

Chapter NR 514

PLAN OF OPERATION AND CLOSURE PLANS FOR LANDFILLS

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

NR 514.01 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 and to outline the requirements for preparation of plans of operation and closure plans for landfills. This chapter is adopted under s. 227.11, Stats., and ch. 289, Stats.

History: Cr. Register, January, 1988, No. 385, eff. 2-6-88; am. Register, June, 1996, No. 486, eff. 7-1-96.

NR 514.02 Applicability. (1) Except as otherwise provided, this chapter governs all landfills as defined in s. 289.01 (20), Stats., except small construction and demolition waste landfills regulated under ch. NR 503, hazardous waste facilities as defined in s. 291.01 (8), Stats., and regulated under chs. NR 660 to 679, 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.

History: Cr. Register, January, 1988, No. 385, eff. 2-6-88; correction in (1) made under s. 13.93 (2m) (b) 7., Stats., Register, May, 1994, No. 461; am. (1), Register, June, 1996, No. 486, eff. 7-1-96; **correction in (1) made under s. 13.93 (2m) (b) 7., Stats.**

NR 514.03 Definitions. The terms used in this chapter are defined in s. NR 500.03.

History: Cr. Register, January, 1988, No. 385, eff. 2-6-88.

NR 514.04 Procedural requirements. (1) GENERAL. No person may establish or construct a landfill or expand a landfill until a plan of operation has been submitted in accordance with s. NR 500.05 and this chapter and has been approved in writing by the department. No person may establish, construct or close an approved landfill except in accordance with this chapter, s. NR 506.08 and with the approved plan of operation. No person may submit a plan of operation for a new or expanded landfill prior to the submittal of a feasibility report by that person.

(2) DATA PRESENTATION. All plans of operation for landfills shall contain the complete plans and specifications necessary for construction, operation, monitoring, closing and long-term care. These documents shall be used for the day-to-day construction, operation and closure of the landfill and shall be presented in a manner that is clear and understandable.

(3) NONCOMPLIANCE WITH PLANS OR ORDERS. The plan of operation shall identify all person owning a 10% or greater legal or equitable interest in the applicant or in the assets of the applicant, including shareholders of a corporation which is an applicant and partners of a partnership which is an applicant. The plan of operation shall also identify all other Wisconsin solid or hazardous waste facilities for which the applicant or any identified per-

son is named in, or subject to an order or plan approval issued by the department. In addition, the feasibility report shall identify all other Wisconsin solid or hazardous waste facilities which are owned by persons, including corporations and partnerships, in which the applicant or any identified person owns or previously owned a 10% or greater legal or equitable interest or a 10% or greater interest in the assets and include a statement indicating whether or not all plan approvals and orders relating to all identified facilities are being complied with.

Note: If noncompliance with an order or plan approval occurs while the applicant has or had a 10% or greater legal or equitable interest in the facility and is continuing, the department is prohibited from licensing the new or expanded solid waste disposal facility, unless the applicant provides proof of financial responsibility under s. 289.34 (3), Stats., to assure that compliance is achieved.

(4) COMPLETENESS. Within 30 days after a plan of operation is submitted or, if the plan of operation is submitted with the feasibility report, within 30 days after the department issues notice that the feasibility report is complete, the department shall provide written notification to the applicant and any other person who has filed a written request whether or not the plan of operation is complete. If the submittal is deemed incomplete, the department will specify the information which shall be submitted before the plan may be deemed complete. The department will determine if the plan of operation is complete by determining whether or not the minimum requirements of this chapter and the conditions of any feasibility approval have been met. The department may require the applicant to submit additional information after determining that the plan of operation is complete if the department establishes that the plan of operation is insufficient without the additional information.

(5) REVIEW TIMES. The department may not approve or disapprove a plan of operation until after the applicant obtains a favorable determination of feasibility for the landfill. The department shall either approve or disapprove the plan in writing within 90 days after submission of a complete plan of operation or within 60 days after a favorable determination of feasibility, whichever is later.

(6) PLAN APPROVAL MODIFICATIONS. Except as provided under s. NR 514.09, proposed changes to the approved plan shall be submitted to and approved by the department prior to implementation.

History: Cr. Register, January, 1988, No. 385, eff. 2-6-88; am. Register, June, 1996, No. 486, eff. 7-1-96; renum. (3) to (5) to be (4) to (6), cr. (3), Register, September, 1998, No. 513, eff. 10-1-98.

NR 514.05 Engineering plans. The plan of operation for all new landfills and expansions of existing landfills shall contain a set of engineering plans which are drawn in accordance with ss. NR 500.05 and 504.07 to 504.11, and the following requirements. Engineering plans shall be drawn on standard 24 inch by 36 inch plan sheets. If facility details cannot be shown on standard plan sheets at a 1:100 scale, the engineering plans may be drawn on 30 inch by 42 inch plan sheets. All plan sheets except the title sheet, existing conditions sheet, cross-sections and details sheets shall utilize the existing conditions sheet as a base map. For complex plans, existing conditions within the landfill area may be shown by lighter lines or may be eliminated.

(1) **TITLE SHEET.** A title sheet shall be included indicating the project title, who prepared the plans, the date the plans were prepared, the applicant for whom the plans were prepared, a table of contents, a map showing the location of the facility within the county or multicounty area, the location of the county or multicounty area within the state and the area to be served.

(2) **EXISTING CONDITIONS.** An existing conditions plan shall be included consisting of a detailed topographic map of the proposed facility landfill and all areas within 1,500 feet of the proposed limits of filling prior to development. The minimum scale shall be 1" = 200 feet with a maximum 2 foot contour interval. The contour interval selected shall be sufficiently small to clearly show surface water flow patterns within and around the landfill. All elevations shall be related to USGS datum. The plan shall identify and define the following:

(a) Surface waters including intermittent and ephemeral streams and wetlands.

(b) Property boundaries, the proposed landfill boundary, and the proposed limits of filling.

(c) A north arrow, landfill survey grid, a formula for converting grid locations to the state plane coordinate system, and the locations of all existing and proposed survey monuments.

(d) Residential and commercial structures and other buildings.

(e) Locations of all soil borings, all existing and abandoned groundwater monitoring wells, and all public and private water supply wells, and the general locations of all known septic system drain fields within 1,000 feet of the landfill area or within 500 feet of any monitoring well.

(f) The locations of all other landfills, demolition landfills and all other solid waste facilities for the processing, storage or composting of solid wastes.

(g) Utility lines, underground pipelines and electrical lines, access control and other constructed topographic and drainage features.

(3) **SUB-BASE GRADES AND BASE GRADES.** Plan sheets shall be included which depict the sub-base grades, all sub-base appurtenances such as lysimeters or drain pipes, and the base grades.

