



# **STANDARDS FOR LANDFILLS IN MANITOBA**

**DEPARTMENT OF  
SUSTAINABLE DEVELOPMENT**

**2016**

# FORWARD

The Government of Manitoba has developed this document and is intended to outline minimum requirements for basic siting, design, operation, monitoring, planning, closure and post closure activities for new and existing Class 1, Class 2 and Class 3 Waste Disposal Grounds (WDGs).

This document replaces two guidelines:

- *Guidelines for the Siting of Class 2 and Class 3 Waste Disposal Grounds in Manitoba (Guideline No. 95-01)* published by Manitoba Environment, January 1995; and
- *Manitoba Guidelines for Waste Disposal Grounds* published by KGS Group for Manitoba Conservation, March 2003.

**Comments or inquiries regarding this document may be directed to:**

**Manitoba Sustainable Development  
Environmental Stewardship Division  
Environmental Approvals Branch**

***General Inquiry Line: 1 (204) 945-8321***

***<http://www.gov.mb.ca/conservation/eal/index.html>***

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## DEFINITIONS

"**Access Road**" means a road that leads from a Provincial Trunk Highway, Provincial Road, or a municipal road.

"**Accredited Laboratory**" means an analytical facility accredited by the Standard Council of Canada (SCC), or accredited by another accrediting agency recognized by Manitoba Sustainable Development to be equivalent to the SCC, or be able to demonstrate, upon request, that it has the quality assurance/quality control (QA/QC) procedures in place equivalent to accreditation based on the international standard ISO/IEC 17025, or otherwise approved by the Director.

"**Act**" means *The Environment Act*.

"**Active Area**" means an area of a landfill that is currently being used for the deposit of solid waste.

"**Affected Area**" means a geographical area, excluding the property of the Development.

"**All Weather Road**" means a graded and/or graveled road or road of equivalent materials that is passable by vehicles under both wet and dry weather conditions.

"**Approved**" means approved by the Director or designated Environment Officer in writing.

"**Background Water Quality**" means the quality of water in any geologic zone monitored with regards to the chemical and microbiological parameters specified in a Licence issued pursuant to *The Environment Act* by the Director.

"**Berm**" means an embankment or ridge that forms a barrier.

"**Biosolids**" means accumulated organic solids, resulting from wastewater treatment processes, that have received adequate treatment to permit the material to be recycled.

"**Body of Water**" means any body of flowing or standing water whether natural or artificially created.

"**BTEX**" means benzene, toluene, ethylbenzene, and xylenes.

"**Building**" means a structure used for residential or business purposes, other than a building used in the operation or maintenance of a waste management facility.



**"Buffer"** means a strip of land that is managed to reduce or eliminate the impacts of land use practices on sensitive areas or natural features.

**"Bulky Metallic Waste"** means large metallic waste that can be recycled or reused, such as motor vehicles, farm and industrial machinery, large appliances and sheet metal.

**"CCME"** means Canadian Council of Ministers of the Environment.

**"Cell"** means an area of a landfill in which solid waste has been, or is to be, deposited.

**"Certified Technician"** means an individual who is qualified and authorized for the removal, discharge, handling and disposal of refrigerants that contain ozone depleting substances and other hydrocarbons.

**"Class 1 Waste Disposal Ground"** means a landfill that

- (a) receives more than 5,000 tonnes of solid waste in a year or 400 tonnes of solid waste in a 30 day period;
- (b) receives solid waste from outside the province; or
- (c) is operated by anyone other than a municipality or regional waste management authority and
  - (i) disposes of solid waste generated by the operator, or
  - (ii) receives solid waste generated by others for commercial purposes.

**"Class 2 Waste Disposal Ground"** means a landfill other than a Class 1 waste disposal ground or a Class 3 waste disposal ground.

**"Class 3 Waste Disposal Ground"** means a landfill that was subject of an operating permit for a Class 3 waste disposal ground under the former regulation that was in effect immediately before the coming into force of this regulation.

**"Closure Plan"** means a plan indicating the actions to be taken for the closure of the Development, or a portion of the Development.

**"Component"** means a landfill cell, pad or structure that forms a part of a process or system within an activity area of the Development.

**"Compost"** means solid mature product resulting from composting.

**"Composting"** means a managed process of bio-oxidation of a solid heterogeneous organic substrate including a thermophilic phase.

**"Contaminant"** means a contaminant as defined in *The Dangerous Goods Handling and Transportation Act*.

**"Cover Material"** means material which is non-flammable, does not interfere with landfill gas collection or extraction systems, does not biodegrade to produce landfill gas, is a deterrent to vectors, is free of roots, vegetation and frozen material, or is a material approved by the Director, that is used to cover compacted solid waste.

**"Daily"** means any 24-hour period.

**"Director"** means an employee so designated pursuant to *The Environment Act*.

**"Engineer(s)"** means an engineer or engineers registered as a professional engineer with Engineers Geoscientists Manitoba.

**"Environment Officer"** means an employee so designated pursuant to *The Environment Act*.

**"Final Cover"** means earth compacted to a thickness of at least 0.5 metre applied to the surface of the compacted waste cell that has achieved the final elevation for cell closure, and is graded to minimize ponding of water on the surface.

