wells, including all of the following:

1. Procedures and type of equipment used to retrieve samples.

2. Volume of sample required for analysis.

3. Procedures and type of equipment to filter samples, including when to filter and when not to filter samples, if applicable.

4. The rate of flow when sampling, when applicable.

5. Procedures and type of equipment to physically and chemically preserve samples.

6. Procedures to clean sampling equipment following sampling of one well and prior to sampling the next well.

(f) Procedures for establishing field quality assurance and quality control, including all of the following:

1. Field blank, duplicate sample and trip blank procedures.

2. The frequency at which the field blanks, duplicate samples and trip blanks will be collected or processed.

(g) Special procedures to sample water supply wells.

(h) Special procedures to sample leachate headwells and other devices.

(i) Chain of custody procedures, including persons responsible for sampling and methods for transporting samples to the laboratory.

(2) AVAILABILITY OF SAMPLING PLAN. A copy of the approved sampling plan shall be kept at the facility or at the office of the facility owner and a copy shall be provided to the sampling personnel for use during sampling. The approved sampling plan shall be followed unless the department is notified of and concurs with modifications. The owner or operator shall submit documentation of the approved changes to the department within 90 days. The owner or operator shall retain field records of all monitoring activities throughout the long-term care period.

**History:** Cr. Register, June, 1996, No. 486, eff. 7-1-96.

**NR 507.17 Sampling, analysis, and laboratory requirements.** This section applies to all sampling required under chs. NR 507 and 508. The owner or operator shall obtain and analyze samples according to the approved sampling plan and the following requirements:

(1) FIELD MEASUREMENTS. The owner or operator shall observe and record physical measurements in the field at the time of sampling each groundwater monitoring well or leachate well, including all of the following:

(a) *Water level elevation.* Water level elevations shall be measured prior to purging the well for sampling and recorded to the nearest 0.01 foot. The elevation shall be corrected to national geodetic survey datum. The measuring point shall be the top of the well casing and shall be identified on the well itself if the top of the casing is not level.

(b) *Physical appearance.* The physical appearance of the sample, including color, odor and turbidity, shall be recorded at the time of sampling.

(c) *Chemical measurements.* Field specific conductance at 25°C and field pH shall be measured immediately following purging of each well. If the well can be purged dry, these measurements shall be taken when the sample is collected. Field specific conductance readings shall be corrected to 25°C if the meter used does not automatically correct for temperature.

(2) SAMPLE COLLECTION. Samples shall be collected in accordance with the approved sampling plan under s. NR 507.16.

(3) ANALYTICAL PARAMETERS. The analytical parameters which shall be used for environmental monitoring under this chapter are listed in Appendices I through IV. The department may require analysis of additional parameters depending on the characteristics of the waste, the raw process materials used, or the provisions of ch. NR 140.

(4) ANALYTICAL METHODS. Groundwater, lysimeter and leachate samples shall be handled and analyzed in accordance with the requirements of the methods listed in Appendices II, III and IV corresponding to the listed analytical parameters. Water supply

samples shall be handled in accordance with s. NR 507.20. The department may approve alternative analytical methods under s. NR 149.12.

**(5) LABORATORY REQUIREMENTS.** All chemical analyses shall be conducted by a laboratory certified under s. 299.11, Stats., and ch. NR 149 for that test category. The limit of detection and the limit of quantitation shall be determined in accordance with s. NR 149.11 (5). The analytical laboratory shall meet the requirements of the analytical method and ch. NR 149. Section NR 140.16 (4) applies to analytical results that do not meet the requirements of this paragraph.

**Note:** Section NR 149.14 requires each laboratory to maintain a quality control program and to document the quality control data. The same section allows the department to request a copy of quality control data to be submitted for its review.

**(6) DATA REPORTING REQUIREMENTS.** The owner or operator shall report laboratory quality control indicators in accordance with s. NR 507.26 (3) (b).

**(7) OTHER/TEST REQUIREMENTS.** The following tests shall be performed using department guidance, or if no guidance is available, current industry standards or procedures:

- (a) Physical tests of soil.
- (b) Physical tests of waste.
- (c) Chemical tests of waste.
- (d) Air quality tests.
- (e) Gas tests.
- (f) Field pH tests.
- (g) Field conductivity tests.
- (h) Product quality testing.
- (i) Nutrient testing of soils and waste.
- (j) Turbidity tests.
- (k) Water elevation.
- (L) Temperature.
- (m) Leachate liner compatibility testing.

**Note:** ASTM publishes methods for these tests. Copies of ASTM test methods are available from: ASTM, 1916 race street, Philadelphia, Pennsylvania, 19103.

**History:** Cr. Register, June, 1996, No. 486, eff. 7-1-96.

#### **NR 507.18 Baseline groundwater quality sampling.**

An applicant for a proposed facility for all its monitoring wells and the owner or operator of an existing facility for its designated Subtitle D wells shall establish baseline groundwater quality in accordance with subs. (1) to (3). Owners or operators shall establish baseline groundwater quality at all new or replacement groundwater monitoring wells in accordance with sub. (4). The department may require the owners or operators of other facilities at which monitoring is required to establish baseline groundwater quality in accordance with sub. (4). Collection, handling and analysis of groundwater monitoring samples specified in subs. (1) to (4) shall be performed in accordance with ss. NR 507.16 and 507.17.

**(1) BASELINE GROUNDWATER QUALITY FOR DETECTION MONITORING PARAMETERS EXCEPT VOCs.** (a) Baseline groundwater quality shall be established at all wells which were installed outside the proposed limits of filling to evaluate the proposed facility. Samples shall be analyzed for each detection monitoring parameter as appropriate for the particular waste types accepted at the landfill. Appendix I, Tables 1 and 2 indicate which parameters shall be analyzed for each waste type. The department may require additional parameters based on the waste types and waste characteristics accepted at the landfill.

(b) The owner or operator shall obtain and analyze a minimum of 8 samples to determine baseline groundwater quality for the parameters required under this subsection. For a proposed facility, a minimum of 4 samples, with at least 30 days between sampling rounds, shall be taken and analyzed and the results shall be submitted with the feasibility report. The remaining samples shall be taken with at least 30 days between sampling rounds and the

results shall be submitted with the plan of operation unless otherwise approved in writing by the department.

**(2) BASELINE GROUNDWATER QUALITY FOR PUBLIC HEALTH AND WELFARE PARAMETERS NOT INCLUDED AS DETECTION MONITORING PARAMETERS IN SUB. (1).** (a) Unless otherwise specified by the department, baseline groundwater quality shall be established at all wells outside the proposed limits of filling which were installed to evaluate the proposed facility. Baseline water quality for these wells shall be established for the public health and welfare groundwater quality standards listed in Appendix I, Table 3.

(b) For a proposed facility, a minimum of 4 samples, with at least 30 days between sampling rounds, shall be collected and analyzed and the results shall be submitted with the feasibility report. Four additional samples, with at least 30 days between sampling rounds, shall be collected and analyzed for any parameter listed in Appendix I, Table 3 from any well which meets one or more of the following criteria:

1. One of the initial 4 sample values attains or exceeds the ES for that parameter.
2. Two or more of the initial 4 sample values attains or exceeds the PAL for that parameter.
3. The average of the initial 4 sample values attains or exceeds the PAL for that parameter.

(c) If additional samples are required under par. (b), the results of the 4 additional samples shall be submitted in the plan of operation and in accordance with s. NR 507.26 (3).

**(3) BASELINE GROUNDWATER QUALITY FOR VOCs.** (a) Baseline groundwater quality shall be established for all VOCs listed in Appendix III, at all monitoring wells outside the proposed limits of filling. Landfills designed to accept primarily coal ash are exempt from baseline groundwater quality monitoring for VOCs.

(b) Samples shall be collected for VOC analysis from each well at the same time as the first and second sampling rounds for the other detection monitoring parameters. If any well has VOC parameters in concentrations above their limit of detection in either of the first 2 sampling rounds, that well shall be sampled for VOCs 2 additional times for a total of 4 sampling rounds. The results shall be submitted with the feasibility report and in accordance with s. NR 507.26 (3).

**(4) BASELINE GROUNDWATER QUALITY AT NEW OR REPLACEMENT MONITORING WELLS.** All new or replacement groundwater monitoring wells installed after July 1, 1996, shall be sampled on a semi-annual basis beginning with the sampling event following installation for the parameters specified in subs. (1) to (3) to establish baseline groundwater quality. The results shall be submitted in accordance with s. NR 507.26 (3). The department may waive the requirement to establish baseline groundwater quality monitoring for a replacement well which is established in the same environment and proximity as the well being replaced.

**History:** Cr. Register, June, 1996, No. 486, eff. 7-1-96.

#### **NR 507.19 Detection groundwater monitoring.**

Owners or operators of solid waste disposal facilities shall implement a detection groundwater monitoring program in accordance with this section and the approved plan of operation unless otherwise approved in writing by the department. If assessment monitoring is a required response in accordance with s. NR 508.05, the owner or operator shall continue detection monitoring at all wells without interruption unless the department approves otherwise. The department may require the owner or operator of a solid waste disposal facility to sample water supply wells in accordance with s. NR 507.20.

**(1) NUMBER OF REQUIRED MONITORING POINTS.** The number of required monitoring points and the proposed detection monitoring program shall be as approved in writing by the department based on the facility size, waste types, facility design and hydrogeologic and geologic setting of the facility. The detection monitoring program shall be adequate to determine upgradient and downgradient

water quality, horizontal and vertical gradients and to detect any impacts from the facility on groundwater quality.

(2) **SAMPLING FREQUENCY.** The minimum sampling frequency for detection groundwater monitoring shall be appropriate for the particular waste types accepted at the landfill and are listed in Appendix I, Tables 1 and 2. The department may approve other sampling frequencies in writing.

(3) **SAMPLING PARAMETERS.** The sampling parameters required for detection groundwater monitoring shall be appropriate for the particular waste types accepted at the landfill. Appendix I, Tables 1 and 2 indicate which sampling parameters are appropriate for each waste type. Appendix III lists the volatile organic compounds to be sampled when a VOC scan is required. The department may approve other sampling parameters in writing. If 10% or more of a municipal solid waste landfill's total design capacity consists of a waste type listed in Appendix I, Table 2, the detection monitoring program shall include the additional parameters listed in Appendix I, Table 2 for that waste type. The owner or operator may demonstrate that a parameter is not present in the waste or leachate. The department shall review such a demonstration and take the appropriate action.

(4) **PREVENTIVE ACTION LIMITS.** Preventive action limits for inorganic detection monitoring parameters shall be calculated in accordance with s. NR 507.27.

**History:** Cr. Register, June, 1996, No. 486, eff. 7-1-96.

**NR 507.20 Water supply well monitoring.** The department may require the owner or operator to sample water supply wells as part of a detection groundwater monitoring program or to determine the extent of groundwater contamination.

(1) **WATER SUPPLY WELL SAMPLES.** (a) Water supply well samples shall be collected, handled and analyzed in accordance with the procedures specified in ch. NR 809.

(b) Water supply well samples shall be analyzed in accordance with plans approved by the department.

(c) Water supply well samples may not be filtered.

(2) **NOTIFICATION OF REFUSAL TO GRANT ACCESS.** If a property owner refuses access to a water supply well, the owner or operator shall notify the department in accordance with s. NR 507.26 (2) (b).

(3) **PRIVATE WATER SUPPLY WELL DOCUMENTATION.** The owner or operator of a solid waste disposal facility which is required by the department to sample private wells shall do each of the following during the first round of sampling after July 1, 1996:

(a) Attach a label supplied by the department to each private well.

(b) Submit to the department along with the sampling results all the information on the groundwater monitoring inventory form 3300-67 in Appendix V for each well.

**Note:** Copies of this form may be obtained from the department of natural resources, bureau of drinking water and groundwater, 101 South Webster Street, Natural Resources Building, PO Box 7921, Madison, Wisconsin 53707.

**History:** Cr. Register, June, 1996, No. 486, eff. 7-1-96.

**NR 507.21 Lysimeter fluid and leachate monitoring.** The owner or operator of a solid waste disposal facility shall sample lysimeter fluid and leachate in accordance with this section.

(1) **SAMPLING PARAMETERS.** Owners or operators of landfills shall sample lysimeter fluid and leachate beginning with the first sampling period following acceptance of waste in accordance with Appendix I, Tables 4 and 5 or as otherwise approved by the department in writing. If 10% or more of a municipal solid waste landfill's total design capacity consists of municipal solid waste combustor residue, paper mill sludge, fly or bottom ash, or foundry sand, the lysimeter and leachate monitoring shall include the additional parameters listed in Appendix I, Table 4 or 5 for those waste types. The owners or operators shall maintain records of all leachate pumped and at a minimum shall record the information annually. The owners or operators shall report the monthly

leachate volumes and lysimeter fluid volumes to the department semi-annually in accordance with s. NR 507.26 (3).