(4) **ENGINEERING DESIGN FEATURES.** Separate plan sheets shall be included to depict the overall landfill area and the limits of liner construction and filling. The plan sheets shall depict the layout and slope of the liner system and leachate collection system including pipes, sumps, riser pipes on interior sideslopes, manholes, trenches, berms, lift stations, permanent storm water control structures, pipe cleanouts and other pertinent structures. Invert elevations shall be provided at any changes in grade for all leachate and groundwater collection and transfer systems.

(5) **PHASING.** A series of phasing plan sheets shall be included to show landfill development through time. The location of peripheral features such as support buildings, access roads, drainage ditches, sedimentation basins, any other storm water management features and screening berms shall be indicated on this plan. At a minimum, a separate plan sheet shall be provided for initial construction and for each subsequent phase of development or new area where substantial construction is to be performed. These subsequent phasing plan sheets shall present the final filling surfaces in the previous phases of development; the limits of clearing, grubbing and topsoil removal; the base grades of the new phase of filling; the anticipated surface contours of soil stockpiles at the time depicted on the plan sheet; and storm water management features. Each plan shall include a list of construction items and quantities necessary to prepare the phase of development indicated on the plan.

(6) **STORM WATER MANAGEMENT.** Plan sheets shall be included which depict the features to be constructed for storm water management at the time of initial construction, during phased development, and after closure of the landfill. Plan sheets shall include the

locations of sediment basins, drainage ditches, auxiliary sediment traps, and the anticipated extent of cleared ground and stockpiles during each major phase of landfill development. Plan sheets shall include a list of anticipated actions and materials needed for sediment and erosion control.

(7) **WASTE FINAL GRADES AND FINAL TOPOGRAPHY.** A final waste grades plan sheet shall be included to indicate waste final grades, including daily and intermediate cover. A final topography plan sheet shall be included to indicate the appearance of the entire facility following closure including storm water drainage features and the location of gas extraction wells and all other penetrations of the final cover.

(8) **MONITORING.** A facility monitoring plan shall be included to show the location of the design management zone as determined under s. NR 140.22 and all devices for the monitoring of leachate quality and quantity, unsaturated zone water quality and flow rate, groundwater quality, storm water quality, gas production, gas migration, gas condensate and surface settlement.

(9) **LONG-TERM CARE.** A long-term care plan sheet shall be included showing the topography of the landfill following closure. This plan sheet shall list those items anticipated to be performed during the period of long-term care including the proposed schedule for monitoring and maintenance of the landfill. This information may be included on the final topography plan sheet if clarity is not compromised or reference may be made to the appropriate section of the operations manual and design report.

(10) **CROSS-SECTIONS AND DETAILED PLAN REVIEW SHEETS.** (a) A minimum of 2 cross-sections in each direction shall be drawn perpendicular and parallel to the facility baseline through the major dimensions of the landfill. The location of the cross-sections shall be illustrated by a reduced scale plan view on each cross-section. Each combined engineering and geologic cross-section shall show:

1. Existing grades.
2. Sub-base, base, top of leachate collection blanket grades and final grades.
3. Soil borings and monitoring wells which the section passes through or is adjacent to.
4. Soil and bedrock types. For clarity, a number or symbol shall be used to label major soil units instead of extensive shading.
5. Stabilized water table contours.
6. Leachate collection and monitoring systems.
7. Gas venting or extraction and monitoring systems.
8. Limits of refuse filling.
9. Erosion, storm water and sediment control structures.
10. Access roads and ramps on the perimeter of the disposal area and within the active fill area.
11. The filling sequence or phasing interfaces and other facility features.

(b) Cross-sections shall be included to illustrate all important construction features of the liner, final cover, lysimeters, leachate collection trenches and sumps, liner penetrations, sideslope risers, piping systems for gas and gas condensate and drainage systems for storm water.

(c) Detailed plan view sheets shall be included for piping outside the limits of filling for leachate header and drain lines, gas and condensate lines, and leachate forcemains, with notations of pipe slope and intersection elevations with appurtenances such as manholes, lift stations, collection tanks and gas blower stations.

(11) **DETAILS.** Drawings showing details and typical sections shall be included for storm water control structures; access roads; fencing; final cover and base liner systems; leachate and gas control systems such as pipe bedding, manholes, transfer lines, force mains and storage tanks; leachate transfer lines which extend through the liner; groundwater and unsaturated zone monitoring

devices; and buildings. This plan sheet shall include all other construction details such as leachate and refuse containment berms between subsequent phases of development.

History: Cr. Register, January, 1988, No. 385, eff. 2-6-88; correction in (2) (k) made under s. 13.93 (2m) (b) 5., Stats., Register, May, 1994, No. 461; am. (intro.), (2) (intro.), (b), (5), (9), (11), r. and recr. (2) (c) to (k), (3), (4), (6) to (8), Register, June, 1996, No. 486, eff. 7-1-96; **CR 05-020: am. (7) Register January 2006 No. 601, eff. 2-1-06.**

NR 514.06 Operations manual and design report.

The plan of operation for all new landfills and expansions of existing landfills shall contain an operations manual and design report which shall comply with ss. NR 500.05, 504.05 to 504.11 and, at a minimum, shall contain the following information:

(1) **TABLE OF CONTENTS.** The report shall include a table of contents which outlines by section title and page number the discussion required in this section.

(2) **GENERAL INFORMATION.** The report shall identify the name of the landfill; the registered professional engineer who prepared the plans; landfill owner, licensee and operator; location by quarter-quarter section; the proposed limits of filling; the anticipated life and closure date; disposal capacity; waste tonnages and corresponding volumes, percent municipal waste versus industrial waste, anticipated geographic service area, and anticipated industrial waste types; waste types and quantities to be disposed; any exemptions requested from the department; and a list of the conditions of facility development as stated in the feasibility determination and the measures incorporated in the plan of operation to address those conditions.

(3) **DESIGN RATIONALE.** The report shall include a discussion of the considerations and rationale behind design of the discretionary aspects of major engineering features which are not explicitly required by state or federal regulations or the conditions of the department's feasibility approval for the landfill. This shall include base grade configuration and relationship to subsurface conditions, liner design, phases of landfill development and closure, traffic routing, storm water management, erosion, and sediment control measures, gas extraction and treatment systems, final cover systems, and monitoring systems. Specific attention shall be given to sidewall penetrations, sideslope riser and sump area volumes and construction, and piping located outside of the limits of filling. In addressing each of the above design items, the report shall indicate how the anticipated waste types and characteristics influenced the chosen design.