**"Groundwater"** means water under the surface of the ground, whether in liquid or solid form.

**"Hazardous Waste"** means a product, substance or organism as defined in *The Dangerous Goods Handling and Transportation Act*, or any amendments thereto.

**"HDPE"** means high density polyethylene.

**"Hydraulic Conductivity"** means the quantity of water that will flow through a unit cross-sectional area of a porous material per unit of time under a hydraulic gradient of 1.0.

**"Industrial Waste"** means waste product generated by industry other than hazardous waste and liquid industrial waste.

**"Landfill"** means a facility at which solid waste is disposed of by placing it on or in land.

**"Landfill Gas"** means a mixture of gases generated by the microbial decomposition and chemical reactions between wastes in a landfill.

**"Leachate"** means liquid that has percolated through solid waste and contains dissolved and/or suspended materials from the solid waste.

**"Leachate Head"** means a pressure head on the leachate liner.

**"Licence"** means a licence issued under the Act.

**"Liner"** means a continuous layer of reworked soil, or manufactured materials, placed beneath and on the sides of a waste disposal ground active area, a compost facility, or a storage area intended to restrict the downward or lateral escape of solid waste, leachate, and or gases, or to restrict the upward movement of groundwater into an area.

**"Liquid Waste"** means waste that has a slump of more than 150 mm using the Canadian Standards Association Slump Test Method A23.2-5C.

**"Material Recovery Facility"** means a building where commingled recyclables are separated and processed (including sorting, baling and crushing) or where source separated recyclables are processed for sale to various markets.

**"Mil"** means one-thousandth of an inch.

**"Monitoring Well"** means a well drilled to measure groundwater levels and collect groundwater samples for analysis to determine the concentration of groundwater constituents.

**"Pollutant"** means a pollutant as defined in *The Environment Act*.

**"Post Closure Plan"** means a plan indicating the actions to be taken for the care, maintenance, and monitoring of the Development after closure, that will prevent, mitigate, or minimize the threat to public health and the environment.

**"Operator"**, in relation to a waste management facility, means the holder of a licence or permit issued in respect of the waste management facility.

**"Permit"** means a permit issued under section 5 under the Waste Management Facilities Regulation.

**"QA/QC"** means quality assurance/quality control.

**"Qualified Professional"** means an individual properly trained and authorized to practice in a specific area or field which may include assessment, design, or providing consultation for an aspect of the Development; to include but not be limited to Professional Engineers, Geoscientists or Landscape Architects.

**"Remote Seasonal Waste Facility"** means a facility for the deposit of solid waste that

- (a) it serves a population of less than 200;
- (b) it is located in an area that does not have all-season road access; and
- (c) is operated for less than six months in a year.

**"Representative Sample"** means a sample collected by a methodology acceptable to an Environment Officer.

**"Site"** means the area both permanent and temporary which is required for the construction and operation of the Development.

**"Solid Waste"** means any waste in solid form, including dead animals.

**"Special Waste"** means bagged asbestos containing materials, dead animals including specified risk materials (SRM), slaughterhouse waste and food products deemed to be unacceptable by the Canadian Food Inspection Agency (CFIA), biosolids, and any other waste identified by the Director.

**"Surface Water"** means any naturally or artificially created body of flowing or standing water that is above the surface of land.

**"SWANA"** means the Solid Waste Association of North America.

**"Waste Disposal Ground"** means a parcel of land that is used for the disposal of solid or industrial waste, also referred to as a landfill.

**"Waste Management Facility"** means a landfill, a composting facility, transfer station, a material recovery facility, or a remote seasonal waste facility.

## **1.0 REGULATORY REQUIREMENTS**

Solid waste management and disposal in Manitoba is regulated under the Waste Management Facilities Regulation (MR 111/2016) (the Regulation) under *The Environment Act* (C.C.S.M. c. E 125) (the Act). The most up to date version of the Regulation and the Act can be found on the Manitoba Laws [website](#). The regulation is organized as follows:

- Part 1: Interpretation
- Part 2: Licences and Permits for Waste Management Facilities
- Part 3: Waste Management Facility Operating Requirements
- Part 4: Closure Requirements
- Part 5: Miscellaneous
- Part 6: Transitional and Repeal
- Schedule A: Waste Management Facility Permit Application
- Schedule B: Landfill Requirements
- Schedule C: Transfer Station Requirements
- Schedule D: Composting Facility Requirements
- Schedule E: Material Recovery Facility Requirements
- Schedule F: Remote Seasonable Waste Facility Requirements

## 2.0 APPROVAL PROCESS

Prior to constructing, modifying, or operating any waste management facility an appropriate approval must be obtained. The following subsections provide basic information and guidance about the approval process.