(2) **ADDITIONAL LEACHATE SAMPLING.** Owners or operators of municipal solid waste facilities required to designate Subtitle D wells in accordance with s. NR 507.15 (2) (a) may monitor leachate annually for parameters listed in Appendix II. Within 14 days after obtaining the leachate sampling results, the owner or operator shall place the results in the operating record and, within 60 days after the end of the sampling period, submit the results to the department.

**History:** Cr. Register, June, 1996, No. 486, eff. 7-1-96.

**NR 507.215 Leachate recirculation monitoring.** The owner or operator of a solid waste facility that recirculates leachate shall sample for, maintain records of, and report to the department as required the following:

(1) **LIQUID MASS BALANCE.** The volumes of leachate extracted from each leachate drainage basin, the volumes of leachate recirculated into each leachate drainage basin and monthly precipitation records from on-site instrumentation or the nearest national weather system station.

(2) **LEACHATE HEAD.** The monthly level of leachate head on the liner in each leachate drainage basin where recirculation has been implemented.

(3) **LEACHATE CHARACTERISTICS.** Samples of leachate shall be taken quarterly from the sump or leachate collection tanks. Those samples shall be tested semiannually for a VOC scan and quarterly for the following parameters:

(a) BOD.

(b) COD.

(c) Ammonia-nitrogen.

(d) Field pH.

(e) Field specific conductance.

(f) Alkalinity.

(g) Hardness.

(4) **LANDFILL GAS.** (a) The monthly total volume of gas extracted from each leachate drainage basin. Gas volumes shall be recorded for a period of at least 3 years beyond the termination of leachate recirculation.

(b) An annual assessment of the liquid level in each gas extraction well.

**History:** CR 04-077: cr. Register November 2005 No. 599, eff. 12-1-05.

**NR 507.22 Gas monitoring.** The department may require the owner or operator to install gas monitoring devices, to prepare and submit gas sampling and analysis programs, to monitor for gas migration, and to determine the effectiveness of any gas extraction systems. If explosive gases are detected in any gas monitoring well located outside of the limits of filling, the department may require any or all of the following: more frequent monitoring, monitoring for pressure or other parameters, and the installation of additional gas monitoring wells which may include nests of wells screened over shorter vertical intervals. Where monitoring is required, the owner or operator shall comply with all of the following:

(1) **SAMPLING PARAMETERS.** The owner or operator shall sample gas monitoring wells quarterly for percent methane and percent oxygen. Each time a well is sampled, the following shall be recorded: temperature, ground condition, barometric pressure, information as to whether the barometric pressure is rising or falling, and initial and stabilized methane levels. Initial readings are not required to be reported unless the stabilized reading for a particular monitoring point drops to zero.

(2) **SAMPLING.** Sampling shall be performed with properly calibrated instruments. When a gas monitoring well is being sampled, the gas monitoring instrument shall be attached to the well prior to opening the valve on the gas monitoring well.

(3) **REPORTING.** Unless otherwise approved by the department, the owner or operator shall report gas monitoring sampling results in accordance with s. NR 507.26 (3).

(4) **NOTIFICATION AND REMEDIATION.** The owner or operator shall immediately notify the department and take all necessary steps to protect public health and welfare if a stabilized reading exceeds the lower explosive limit of any explosive gas generated by the waste fill in the soils outside of the limits of filling or air within 200 feet of the landfill property boundary or beyond the landfill property boundary, or 25% of the lower explosive limit in any facility structure, excluding gas control or recovery system components. Within 30 days of determining that the applicable gas level was exceeded, the owner or operator shall submit a remediation plan to the department describing the degree and extent of the problem and the proposed remedy. Within 60 days of determining that the applicable gas level was exceeded, the owner or operator shall implement the remediation plan. As additional requirements for owners or operators of landfills meeting the requirements of s. NR 507.15 (2), within 7 days of determining that the applicable gas level was exceeded, the operating record shall be updated to indicate the level detected and the steps taken to protect public health. The proposed remediation plan and notification of its implementation shall also be placed in the operating record. The department may upon written request, approve alternate schedules for submittal and implementation of the remediation plan.

**History:** Cr. Register, June, 1996, No. 486, eff. 7-1-96.

**NR 507.23 Surface water monitoring.** The department may require the owner or operator to monitor storm water runoff, leachate seeps, sumps, sedimentation ponds, any surface water bodies including wetlands and other storm water discharges resulting from facility operation. Unless otherwise approved by the department, the owner or operator shall report surface water monitoring results in accordance with s. NR 507.26 (3).

(1) **SAMPLE COLLECTION.** All sampling shall be done in accordance with plans approved by the department. The owner or operator shall record the amount of precipitation in the 24 hours prior to sampling and submit the information with the sample results.

(2) **IDENTIFICATION.** All surface water sampling locations shall be surveyed and permanently and clearly marked.

(3) **LOCATION.** All surface water monitoring points shall be documented in accordance with s. NR 507.14 (1) and (5) (a). All elevations shall be corrected to the national geodetic survey datum and recorded to the nearest 0.01 foot.

**History:** Cr. Register, June, 1996, No. 486, eff. 7-1-96.

**NR 507.24 Air monitoring.** If the facility has the potential to cause air pollution as defined in s. 285.01 (3), Stats., the department may require the owner or operator to monitor air quality for particulates, toxics or other constituents in the ambient air from point sources or in buildings at or associated with the facility. The department shall specify sampling times and locations and all sampling shall be implemented in accordance with plans approved by the department.

**History:** Cr. Register, June, 1996, No. 486, eff. 7-1-96.

**NR 507.25 Other monitoring.** If the facility has the potential to cause environmental pollution as defined in s. 299.01 (4), Stats., the department may require the owner or operator to monitor any or all of the following: landfill settlement; berm, side-slope and final cover stability; vegetative growth; drainage control structures; gradient control systems; and any other aspects of facility operation. All required monitoring shall be done in accordance with plans approved by the department. The department may require geophysical investigations to complement groundwater monitoring efforts.

**History:** Cr. Register, June, 1996, No. 486, eff. 7-1-96.

**NR 507.26 Documentation of environmental monitoring.** The owner or operator of a solid waste disposal facility shall document all sampling and analysis activities in accordance with this section.

(1) **FIELD RECORDS.** Field records of all monitoring activities shall be prepared in sufficient detail to document whether the sampling plan has been followed. The facility owner or operator shall retain all field records in an operating record at the facility or in an alternative location approved by the department until the end of the long-term care period for the facility. Field records shall be available for department inspection on request.

(2) **WATER SUPPLY WELL SAMPLING RESULTS.** (a) The owner or operator shall report to the department the results of all water supply well sampling required by the department within 10 days after receipt in accordance with ch. 160, Stats. The results shall be accompanied by 2 copies of a cover letter which highlights values that attain or exceed enforcement standards in s. NR 140.10 Table 1.

(b) If the owner or operator is unable to sample a water supply well because the property owner refuses access, the responsible parties shall notify the department within 30 days after the refusal, and shall document in writing within 60 days, the efforts undertaken to gain access when requested by the department.

(3) **ALL OTHER ENVIRONMENTAL MONITORING RESULTS.** The owner or operator shall submit sampling results and water elevation data to the department within 60 days of the end of the sampling period. An explanation of any deviation from the approved sampling plan or analytical procedures shall be submitted at the same time.

(a) *Data submittal format.* 1. Except as provided in subd. 2., the owner or operator shall submit results of all environmental monitoring in an electronic format specified by the department.

**Note:** The specific data formats for electronic monitoring result submittals may be obtained from the department of natural resources, bureau of waste management, wa/3, p.o. box 7921, Madison, Wisconsin 53707.

2. The owner or operator of a solid waste disposal facility with fewer than 10 required sampling points may request that sampling results and groundwater elevation data be accepted on approved department forms. The department may approve replicate forms generated by the facility owner or operator for use in submitting sampling results.

(b) *Sampling results.* The owner or operator shall submit all sampling results above the limit of detection. In addition, the owner or operator shall submit all of the following information for each sampling round:

1. The limit of detection and the limit of quantitation for each parameter. The limit of detection and the limit of quantitation shall be determined in accordance with a method specified by the department as required in s. NR 149.11 (5).

2. A result qualifier for each detected parameter with a reported value between the limit of detection and the limit of quantitation.

3. The analytical method used with each parameter for each sample.

4. Quality control flags to indicate all of the following:

a. All parameters that are also detected in method blanks, trip blanks or field blanks or both in concentrations above the limit of detection;

b. All parameters from samples which fail to meet preservation and holding times specified in EPA SW-846;

**Note:** Copies of EPA SW-846 are available for inspection at the offices of the department of natural resources, the secretary of state and the revisor of statutes. Copies may be obtained from the national technical information service, 5285 port royal road, Springfield, Virginia 22161. Phone (703) 487-4600.

c. All parameters which fail to meet quality control specifications in s. NR 149.14.

5. Laboratory certification identification number as specified in ch. NR 149.

(c) *Notification.* The owner or operator shall notify the department of values which have attained or exceeded groundwater standards in accordance with s. NR 507.30.

**History:** Cr. Register, June, 1996, No. 486, eff. 7-1-96.

#### NR 507.27 Calculation of groundwater standards.

The owner or operator shall propose PALs for inorganic monitoring parameters and ACLs and submit PAL or ACL calculations to the department for approval. Calculations of PALs for inorganic monitoring parameters and ACLs shall be based on historical data for each well unless the department determines that data from a well with similar groundwater quality may be used.

(1) **PREVENTIVE ACTION LIMITS.** The owner or operator of an existing solid waste disposal facility shall calculate PALs for inorganic detection monitoring parameters at the direction of the department. Applicants for a proposed solid waste disposal facility shall calculate PALs for inorganic detection monitoring parameters prior to submitting the plan of operation. Detection monitoring parameters are listed in Appendix I Tables 1 and 2. The owner or operator shall calculate PALs for the inorganic detection parameters required at each well in accordance with the methods specified in s. NR 140.20. PALs are not required for pH or temperature. PALs may not be calculated for any parameter which has an ES established in ch. NR 140. The department may require the owner or operator to conduct additional sampling if the department determines that the data used to calculate a PAL is not representative of background water quality.

(2) **ALTERNATIVE CONCENTRATION LIMITS.** Applicants for proposed solid waste disposal facilities and the owner or operator of an existing solid waste disposal facility may request an exemption and calculate ACLs for any inorganic public health or welfare parameter which has established standards listed in ch. NR 140 Tables 1 and 2 in accordance with s. NR 507.29.

**Note:** Guidance for calculations is available from the department of natural resources, technical support section of the bureau of waste management, 101 South Webster Street, PO Box 7921, Madison, Wisconsin 53707-7921.

**History:** Cr. Register, June, 1996, No. 486, eff. 7-1-96.

**NR 507.28 Evaluation of groundwater standards exceedances.** The owner or operator shall determine whether a groundwater standard has been attained or exceeded and whether a PAL or ES applies in accordance with this section.

(1) **DETERMINATION OF GROUNDWATER STANDARD EXCEEDANCE.** The owner or operator shall determine whether a reported value has attained or exceeded a PAL or ES in accordance with s. NR 140.14.

(2) **THE POINT OF STANDARDS APPLICATION.** The point of standards application to determine if a PAL or ES has been attained or exceeded is specified in either s. NR 140.22 (2) or (3). The design management zone and waste boundary are defined in s. NR 140.22 (3). The department may consider an expansion or reduction of the design management zone in accordance with s. NR 140.22 (3) (b) to (d). For purposes of evaluating compliance, a groundwater monitoring well located at the property line is a point of standards application for an ES.

(3) **DEMONSTRATION OF A FALSE GROUNDWATER STANDARD EXCEEDANCE.** The owner or operator may demonstrate, by resampling or other means, that a source other than the solid waste disposal facility caused the contamination or that the sample result

attaining or exceeding a groundwater standard is due to an error. The owner or operator shall notify the department of the intent to either begin assessment monitoring or determine that a false exceedance has occurred. The owner or operator shall submit the statement of intent with the notification required in s. NR 507.30 (1). The owner or operator shall submit the written demonstration of false exceedance with the results of the next routine monitoring.

#### NR 507.29 Exemptions to groundwater standards.

The owner or operator of a solid waste disposal facility may request an exemption to groundwater standards in accordance with ss. NR 140.28 and 500.08 (4) and this section. The exemption request shall be submitted to the department in writing. The department may require additional information in order to review the exemption request.

(1) **EXEMPTION SUBMITTAL.** The exemption request shall include all of the following:

(a) A list of the specific wells and parameters for which an exemption is being requested.

(b) Proposed ACLs and calculations in accordance with s. NR 507.27.