(4) **INITIAL CONSTRUCTION.** The report shall discuss initial preparations and construction methods relating to clearing and grubbing, topsoil stripping and other excavations; soil storage and visual screening development; storm water control features; base liner and granular drainage layers; leachate collection and gas venting systems; access roads and entrance area screening and fencing; environmental monitoring device installation and other special design features. This discussion shall propose a schedule of field measurements, photographs to be taken, and sampling and testing procedures to be utilized to verify that the infield conditions encountered were the same as those defined in the feasibility report.

(5) **STORM WATER MANAGEMENT.** The report shall describe storm water management at the time of initial construction, during phased development, and after closure of the landfill. The report shall include:

(a) Narrative demonstrating compliance with s. NR 504.09.

(b) Detailed description of temporary and permanent erosion and sediment control measures to be used to accomplish the concepts in s. NR 504.09 (1) (b).

(c) Specifications for design of sediment basins, culverts, drainage ditches, auxiliary sediment traps, and the anticipated extent of cleared ground and stockpiles during each major phase of landfill development.

(d) A list of anticipated actions and materials needed for sediment and erosion control.

(e) A maintenance and follow-up program designed to meet the concepts in s. NR 504.09 (1) (b).

(f) Schedules for the following activities: cleaning sediment basins and ditches; seeding and stabilization of stockpiles and drainage channels; and topsoiling, seeding and stabilization of disturbed areas and areas affected by erosion.

(6) **SOIL REQUIREMENTS.** (a) The report shall include a proposed testing schedule to document the placement of all general soil fill and backfill, base liner, final cover layers and all venting or drainage layers used in any phase of development or closure. The report shall contain an explicit statement and description of testing methods if construction and documentation are proposed to be performed other than in accordance with the requirements of ch. NR 516. The report shall include justification for any proposed changes to the testing requirements of ch. NR 516.

(b) The report shall specify the proposed gradations of soil materials and the proposed size of the perforations used in the leachate collection system piping and the drainage layer in the final cover system. The report shall include an analysis of the pipe and soil materials to demonstrate whether the gradation of sand and gravel and the pipe opening sizes are stable and self-filtering. The report shall describe the use of filter layers or other mechanisms used to maintain the porosity in the leachate collection blanket, collection trenches and sumps.

(c) The report shall include the documentation required by s. NR 504.075 for any soil borrow source that was not included in the approved feasibility report for the landfill.

(7) **MONITORING.** (a) The report shall include a proposed monitoring program for groundwater, surface water, volumes and quality of gas and gas condensate, unsaturated zone, leachate volume and quality, and surface settlement developed in accordance with ch. NR 507 and the specific requirements of the feasibility approval. The proposed monitoring program shall include a table listing frequencies of sampling, parameters to be analyzed, and a schedule for the anticipated installation or abandonment of sampling points. The table shall indicate existing and proposed sampling points and devices and the anticipated periods during which the points and devices will be monitored before landfill development, during each major phase of landfill development, and during the period of long-term care.

(b) The report shall include a listing of all groundwater elevation data collected from all groundwater sampling points subsequent to preparation of the feasibility report.

(8) **OPERATIONS.** The report shall describe the daily operations including a discussion of the timetable for the construction of each phase of liner or final cover; waste types accepted or excluded; typical waste handling techniques and methods for handling unusual waste types; hours of operation; traffic routing; storm water management; sediment and erosion control; windy, wet and cold weather disposal operations; fire protection equipment; anticipated staffing requirements; methods for vector, dust and odor control; daily cleanup; leachate removal during hours of operation as well as nights, weekends, and holidays; direction of filling; salvaging; record keeping; and parking for visitors, users and employees. The report shall describe any limitations or operational practices necessary due to the presence of other open or closed landfills, demolition landfills, processing facilities, storage facilities, composting facilities or any other solid waste facilities located on the same property.

(9) **PHASED DEVELOPMENT.** The report shall describe landfill operations and the development of subsequent phases. This discussion shall define the critical stage of refuse disposal for each phase as it relates to the start of construction of subsequent phases. The purpose of this planning is to ensure that the scheduling of future construction takes into account the length of the construc-

tion season, limitations imposed by weather and season, and the capacity remaining in existing phases such that an orderly transition is maintained. The report shall describe the anticipated construction in each phase for storm water management, monitoring, abandonment of fill areas, and the installation and maintenance of gas and leachate control structures.

(10) PHASED CLOSURE. The report shall describe landfill operations, actions taken when phases of the landfill reach waste final grades and closure of phases at waste final grades. The report shall include a discussion of the anticipated sequence of the required events for closure of the landfill and a discussion of those actions necessary to prepare the landfill for long-term care and final use.

(11) LONG-TERM CARE. The report shall include a proposed long-term care schedule describing the procedures to be utilized for the inspection and maintenance of cover vegetation, storm water control structures, refuse or ground surface settlement or siltation, erosion damage, gas and leachate control features, gas, leachate and groundwater monitoring, and other long-term care needs. The report shall include a final use plan for the landfill.

(12) WRITTEN AGREEMENTS. The appendix of the report shall include the following written agreements:

- (a) A draft leachate treatment agreement.
- (b) A signed clay procurement agreement or option for acquisition of the borrow source property for the volumes necessary to construct and close the first major phase of the facility.
- (c) Any miscellaneous agreements such as easements.

(13) SPECIFICATIONS. The report shall include specifications for construction, operation and closure of the landfill. These specifications shall include detailed instructions to the operator and any contractors for all aspects of construction and operation. References to specifications on the plan sheets shall be described. This may include information such as geosynthetic material installation instructions, tank manufacturer installation instructions and pump performance criteria, materials and construction methods for sideslope risers, sidewall penetrations, sump areas, and all piping located outside the limits of filling.

(14) DESIGN CALCULATIONS. The report shall include and explain all design calculations to facilitate department review and provide the necessary information on financial responsibility for closure and long-term care of the landfill as required by subch. IV of ch. 289, Stats. The report shall include a discussion of all calculations, such as refuse to cover balance computations, base liner and final covering soils materials needs related to available borrow soil volumes, stockpile sizing estimates, required interface shear strength and shear strength of the soil materials where the interfaces evaluated include the upper and lower interfaces for all geosynthetics such as geomembranes, geotextiles, and geosynthetic clay liners, design of the storm water management system, infiltration and leachate collection and leakage volumes. All calculations shall be summarized with the detailed equations presented in the appendix of the report. References to the appropriate plan sheets, from which variables are obtained for these calculations, shall be included in these summaries.