### 2.1 Classifications

Identifying the Class of a WDG is the first step in the approval process. Landfills in Manitoba are divided into three classes:

- Class 1 Waste Disposal Grounds (WDGs), which are the largest facilities that
  - a) receives more than 5,000 tonnes of solid waste in a year or 400 tonnes of solid waste in a 30-day period;
  - b) receives solid waste from outside the province; or
  - c) is operated by anyone other than a municipality or regional waste management authority and
    - i) disposes of solid waste generated by the operator, or
    - ii) receives solid waste generated by others for commercial purposes.
- Class 2 WDGs, which are facilities that do not fall under the definition of a Class 1 or Class 3 WDG; and
- Class 3 WDGs, which are WDGs that were previously classified as Class 3 WDGs under the former Waste Disposal Grounds Regulation.

### 2.2 Environment Act Licences

An Environment Act Licence (EAL) must be obtained prior to any construction, modification, or operation of:

- Class 1 WDGs,
- landfill gas collection systems,
- commercial composting operations, or
- gasification plants.

The licensing process is prescribed by the Licensing Procedures Regulation (M.R. 163/88) and is summarized in a [flow chart](#).

The Environment Act Proposal (EAP) Report Guideline, which provides all information about how to apply for an EAL, is also available [online](#).

An EAP consists of:

- A cover letter;
- A signed EAP form (available online);
- Hard and electronic copies of the proposal document(s); and
- The application fee payable to the Minister of Finance.

The fees for the applications vary by Class of Development, which differ from the Class of WDG (see Table 1, below). A current fee schedule can be found in the Environment Act Fees Regulation online. The class of development licence required for each type of facility are listed in Table 1, below.

**Table 1 – Environment Act Licence Development Types**

Type of Facility	Class of Development	Section under The Environment Act
Class 1 WDG	Class 2 Development	Section 11
Commercial Composting Facility	Class 1 Development	Section 10
Biosolids Composting	Class 2 Development	Section 11
Landfill Gas System *	Class 1 Development	Section 10
Gasification Plant for conversion of waste to energy	Class 1 Development	Section 10

**NOTE:** any landfill gas system that is required to mitigate landfill emissions (ie. collection and treatment/utilization/flaring of landfill gas) in accordance with *The Climate Change and Emissions Reductions Act (C.C.S.M c. C135)* and the *Prescribed Landfills Regulation (M.R. 180/2009)* is licensed as a Class 1 Development under Section 10 of *The Environment Act*.

### 2.3 Permits

Prior to construction, operation, or expansion of any type of waste management facility, excluding the licensed facilities described in the section above, a permit to operate is required under the Regulation. These facilities include:

- Class 2 WDGs,
- Class 3 WDGs,
- Transfer Stations,
- Composting Facilities,
- Material Recovery Facilities, and
- Remote Seasonal Waste Facilities.

A proponent must complete and submit a permit application on a form approved by the Director, and must include the information set out in Schedule A (Waste Management Facilities Permit Application) of the Regulation. For a landfill, the proposal must also include supporting information prepared by a qualified professional that contains the assessment of geological and hydrological conditions specific to the landfill and its surrounding areas.

The Director has the authority to request, and may require the applicant to provide any additional information considered necessary to assess the application. The Director may also issue a permit that imposes terms and conditions considered necessary to protect human health and the environment, or refuse to issue a permit if it is evident that the facility will have a negative impact on human health or the environment. Refusals will be

communicated to the proponent within 30 days of the decision, in writing, with reasons for the refusal.

Permit renewals are required every 5 years under the Regulation. Renewal forms are available online on the Manitoba Sustainable Development Solid Waste Program website. All renewal applications must be submitted to the Director at a minimum 90 days prior to the expiration of the current permit.

## 2.4 Transitions

### 2.4.1 Converting a Class 2 WDG to a Class 1 WDG

When a Class 2 WDG no longer meets the requirements for a Class 2 WDG, the facility is required to apply for a Class 1 WDG EAL in order to continue to operate. The process to obtain an EAL is outlined in the *Licensing Procedures Regulation* (M.R. 163/88).

### 2.4.2 Permits Under Former Regulation

Permits issued under the former Waste Disposal Grounds Regulation are required to be renewed under the Regulation. The amount of solid waste received in a year will determine when the permit renewal is required for those facilities that currently have permits without expiry dates. Existing landfills that have an expiry date on the Permit will be required to renew a minimum 90 days prior to the expiry date on the Permit.

The permit renewal will occur as outlined in Table 2:

**Table 2 – Permit Renewal Timeline**

Type of Landfill	Permit	EAL	Timeline to apply for Permit or EAL
Operating an existing Class 1 WDG under an Operating Permit		X	1 year
Operating an existing Landfill that will change to a Class 1 WDG		X	1 year
Accepts between 1,001 - 5,000 tonnes in a year	X		2 years
Accepts between 501 tonnes - 1,000 tonnes in a year	X		3 years
Accepts between 0 - 500 tonnes in a year	X		4 years



Permits under the former regulation will remain in effect until a new permit is issued. The facility is subject to the terms and conditions in the permit. The permit may also be suspended, revoked, or amended in accordance with the Regulation.

### 3.0 SITING CRITERIA

The following subsections provide basic information and guidance on acceptable siting and siting requirements for any landfill and remote seasonal waste facility in Manitoba.

#### 3.1 Setback Requirements

The following tables outline the preliminary screening criteria to be used when developing a Class 1, Class 2 or Class 3 WDG. Setback distances are measured from the declared property line of the proposed facility to the development or feature in question. In addition to new construction, a proponent expanding a landfill shall also comply with the setbacks as provided below unless otherwise approved by the Director.