**Note:** For proposed facilities, the information required in par. (b) may be submitted with the plan of operation.

(c) A discussion of how the criteria listed in s. NR 140.28 (2), (3) or (4) are met.

(2) **ACLs.** The department may approve ACLs in its response to the exemption request.

**History:** Cr. Register, June, 1996, No. 486, eff. 7-1-96.

#### NR 507.30 Notification and response when values attain or exceed a standard.

The owner or operator of a solid waste facility shall notify the department in writing and respond as follows when a groundwater standard at the point of standards application or an explosive gas level has been attained or exceeded at the following devices:

(1) **ALL GROUNDWATER MONITORING WELLS.** (a) The owner or operator shall notify the department in writing if any value attains or exceeds a groundwater standard. The notification shall specify the parameters for which standards have been attained or exceeded and the wells at which the standard was attained or exceeded and it shall provide a preliminary analysis of the cause and significance of each concentration in accordance with s. NR 140.24 (1) (a) or 140.26 (1) (a). The sampling results and 2 copies of the notification shall be submitted to the department within 60 days from the end of the sampling period.

(b) When a groundwater standard has been attained or exceeded, the owner or operator shall respond in accordance with ch. NR 508.

(2) **WATER SUPPLY WELLS.** The owner or operator shall notify the department in writing if any value in a water supply sample attains or exceeds a groundwater standard or any other substances of concern are detected in the sample. The notification shall be in accordance with ss. NR 507.26 (2) and 507.30 (1).

(3) **GAS MONITORING WELLS.** When a stabilized gas reading exceeds the lower explosive limit at locations specified in s. NR 507.22 (4), the owner or operator shall immediately notify the department and respond in accordance with s. NR 507.22 (4).

**History:** Cr. Register, June, 1996, No. 486, eff. 7-1-96.



**APPENDIX I  
BASELINE AND DETECTION MONITORING REQUIREMENTS**

**Table 1  
DETECTION GROUNDWATER MONITORING FOR LANDFILLS  
ACCEPTING MUNICIPAL SOLID WASTE**

Waste Type	Detection Parameters <sup>1</sup>	Frequency for All Wells	Frequency for Subtitle D Wells
Municipal solid waste	Alkalinity Chloride COD Field conductivity (at 25°C) Field pH Field temperature Groundwater elevation Hardness	Semi-annual	Semi-annual
	VOC scan	Annual	Semi-annual
Municipal solid waste combustor residue	Alkalinity Boron Cadmium Chloride COD Field conductivity (at 25°C) Field pH Field temperature Groundwater elevation Hardness Lead Selenium Sulfate	Semi-annual	Semi-annual

<sup>1</sup> Additional parameters are required if other waste types are accepted at the landfill. See Table 2.

**Note:** Refer to Appendix III for a list of VOCs, parameter numbers, CAS numbers, synonyms and analytical methods required to run VOC analyses.

**Note:** Refer to Appendix IV for a list of metals and indicator parameters, the parameter numbers and the analytical methods required to run the analyses.

**Table 2**

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

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

**Note:** Refer to Appendix IV for a list of metals and indicator parameters, the parameter numbers and the analytical methods required to run the analyses.

**Table 3**

**BASELINE GROUNDWATER MONITORING  
PUBLIC HEALTH AND WELFARE PARAMETERS  
NOT INCLUDED AS DETECTION MONITORING PARAMETERS**

PUBLIC WELFARE STANDARDS	PUBLIC HEALTH STANDARDS	
Copper Manganese Sulfate Zinc	Arsenic Barium Cadmium Chromium Fluoride Lead Mercury Nitrate + Nitrite (as N) Selenium Silver	Antimony* Beryllium* Cobalt* Nickel* Thallium* Vanadium*
*Only required for background at Subtitle D wells		

**Note:** Refer to Appendix IV for parameter numbers and required analytical methods.

**Table 4**  
**DETECTION LEACHATE MONITORING**  
**FOR ALL LANDFILLS<sup>1</sup>**

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.			
Semi-Annual Monitoring Parameters			
BOD <sub>5</sub> Field Conductivity (at 25°C) Field pH Alkalinity Cadmium Chloride COD Hardness Iron Lead Manganese Mercury Ammonia nitrogen Total Kjeldahl nitrogen Sodium Sulfate Total suspended solids VOC scan  Other parameters specified by waste type in this table if accepted at the landfill	BOD <sub>5</sub> Field Conductivity (at 25°C) Field pH Alkalinity Cadmium Chloride COD Hardness Iron Lead Manganese Mercury Ammonia nitrogen Total Kjeldahl nitrogen Sodium Sulfate Total suspended solids VOC scan	BOD <sub>5</sub> Field Conductivity (at 25°C) Field pH Alkalinity Boron Cadmium Chloride COD Hardness Iron Lead Manganese Mercury Selenium Sulfate Total suspended solids	BOD <sub>5</sub> Field Conductivity (at 25°C) Field pH Alkalinity Cadmium Chloride COD Fluoride Hardness Iron Lead Manganese Mercury Sodium Sulfate Total suspended solids VOC scan
Annual Monitoring Parameters			
Base/Neutral Extractable Compounds Acid Extractable Compounds	Base/Neutral Extractable Compounds Acid Extractable Compounds	Base/Neutral Extractable Compounds Acid Extractable Compounds	Base/Neutral Extractable Compounds Acid Extractable Compounds

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

**Note:** Leachate samples shall not be filtered. The color, odor and turbidity shall also be noted for all samples.

**Note:** Refer to Appendix III for a list of VOCs, parameter numbers, CAS numbers, synonyms and analytical methods required to run VOC analyses.

**Note:** Refer to Appendix IV for a list of metals and indicator parameters, the parameter numbers and the analytical methods required to run the analyses.

**Table 5**  
**DETECTION LYSIMETER MONITORING**  
**FOR ALL LANDFILLS<sup>1,2</sup>**

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 and be reported to the department semi-annually.				
Semi-annual Monitoring Parameters				
Field conductivity (at 25°C) Field pH Alkalinity Hardness Chloride COD 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 Chloride COD Lead Total Kjeldahl nitrogen  Sodium Sulfate	Field conductivity (at 25°C) Field pH Alkalinity Hardness Chloride COD Total Kjeldahl nitrogen Sodium Sulfate	Field conductivity (at 25°C) Field pH Alkalinity Boron Hardness Chloride COD Total Kjeldahl nitrogen Sulfate	Field conductivity (at 25°C) Field pH Alkalinity Hardness Chloride COD Fluoride Total Kjeldahl nitrogen Sulfate
Annual Monitoring Parameters				
VOC Scan	VOC Scan	VOC Scan		VOC Scan

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

<sup>2</sup> Lysimeter samples may not be filtered. When only small sampling volumes are obtained, the VOC scan shall take precedence. The color, odor and turbidity shall also be noted for all samples.

**Note:** Refer to Appendix III for a list of VOCs, parameter numbers, CAS numbers, synonyms and analytical methods required to run VOC analyses.

**Note:** Refer to Appendix IV for a list of metals and indicator parameters, the parameter numbers and the analytical methods required to run the analyses.

**APPENDIX II**  
**SUBSTANCES FOR ASSESSMENT MONITORING<sup>1</sup>**  
**AT MUNICIPAL SOLID WASTE LANDFILLS**

Common name <sup>2</sup>	Parameter No. <sup>3</sup>	CAS RN <sup>4</sup>	Synonyms	Analytical methods <sup>5</sup>
Acenaphthene	34205	83-32-9	1,2-Dihydroacenaphthylene	8100, 8270, 8310
Acenaphthylene	34200	208-96-8		8100, 8270, 8310
Acetone	81552	67-64-1	2-Propanone	8260
Acetonitrile	76997	75-05-8	Methyl cyanide	8015,8260
Acetophenone	81553	98-86-2	1-Phenylethanone	8270
2-Acetylamino fluorene	73501	53-96-3	N-9H-fluorene-2-yl-Acetamide; 2-AAF	
Acrolein	34210	107-02-8	2-Propenal	8015,8030, 8260
Acrylonitrile	34215	107-13-1	2-Propenenitrile	8015,8030, 8260
Aldrin	39330	309-00-2	1,4:5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexachloro- 1,4,4a,5,8,8a-hexahydro- (1 $\alpha$ ,4 $\alpha$ ,4a $\beta$ ,5 $\alpha$ ,8 $\alpha$ -,8a $\beta$ )-	8081, 8080, 8270
Allyl chloride	78109	107-05-1	3-Chloro-1-propene	8021, 8260
4-Aminobiphenyl	77581	92-67-1	[1,1'-Biphenyl]-4-amine	8270
Anthracene	34220	120-12-7		8100*, 8270
Antimony	01097	7440-36-0		6010, 7040*, 7041
Arsenic	01002	7440-38-2		6010, 7060, 7061
Barium	01007	7440-39-3		6010, 7080*
Benzene	34030	71-43-2		8021,8260
Benzo[a]anthracene	34526	56-55-3	Benzanthracene	8100, 8270, 8310
Benzo[b]fluoranthene	34230	205-99-2	Benz[e]acephenanthrylene	8100, 8270, 8310
Benzo[k]fluoranthene	34242	207-08-9		8100, 8270, 8310
Benzo[ghi]perylene	34521	191-24-2		8100, 8270, 8310
Benzo[a]pyrene	34247	50-32-8		8100, 8270, 8310
Benzyl alcohol	77147	100-51-6	Benzenemethanol	8270
Beryllium	01012	7440-41-7		6010, 7090, 7091
alpha-BHC	39076	319-84-6	Cyclohexane, 1,2,3,4,5,6-hexachloro-,(1 $\alpha$ ,2 $\alpha$ ,3 $\beta$ ,4 $\alpha$ ,5 $\beta$ , 6 $\beta$ )	8081, 8270, 8080, 8250*
beta-BHC	39338	319-85-7	Cyclohexane, 1,2,3,4,5,6-hexachloro-,(1 $\alpha$ ,2 $\beta$ ,3 $\alpha$ ,4 $\beta$ ,5 $\alpha$ ,6 $\beta$ )-	8081, 8270, 8080, 8250*
delta-BHC	34259	319-86-8	Cyclohexane, 1,2,3,4,5,6-hexachloro-,(1 $\alpha$ ,2 $\alpha$ ,3 $\alpha$ ,4 $\beta$ ,5 $\alpha$ ,6 $\beta$ )-	8081, 8270, 8080, 8250*
gamma-BHC; Lindane	39340	58-89-9	Cyclohexane, 1,2,3,4,5,6-hexachloro-,(1 $\alpha$ ,2 $\alpha$ ,3 $\beta$ ,4 $\alpha$ ,5 $\alpha$ ,6 $\beta$ )-	8081, 8270, 8080, 8250*
Bis(2-chloroethoxy)methane	34278	111-91-1	Ethane, 1,1'-[methylenebis(oxy)]bis-[2-chloro-	8270
Bis(2-chloroethyl)ether	34273	111-44-4	Ethane, 1,1'-oxybis[2-chloro-	8270