(14m) ASSESSMENT. The report shall include an assessment of the shear strength and slope stability of soils and wastes in the following scenarios:

- (a) Interim and final waste slopes, incorporating in-field waste densities, settlement, leachate recirculation, precipitation and any other factors that affect strength of waste or final cover. The analyses shall include interior slopes between filling phases and exterior slopes after attainment of waste final grades.
- (b) Haul roads and access ramps on interim slopes at waste final grades and on final cover, including passive load of cover soils and dynamic loads due to construction, hauling and maintenance vehicles.

(15) FINANCIAL RESPONSIBILITY ANALYSIS. A detailed analysis in accordance with ch. NR 520 shall be made of the costs associ-

ated with closure of the landfill and of performing each year of long-term care. All assumptions used in developing the cost estimates shall be listed, including sources of the cost estimates and rationale for the selected cost factors. The anticipated operating life and replacement schedule of all engineering design features shall be addressed and reflected in the cost estimates. The proposed methods of establishing proof of financial responsibility for closure as well as long-term care shall also be specified.

(16) APPENDIX. An appendix shall be included which lists the references used and includes any additional data not previously presented, supplemental design calculations, material specifications, operating agreements such as draft leachate treatment agreements or signed soil borrow agreements, documents related to long-term care funding, documents related to placing a notification on the deed of properties with wells within the 1200-foot setback and other appropriate information.

History: Cr. Register, January, 1988, No. 385, eff. 2-6-88; am. (intro.), (2), (4), renum. (3) to be (13), (5) to (11), (12) and (15) to be (6) to (12), (14) and (16) and am. (6) (a), (b), (7) (a), (b), (8), (9), (10), (11), (13) and (14), cr. (3), (5), (15), r. (13), (14), Register, June, 1996, No. 486, eff. 7-1-96; CR 04-077: cr. (14m) Register November 2005 No. 599, eff. 12-1-05; CR 05-020: cr. (6) (c), am. (16) Register January 2006 No. 601, eff. 2-1-06.

NR 514.07 Miscellaneous requirements for plans of operation. The plan of operation for all new landfills and expansions of existing landfills shall include the following information where applicable:

(1) GEOSYNTHETICS REQUIREMENTS. The plan of operation for any landfill which includes a composite liner, composite capping layer or utilizes a geomembrane for a liner or utilizes a geomembrane or geomembrane-GCL for a capping layer shall provide the following design details and specifications for the geosynthetic components. The department may specify additional requirements for other geosynthetic materials used in significant structural features of the landfill.

(a) A description of the proposed geomembranes, GCLs and other geosynthetics to be used in construction of the landfill, including resins and additives, physical properties, bentonite characteristics, chemical resistance properties and potential suppliers. For GCLs, this shall include identification of the geotextile properties and reinforcement.

(b) Design calculations that demonstrate the stability of the landfill and its components against failure along potential failure surfaces, such as the leachate collection system and final cover, during operations as well as after closure. Potential failure surfaces considered shall include the interfaces both below and above the geomembrane in the liner and final cover. Potential failure scenarios considered shall include both saturated and unsaturated conditions for the cover. The design calculations may use typical data or specifications from technical literature rather than values from testing of site specific materials if the sources of the typical data or specifications and the test methods used to generate them are cited with the calculations and a safety factor of at least 1.3 is used to assess stability.

(c) Construction methods and supervisory controls for preparing the surface of the topmost lift of compacted clay prior to the installation of a geomembrane or soil barrier layer prior to installation of a GCL. The plan of operation shall propose inspection methods and removal of coarse gravel or cobbles after rolling the topmost lift of compacted clay or soil barrier layer to achieve a smooth surface.

(d) A description of measures to be taken to store and protect all geomembranes, GCLs and geocomposite drains, transport geomembrane, GCL and geocomposite drain panels from storage to the working area, and construction methods to be used to place geomembrane, GCL and geocomposite drain panels.

(e) The proposed orientation of all geomembrane and GCL panels for the landfill liner and capping layer in relation to slope, collection trenches, penetrations, anchor trench and phase boundaries, seaming methods and phased construction.

(f) Typical design details of geomembrane and GCL seams and seaming methods, anchor trenches, patches, collars for all penetrations, installation in corners and leachate collection trenches. The plan of operation shall describe acceptable working conditions for geomembrane, GCL and geocomposite drain installation, installation instructions for working under weather variations and extremes, and criteria for halting or limiting GCL and geomembrane installation.

(g) Proposed methods for testing welds or other joining methods for geomembranes and other components or penetrations if geomembranes used in previously constructed phases are obtained from different manufacturers or are made from different resins. The plan of operation shall also include measures to preserve the edges of geomembranes and GCLs to be joined to future phases and describe measures to repair all geomembrane, GCL and geocomposite drain defects, unacceptable wrinkling, and unacceptable seams.

(h) Construction methods for placing the leachate collection system, sump backfill, and sideslope riser over the composite liner; the first 10 feet of wastes over the leachate collection system; and subsurface drain layer and rooting zone soils over the composite cap. The measures shall assure that the geomembrane and GCLs are not damaged by construction of soil layers, placement or compaction of wastes, waste consolidation or mass movements or puncturing of the geomembrane.

(i) A construction quality control plan that will be followed by all contractors preparing the surface of the compacted clay liner or soil barrier layer, constructing the geomembrane liner and placing drainage blanket. The construction quality control plan shall include means for determining and documenting: receipt of the proper geomembrane, GCL and geocomposite drain material; acceptable subgrade and weather conditions for work to occur; seamer qualifications and procedures for trial seams; acceptability of test welds and machine settings; acceptable seaming practices; achieved seam quality and procedures for dealing with failing tests; patching; and sealing of geomembrane penetrations. The construction quality control plan shall also describe how progress in construction, as well as any variations from the approved plans, will be recorded and reported.

(j) A construction quality assurance plan that will be followed by the registered professional engineer and qualified technician responsible for evaluating the construction and ensuring that the fabrication and installation meet design specifications. The construction quality assurance plan shall include continuous observation of all aspects of geomembrane, GCL and geocomposite drain installation activities by qualified engineers or technicians. The construction quality assurance plan shall include use of nondestructive and destructive testing of seams and samples and shall propose a schedule of tests and associated frequencies in accordance with those specified in ch. NR 516. The construction quality assurance plan shall include proposed methods of verifying the acceptability of the prepared subgrade, repairs, patches, penetrations, seams, and adaptations by the owner and contractors to unforeseen conditions.

(k) An outline of the contents of the anticipated preconstruction submittal which complies with the requirements of s. NR 516.04 (5) concerning geomembrane and GCL construction and which will be prepared and submitted prior to each construction event.