**Table 3 - Setback Requirements for Class 1 WDGs, Class 2 WDGs, and Class 3 WDGs**

DEVELOPMENT OR FEATURE	SETBACK	REFERENCE
Railway or public road (except the access road to the waste disposal ground)	100 metres	Waste Management Facilities Regulation 111/2016
Property boundary of any cemetery	400 metres	Waste Management Facilities Regulation 111/2016
Potable water well	400 metres	Waste Management Facilities Regulation 111/2016
Natural gas pipeline or underground utility corridor	100 metres	Waste Management Facilities Regulation 111/2016
Building	400 metres	Waste Management Facilities Regulation 111/2016
Surface water	1 kilometre	Waste Management Facilities Regulation 111/2016
Airport	*15 kilometres	Transport Canada

**\*NOTE: Contact Transport Canada, Aviation, Winnipeg Operations at [caspnr-sacrpn@tc.gov.ca](mailto:caspnr-sacrpn@tc.gov.ca) for specific information regarding your location.**

Upon written request from the proponent, a variance, with or without conditions, may be issued with regard to the above setback requirements. Variances will only be considered if suitable alternatives are not available, and the variance does not result in unacceptable degradation of the environment.

Established facilities that are operating in non-compliance with the above will be evaluated on a site by site basis during the review process (e.g., natural gas pipelines for existing facilities). In accordance with the permit renewal process, sites will be assessed to determine if any environmental concern is present or additional protection is required.

### 3.2 Exclusion Areas

Locating a landfill in the areas indicated in Table 4 is prohibited.

**Table 4 – Landfill Exclusion Areas**

<b>AREAS</b>	<b>EXCEPTIONS</b>
Groundwater	Seasonal high water table is at least one metre below the lowest cut or base of liner elevation
Flood prone areas	Construct above 100 year flood elevation or adequate flood protection measures are incorporated into the design
Steep slopes	NONE
Gravel pit or quarry	NONE
Permafrost	NONE

### 3.3 Subsoil Investigation Requirements

All proposed landfill and remote seasonal waste facilities must be evaluated to determine geological and hydrogeological conditions including but not limited to the type, distribution and continuity of subsoils, groundwater and bedrock. This is completed by conducting a subsurface investigation at the site.

#### 3.3.1 Test Hole Requirements

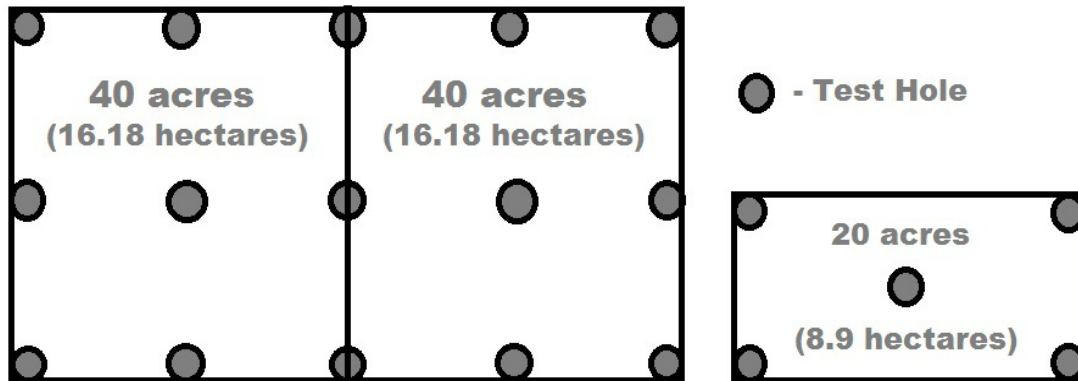
During subsurface investigation, test holes must be evenly distributed and drilled to a minimum depth of 10 metres below the proposed base of the active area unless auger refusal is reached before this depth. The minimum test hole density is listed in Table 5.

**Table 5 - Minimum Test Hole Density**

<b>AREA</b>		<b>NUMBER OF TEST HOLES</b>
<b>(acres)</b>	<b>(hectares)</b>	
<b>20</b>	<b>8</b>	<b>5</b>
<b>40</b>	<b>16</b>	<b>9</b>
<b>80</b>	<b>32</b>	<b>15</b>

The test holes may be arranged in the grid patterns illustrated in Figure 1.

**Figure 1 – Suggested Test Hole Grid Patterns**



Based on the results from the subsurface investigation, additional test holes should be added if warranted by site conditions.

### **3.3.2 Permeability**

The permeability of the major subsurface soil strata shall be determined by analysis carried out by an accredited soils laboratory. Analysis should be performed on representative samples obtained during the subsurface investigation. Testing may include but not be limited to the following:

- Atterburg limits (plastic limit, liquid limit, and plasticity index, ASTM D4318)
- Soil Classification (ASTM D2487)
- Moisture Content (ASTM D2216)
- Particle Size Analysis (Hydrometer test, ASTM D422)
- Visual Classification
- Standard Proctor Density (ASTM D698)
- Hydraulic Conductivity (ASTM D5084).