Common name <sup>2</sup>	Parameter No. <sup>3</sup>	CAS RN <sup>4</sup>	Synonyms	Analytical methods <sup>5</sup>
Bis(2-chloro-1-methylethyl) ether [see note 6]	73522	108-60-1	2,2'-Dichlorodiisopropylether	8021, 8270
Bis(2-ethylhexyl) phthalate	39100	117-81-7	1,2-Benzenedicarboxylic acid, bis(2-ethylhexyl)ester	8061, 8060*, 8270
Bromochloromethane	77297	74-97-5	Chlorobromomethane	8021, 8260
Bromodichloromethane	32101	75-27-4	Dichlorobromomethane	8021, 8260
Bromoform	32104	75-25-2	Tribromomethane	8021, 8260
4-Bromophenyl phenyl ether	34636	101-55-3	Benzene, 1-bromo-4-phenoxy-	8270
Butyl benzyl phthalate	34292	85-68-7	Benzyl butyl phthalate	8060*, 8061, 8270
Cadmium	01027	7440-43-9		6010, 7130*, 7131
Carbon disulfide	77041	75-15-0		8260
Carbon tetrachloride	32102	56-23-5	Tetrachloromethane	8021, 8260
Chlordane [see note 7]	39350	57-74-9	4,7-Methano-1H-indene, 1,2,4,5,6,7,8,8-octachloro-2,3,3a,4,7,7a-hexahydro	8081, 8080, 8250*
p-Chloroaniline	73529	106-47-8	Benzenamine, 4-chloro-	8270
Chlorobenzene	34301	108-90-7	Monochlorobenzene	8021, 8260
Chlorobenzilate	39460	510-15-6	Benzeneacetic acid, 4-chloro- $\alpha$ -(4-chlorophenyl)- $\alpha$ -hydroxy-, ethyl ester	8270
p-Chloro-m-cresol	34452	59-50-7	Phenol, 4-chloro-3-methyl-	8040*, 8041, 8270
Chloroethane	34311	75-00-3	Ethyl chloride	8021, 8260
Chloroform	32106	67-66-3	Trichloromethane	8021, 8260
2-Chloronaphthalene	34581	91-58-7		8120, 8270
2-Chlorophenol	34586	95-57-8		8040*, 8041, 8270
4-Chlorophenyl phenyl ether	34641	7005-72-3	Benzene, 1-chloro-4-phenoxy-	8270
Chloroprene	81520	126-99-8	1,3-Butadiene, 2-chloro-	8021, 8260
Chromium	01034	7440-47-3		6010, 7190*, 7191
Chrysene	34320	218-01-9		8100, 8270, 8310
Cobalt	01037	7440-48-3		6010, 7200*, 7201
Copper	01042	7440-50-8		6010, 7210, 7211
m-Cresol	77151	108-39-4	3-Methylphenol	8270
o-Cresol	77152	95-48-7	2-Methylphenol	8270
p-Cresol	77146	106-44-5	4-Methylphenol	8270
Cyanide	00720	57-12-5		9010
2,4-D; 2,4-Dichlorophenoxy-acetic acid	39730	94-75-7	Acetic acid, (2,4-dichlorophenoxy)-	8150, 8151
4,4'-DDD	39361	72-54-8	Benzene, 1,1'-(2,2-dichloroethylidene)bis[4-chloro-	8081, 8080, 8270
4,4'-DDE	39366	72-55-9	Benzene, 1,1'-(dichloroethenylidene)bis[4-chloro-	8081, 8080, 8270
4,4'-DDT	39371	50-29-3	Benzene, 1,1'-(2,2,2-trichloroethylidene)bis[4-chloro-	8081, 8080, 8270
Diallate	73540	2303-16-4	Carbamothioic acid, bis(1-methylethyl)-, S-(2,3-dichloro-2-propenyl) ester	8270

Common name <sup>2</sup>	Parameter No. <sup>3</sup>	CAS RN <sup>4</sup>	Synonyms	Analytical methods <sup>5</sup>
Dibenzo[a,h]anthracene	34556	53-70-3	Dibenz[a,h]anthracene	8100, 8270, 8310
Dibenzofuran	81302	132-64-9		8270
Dibromochloromethane	32105	124-48-1	Chlorodibromomethane	8021, 8260
1,2-Dibromo-3-chloropropane	38437	96-12-8	DBCP	8021, 8260, 8270
1,2-Dibromoethane	77651	106-93-4	EDB, Ethylene dibromide	8021, 8260
Di-n-butyl phthalate	39110	84-74-2	1,2-Benzenedicarboxylic acid, dibutyl ester	8060*, 8270, 8061
o-Dichlorobenzene	34536	95-50-1	1,2-Dichlorobenzene	8021, 8120, 8270
m-Dichlorobenzene	34566	541-73-1	1,3-Dichlorobenzene	8021, 8120, 8270
p-Dichlorobenzene	34571	106-46-7	1,4-Dichlorobenzene	8021, 8120, 8270
3,3'-Dichlorobenzidine	34631	91-94-1	[1,1'-Biphenyl]-4,4'-diamine, 3,3'-dichloro-	8270
trans-1,4-Dichloro-2-butene	73547	110-57-6	2-Butene, 1,4-dichloro-, (E)-	8260
Dichlorodifluoromethane	34668	75-71-8	Freon 12, CFC-12	8021, 8260
1,1-Dichloroethane	34496	75-34-3	Ethylidene chloride	8021, 8260
1,2-Dichloroethane	32103	107-06-2	Ethylene dichloride	8021, 8260
1,1-Dichloroethylene	34501	75-35-4	Vinylidene chloride; 1,1-Dichloroethene	8021, 8260
cis-1,2-Dichloroethylene	77093	156-59-2	cis-1,2-Dichloroethene	8021, 8260
trans-1,2-Dichloroethylene	34546	156-60-5	trans-1,2-Dichloroethene	8021, 8260
2,4-Dichlorophenol	34601	120-83-2		8040*, 8041, 8270
2,6-Dichlorophenol	77541	87-65-0		8270
1,2-Dichloropropane	34541	78-87-5	Propylene dichloride	8021, 8260
1,3-Dichloropropane	77173	142-28-9	Trimethylene chloride	8021, 8260
2,2-Dichloropropane	77170	594-20-7		8021, 8260
1,1-Dichloropropene	77168	563-58-6	1,1-dichloropropylene .	8021, 8260
cis-1,3-Dichloropropene	34704	10061-01-5	1,3-dichloropropylene, (Z)	8021, 8260
trans-1,3-Dichloropropene	34699	10061-02-6	1,3-dichloropropylene, (E)	8021, 8260
Dieldrin	39380	60-57-1	2,7:3,6-Dimethanonaphth[2,3-b]oxirene, 3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-, (1 $\alpha$ ,2 $\beta$ ,2 $\alpha$ ,3 $\beta$ ,6 $\beta$ ,6 $\alpha$ ,7 $\beta$ ,7 $\alpha$ )-	8081, 8080, 8270
Diethyl phthalate	34336	84-66-2	1,2-Benzenedicarboxylic acid, diethyl ester	8081, 8060*, 8270
O,O-Diethyl O-2-pyrazinyl phosphorothioate	73553	297-97-2	Thionazin	8270
Dimethoate	46314	60-51-5	Phosphorodithioic acid, O,O-dimethyl S-[2-(methylamino)-2-oxoethyl] ester	8270
p-(Dimethylamino)azobenzene	73558	60-11-7	Benzenamine, N,N-dimethyl-4-(phenylazo)-	8270
7,12-Dimethylbenz[a]anthracene	73559	57-97-6	Benz[a]anthracene, 7,12-dimethyl-	8270
3,3'-Dimethylbenzidine	73560	119-93-7	[1,1'-Biphenyl]-4,4'-diamine, 3,3'-dimethyl-	8270
2,4-Dimethylphenol	34606	105-67-9	2,4-Dimethylphenol	8040*, 8041, 8270



Common name <sup>2</sup>	Parameter No. <sup>3</sup>	CAS RN <sup>4</sup>	Synonyms	Analytical methods <sup>5</sup>
Dimethyl phthalate	34341	131-11-3	1,2-Benzenedicarboxylic acid, dimethyl ester	8060*, 8270
m-Dinitrobenzene	45622	99-65-0	1,3-Dinitrobenzene	8270
4,6-Dinitro-o-cresol	79533	534-52-1	2-Methyl-4,6-dinitrophenol	8040*, 8041, 8270
2,4-Dinitrophenol	34616	51-28-5		8040*, 8041, 8270
2,4-Dinitrotoluene	34611	121-14-2	1-Methyl-2,4-dinitrobenzene	8090*, 8091, 8270
2,6-Dinitrotoluene	34626	606-20-2	2-Methyl-1,3-dinitrobenzene	8090*, 8091, 8270
Dinoseb	81287	88-85-7	DNBP; 2-sec-Butyl-4,6-dinitrophenol	8150, 8270
Di-n-octyl phthalate	34596	117-84-0	1,2-Benzenedicarboxylic acid, dioctyl ester	8060*, 8061, 8270
Diphenylamine	77579	122-39-4	Benzenamine, N-phenyl-	8270
Disulfoton	81888	298-04-4	Phosphorodithioic acid, O,O-diethyl S-[2-(ethylthio)ethyl]ester	8041, 8140*, 8270
Endosulfan I	34361	959-98-8	6,9-Methano-2,4,3-benzodioxathiepin, 6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9a hexahydro-, 3-oxide, (3 $\alpha$ ,5 $\alpha$ $\beta$ ,6 $\alpha$ ,9 $\alpha$ ,9 $\alpha$ $\beta$ )-	8081, 8270, 8080, 8250*
Endosulfan II	34356	33213-65-9	6,9-Methano-2,4,3-benzodioxathiepin, 6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9a-hexahydro-, 3-oxide, (3 $\alpha$ ,5 $\alpha$ $\alpha$ ,6 $\beta$ ,9 $\beta$ ,9 $\alpha$ )-	8081, 8270, 8080
Endosulfan sulfate	34351	1031-07-8	6,9-Methano-2,4,3-benzodioxathiepin, 6,7,8,9,10,10-hexachloro-1,5,5a,6,9,9a-hexahydro-, 3,3-dioxide	8081, 8080, 8270
Endrin	39390	72-20-8	2,7:3,6-Dimethanonaphth[2,3-b]oxirene, 3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-, (1 $\alpha$ ,2 $\beta$ ,2 $\alpha$ $\beta$ ,3 $\alpha$ ,6 $\alpha$ ,6 $\alpha$ $\beta$ ,7 $\beta$ ,7 $\alpha$ )-	8081, 8270, 8080, 8250*
Endrin aldehyde	34366	7421-93-4	1,2,4-Methenocyclopenta[cd]pentalene-5-carboxaldehyde, 2,2a,3,3,4,7-hexachlorodecahydro-, (1 $\alpha$ ,2 $\beta$ ,2 $\alpha$ $\beta$ ,4 $\beta$ ,4 $\alpha$ $\beta$ ,5 $\beta$ ,6 $\alpha$ $\beta$ ,6 $\beta$ ,7R*)-	8081, 8080, 8270
Ethylbenzene	78113	100-41-4		8021, 8260
Ethyl methacrylate	73570	97-63-2	2-Propenoic acid, 2-methyl-, ethyl ester	8015, 8260, 8270
Ethyl methanesulfonate	73571	62-50-0	Methanesulfonic acid, ethyl ester	8270
Famphur	38462	52-85-7	Phosphorothioic acid, O-[4-[(dimethylamino)sulfonyl]phenyl]-O,O-dimethyl ester	8270
Fluoranthene	34376	206-44-0		8100, 8270
Fluorene	34381	86-73-7	9H-Fluorene	8100, 8270
Heptachlor	39410	76-44-8	4,7-Methano-1H-indene, 1,4,5,6,7,8,8-heptachloro-3a,4,7,7a-tetrahydro-	8081, 8080, 8270
Heptachlor epoxide	39420	1024-57-3	2,5-Methano-2H-indeno[1,2-b]oxirene, 2,3,4,5,6,7,7-heptachloro-1a,1b,5,5a,6,6a,-hexahydro,(1 $\alpha$ ,1 $\beta$ $\beta$ ,2 $\alpha$ ,5 $\alpha$ ,5 $\alpha$ $\beta$ ,6 $\beta$ ,6 $\alpha$ )	8081, 8080, 8270
Hexachlorobenzene	39700	118-74-1		8120, 8270
Hexachlorobutadiene	34391	87-68-3	1,3-Butadiene, 1,1,2,3,4,4-hexachloro-	8120, 8270
Hexachlorocyclopentadiene	34386	77-47-4	1,3-Cyclopentadiene, 1,2,3,4,5,5-hexachloro-	8120, 8270
Hexachloroethane	34396	67-72-1		8120, 8270
Hexachlorophene	73575	70-30-4	Phenol, 2,2'-methylenebis[3,4,6-trichloro-	8270