(L) A construction quality assurance plan for conducting a leak location survey on the installed geomembrane. The leak location survey shall be conducted after placement of the leachate collection layer for a composite liner. The quality assurance plan shall include continuous observation of all aspects of the leak location survey testing by qualified professional engineers or technicians. The quality assurance plan shall include use of nondestructive methods to detect, locate and verify repairs of defects in geomem-

brane. The quality assurance plan may include electrical resistivity testing or other testing methods acceptable to the department.

(2) CODISPOSAL OF INDUSTRIAL SOLID WASTES. The plan of operation for any landfill which accepts municipal solid wastes shall describe measures to be taken for the disposal of solid wastes from industrial sources, cleanups of spills and contaminated sites, or other commercial activities. The plan of operation shall propose lists of waste categories, testing protocols and schedules, and disposal protocols. The plan of operation shall describe the format for transmitting summary information to the department.

(3) CLOSURE OF LANDFILLS WITH COMPOSITE LINERS AND COMPOSITE CAPS. The plan of operation for any landfill which accepts municipal solid wastes may propose to delay final cover placement for one or more years after attaining final waste grades in each phase of closure provided the following requirements are followed:

(a) Intermediate cover consisting of a minimum of one foot of soil shall be placed and the area shall be seeded as portions of a phase reach waste final grades.

(b) No additional waste placement shall occur in areas which have reached waste final grades and received intermediate cover.

(c) For landfills designed with active gas extraction systems, the components of the active gas extraction system within each phase shall be installed and made operational following attainment of waste final grades within that phase. The blower, flare, driplegs, controls, condensate handling, and appurtenances of the gas extraction system shall be installed prior to or as part of the attainment of waste final grades within the first phase of waste filling.

(4) CLOSURE OF PAPERMILL SLUDGE LANDFILLS. The plan of operation for a landfill designed to accept pulp and papermill sludges or other low-strength wastes may propose that final cover placement be delayed after completing placement of the support layer in each phase of closure. The time period of the delay shall be limited to 2 years unless otherwise approved by the department. The proposal shall also justify why the delay in final cover placement is warranted.

(5) MUNICIPAL SOLID WASTE COMBUSTOR RESIDUE MANAGEMENT PLANS. The plan of operation for any landfill which proposes to accept municipal solid waste combustor residue shall include a residue management plan. The department may approve residue management plans for facilities which have approved plans which are substantially equivalent to the requirements of ss. NR 514.04 to 514.08.

(a) All residue management plans shall contain the name and location of the proposed sources and the expected volume from each source of municipal solid waste combustor residue to be accepted.

(b) All residue management plans shall establish a timetable for evaluating the results of the testing requirements of s. NR 502.13 (8) and any trends in the results from previous testing periods to determine the need for any changes to the proposed landfill design or operation.

(c) The residue management plan shall include plan sheets which address the design requirements of s. NR 504.11 and include plan views, cross-sections and details as necessary to illustrate the applicable design features of the portion of the landfill which will be utilized for disposal of municipal solid waste combustor residue. Phasing plan sheets shall also be included to show development of that portion of the landfill through time.

(d) The residue management plan shall contain an operations manual and design report which describes the daily operation of the portion of the landfill to be utilized for disposal of municipal solid waste combustor residue, including a discussion of the timetable for the phases of development; waste types accepted or excluded; typical waste handling techniques and methods for han-

dling unusual waste types; hours of operation; traffic routing; drainage and erosion control; windy, wet and cold weather disposal operations; methods for dust control; and direction of filling. Methods to maintain compliance with the requirements of s. NR 506.15 shall also be described.

(e) The residue management plan shall propose any modifications to the groundwater, unsaturated zone and leachate monitoring program necessary to comply with the requirements of ch. NR 507.

(6) OTHER REQUIREMENTS. The plan of operation shall provide the following details and specifications, where applicable. The department may specify additional requirements.

(a) Descriptions of alternative cover materials to be used for daily or intermediate cover.

(b) Description of a 24 hour leak test for the geomembrane component of lysimeters and sumps for sideslope risers. Alternative leak detection methods, such as electrical resistivity may be proposed.

(c) Documentation of the strength of the selected resin, diameter and wall thickness of the sideslope riser pipe, with regard to maximum overburden weight over the sumps of municipal solid waste or industrial waste at field capacity. The plan of operation shall include a description of physical and hydraulic specifications of commercially available pumps that are able to traverse any bend or elbow in the riser pipe to reach design pump intake position, for both placement and removal. The description shall include cross-sections of the riser pipe bends and the pumps when wheels, connectors, hoses, electrical leads and head level controls are attached. Pump selection shall be based on the maximum pumping capacity needed for the highest calculated leachate flow rates, including potential leachate recirculation.

(6m) CONTIGUOUS LANDFILL EXPANSIONS. The plan of operation for any proposed landfill which is either a vertical or horizontal overlay to an existing approved facility shall include a summary of all applicable conditions of department issued, chs. NR 500 to 538, approvals or orders that are active and subject to compliance at the time of the plan of operation report submittal. The summary shall be submitted on forms provided by the department and at a minimum shall contain all of the following:

(a) A chronological listing of all department issued chs. NR 500 to 538 approvals, orders and expedited plan modifications deemed as acceptable by the department under s. NR 514.09 for the existing landfill.

(b) A listing of all approval conditions or order conditions that are active and subject to compliance at the time of the plan of operation report submittal.

(c) The status of each condition listed in par. (b) shall be identified as:

1. "Remain active": The applicant intends to continue to meet the requirement of the condition in the proposed expansion.

2. "Comparable code": The applicant believes the requirement of the condition is addressed in chs. NR 500 to 538.

3. "Alternative proposed": The applicant believes the condition is no longer required due to changes in the proposed plan of operation report.

(d) Identification of specific applicable codes, plan of operation report sections or further justification to support the applicant's recommended status category in par. (c).

(e) The department shall provide a summary of the facility's active approval conditions or order conditions as an informational attachment to the plan of operation determination. This summary shall consider the applicant's recommended status in par. (c) and any applicable department issued conditions in the plan of operation determination. A department summary under this paragraph does not relieve the applicant of the compliance requirement of any condition prior to the issuance of the summary.

(7) LEACHATE RECIRCULATION PLANS. The plan of operation for any landfill that proposes to recirculate leachate shall include a leachate recirculation plan. The leachate recirculation plan shall include, at a minimum, the following elements:

(a) A narrative which explains the design rationale for the proposed system. The design rationale shall address the leachate loading rate; distribution frequency; leachate distribution system including well or pipe spacing and placement, well or pipe length, screened interval, sealing material and bedding material; anticipated flow characteristics; and restricted areas where leachate will not be recirculated. The design shall incorporate, as appropriate, the requirements of s. NR 504.095.