The soils laboratory should also be asked to provide a professional assessment, based upon the analysis and the testing, as to whether the soil samples could achieve a permeability of  $1 \times 10^{-7}$  cm/s or less in their in situ and reworked states.

### **3.4 Groundwater Investigation Information**

A minimum of three groundwater wells (piezometers) are required for most sites in Manitoba. On the basis of the assumed direction of the groundwater flow, one well should be sited upstream and two should be sited downstream of the proposed landfill.

The following data shall be obtained from the groundwater wells:

- the elevation of the groundwater table (the piezometric surface);
- the groundwater flow direction; and
- baseline groundwater chemistry.

### **3.4.1 Chemistry**

The chemical parameters that must be included in the groundwater baseline chemistry analysis are listed in Table 6. The baseline chemistry is required to compare with future groundwater samples when determining if the landfill is affecting the local groundwater. Additional testing for other chemical parameters (e.g., pesticides, other trace elements) may be required by Manitoba Sustainable Development on a site specific basis.

### **3.4.2 Exceptions**

Some sites in Manitoba are located in areas where a thick veneer of impermeable soils overlie and protect the local aquifer or in areas where there are no recognized aquifers. Groundwater wells may not be required at these sites if the following conditions are met:

- the subsoil investigation provides a minimum separation distance of 10 metres of low permeability clay or clay till between the expected base of the active area and the aquifer (i.e., equivalent time of travel (refer to Section 3.5) to aquifer is greater than 2 metres of  $1 \times 10^{-7}$  cm/s material); and
- no usable aquifer is encountered within 10 metres of the expected base of the active area.

**Table 6 - Baseline Groundwater Chemistry Parameters**

<b>Chemical Parameters</b>	
<b>Inorganics</b>	
Alkalinity – Total	Magnesium – Dissolved
Ammonia – Total	Manganese – Dissolved
Arsenic – Total	Mercury – Dissolved
Barium – Dissolved	Nitrate - Reported as N
Boron – Dissolved	Nitrite - Reported as N
Cadmium – Dissolved	Total Kjeldahl Nitrogen – Reported as N
Calcium – Dissolved	pH
Calcium Carbonate	Total Phosphorous
Chloride	Potassium – Dissolved
Chromium – Dissolved	Silicon – Dissolved
Conductivity	Sodium – Dissolved
Copper – Dissolved	Total Dissolved Solids (TDS)
Iron – Dissolved	Sulphate
Lead – Dissolved	Uranium – Dissolved
	Zinc – Dissolved
<b>Volatile Organic Compounds (VOC's)</b>	
BTEX	
<b>Other Organics</b>	
Biological Oxygen Demand (BOD)	Chemical Oxygen Demand (COD)
Dissolved Organic Carbon (DOC)	
<b>Field Parameters</b>	
pH	Groundwater Elevation
Conductivity	Dissolved Oxygen
Temperature	

- **Note:** All metals (except Arsenic) are to be sampled for dissolved analysis.

- **Note:** Dissolved samples should be filtered in the field and preserved in the field at time of sampling. If dissolved samples are not to be filtered and preserved in the field then Manitoba Sustainable Development and the Laboratory must be notified prior to sampling.

### 3.5 Geologic Site Evaluation

The suggested method to evaluate the geologic sensitivity of groundwater to leachate contamination is the estimated ‘time of travel’ (ToT) of leachate contaminants through the soil and proposed liners (permeability). For the calculation, it is acceptable to assume that the flow paths are vertically downward in all cases, and the lateral movement of contaminants is not a factor. An exception to this assumption would be circumstances with coarse soils in close proximity to surface water (e.g., rivers or lakes).

ToT calculations must include the following:

- composition of liner or liner systems;
- leachate head on the liner or liner system;
- depth to groundwater; and
- depth and types of soils (including bedrock if applicable).

In addition to the above, consideration for the inclusion of leachate collection, extraction and management should also be included for any design with a ToT of less than 75 years. If leachate management is not included for those sites with ToT less than 75 years, justification and supporting calculations, groundwater sampling results, etc. must be provided in the design submission. Table 7 below demonstrates the geological sensitivity rating. Locating a site in an area with a sensitivity rating of ‘high’ is discouraged unless the proponent is prepared to install a properly designed leachate control and management system, and a suitable liner system.

**Table 7 - Site Evaluation for Geological Sensitivity**

<b>GEOLOGICAL SENSITIVITY RATING</b>	<b>DESCRIPTION</b>
High	Water moving vertically will reach the aquifer in less than 25 years.
Moderate	Water moving vertically will reach the aquifer in 25 to 90 years.
Low	Water moving vertically will reach the aquifer in 90 or more years.

## 4.0 LANDFILL DESIGN AND CONSTRUCTION

The following subsections provide and summarize information required for landfill design and construction in Manitoba. Note that landfill construction must occur in accordance with plans approved by the Director: **Always refer to the Permit or Licence for additional or specific construction requirements.**

### 4.1 Qualified Professionals

Landfills have the potential to create long term negative impacts on the environment. Therefore, Manitoba requires that the design and construction of landfills must be overseen by qualified professionals who understand and can identify potential factors that may harm the environment, and can provide methods to reduce actual or potential harm and incorporate these methods into the design.