Common name <sup>2</sup>	Parameter No. <sup>3</sup>	CAS RN <sup>4</sup>	Synonyms	Analytical methods <sup>5</sup>
Hexachloropropene	73576	1888-71-7	1-Propene, 1,1,2,3,3,3-hexachloro-	8270
2-Hexanone	77103	591-78-6	Methyl butyl ketone	8015, 8260
Indeno(1,2,3-cd)pyrene	34403	193-39-5	Indeno[1,2,3-cd]pyrene	8100, 8270
Isobutyl alcohol	77033	78-83-1	1-Propanol, 2-methyl-	8015, 8260
Isodrin	39430	465-73-6	1,4,5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a hexahydro-(1 $\alpha$ ,4 $\alpha$ ,4a $\beta$ ,5 $\beta$ ,8 $\beta$ ,8a $\beta$ )-	8270
Isophorone	34408	78-59-1	2-Cyclohexen-1-one, 3,5,5-trimethyl-	8090*, 8270
Isosafrole	73582	120-58-1	1,3-Benzodioxole, 5-(1-propenyl)-	8270
Kepone	81281	143-50-0	1,3,4-Metheno-2H-cyclobuta- [cd]pentalen-2-one, 1,1a,3,3a,4,5,5a,5b,6-decachloro- octahydro-	8270
Lead	01051	7439-92-1		6010, 7420*, 7421
Mercury	71900	7439-97-6		7470
Methacrylonitrile	81593	126-98-7	2-Propenenitrile, 2-methyl-	8015, 8260
Methapyrilene	73589	91-80-5	1,2-Ethanediamine, N,N-dimethyl-N'-2-pyridinyl-N'- (2-thienylmethyl)-	8270
Methoxychlor	39480	72-43-5	Benzene, 1,1'-(2,2,2-trichloroethylidene)bis [4-methoxy-	8081, 8080, 8270
Methyl bromide	34413	74-83-9	Bromomethane	8021, 8260
Methyl chloride	34418	74-87-3	Chloromethane	8021, 8260
3-Methylcholanthrene	73591	56-49-5	Benz[j]aceanthrylene, 1,2-dihydro-3-methyl-	8270
Methyl ethyl ketone	81595	78-93-3	2-Butanone; MEK	8015, 8260
Methyl iodide	77424	74-88-4	Iodomethane	8021, 8260
Methyl methacrylate	81597	80-62-6	2-Propenoic acid, 2-methyl-, methyl ester	8015, 8260
Methyl methanesulfonate	73595	66-27-3	Methanesulfonic acid, methyl ester	8270
2-Methylnaphthalene	77416	91-57-6		8270
Methyl parathion	39600	298-00-0	Phosphorothioic acid, O,O-dimethyl O-(4-nitrophenyl) ester	8141, 8140*, 8270
4-Methyl-2-pentanone	78133	108-10-1	Methyl isobutyl ketone	8015, 8260
Methyl tert-butyl ether	78032	1634-04-4	MTBE	8021, 8260
Methylene bromide	77596	74-95-3	Dibromomethane	8021, 8260
Methylene chloride	34423	75-09-2	Dichloromethane	8021, 8260
Naphthalene	34696	91-20-3		8100, 8270
1,4-Naphthoquinone	73599	130-15-4	1,4-Naphthalenedione	8270
1-Naphthylamine	73600	134-32-7	1-Naphthalenamine	8270
2-Naphthylamine	73601	91-59-8	2-Naphthalenamine	8270
Nickel	01067	7440-02-0		6010, 7520*, 7521
o-Nitroaniline		88-74-4	2-Nitrobenzenamine	8270
m-Nitroaniline		99-09-2	3-Nitrobenzenamine	8270
p-Nitroaniline	73605	100-01-6	4-Nitrobenzenamine	8270
Nitrobenzene	34447	98-95-3		8090*, 8270
o-Nitrophenol	34591	88-75-5	2-Nitrophenol	8040*, 8041, 8270

Common name <sup>2</sup>	Parameter No. <sup>3</sup>	CAS RN <sup>4</sup>	Synonyms	Analytical methods <sup>5</sup>
p-Nitrophenol	34646	100-02-7	4-Nitrophenol	8040*, 8041, 8270
N-Nitrosodi-n-butylamine	78207	924-16-3	1-Butanamine, N-butyl-N-nitroso-	8270
N-Nitrosodiethylamine	78200	55-18-5	Ethanamine, N-ethyl-N-nitroso-	8270
N-Nitrosodimethylamine	34438	62-75-9	Methanamine, N-methyl-N-nitroso-	8270
N-Nitrosodiphenylamine	34433	86-30-6	Benzenamine, N-nitroso-N-phenyl-	8270
N-Nitrosodipropylamine	34428	621-64-7	Di-n-propylnitrosamine	8270
N-Nitrosomethylethylamine	73613	10595-95-6	Ethanamine, N-methyl-N-nitroso-	8270
N-Nitrosopiperidine	73619	100-75-4	Piperidine, 1-nitroso-	8270
N-Nitrosopyrrolidine	78206	930-55-2	Pyrrolidine, 1-nitroso-	8270
5-Nitro-o-toluidine	73622	99-55-8	Benzenamine, 2-methyl-5-nitro-	8270
Parathion	39540	56-38-2	Phosphorothioic acid, O,O-diethyl-O-(4-nitrophenyl) ester	8270
Pentachlorobenzene	77793	608-93-5		8270
Pentachloronitrobenzene	81316	82-68-8		8270
Pentachlorophenol	39032	87-86-5		8040*, 8041, 8270
Phenacetin	73626	62-44-2	Acetamide, N-(4-ethoxyphenyl)	8270
Phenanthrene	34461	85-01-8		8100, 8270
Phenol	34694	108-95-2		8040*, 8041, 8270
p-Phenylenediamine	73628	106-50-3	1,4-Benzenediamine	8270
Phorate	46313	298-02-2	Phosphorodithioic acid, O,O-diethyl S-[(ethylthio)methyl] ester	8041, 8140*, 8270
Polychlorinated biphenyls		See Note 8	PCBs; 1,1'-Biphenyl, chloro derivatives, Arochlors	8081, 8270, 8080, 8250*
Pronamide	39080	23950-58-5	Benzamide, 3,5-dichloro-N-(1,1-dimethyl-2-propynyl)-	8270
Propionitrile	77007	107-12-0	Ethyl cyanide; Propanenitrile	8015, 8260
Pyrene	34469	129-00-0		8100, 8270
Safrole	77545	94-59-7	1,3-Benzodioxole, 5-(2-propenyl)-	8270
Selenium	01147	7782-49-2		6010, 7740, 7741
Silver	01077	7440-22-4		6010, 7760*, 7761
Silvex	39760	93-72-1	2,4,5-TP; Propanoic acid, 2-(2,4,5-trichlorophenoxy)-	8150, 8151
Styrene	77128	100-42-5	Ethenylbenzene	8021, 8260
Sulfide	00745	18496-25-8		9030
2,4,5-T	39740	93-76-5	2,4,5-Trichloro-phenoxyacetic acid	8150, 8151
1,2,4,5-Tetrachlorobenzene	77734	95-94-3		8270
1,1,1,2-Tetrachloroethane	77562	630-20-6		8021, 8260
1,1,2,2-Tetrachloroethane	34516	79-34-5		8021, 8260
Tetrachloroethylene	34475	127-18-4	Perchloroethylene; Tetrachloroethene; PCE	8021, 8260
2,3,4,6-Tetrachlorophenol	77770	58-90-2		8270
Thallium	01059	7440-28-0		6010, 7840, 7841
Tin	01102	7440-31-5		6010, 7870

Common name <sup>2</sup>	Parameter No. <sup>3</sup>	CAS RN <sup>4</sup>	Synonyms	Analytical methods <sup>5</sup>
Toluene	78131	108-88-3	Methylbenzene	8021, 8260
o-Toluidine	77142	95-53-4	2-Methylbenzenamine	8270
Toxaphene	39400	See note 9		8081,8270, 8080, 8250*
1,2,4-Trichlorobenzene	34551	120-82-1		8270
1,1,1-Trichloroethane	34506	71-55-6	Methylchloroform	8021, 8260
1,1,2-Trichloroethane	34511	79-00-5		8021, 8260
Trichloroethylene	39180	79-01-6	Trichloroethene; TCE	8021, 8260
Trichlorofluoromethane	34488	75-69-4	Freon 11, Fluorotrichloromethane, CFC-11	8021, 8260
2,4,5-Trichlorophenol	77687	95-95-4		8270
2,4,6-Trichlorophenol	34621	88-06-2		8040*, 8041, 8270
1,2,3-Trichloropropane	77443	96-18-4		8021, 8260
O,O,O-Triethyl phosphorothioate	73652	126-68-1	Phosphorothioic acid, O,O,O-triethyl ester	8270
sym-Trinitrobenzene	73653	99-35-4	Benzene, 1,3,5-trinitro-	8270
Vanadium	01087	7440-62-2		6010, 7910, 7911
Vinyl acetate	77057	108-05-4	Ethenyl ester acetic acid	8260
Vinyl chloride	39175	75-01-4	Chloroethene	8021, 8260
Xylene (total) [see note 10]	81551	1330-20-7	Dimethylbenzene	8021, 8260
Zinc	01092	7440-66-6		6010, 7950, 7951
Sulfide	00745	18496-25-8		9030
2,4,5-T	39740	93-76-5	2,4,5-Trichloro-phenoxyacetic acid	8150, 8151
1,2,4,5-Tetrachlorobenzene	77734	95-94-3		8270
1,1,1,2-Tetrachloroethane	77562	630-20-6		8021, 8260
1,1,2,2-Tetrachloroethane	34516	79-34-5		8021, 8260
Tetrachloroethylene	34475	127-18-4	Perchloroethylene; Tetrachloroethene; PCE	8021, 8260
2,3,4,6-Tetrachlorophenol	77770	58-90-2		8270
Thallium	01059	7440-28-0		6010, 7840, 7841
Tin	01102	7440-31-5		6010, 7870
Toluene	78131	108-88-3	Methylbenzene	8021, 8260
o-Toluidine	77142	95-53-4	2-Methylbenzenamine	8270
Toxaphene	39400	See note 9		8081,8270, 8080, 8250*
1,2,4-Trichlorobenzene	34551	120-82-1		8270
1,1,1-Trichloroethane	34506	71-55-6	Methylchloroform	8021, 8260
1,1,2-Trichloroethane	34511	79-00-5		8021, 8260
Trichloroethylene	39180	79-01-6	Trichloroethene; TCE	8021, 8260
Trichlorofluoromethane	34488	75-69-4	Freon 11, Fluorotrichloromethane, CFC-11	8021, 8260
2,4,5-Trichlorophenol	77687	95-95-4		8270
2,4,6-Trichlorophenol	34621	88-06-2		8040*, 8041, 8270
1,2,3-Trichloropropane	77443	96-18-4		8021, 8260
O,O,O-Triethyl phosphorothioate	73652	126-68-1	Phosphorothioic acid, O,O,O-triethyl ester	8270

Common name <sup>2</sup>	Parameter No. <sup>3</sup>	CAS RN <sup>4</sup>	Synonyms	Analytical methods <sup>5</sup>
sym-Trinitrobenzene	73653	99-35-4	Benzene, 1,3,5-trinitro-	8270
Vanadium	01087	7440-62-2		6010, 7910, 7911
Vinyl acetate	77057	108-05-4	Ethenyl ester acetic acid	8260
Vinyl chloride	39175	75-01-4	Chloroethene	8021, 8260
Xylene (total) [see note 10]	81551	1330-20-7	Dimethylbenzene	8021, 8260
Zinc	01092	7440-66-6		6010, 7950, 7951

1 This list includes all the substances required for assessment monitoring under EPA RCRA Subtitle D (40 CFR Part 258 Appendix II).

2 Common names are those widely used in government regulations, scientific publications and commerce; synonyms exist for many chemicals.

3 Parameter No. refers to the Wisconsin identification number and the EPA Storet number for each parameter. The parameter code number refers to a specific parameter, the medium of concentration, and the units of concentration.

4 Chemical Abstracts Service registry number.

5 For Analytical Methods, refer to the analytical procedure numbers used in EPA Report SW-846 "Test Methods for Evaluating Solid Waste," third edition, Final Update 2B, January 1995. For the appropriate extraction procedure refer, in the same document, to Table 2-37 "Preparation Methods for Organic Analytes," and refer to Table 2-36 for the "Required Containers, Preservation Techniques, and Holding Times for Aqueous Matrices."

**Note:** Analytical details can be found in SW-846 and in documentation on file with EPA. CAUTION: The methods listed are representative SW-846 procedures and may not always be the most suitable methods for monitoring an analyte under the regulations. The publication SW-846 may be obtained from:

National Technical Information Service  
5285 Port Royal Road  
(703) 487-4650.  
Springfield, VA 22161

6 This substance is often called Bis(2-chloroisopropyl) ether, the name the Chemical Abstracts Service applies to its noncommercial isomer, Propane, 2,2'-oxy-bis[2-chloro-(CAS RN 39638-32-9)].

7 Chlordane: This entry includes alpha-chlordane (CAS RN 5103-71-9), beta-chlordane (CAS RN 5103-74-2), gamma-chlordane (CAS RN 5566-34-7), and constituents of chlordane (CAS RN 57-74-9 and CAS RN 12789-03-6).

8 Polychlorinated biphenyls (CAS RN 01336-36-3); this category contains congener chemicals, including constituents of Aroclor-1016 (CAS RN 12674-11-2), Aroclor-1221 (CAS RN 11104-28-2), Aroclor-1232 (CAS RN 11141-16-5), Aroclor-1242 (CAS RN 53469-21-9), Aroclor-1248 (CAS RN 12672-29-6), Aroclor-1254 (CAS RN 11097-69-1) and Aroclor-1260 (CAS RN 11096-82-5).

9 Toxaphene: This entry includes congener chemicals contained in technical toxaphene (CAS RN 8001-35-2), i.e., chlorinated camphene.

10 Xylene (total): This entry includes o-xylene (CAS RN 96-47-6), m-xylene (CAS RN 108-38-3), p-xylene (CAS RN 106-42-3), and unspecified xylenes (dimethylbenzenes) (CAS RN 1330-20-7).

\* This method incorporates outdated analytical technology and is scheduled to be removed from EPA approved lists.

**Note:** Copies of the test procedures are available for inspection at the offices the department of natural resources, the secretary of state, and the revisor of statutes.