(b) Plan sheets to show the conceptual layout of the leachate recirculation distribution system and design details.

(c) Calculations of proposed loading rates. Proposed loading rates for leachate recirculation shall be calculated for each leachate drainage basin. Calculation methods shall be defined so that supplemental calculations can be performed to accommodate changes due to field observations, waste characteristics, weather and other factors. Factors to be addressed shall include recirculated volumes of leachate, precipitation based on local records and on-site data, field capacities and absorptive capacities of the land-filled waste, waste filling rates, separation distances and elevations of distribution piping or wells, and loss of water by waste decomposition processes and water vapor in landfill gas.

(d) Calculation of effects on flow rates in the leachate collection system and maximum leachate head on the liner. The location of leachate head level monitoring devices relative to the collection pipes and base grade slope lengths shall be used to determine the maximum leachate head in the facility. Proposed loading rates for leachate recirculation shall be determined which limit maximum leachate head on the liner to 12 inches.

(e) An operational plan which addresses the daily operations; how leachate seeps, odors and build-up will be prevented or contained and actions to be taken if nuisance conditions occur; how any enhanced methane production will be managed by gas extraction systems; and care and maintenance of the tanks, pumps and distribution systems.

(f) A description of warning symptoms and failure thresholds which will be used to initiate investigation, stand-by, termination and changes to the leachate recirculation system. The operational plan shall identify warning symptoms and failure thresholds, including but not limited to elevated leachate heads on the liner, significant and persistent odors, excessively acidic leachate chemistry or other monitoring data indicate poor waste decomposition conditions, seeps and other surface expressions of recirculated leachate, excessive pressures within the waste mass, saturated conditions in the waste mass, reduced shear strength of the waste mass and any other warning symptom conditions appropriate to the site. Warning symptoms shall result in a suspension of leachate recirculation, investigation and changes to be implemented before resuming leachate recirculation. Failure thresholds shall result in termination of leachate recirculation, investigation and changes that will be submitted to the department for review and approval in writing prior to resumption of leachate recirculation.

(g) A monitoring plan which tracks volumes of leachate extracted and recirculated and volumes of precipitation in each leachate drainage basin; leachate heads on the liner; gas volumes; and leachate characteristics. The monitoring plan shall incorporate, as appropriate, the requirements of s. NR 507.215.

(h) A plan which specifies documentation and record-keeping of the construction, operation and monitoring of the leachate recirculation system. This plan shall specify the information that will be sent to the department and the frequency of those submittals.

(i) Landfill gas extraction. The plan of operation shall include diagrams and narrative concerning gas extraction equipment, fittings and devices to be used to extract gas produced as a result of leachate recirculation. The plan of operation shall contain a schedule of operation of the gas extraction system in those cells which are subject to leachate recirculation.

(j) A description of the circumstances under which leachate will be diverted to a wastewater treatment plant rather than recirculated.

(8) ADDITIONAL REQUIREMENTS FOR LANDFILLS WITH EXTENDED COLLECTION LINES. (a) Landfills shall meet the requirements of pars. (b) to (i) where they will accept municipal solid waste and contain leachate collection lines that exceed 1,200 feet from the end of each cleanout to the toe of the opposite slope. Where the requirements of this subsection differ from other requirements of this chapter, these requirements shall take precedence.

(b) The design calculations required by s. NR 514.06 (14) shall include assessments of the landfill foundation for stability and settlement, using parameters determined from samples taken from borings in the subgrade below the proposed fill area.

(c) The report shall describe the design rationale for the layout of the leachate collection system and its alignment. This description shall include:

1. A discussion of the pipe strength calculations for the design overburden weight and the required pipe materials, including considerations for wet unit weights, densified waste after consolidation and decomposition and the potential use of leachate recirculation.

2. A demonstration that the design minimizes changes in alignment of leachate collection trenches and leachate collection pipe.

3. A hydraulic capacity analysis that demonstrates the ability of the leachate collection system to contain design flows within the collection trench and sump system. The hydraulic capacity analysis shall include the following, at a minimum:

a. Design specifications for the leachate collection blanket, leachate collection trench dimensions, backfill for the leachate collection trench, slopes of landfill base and sideslopes, slopes of pipe and trenches, and the liner area draining to each sump.

b. Active filling life assessment based on precipitation rate of 2 inches per month, with and without leachate recirculation.

c. Post-closure assessment based on hydraulic conductivities of 10% or less of the design hydraulic conductivities for the leachate collection blanket and leachate collection trench backfill and an assumed annual leachate collection rate of one inch per year.

d. Sump dimensions and pump specifications selected to maintain maximum leachate accumulation within the sumps and intersecting leachate collection trenches, with examples of commercially available pumps.

(d) The report shall include the calculations for the maximum anticipated overburden loads as calculated under s. NR 504.06 (6) (e) and selected leachate collection pipe materials to comply with these calculated loads. Calculations shall be performed demonstrating the leachate collection pipe and bedding material as placed possess structural strength to support maximum loads imposed by the overlying materials and equipment. The calculations shall demonstrate that the pipe is designed to maintain its wall integrity and not deform under expected maximum loads to the extent that the loading or deformation negatively affect the performance and cleaning of the leachate collection systems.

(e) Specifications and construction methods for bedding of leachate collection pipes shall be included, to maximize competent support of the pipes, eliminate bridging and maintain design slope of the pipe.

(f) The report shall include specifications for the use of sweep bends at all changes of alignment of leachate collection pipes,

construction methods to provide support for pipe and sweep bends, and measures to be taken to minimize obstructions to or friction with pipe cleaning equipment.

(g) The report shall include a construction quality assurance plan to be followed by the registered professional engineer and qualified technician responsible for evaluating construction of the collection trench and leachate collection piping and ensuring that the fabrication and installation meet the design specifications. The construction quality assurance plan shall include continuous observation of all aspects of collection trench construction and collection pipe installation activities by qualified engineers or technicians. The construction quality assurance plan shall include use of observations, survey measurements, and testing frequencies in accordance with those specified in ch. NR 516. The quality assurance plan shall include proposed methods for verifying the acceptability of the collection trench, collection pipe alignment, collection pipe materials and sweep bends, and adaptations by the owner or contractors to unforeseen conditions.

(h) The report shall describe proposed equipment and methods which are capable of inserting cleanout devices through all leachate collection pipes, from insertion at each access point to, at a minimum, the toe of the opposite sideslope.

(i) The report shall include procedures for soil borings and laboratory consolidation testing to verify settlement analyses.