### 4.2 General Design and Construction Requirements

In addition to the requirements in the *Waste Management Facilities Regulation*, the following must be submitted:

1. Site plan to scale including, but not limited to the following:
  - pre-construction elevation contours (*1:2000 scale*)
  - location of property boundaries
  - location of cells, recycling, burning and compost areas (*where applicable*)
  - location of litter control fencing/berm
  - location of buildings (*if applicable*)
  - location of internal roads
  - location of bore holes/test pits and sealing method
  - location of proposed monitoring wells
  - location of surface drainage network (*if applicable*)
  - location of wells, sinkholes, surface water courses and
  - location of leachate pond(s) (*if applicable*)
2. Design plan to scale including, but not limited to the following:
  - proposed active area design, leachate collection and disposal method
  - design slopes and berm grades
  - WDG area cut & fill depths
  - leachate pond design
  - details and design information for composting pad (*if applicable*)
3. Additional information including, but not limited to the following:
  - landfill gas collection and management plan (*if applicable*)
  - background water chemistry
  - soil test results
  - bore hole logs

#### 4.2.1 New or Expanding Landfill Design Requirements

In addition to the requirements indicated in the sections above, any new or expanding landfill permit applications also have the following requirements:

- Submission of design plans for any waste cell construction (level of detail and construction supervision is dependent upon site conditions);
- Notification to the assigned Environment Officer five days prior to proceeding with any **approved** construction or alteration activity at the facility;
- Active areas and material storage areas must be designed, constructed or fenced to retain loose garbage and materials, in order to reduce windblown litter;
- Any above grade waste cells must be designed to retain leachate to the depth to which potential leachate could accumulate (i.e., lined with impermeable material);  
Additional height of above grade berms shall be designed for slope stability, but may be developed without the 1 metre liner perpendicular to the slope, upon approval of the Director. This is because it is recognized that the primary purpose (above liquid leachate level) is waste containment, not liquid containment; and
- Cut and fill clay cells or compacted clay lined cells may require soil sampling to be conducted after construction and prior to being placed into operation. The Operator must arrange for testing to occur with the assigned Environment Officer.

**No person may set any waste cell into operation or place any waste in a cell, until receiving written authorization from an Environment Officer.**

#### 4.2.2 Class 2 WDG and Class 3 WDG Design Requirements

In addition to the requirements indicated in the sections above, Class 2 WDG and Class 3 WDG permit applications also have the following requirements depending on the cell type:

1. Cut and fill clay cells
  - Must demonstrate no less than 75 years time of travel to groundwater;
  - Must demonstrate no less than  $1 \times 10^{-8}$  cm/s hydraulic conductivity on any non-reworked permeability test sample;
  - Must demonstrate that there is no groundwater or bedrock within 2 metres of the cell base; and
  - Testing of the material after construction is required.
2. Compacted clay lined cells – below grade
  - Testing of all clay liners must be conducted by a qualified professional to confirm a compaction of 95% standard proctor density on maximum lifts of 150 mm; and
  - All clay lined cells or leachate ponds must be constructed to achieve a hydraulic conductivity of not more than  $1 \times 10^{-7}$  cm/s with a minimum



thickness of not less than 1 metre measured perpendicular to the slope (unless otherwise approved by the Director).

3. Composite or synthetic lined cells

- Liners shall be installed in accordance with specification from the liner manufacturer under continuous and direct supervision of an engineer or a qualified installation supervisor designated by the manufacturer or representative;
- Destructive and non-destructive testing of any high density polyethylene (HDPE) liner shall be carried out in accordance with industry standards and results must be compiled and provided to the Director prior to using or covering the waste cell;
- Any HDPE liner must have a minimum thickness of 60 mil;
- All sections of HDPE liners must be joined by double channel fusion seaming;
- No synthetic liners, excluding Geosynthetic Clay Liners (GCL), shall be covered prior to authorization by an Environment Officer; and
- Synthetic liners shall be covered prior to waste placement in accordance with manufacturer's recommendations and standards.

#### **4.2.3 Leachate Collection System Design Requirements**

For those sites that are designed to include a leachate collection system, the following design requirements must be met:

- A porous layer or trench must be designed into the cell to channel leachate to a collection and extraction point; and
- Alternative aggregates that are compatible with the chemical properties of leachate, such as tire derived aggregate (TDA), crushed glass, or other materials approved by the Director, may be used in place of traditional stone.

#### **4.2.4 Leachate Containment System Design Requirements**

For those sites that are designed to include a leachate containment system, the following design requirements must be met:

- Minimum 1 metre depth of clay or compacted clay that can achieve  $1 \times 10^{-7}$  cm/s or equivalent geosynthetic lined cell;
- Freeboard of 1 metre above the maximum elevation of leachate held in the cell;
- Sized to contain, until evaporation, all leachate collected at the facility.