**APPENDIX III**  
**VOLATILE ORGANIC COMPOUNDS FOR DETECTION MONITORING<sup>1</sup>**  
**AT MUNICIPAL SOLID WASTE LANDFILLS**

Common name <sup>2</sup>	Parameter No. <sup>3</sup>	CAS RN <sup>4</sup>	Synonyms	Analytical methods <sup>5</sup>
Acetone <sup>1</sup>	81552	67-64-1	2-Propanone	8260
Benzene	34030	71-43-2		8021, 8260
Bromodichloromethane	32101	75-27-4	Dichlorobromomethane	8021, 8260
Bromoform	32104	75-25-2	Tribromomethane	8021, 8260
Carbon disulfide <sup>1</sup>	77041	75-15-0		8260
Carbon tetrachloride	32102	56-23-5	Tetrachloromethane	8021, 8260
Chlorobenzene	34301	108-90-7	Monochlorobenzene	8021, 8260
Chloroethane	34311	75-00-3	Ethyl chloride	8021, 8260
Chloroform	32106	67-66-3	Trichloromethane	8021, 8260
Dibromochloromethane	32105	124-48-1	Chlorodibromomethane	8021, 8260
1,2-Dibromo-3-chloropropane	38437	96-12-8	DBCP	8021, 8260
1,2-Dibromoethane	77651	106-93-4	EDB; Ethylene dibromide	8021, 8260
o-Dichlorobenzene	34536	95-50-1	1,2-Dichlorobenzene	8021, 8260
m-Dichlorobenzene	34566	541-73-1	1,3-Dichlorobenzene	8021, 8260
p-Dichlorobenzene	34571	106-46-7	1,4-Dichlorobenzene	8021, 8260
Dichlorodifluoromethane	34668	75-71-8	Freon 12, Difluorodichloromethane	8021, 8260
1,1-Dichloroethane	34496	75-34-3		8021, 8260
1,2-Dichloroethane	32103	107-06-2	Ethylene dichloride	8021, 8260
1,1-Dichloroethylene	34501	75-35-4	Vinylidene chloride	8021, 8260
cis-1,2-Dichloroethylene	77093	156-59-2	cis-1,2-Dichloroethene	8021, 8260
trans-1,2-Dichloroethylene	34546	156-60-5	trans-1,2-Dichloroethene	8021, 8260
1,2-Dichloropropane	34541	78-87-5		8021, 8260
cis-1,3-Dichloropropylene	34704	10061-01-5	cis-1,3-Dichloropropene, Z-Dichloropropylene	8021, 8260
trans-1,3-Dichloropropylene	34699	10061-02-6	trans-1,3-Dichloropropene, E-Dichloropropylene	8021, 8260
Ethylbenzene	78113	100-41-4		8021, 8260
Methyl bromide	34413	74-83-9	Bromomethane	8021, 8260
Methyl chloride	34418	74-87-3	Chloromethane	8021, 8260
Methylene bromide	77596	74-95-3	Dibromomethane	8021, 8260
Methylene chloride	34423	75-09-2	Dichloromethane	8021, 8260
Methyl ethyl ketone <sup>1</sup>	81595	78-93-3	2-Butanone; MEK	8260
Methyl tert-butyl ether	78032	1634-04-4	MTBE	8021, 8260
Naphthalene	34696	91-20-3		8021, 8260
Styrene	77128	100-42-5	Ethenylbenzene	8021, 8260
Tetrachloroethylene	34475	127-18-4	Perchloroethylene; Tetrachloroethene; PCE	8021, 8260
Tetrahydrofuran <sup>1</sup>	81607	109-99-9	THF	8260
Toluene	78131	108-88-3	Methylbenzene	8021, 8260

Common name <sup>2</sup>	Parameter No. <sup>3</sup>	CAS RN <sup>4</sup>	Synonyms	Analytical methods <sup>5</sup>
1,1,1-Trichloroethane	34506	71-55-6	Methylchloroform	8021, 8260
1,1,2-Trichloroethane	34511	79-00-5		8021, 8260
Trichloroethylene	39180	79-01-6	Trichloroethene; TCE	8021, 8260
Trichlorofluoromethane	34488	75-69-4	Fluorotrichloromethane, Freon 11	8021, 8260
Vinyl chloride	39175	75-01-4	Chloroethene	8021, 8260
Xylene (total) [see note 6]	81551	1330-20-7	Dimethylbenzene	8021, 8260

1 Includes the Volatile Organic Compounds (VOCs) necessary when a "VOC Scan" is required under s. NR 507 Wis. Adm. Code Appendix 1 Table 1, Table 4 and Table 5. Acetone, Carbon disulfide, Methyl ethyl ketone, and Tetrahydrofuran are exempted if EPA Method 8021 is used for the analysis.

2 Common names are those widely used in government regulations, scientific publications and commerce; synonyms exist for many chemicals.

3 Parameter No. refers to the Wisconsin identification number and the EPA Storet number for each parameter. The parameter code number refers to a specific parameter, the medium of concentration, and the units of concentration.

4 Chemical Abstracts Service registry number.

5 For Analytical Methods, refer to the analytical procedure numbers used in EPA Report SW-846 "Test Methods for Evaluating Solid Waste," third edition, Final Update 2B, January 1995. For the appropriate extraction procedure refer, in the same document, to Table 2-37 "Preparation Methods for Organic Analytes," and refer to Table 2-36 for the "Required Containers, Preservation Techniques, and Holding Times for Aqueous Matrices."

**Note:** Analytical details can be found in SW-846 and in documentation on file with EPA. CAUTION: The methods listed are representative SW-846 procedures and may not always be the most suitable methods for monitoring an analyte under the regulations. The publication SW-846 may be obtained from:

National Technical Information Service  
 5285 Port Royal Road  
 Springfield, VA 22161  
 (703) 487-4650.

**Note:** Copies of the test procedures are available for inspection at the offices of the department of natural resources, the secretary of state, and the revisor of statutes.

6 Xylene (total): This entry includes o-xylene (CAS RN 96-47-6), m-xylene (CAS RN 108-38-3), p-xylene (CAS RN 106-42-3), and unspecified xylenes (dimethylbenzenes) (CAS RN 1330-20-7).

**APPENDIX IV**  
**LIST OF METALS AND INDICATOR PARAMETERS<sup>1</sup>**  
**FOR MUNICIPAL AND INDUSTRIAL SOLID WASTE LANDFILLS**

Parameter	Parameter Number <sup>2</sup> (Total or unfiltered)	Parameter Number <sup>2</sup> (Dissolved or Filtered)	Regulatory Category <sup>4</sup>	Analytical methods <sup>3,5,6</sup>
Alkalinity	00410	39036	A,B	301.1 <sup>5</sup> 301.2 <sup>5</sup> 2320 B <sup>6</sup>
Antimony	01097	01095	D	6010, 7040*, 7041
Arsenic	01002	01000	C,D	6010, 7060, 7061
Barium	01007	01005	C,D	6010, 7080*
Beryllium	01012	01010	D	6010, 7090, 7091
Biochemical oxygen demand, BOD <sub>5</sub>	00310	00311	B	405.1 <sup>5*</sup> 5210 <sup>6</sup>
Boron	01022	01020	B	6010
Cadmium	01027	01025	B,C,D	6010, 7130*, 7131
Calcium	00916	00915	E	6010, 7140
Chemical oxygen demand, COD	00340	00341	A,B	410.1 <sup>5</sup> 410.2 <sup>5</sup> 410.3 <sup>5</sup> 410.4 <sup>5</sup> 5220 B <sup>6</sup>
Chloride	00940	82295	A,B,C	9250
Chromium	01034	01030	C,D	6010, 7190*, 7191
Cobalt	01037	01035	D	6010, 7200*, 7201
Copper	01042	01040	C,D	6010, 7210
Cyanide	00720	00723	E	9010
Fluoride	00951	00950	B,C	300.0 <sup>5</sup> 340.2 <sup>5</sup> 340.1 <sup>5</sup> 4500-F-B <sup>6</sup> 4500-F-C <sup>6</sup> 4500-F-D <sup>6</sup> 4500-F-E <sup>6</sup>
Hardness	00900	22413	A,B	130.1 <sup>5</sup> 130.2 <sup>5</sup> 2340 C <sup>6</sup>
Iron	74010	01046	A,B,C	6010, 7380, 7381
Lead	01051	01049	B,C,D	6010, 7420*, 7421
Magnesium	00927	00925	E	6010, 7450



Parameter	Parameter Number <sup>2</sup> (Total or unfiltered)	Parameter Number <sup>2</sup> (Dissolved or Filtered)	Regulatory Category <sup>4</sup>	Analytical methods <sup>3,5,6</sup>
Manganese	01055	01056	C	6010, 7460, 7461
Mercury	71900	71890	C	7470
Nickel	01067	01065	D	6010, 7520*, 7521
Nitrate (NO <sub>3</sub> -N)	00620	00618	E	9200
Nitrate + Nitrite (NO <sub>3</sub> +NO <sub>2</sub> )	00630	00631	C	353.3 <sup>5</sup> 353.2 <sup>5</sup> 353.4 <sup>5</sup> 4500-NO <sub>3</sub> E <sup>6</sup> 4500-NO <sub>3</sub> F <sup>6</sup> 4500-NO <sub>3</sub> G <sup>6</sup>
Nitrite (NO <sub>2</sub> -N)	00615	00613	E	345.1 <sup>5</sup> 4400-NO <sub>2</sub> B <sup>6</sup>
Ammonia nitrogen	00610	00608	B	350.2 <sup>5</sup> 350.3 <sup>5</sup> 350.1 <sup>5</sup> 4500-NH <sub>3</sub> B <sup>6</sup> 4500-NH <sub>3</sub> C <sup>6</sup> 4500-NH <sub>3</sub> E <sup>6</sup> 4500-NH <sub>3</sub> F <sup>6</sup> 4500-NH <sub>3</sub> H <sup>6</sup>
Kjeldahl nitrogen	00625	00623	E	351.3 <sup>5</sup> 351.1 <sup>5</sup> 351.2 <sup>5</sup> 351.4 <sup>5</sup> 4500-N-B <sup>6</sup> 4500-NH <sub>3</sub> E <sup>6</sup> 4500-NH <sub>3</sub> C <sup>6</sup> 4500-NH <sub>3</sub> F <sup>6</sup> 4500-NH <sub>3</sub> H <sup>6</sup>
Organic nitrogen	00605	00607	E	
Total nitrogen	00600	00601	E	
pH (Lab)	00403	00403	E	9040
pH (Field)	00400	00400	A,B	
Potassium	00937	00935	E	258.1 <sup>5</sup> 200.7 <sup>5</sup> 3111 B <sup>6</sup> 3120 B <sup>6</sup> 3500-KD <sup>6</sup>
Selenium	01147	01145	B,C,D	6010, 7740, 7741
Silver	01077	01075	C,D	6010, 7760*, 7761
Sodium	00929	00930	B	7770
Solids, Total Dissolved	00247	00360	A,B,C	
Specific Conductance (Lab)	00095	00095	E	9050
Specific Conductance (Field)	00094	00094	A,B	9050
Sulfate	00945	00946	B,C	9035
Sulfide	00745	00746	E	9030

Parameter	Parameter Number <sup>2</sup> (Total or unfiltered)	Parameter Number <sup>2</sup> (Dissolved or Filtered)	Regulatory Category <sup>4</sup>	Analytical methods <sup>3,5,6</sup>
Temperature (Field)	00010	00010	A,B	170.1 <sup>5</sup> 2550 B <sup>6</sup>
Thallium	01059	01057	D	6010, 7840, 7841
Tin	01102	01100	E	6010, 7870
Vanadium	01087	01085	D	6010, 7910, 7911
Zinc	01092	01090	C,D	6010, 7950 7951

1 This list includes all the metals and inorganic indicator parameters required for groundwater monitoring as part of the Wisconsin Solid Waste Program. Some solid waste facilities may require monitoring under other regulatory programs. Refer to tables in the text for the specific parameter categories required.

2 Parameter Number refers to the Wisconsin identification number and the EPA Storet number for each parameter. The parameter code number refers to a specific parameter, the medium of concentration, and the units of concentration.

3 For Analytical Methods, refer to the analytical procedure numbers used in EPA Report SW-846 "Test Methods for Evaluating Solid Waste," third edition, Final Update 2B, January 1995. Refer to Table 2-36 for the "Required Containers, Preservation Techniques, and Holding Times for Aqueous Matrices."

**Note:** Analytical details can be found in SW-846 and in documentation on file with EPA. CAUTION: The methods listed are representative SW-846 procedures and may not always be the most suitable methods for monitoring an analyte under the regulations. The publication SW-846 may be obtained from:

National Technical Information Service  
5285 Port Royal Road  
Springfield, VA 22161  
(703) 487-4650.