(9) The plan of operation for all new and expanded municipal solid waste landfills submitted to the department after January 1, 2007 shall include a plan for significantly reducing the amount of degradable organic material remaining after site closure in order to materially reduce the amount of time the landfill will take to achieve landfill organic stability. All municipal solid waste landfills that have a plan of operation approved between January 1, 2004 and January 1, 2007 shall submit a plan modification to the department no later than January 1, 2007 for significantly reducing the amount of degradable organic material remaining after site closure in order to materially reduce the amount of time the landfill will take to achieve landfill organic stability.

History: Cr. Register, January, 1988, No. 385, eff. 2-6-88; correction in (2) (b) made under s. 13.93 (2m) (b) 5., Stats., Register, May, 1994, No. 461; r. and recr., Register, June, 1996, No. 486, eff. 7-1-96; CR 04-077: cr. (1) (L), (6) (c) and (7) to (9) Register November 2005 No. 599, eff. 12-1-05; **CR 05-020: am. (1), cr. (6m) Register January 2006 No. 601, eff. 2-1-06; correction made under s. 13.93 (2m) (b) 1., Stats., Register January 2006 No. 601.**

NR 514.08 Closure plans. Closure plans may be required by the department for solid waste disposal facilities which do not have an approved plan of operation under s. 289.30, Stats., or which are required by order or approval to develop a closure plan, as remediation for groundwater or surface water contamination, or to control gas migration. Closure plans shall present the complete plans and engineering analysis necessary for evaluation of the design, remaining operation, monitoring, closure and post closure care of the facility. These closure plans shall address all the requirements of s. NR 506.08. The department may require that the plans address any or all of the information contained in chs. NR 504, 507, 508, 512, 514 and 516.

History: Cr. Register, May, 1992, No. 437, eff. 6-1-92; r. and recr., Register, June, 1996, No. 486, eff. 7-1-96; am. Register, August, 1997, No. 500, eff. 9-1-97.

NR 514.09 Expedited plan modifications. (1) APPLICABILITY. (a) If an expedited plan modification is requested by an owner or operator, this section applies to all proposals that can be determined by the department to be low risk to modify provisions in approved plans of operation, except those identified in par. (b), that would not result in a violation of a statute or administrative rule, and would not require issuance of an exemption by the department. Modifications to which this section applies include, but are not limited to the following:

1. Revisions to surface water control systems.

2. Use of an alternate borrow source, other than for landfill liner material, following the department's performance of an initial site inspection of the borrow source.

3. Soil daily cover.
4. Use of foundry sand, bottom ash or papermill sludge for alternate daily cover material. Also, if soil daily cover will be placed at the end of each operating week, use of tarps, geotextiles, spray-on foams and similar alternate daily cover materials.
5. Access roads within a landfill.
6. Waste filling or closure sequence, if the unclosed area of the landfill would not be increased at any point in the landfill's remaining operational life relative to the existing approved plan.
7. Minor changes in design and material substitutions for gas extraction systems or leachate head wells, that do not include changes to the gas flare design, and do not include a reduced number of gas extraction wells or leachate head wells within a particular phase of the landfill. Also, replacement of damaged or non-functional features of gas extraction systems or leachate head wells that do not involve significant changes in design, location or materials of construction.
8. Installation, abandonment or sampling of groundwater, gas or leachate monitoring devices not required in the existing approved plan.
9. Environmental sampling methods.
10. Except as provided under par. (b), other modifications determined by the department to pose low potential risk of adverse impacts on public health or the environment.

Note: No approvals are necessary when a landfill owner initiates a contaminant investigation or assessment monitoring according to chs. NR 507 and 508. However, if an alternate assessment plan is proposed under s. NR 508.05 (2), the landfill owner must request an approval under that section.

(b) This section does not apply to proposals to modify approved plans of operation that would result in any of the following:

1. Enlargement, relocation or expansion of a landfill.
2. A change in the design or construction of landfill liners, final cover or leachate collection, transfer, recirculation or storage systems.
3. Termination of groundwater monitoring at any landfill.
4. Reduction of groundwater monitoring at any landfill to less than the minimum required in chs. NR 503 and 507, according to the type of landfill and wastes disposed.
5. Reduction of groundwater monitoring at facilities that have written approval for groundwater monitoring less than the minimum required in chs. NR 503 and 507.
6. The need for an additional regulatory permit or review under legal authority other than chs. NR 500 to 538.
7. A change which would be less stringent than a federally-mandated requirement including those in 40 CFR, Subchapter I, Parts 257 and 258.
8. Violation of an existing written condition contained in a department approval document, except if the applicant provides a list of each condition in the cover letter and the applicant is also requesting to modify these conditions.
9. Expenditure of department technical review time in excess of 8 hours to determine whether the proposal is low risk and complete any other tasks necessary to review the request.

(2) **PROCEDURE.** A proposal to modify an approved plan of operation is deemed approved under s. 289.30 (6), Stats., if all of the following occur:

(a) The owner or operator submits a written proposal to the department which describes the proposed plan modification. With the proposal, the owner or operator shall submit a cover letter that includes all of the following:

1. Identification of the applicable subdivision of sub. (1) (a) under which the proposal falls and a statement requesting review of the proposal under the expedited process outlined in this section.
2. A brief description of the proposal.

(b) Either the department does not object to the proposed modification within 30 days after receipt of the notice under par. (a), or the department withdraws its objection to the proposal. Notification by the department that it does not consider a proposed plan modification submitted under sub. (1) (a) 10. to pose a low potential risk of adverse impacts on public health or the environment shall be considered to be an objection, and therefore, subject to the dispute resolution process of sub. (3).

(c) The department determines the proposal is low risk including, but not limited to the following criteria: improper design of the component or feature being modified could not result in leachate being released outside the limits of waste fill and would not require removal of waste to complete future replacement or repair of the component.

(d) The appropriate expedited plan modification review fee is paid in accordance with ch. NR 520, Table 3.

(3) **DISPUTE RESOLUTION.** (a) If the department objects to a proposed modification under sub. (2), the following procedures shall apply:

1. Within 20 days after the department objects to the proposed modification, the owner or operator may file a request with the secretary of the department for a conference to discuss the reasonableness of the department's objection to the proposed modification.

2. The secretary may designate appropriate department personnel to confer with the owner or operator regarding the reasonableness of the objection. The designated department personnel shall include supervisory personnel who did not participate in the objection to the proposed modification.

3. The department personnel designated by the secretary shall make arrangements to confer with the owner or operator at the earliest practical time. The department shall promptly notify the owner or operator in writing whether or not the objection to the proposed modification will be withdrawn.

(b) This section does not affect in any manner any other provision of law authorizing administrative or judicial review of a department objection under this section.