## 5.0 LANDFILL OPERATION

### 5.1 Operation Manual

Operators of landfills are required to maintain an Operation Manual that includes an Emergency Response Plan, waste acceptance procedures and policies, a site drawing, and process descriptions necessary for the safe and efficient operation of the facility. The Operation Manual must be reviewed and updated every 5 years and submitted to the Director upon request. A copy of the Operation Manual must be kept at the site and must be accessible to every person who is working at the facility.

The Operation Manual may include, but should not be limited to the following:

- Introduction
  - site summary
  - site management
  - site security measures (e.g., site operator, contact information, hours of operation, gate, applicable signage)
  
- Landfill Design and Construction
  - landfill capacity and layout
  - construction method for initial cell/area and future cells
  - surface water control
    - entrance
    - active area
    - storage/recyclable areas
  - stormwater control
  - engineered systems
    - liner systems
    - leachate management
  - landfill gas system (if applicable)
  
- General Operations
  - site access and fencing
    - around entire site
    - active area
    - temporary/moveable or permanent
  - site supervision
  - signage
  - general safety
  
- Monitoring and Reporting Programs
  - procedure for required or voluntary sampling at the site
    - groundwater
    - surface water
    - leachate
    - air emissions and landfill gas

- sampling frequency
  - analytical plan
  - review and interpretation of results
- Contingency Plans
- Disposal Operations
  - waste collection and delivery (if applicable)
  - method of waste handling to the active area
  - cell construction and waste placement
  - compaction and cover including frequency and type of cover material, as well as provisions for winter and interim cover
  - method for stockpiling and spreading of cover material, including provisions for winter;
  - equipment and operation schedule (e.g., dedicated machine, contract, and municipal equipment)
  - acceptable materials
  - prohibited materials
  - burning
  - animal and insect control
- Site Inspection and Maintenance
  - general site inspection
  - roads
  - ditches
  - operating and machinery maintenance records
  - annual report
  - financial assurance documentation
- Site Safety
  - public safety
  - employee personal protective equipment
  - employee training
- Fire Prevention and Emergency Response Plan
- Landfill Closure Plan
  - closure plan
  - closure design
  - final cover
  - post-closure activities

## **5.2 Record Keeping and Reporting**

The following records must be maintained by the landfill Operator in an accessible and secure location. Note that this list is not exhaustive:

- a copy of the Permit or EAL;
- development and construction drawings;
- operational records;
- inspection records;
- training procedures;
- operation manual;
- closure and post closure plans;
- monitoring results and reports;
- leachate volumes pumped; and
- copies of all annual reports

In addition to the above, reports that may be required are detailed in the following sections.

### **5.2.1 Assessment and Recommendation**

The Director may require the Operator to prepare, or arrange to have prepared by a qualified professional, a report detailing any matter related to the construction and operation of the facility that the Director considers necessary to protect human health and the environment.

### **5.2.2 Tonnage Records**

The Operator shall submit, unless otherwise exempt, the annual received tonnage records as a part of the Waste Reduction and Recycling Support (WRARS)\_reporting requirements. The Operator must remit the WRARS Levy to Green Manitoba for each six month period per year. Reporting periods are from January 1 to June 30 and July 1 to December 31. The WRARS Levy is applicable to all municipal solid waste, including residential, industrial, commercial and institutional waste (ICI), and construction, renovation and demolition waste (CR&D). Ashes from burned waste are also to be included in the reported tonnage to WRARS.

### **5.2.3 Annual Report**

Unless otherwise exempt in the Permit or EAL, the Operator shall submit, on or before the 15<sup>th</sup> day of April of each year, an annual report with respect to all activities at the landfill conducted pursuant to the Permit or EAL during the previous calendar year. The format of the report shall be approved by the Director and contain information as identified in the approved Operation Manual.

## **5.3 Site Security and Safety**

### **5.3.1 Contingency and Emergency Response Plan**

The emergency response plan should be posted at the site for all staff to use. The plan must include the following:

- Hazard identification;
- Fire suppression plan and resources;
- Emergency personnel list;
- Outside contacts;
- Evacuation plans;
- Emergency response procedures;
- Equipment listing;
- Maps/drawings; and
- Hazardous materials list.

Guidebooks that provide more information on Emergency Response Planning can be obtained [online](#).

### **5.3.2 Site Supervision**

Landfills are to be supervised by a Certified Operator at all times when the facility is open to the public and landfilling is occurring to the active area. If the Operator is not on duty, or the facility is closed, the gate must be closed and locked or barricaded to prevent access to the site.

Operator tasks may include the following:

- controlling the entrance and checking loads for wastes prohibited at the facility;
- directing traffic to appropriate disposal areas;
- ensuring safety procedures are followed by visitors;
- recording waste volumes and accepting fees (if applicable);
- conducting routine inspections and maintenance; and
- operational activities as required (e.g., equipment operation for compacting and covering waste, cutting grass, pushing snow).

### **5.3.3 Operator Certification**

Landfill Operators are required to be trained to understand their responsibilities at the facility. Commencing July 1, 2019, when a Class 1, Class 2 or Class 3 WDG is open to the public and accepting waste at the active area, it must be staffed by an Operator who has successfully completed a course of instruction by the Solid Waste Association of

North America (SWANA). These courses include the Landfill Operations Basics Course and the Manager of Landfill Operations Course. Only Class 1 WDGs must employ an individual with the Manager of Landfill Operations course. Operators can contact SWANA directly to register to attend one of these courses or to obtain additional information.