**Note:** Copies of the test procedures are available for inspection at the offices of the department of natural resources, the secretary of state and the revisor of statutes.

4 Regulatory categories:

- A. Municipal Solid Waste Detection Monitoring Parameter (see Appendix I, Tables 1, 4, and 5 c. NR 507 Wis. Adm. Code)
- B. Special Waste Detection Monitoring Parameter (see Appendix I, Tables 2, 4, and 5, c. NR 507 Wis. Adm. Code)
- C. Public Health and Welfare Parameter for Background Water Quality Monitoring (see Appendix I, Table 3, c. NR 507 Wis. Adm. Code)
- D. EPA Subtitle D Metal for Background and Detection Monitoring (40 CFR Part 258 Appendix I)
- E. Site Specific Monitoring Parameter

5 "Methods for Chemical Analysis of Water and Waste", EPA-600/4-79-020 United States Environmental Protection Agency, Revised March 1983 and 1979 where applicable. Available from National Technical Information Service, 5285 Port Royal Road, Springfield, Virginia 22161.

**Note:** Copies of the test procedures are available for inspection at the offices of the department of natural resources, the secretary of state and the revisor of statutes.

6 "Standard Methods for the Examination of Water and Wastewater", Joint Editorial Board, American Public Health Association, American Water Works Association, and Water Pollution Control Federation, 17th Edition, 1989. Available from American Public Health Association, 1015 15th Street NW, Washington D.C. 20005.

**Note:** Copies of the test procedures are available for inspection at the offices of the department of natural resources, the secretary of state and the revisor of statutes.

\* This method incorporates outdated analytical technology and is scheduled to be removed from EPA approved lists.

**Appendix V Form A - GROUNDWATER MONITORING WELL INFORMATION FORM**

State of Wisconsin  
Department of Natural Resources

GROUNDWATER MONITORING WELL INFORMATION FORM  
Chapter 144, Wis. Stats.  
Form 4400-89  
Rev. 1-90

Facility Name _____		Facility ID Number _____				Date _____		Completed By (Name and Firm) _____											
Well Name	DNR Well ID Number	Well Location	N	S	E	W	Well Casings		Elevations		Reference		Well Depth	Type of Well (✓)			Gradient U, S, D or N		
							Diam.	Type	Top of Well Casings	Ground Surface	MSL	Site Datum		Screen Length	Other	Abandoned		Ent. State Apply	
Location Coordinates Are:												Remarks:							
<input type="checkbox"/> Local Grid System (preferred) <input type="checkbox"/> State Plane Coordinate <input type="checkbox"/> Northern <input type="checkbox"/> Central												File Maint. Completed: _____ Other: _____							

**Form B - MONITORING WELL CONSTRUCTION FORM**

State of Wisconsin Route to: Solid Waste  Haz. Waste  Wastewater  MONITORING WELL CONSTRUCTION  
 Department of Natural Resources Env. Response & Repair  Underground Tanks  Other  Form 4400-113A Rev. 4-90

Facility/Project Name	Local Grid Location of Well <input type="checkbox"/> N. <input type="checkbox"/> E. ft. <input type="checkbox"/> S. <input type="checkbox"/> W.	Well Name
Facility License, Permit or Monitoring Number	Grid Origin Location Lat. _____ Long. _____ or St. Plane _____ ft. N, _____ ft. E.	Wis. Unique Well Number _____ DNR Well Number _____
Type of Well: Water Table Observation Well <input type="checkbox"/> 11 Piezometer <input type="checkbox"/> 12	Section Location of Waste/Source _____ of _____ of Sec. _____ T _____ N,R <input type="checkbox"/> E. <input type="checkbox"/> W.	Date Well Installed ____ / ____ / ____ M M D D Y Y
Distance Well is From Waste/Source Boundary ft. _____	Location of Well Relative to Waste/Source U <input type="checkbox"/> Upgradient S <input type="checkbox"/> Sidegradient D <input type="checkbox"/> Downgradient N <input type="checkbox"/> Not Known	Well Installed By: (Persons' Name and Firm) _____ _____
Is Well A Point of Enforcement Std. Application? <input type="checkbox"/> Yes <input type="checkbox"/> No		

- A. Protective pipe, top elevation \_\_\_\_\_ ft. MSL
- B. Well casing, top elevation \_\_\_\_\_ ft. MSL
- C. Land surface elevation \_\_\_\_\_ ft. MSL
- D. Surface seal, bottom \_\_\_\_\_ ft. MSL or \_\_\_\_\_ ft.

12. USCS classification of soil near screen:  
 GP  GM  GC  GW  SW  SP   
 SM  SC  ML  MH  CL  CH   
 Bedrock \_\_\_\_\_

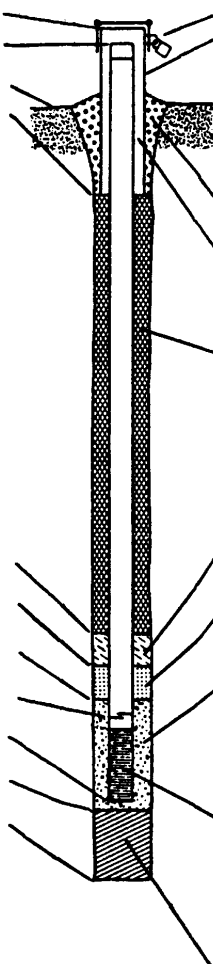
13. Sieve analysis attached?  Yes  No

14. Drilling method used: Rotary  50  
 Hollow Stem Auger  41  
 Other  \_\_\_\_\_

15. Drilling fluid used: Water  02 Air  01  
 Drilling Mud  03 None  99

16. Drilling additives used?  Yes  No  
 Describe \_\_\_\_\_

17. Source of water (attach analysis):  
 \_\_\_\_\_



- 1. Cap and lock?  Yes  No
- 2. Protective cover pipe:  
 a. Inside diameter: \_\_\_\_\_ in.  
 b. Length: \_\_\_\_\_ ft.  
 c. Material: Steel  04  
 Other  \_\_\_\_\_  
 d. Additional protection?  Yes  No  
 If yes, describe: \_\_\_\_\_
- 3. Surface seal: Bentonite  30  
 Concrete  01  
 Other  \_\_\_\_\_
- 4. Material between well casing and protective pipe:  
 Bentonite  30  
 Annular space seal  \_\_\_\_\_  
 Other  \_\_\_\_\_
- 5. Annular space seal:  
 a. Granular Bentonite  33  
 b. \_\_\_\_\_ Lbs/gal mud weight... Bentonite-sand slurry  35  
 c. \_\_\_\_\_ Lbs/gal mud weight... Bentonite slurry  31  
 d. \_\_\_\_\_ % Bentonite... Bentonite-cement grout  50  
 e. \_\_\_\_\_ Ft<sup>3</sup> volume added for any of the above  
 f. How installed: Tremie  01  
 Tremie pumped  02  
 Gravity  08
- 6. Bentonite seal:  
 a. Bentonite granules  33  
 b.  1/4 in.  3/8 in.  1/2 in. Bentonite pellets  32  
 c. \_\_\_\_\_ Other  \_\_\_\_\_
- 7. Fine sand material: Manufacturer, product name, mesh size  
 a. \_\_\_\_\_  
 b. Volume added \_\_\_\_\_ ft<sup>3</sup>
- 8. Filter pack material: Manufacturer, product, mesh size  
 a. \_\_\_\_\_  
 b. Volume added \_\_\_\_\_ ft<sup>3</sup>
- 9. Well casing: Flush threaded PVC schedule 40  23  
 Flush threaded PVC schedule 80  24  
 Other  \_\_\_\_\_
- 10. Screen Material:  
 a. Screen type: Factory cut  11  
 Continuous slot  01  
 Other  \_\_\_\_\_  
 b. Manufacturer \_\_\_\_\_  
 c. Slot size: \_\_\_\_\_ in.  
 d. Slotted length: \_\_\_\_\_ in.
- 11. Backfill material (below filter pack): None  14  
 Other  \_\_\_\_\_

- E. Bentonite seal, top \_\_\_\_\_ ft. MSL or \_\_\_\_\_ ft.
- F. Fine sand, top \_\_\_\_\_ ft. MSL or \_\_\_\_\_ ft.
- G. Filter pack, top \_\_\_\_\_ ft. MSL or \_\_\_\_\_ ft.
- H. Screen joint, top \_\_\_\_\_ ft. MSL or \_\_\_\_\_ ft.
- I. Well bottom \_\_\_\_\_ ft. MSL or \_\_\_\_\_ ft.
- J. Filter pack, bottom \_\_\_\_\_ ft. MSL or \_\_\_\_\_ ft.
- K. Borehole, bottom \_\_\_\_\_ ft. MSL or \_\_\_\_\_ ft.
- L. Borehole, diameter \_\_\_\_\_ in.
- M. O.D. well casing \_\_\_\_\_ in.
- N. I.D. well casing \_\_\_\_\_ in.

I hereby certify that the information on this form is true and correct to the best of my knowledge.

Signature \_\_\_\_\_ Firm \_\_\_\_\_

**Form C - MONITORING WELL DEVELOPMENT FORM**

State of Wisconsin  
Department of Natural Resources

**MONITORING WELL DEVELOPMENT**  
Form 4400-113B Rev. 4-90

Route to: Solid Waste  Haz. Waste  Wastewater   
Env. Response & Repair  Underground Tanks  Other  \_\_\_\_\_

Facility/Project Name		County Name		Well Name	
Facility License, Permit or Monitoring Number		County Code		Wis. Unique Well Number	
				DNR Well Number	
1. Can this well be purged dry? <input type="checkbox"/> Yes <input type="checkbox"/> No				<b>Before Development</b> <b>After Development</b>	
2. Well development method				11. Depth to Water	
surged with bailer and bailed <input type="checkbox"/> 41				a. _____ ft.	
surged with bailer and pumped <input type="checkbox"/> 61					
surged with block and bailed <input type="checkbox"/> 42				Date      b. ____/____/____	
surged with block and pumped <input type="checkbox"/> 62				mm dd yy	
surged with block, bailed and pumped <input type="checkbox"/> 70				Time      c. ____:____ <input type="checkbox"/> a.m. <input type="checkbox"/> p.m.	
compressed air <input type="checkbox"/> 20				mm dd yy	
bailed only <input type="checkbox"/> 10				____:____ <input type="checkbox"/> a.m. <input type="checkbox"/> p.m.	
pumped only <input type="checkbox"/> 51				12. Sediments in well bottom _____ inches	
pumped slowly <input type="checkbox"/> 50				_____ inches	
other <input type="checkbox"/> _____				13. Water clarity    Clear <input type="checkbox"/> 10    Clear <input type="checkbox"/> 20	
3. Time spent developing well _____ min.				Turbid <input type="checkbox"/> 15    Turbid <input type="checkbox"/> 25	
4. Depth of well (from top of well casing) _____ ft.				(Describe)	
5. Inside diameter of well _____ in.				_____	
6. Volume of water in filter pack and well casing _____ gal.				_____	
7. Volume of water removed from well _____ gal.				_____	
8. Volume of water added (if any) _____ gal.				_____	
9. Source of water added: _____				Fill in if drilling fluids were used and well is at solid waste facility:	
10. Analysis performed on water added? <input type="checkbox"/> Yes <input type="checkbox"/> No				14. Total suspended solids _____ mg/l	
(If yes, attach results)				_____ mg/l	
16. Additional comments on development:				15. COD _____ mg/l	
				_____ mg/l	

Well developed by: Person's Name and Firm	I hereby certify that the above information is true and correct to the best of my knowledge.
	Signature: _____
	Print Initials: _____
	Firm: _____
Name:	
Firm:	

NOTE: Shaded areas are for DNR use only. See instructions for more information including a list of county codes.

**Form D - WELL/DRILLHOLE/BOREHOLE ABANDONMENT FORM**

State of Wisconsin  
Department of Natural Resources

**WELL/DRILLHOLE/BOREHOLE ABANDONMENT**  
Form 3300-5B Rev. 12-91

All abandonment work shall be performed in accordance with the provisions of Chapters NR 811, NR 812 or NR 141, Wis. Admin. Code, whichever is applicable. Also, see instructions on back.