History: Cr. Register, June, 199, No. 486, eff. 7-1-96; renum. (1) (a) 1. to 10. to be (1) (a) 4. to 13., am. (1) (a) (intro.) and (b) 2., cr. (1) (a) 1. to 3., Register, August, 1997, No. 500, eff. 9-1-97; **CR 05-020: r. and recr. Register January 2006 No. 601, eff. 2-1-06.**

NR 514.10 Research, development and demonstration plan. The plan of operation for any landfill which proposes a research, development and demonstration program shall include the items specified in this subsection.

(1) **GENERAL.** (a) 1. No landfill owner or operator may initiate a research, development and demonstration plan without prior approval by the department in writing. Items that research, development and demonstration plans are applicable to may include addition of liquids in addition to leachate and gas condensate from the same landfill for accelerated decomposition of the waste mass, allowing run-on water to flow into the landfill waste mass, and allowing testing of the construction and infiltration performance of alternative final cover systems. The research, development and demonstration plan may be proposed for other measures to be taken to enhance stabilization of the waste mass.

2. No landfill owner or operator may continue to implement a research, development, and demonstration plan beyond any time limit placed in the initial plan approval or any renewal without issuance of written approval by the department. Justification for renewals shall be based upon information in annual and final reports as well as research and findings in technical literature.

(b) Research, development and demonstration plans shall meet the following requirements:

1. Research, development and demonstration plans shall be restricted to licensed solid waste landfills. Landfills for disposal of municipal solid waste shall be designed with a composite liner and a composite capping layer. For existing landfills, the effec-

tiveness of the liner system and leachate collection system shall be demonstrated in the plan. For all landfills, the effectiveness of the liner system and leachate collection system shall be assessed at the end of the testing period, with comparison to the effectiveness of the systems at the start of the testing period.

2. Research, development and demonstration plans may be submitted for new landfills, expansions of existing landfills or closed landfills.

3. Research, development and demonstration plans may not include changes to the approved design and construction of sub-grade preparation, liner system, leachate collection and removal systems, final cover system, gas and leachate systems outside limits of waste, run-off controls, run-on controls or environmental monitoring systems exterior to the waste mass.

4. An annual report shall be prepared for each year of the testing period and a final report shall be prepared for the end of the testing period. These reports shall assess the attainment of goals proposed for the process selected for testing, recommend changes, recommend further work, and summarize problems and their resolution. Reports shall include a summary of all monitoring data, testing data and observations of process or effects and shall include recommendations for continuance or termination of the process selected for testing. Annual reports shall be submitted to the department within 3 months after the anniversary date of the written approval by the department. Final reports shall be submitted by the end of the testing period.

5. Implementation of an approved research, development and demonstration plan shall comply with the specific conditions of approval for the initial testing period and any renewal.

6. Structures and features exterior to the waste mass or waste final grades shall be removed at the end of the testing period, unless otherwise approved by the department in writing.

(2) OTHER REQUIREMENTS. A research, development and demonstration plan shall include the following details and specifications. Processes other than adding liquids to the waste mass and leachate recirculation may be practiced in conjunction with the research, development and demonstration plan.

(a) Initial applications for research, development and demonstration plans shall be submitted for review and approval prior to the initiation of the process to be tested. Plans shall specify the process that will be tested, describe preparation and operation of the process, describe waste types and characteristics that the process will affect, describe desired changes and end points that the process is intended to achieve, define testing methods and observations of the process or waste mass that are necessary to assess effectiveness of the process, and include technical literature references and research which support use of the process. The plans shall specify the time period for which the process will be tested. The plans shall specify the additional information, operating experience, data generation or technical developments that the process to be tested is expected to generate.

(b) The test period for the initial application shall be limited to a maximum of 3 years.

(c) Renewals of testing periods shall be limited to a maximum of 3 years each. The maximum number of renewals shall be limited to 3.

(d) Renewals shall require department review and approval of reports of performance and progress on achievement of goals specified in the research, development and demonstration plan.

(e) Research, development and demonstration plans that evaluate introduction of liquids in addition to leachate or gas condensate from the same landfill shall propose measures to be integrated with any approved leachate recirculation plan and compliance with requirements for leachate recirculation.

(f) Research, development and demonstration plans shall include a description of warning symptoms and failure thresholds

which will be used to initiate investigation, stand-by, termination, and changes to the process and any other landfill systems that might be affected by the process, such as gas extraction and leachate recirculation. Warning symptoms shall result in a reduction or suspension of liquids addition, leachate recirculation, investigation and changes to be implemented before resuming the process being tested. Failure thresholds shall result in termination of the process being tested, investigation and changes that will be submitted to the department for review and approval in writing prior to resumption of the process being tested.

(g) Research, development and demonstration plans shall include an assessment of manner in which the process to be tested might alter the impact that the landfill may have on human health or environmental quality. The assessment shall include both beneficial and deleterious effects that could result from the process.

(h) Research, development and demonstration plans shall include a geotechnical stability analysis of the waste mass and an assessment of the changes that implementation of the plan are expected to achieve. The geotechnical stability analysis and assessment shall be repeated at the end of testing period, with alteration as needed to include parameters and parameter values derived from field measurements. The plan shall define relevant parameters and techniques for field measurement.

(i) Research, development and demonstration plans shall propose monitoring parameters, frequencies, test methods, instrumentation, record-keeping and reporting to the department for purposes of tracking and verifying goals of the process selected for testing.

(j) Research, development and demonstration plans shall propose monitoring techniques and instrumentation for potential movements of waste mass and settlement of waste mass, including proposed time intervals and instrumentation, pertinent to the process selected for testing.

(k) Research, development and demonstration plans shall propose construction documentation, construction quality control and construction quality assurance measures, and recordkeeping for construction and equipment installation that is part of the process selected for testing.

(L) Research, development and demonstration plans shall propose operating practices and controls, staffing, monitoring parameters and equipment needed to support operations of the process selected for testing.

(m) Research, development and demonstration plans that include aeration of the waste mass shall include a temperature monitoring plan, a fire drill and safety program, instructions for use of liquids for control of temperature and fires in the waste mass, and instructions for investigation and repair of damage to the liner and leachate collection system.

(n) Research, development and demonstration plans for alternate final cover systems shall include side-by-side test sections with approved final cover systems and a means to quantify exfiltration from the alternate final cover and approved final cover test sections.

(3) TERMINATION. The department may require modifications to or immediate termination of the process being tested if any of the following conditions occur:

(a) Significant and persistent odors.

(b) Significant leachate seeps or surface exposure of leachate.

(c) Significant leachate heads on the liner.

(d) Excessively acidic leachate chemistry or gas production rates or other monitoring data indicate poor waste decomposition conditions.

(e) Instability in the waste mass.

(f) Other persistent and deleterious effects.

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