(1) GENERAL INFORMATION		(2) FACILITY NAME	
Well/Drillhole/Borehole Location	County	Original Well Owner (If Known)	
1/4 of 1/4 of Sec. ; T. N; R. <input type="checkbox"/> E <input type="checkbox"/> W		Present Well Owner	
(if applicable) Gov't Lot	Grid Number	Street or Route	
Grid Location ft. <input type="checkbox"/> N. <input type="checkbox"/> S., ft <input type="checkbox"/> E. <input type="checkbox"/> W.		City, State, Zip Code	
Civil Town Name		Facility Well No. and/or Name (If Applicable)	WI Unique Well No.
Street Address of Well		Reason For Abandonment	
City, Village		Date of Abandonment	

**WELL/DRILLHOLE/BOREHOLE INFORMATION**

(3) Original Well/Drillhole/Borehole Construction Completed On  (Date)  <input type="checkbox"/> Monitoring Well <input type="checkbox"/> Water Well <input type="checkbox"/> Drillhole <input type="checkbox"/> Borehole  Construction Report Available? <input type="checkbox"/> Yes <input type="checkbox"/> No  Construction Type: <input type="checkbox"/> Drilled <input type="checkbox"/> Driven (Sandpoint) <input type="checkbox"/> Dug <input type="checkbox"/> Other (Specify)  Formation Type: <input type="checkbox"/> Unconsolidated Formation <input type="checkbox"/> Bedrock  Total Well Depth (ft.) Casing Diameter (ins.) (From ground surface)  Casing Depth (ft.)  Was Well Annular Space Grouted? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown If Yes, To What Depth? Feet		(4) Depth to Water (Feet)  Pump & Piping Removed? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not Applicable Liner(s) Removed? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not Applicable Screen Removed? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not Applicable Casing Left in Place? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not Applicable If No, Explain  Was Casing Cut Off Below Surface? <input type="checkbox"/> Yes <input type="checkbox"/> No Did Sealing Material Rise to Surface? <input type="checkbox"/> Yes <input type="checkbox"/> No Did Material Settle After 24 Hours? <input type="checkbox"/> Yes <input type="checkbox"/> No If Yes, Was Hole Retopped? <input type="checkbox"/> Yes <input type="checkbox"/> No	
		(5) Required Method of Placing Sealing Material <input type="checkbox"/> Conductor Pipe-Gravity <input type="checkbox"/> Conductor Pipe-Pumped <input type="checkbox"/> Dump Bailer <input type="checkbox"/> Other (Explain)	
		(6) Sealing Materials <input type="checkbox"/> Neat Cement Grout <input type="checkbox"/> Sand-Cement (Concrete) Grout <input type="checkbox"/> Concrete <input type="checkbox"/> Clay-Sand Slurry <input type="checkbox"/> Bentonite-Sand Slurry <input type="checkbox"/> Chipped Bentonite For monitoring wells and monitoring well boreholes only <input type="checkbox"/> Bentonite Pellets <input type="checkbox"/> Granular Bentonite <input type="checkbox"/> Bentonite-Cement Grout	

(7) Sealing Material Used	From (Ft.)	To (Ft.)	No. Yards, Sacks Sealant or Volume	(Circle One)	Mix Ratio or Mud Weight
Surface					

(8) Comments:

(9) Name of Person or Firm Doing Sealing Work	
Signature of Person Doing Work	Date Signed
Street or Route	Telephone Number
City, State, Zip Code	

**Form D - WELL/DRILLHOLE/BOREHOLE ABANDONMENT FORM**

State of Wisconsin  
Department of Natural Resources

**WELL/DRILLHOLE/BOREHOLE ABANDONMENT**  
Form 3300-5B Rev. 12-91

All abandonment work shall be performed in accordance with the provisions of Chapters NR 811, NR 812 or NR 141, Wis. Admin. Code, whichever is applicable. Also, see instructions on back.

(1) GENERAL INFORMATION		(2) FACILITY NAME	
Well/Drillhole/Borehole Location	County	Original Well Owner (If Known)	
1/4 of 1/4 of Sec. ; T. N; R. <input type="checkbox"/> E <input type="checkbox"/> W		Present Well Owner	
(if applicable) Gov't Lot	Grid Number	Street or Route	
Grid Location ft. <input type="checkbox"/> N. <input type="checkbox"/> S., ft <input type="checkbox"/> E. <input type="checkbox"/> W.		City, State, Zip Code	
Civil Town Name		Facility Well No. and/or Name (If Applicable)	WI Unique Well No.
Street Address of Well		Reason For Abandonment	
City, Village		Date of Abandonment	

**WELL/DRILLHOLE/BOREHOLE INFORMATION**

(3) Original Well/Drillhole/Borehole Construction Completed On  (Date)  <input type="checkbox"/> Monitoring Well <input type="checkbox"/> Water Well <input type="checkbox"/> Drillhole <input type="checkbox"/> Borehole  Construction Report Available? <input type="checkbox"/> Yes <input type="checkbox"/> No  Construction Type: <input type="checkbox"/> Drilled <input type="checkbox"/> Driven (Sandpoint) <input type="checkbox"/> Dug <input type="checkbox"/> Other (Specify)  Formation Type: <input type="checkbox"/> Unconsolidated Formation <input type="checkbox"/> Bedrock  Total Well Depth (ft.) Casing Diameter (ins.) (From ground surface)  Casing Depth (ft.)  Was Well Annular Space Grouted? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown If Yes, To What Depth? Feet		(4) Depth to Water (Feet)  Pump & Piping Removed? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not Applicable Liner(s) Removed? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not Applicable Screen Removed? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not Applicable Casing Left in Place? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not Applicable If No, Explain  Was Casing Cut Off Below Surface? <input type="checkbox"/> Yes <input type="checkbox"/> No Did Sealing Material Rise to Surface? <input type="checkbox"/> Yes <input type="checkbox"/> No Did Material Settle After 24 Hours? <input type="checkbox"/> Yes <input type="checkbox"/> No If Yes, Was Hole Retopped? <input type="checkbox"/> Yes <input type="checkbox"/> No	
		(5) Required Method of Placing Sealing Material <input type="checkbox"/> Conductor Pipe-Gravity <input type="checkbox"/> Conductor Pipe-Pumped <input type="checkbox"/> Dump Bailer <input type="checkbox"/> Other (Explain)	
		(6) Sealing Materials <input type="checkbox"/> Neat Cement Grout <input type="checkbox"/> Sand-Cement (Concrete) Grout <input type="checkbox"/> Concrete <input type="checkbox"/> Clay-Sand Slurry <input type="checkbox"/> Bentonite-Sand Slurry <input type="checkbox"/> Chipped Bentonite For monitoring wells and monitoring well boreholes only <input type="checkbox"/> Bentonite Pellets <input type="checkbox"/> Granular Bentonite <input type="checkbox"/> Bentonite-Cement Grout	

(7) Sealing Material Used	From (Ft.)	To (Ft.)	No. Yards, Sacks Sealant or Volume	(Circle One)	Mix Ratio or Mud Weight
	Surface				

(8) Comments:

(9) Name of Person or Firm Doing Sealing Work	
Signature of Person Doing Work	Date Signed
Street or Route	Telephone Number
City, State, Zip Code	

**Form E - SOIL BORING LOG INFORMATION FORM**

State of Wisconsin  
Department of Natural Resources

Route To:  
 Solid Waste       Haz. Waste  
 Emergency Response       Underground Tanks  
 Wastewater       Water Resources  
 Superfund       Other \_\_\_\_\_

**SOIL BORING LOG INFORMATION**  
Form 4400-122      Rev. 5-92

Page \_\_\_\_\_ of \_\_\_\_\_

Facility/Project Name \_\_\_\_\_ License/Permit/Monitoring Number \_\_\_\_\_ Boring Number \_\_\_\_\_

Boring Drilled By (Firm name and name of crew chief) \_\_\_\_\_ Date Drilling Started MM/DD/YY Date Drilling Completed MM/DD/YY Drilling Method \_\_\_\_\_

DNR Facility Well No. \_\_\_\_\_ WI Unique Well No. \_\_\_\_\_ Common Well Name \_\_\_\_\_ Final Static Water Level \_\_\_\_\_ Feet MSL Surface Elevation \_\_\_\_\_ Feet MSL Borehole Diameter \_\_\_\_\_ inches

Boring Location State Plane \_\_\_\_\_ N, \_\_\_\_\_ E S/C/N Lat \_\_\_\_\_ Local Grid Location (if applicable) \_\_\_\_\_ Feet  N  E \_\_\_\_\_ Feet  S \_\_\_\_\_ Feet  W

1/4 of \_\_\_\_\_ 1/4 of Section \_\_\_\_\_, T \_\_\_\_\_ N, R \_\_\_\_\_ E/W Long \_\_\_\_\_ DNR Country Code \_\_\_\_\_ Civil Town/City/ or Village \_\_\_\_\_

Sample Number and Type	Length Att. & Recovered (in)	Blow Counts	Depth in Feet	Soil/Rock Description And Geologic Origin For Each Major Unit	USCS	Graphic Log	Well Diagram	PID/FID	Soil Properties					P 200	RDY Comments
									Compressive Strength	Moisture Content	Liquid Limit	Plasticity Index			

I hereby certify that the information on this form is true and correct to the best of my knowledge.  
 Signature \_\_\_\_\_ Firm \_\_\_\_\_

This form is authorized by Chapters 144.147 and 162, Wis. Stats. Completion of this report is mandatory. Penalties: Forfeit not less than \$10 nor more than \$5,000 for each violation. Fined not less than \$10 or more than \$100 or imprisoned not less than 30 days, or both for each violation. Each day of continued violation is a separate offense, pursuant to ss 144.99 and 162.06, Wis. Stats.



**Form F - GROUNDWATER MONITORING INVENTORY FORM**

Department of Natural Resources

**GROUNDWATER MONITORING INVENTORY FORM**  
Form 3300-67 Rev. 8-93

Wisconsin Unique Well Number <input type="text"/>	<input type="checkbox"/> Add	<input type="checkbox"/> Change	
Inventory Completed By (Last Name, First, MI) _____	Date _____	With <input type="checkbox"/> DNR	<input type="checkbox"/> _____
	m m / d d / y y y y		

Facility Name _____	Facility ID # _____	Local Well ID _____
	High Cap Well # _____	

Primary Contact Name (Last, First, MI) _____	<input type="checkbox"/> Owner <input type="checkbox"/> Driller <input type="checkbox"/> Operator <input type="checkbox"/> Business <input type="checkbox"/> Occupant <input type="checkbox"/> Facility <input type="checkbox"/> Consultant <input type="checkbox"/> Sampler <input type="checkbox"/> Manager <input type="checkbox"/> Other <input type="checkbox"/> Contractor
Telephone Number _____	
Mailing Address _____	
City _____ State _____ Zip Code _____	
Other Contact Name (Last, First, MI) _____	<input type="checkbox"/> Owner <input type="checkbox"/> Driller <input type="checkbox"/> Operator <input type="checkbox"/> Business <input type="checkbox"/> Occupant <input type="checkbox"/> Facility <input type="checkbox"/> Consultant <input type="checkbox"/> Sampler <input type="checkbox"/> Manager <input type="checkbox"/> Other <input type="checkbox"/> Contractor
Telephone Number _____	
Mailing Address _____	
City _____ State _____ Zip Code _____	

<b>Well Location</b>			(X) 1/4 1/4 Sec.  <div style="text-align: center;">                     Location  </div>
<input type="checkbox"/> Town <input type="checkbox"/> City <input type="checkbox"/> Village	Fire # (If avail.) _____	County _____	
Grid or Street Address or Road (If avail.) _____		Govt. Lot # _____	
		OR 1/4 of _____ 1/4 of Section _____	
Subdivision Name _____	Lot _____	Block _____	
Construction Type <input type="checkbox"/> Drilled <input type="checkbox"/> Dug <input type="checkbox"/> Driven Point <input type="checkbox"/> Spring <input type="checkbox"/> Jetted <input type="checkbox"/> Other		OR Latitude _____ Deg.    Min.    Sec. Longitude _____ Land Surface Elevation _____ ft. MSL	
		Number of Wells on Property _____	

Construction Date _____	Well Use <input type="checkbox"/> Private Potable <input type="checkbox"/> Priv. Non-Potable <input type="checkbox"/> Monitoring Well	<input type="checkbox"/> Community-Municipal <input type="checkbox"/> Community OTM <input type="checkbox"/> Non Transient Non-Com. <input type="checkbox"/> Transient Non-Com.
Constructor _____		
Source of Well Data <input type="checkbox"/> Well Report <input type="checkbox"/> Owner/Occupant <input type="checkbox"/> Other*		
Depth From Land Surface To: Bedrock _____ ft.	Casing Diameter _____ in.	Water Bearing Formation <input type="checkbox"/> Sandstone <input type="checkbox"/> Unconsolidated <input type="checkbox"/> Shale <input type="checkbox"/> Limestone <input type="checkbox"/> Crystalline
Well Bottom _____ ft.		Well Status <input type="checkbox"/> Active Use  <input type="checkbox"/> Inactive  <input type="checkbox"/> Perm Filled
Static Water _____ ft.		
Casing Bottom _____ ft.		

Comments: eg. Reason for inventory, Samples taken, Directions to property, Details of well location on property.

\*For "Other", enter a description in the comment area if needed.