The Department will consider certifications from other jurisdictions upon request.

#### **5.3.4 Site Access**

All owners must maintain natural or artificial barriers along the perimeter of the facility to control public access and vehicular traffic onto the site. The type of barrier will depend on the security needs of the site (e.g., limiting access to wildlife and/or trespassers). Public access to the site may be controlled by using barriers or locked gates outside of operating hours.

All landfills must be serviced by an all weather access road designed to accommodate landfill traffic and complying with any road restrictions.

#### **5.3.5 Signage**

Landfill signage is required to bring attention to site hazards and to avoid injury. Additional signage inside the facility may be posted to direct traffic, identify waste locations, and provide speed limits and safety procedures. All landfills must post and maintain signs at the entrance of the facility that indicate the following:

- the name of the facility;
- the operating hours of the facility;
- the types of materials that may be deposited at the facility;
- the types of materials that are not accepted at the facility; and
- a 24-hour emergency contact telephone number.

Signs must be maintained in good condition.

#### **5.3.6 Fire Protection**

The occurrence of fires at landfills is not uncommon. Embers in hot loads, careless smoking, reactive substances, lightning strike, arson, and spontaneous combustion are all possible ignition sources for landfill fires. Understanding landfill fires and their prevention can significantly decrease the cost and severity of environmental and property damages.

### 5.3.6.1 Fire Prevention

#### **ALL LANDFILLS MUST HAVE A STRICT, AND ENFORCED, NO SMOKING POLICY.**

The 3 Cs for fire minimization are compaction, cover and compartmentalize waste.

Common ways to prevent and minimize landfill fires include the following:

- non-combustible intermediate cover layers;
- non-combustible 'walls' between waste cells;
- proper compaction reducing air space, therefore reducing fire potential;
- disposal of hot loads in non-combustible areas or an isolated area at the facility;
- storage of tires away from waste cells (if ignited, tire material can draw the fire deep into the waste pile);
- covering ashes with soil; and
- controlling and monitoring all burning activities.

Once a landfill is properly capped, it is recommended to use compost or similar product to keep the clay from desiccating, cracking and allowing air into the cell, which, if there are hot spots, can contribute to a flare up.

### 5.3.6.2 Fire Control

A source of water, such as a hydrant or pond, should be available at all facilities.

Agreements should be made with local fire services for infrastructure (buildings, equipment, etc).

Considerations when fighting fires at a landfill include the following:

- Type of waste;
- Use of foam (types of foam);
- Availability of soil/sand to be used as a smothering agent;
- Use of quenching pits;
- Availability of equipment;
- Residential and commercial development in area;
- Slope stability and integrity;
- Possibility of cave ins (where bridging of cover over burnt out area collapses);
- Access to the burning area; and
- Personal Protective Equipment for heat, smoke, toxins, etc. (Respiratory protection is mandatory and must be specific to the types of contaminants; otherwise a full Self Contained Breathing Apparatus (SCBA) is required. Gas metres should also be considered); and
- Fire fighter exhaustion.

If a fire occurs at a waste management facility due to an accident, natural causes, or vandalism, the operator of the facility must report the fire and the actions taken to extinguish it by phoning the Manitoba Sustainable Development Emergency Response Line at 204-944-4888 or 1-855-944-4888 and reporting the information to the person who answers the call.

## **5.4 Site Activities**

### **5.4.1 Topsoil Removal and Storage**

Unless otherwise specified by the Director, the topsoil is to be removed and stored for future use at the facility. Other soils and materials removed during the construction and operation of a landfill cell should be stored and used for cover material at the landfill site.

### **5.4.2 Active Area Management**

The active area is designed to accept the waste that cannot be sorted, recycled or reused. It is important to have a direct route for traffic to use to and from the active area, unless the facility has bins or an alternative waste drop off site so the public does not access the active area. Visible signage should be installed to guide users to the disposal or alternative drop off area.

The active area must be enclosed with a fence or berm at least 1.8 metres higher than the height of the solid waste it contains to prevent windblown scatter.

Waste should be placed at the toe of the working face and pushed upslope, compacting in thin layers. At the end of each working day, or as specified in the permit, the cell is to be compacted and covered with a layer of soil to a minimum depth of 15 centimetres. Compacting and covering will reduce rodents and insects, windblown scatter, odours, leachate, and fires.

### **5.4.3 Burning**

The Operator must not burn unless authorized under the licence or permit issued for the facility. Only separated and readily combustible materials such as boughs, leaves, loose straw, paper products, cardboard, non-salvageable untreated wood, and packaging materials derived from wood may be burned, and only when there is an appropriate volume of this material to burn and weather conditions are favorable. Burning of any other materials is prohibited.



Examples of prohibited materials include, but are not limited to the following:

- Garbage
- Plywood
- Plastics
- Rubber
- Chemically treated fabrics
- Finished Furniture
- Railway ties
- Waste oil
- Materials constructed with glues, finishes, or preservatives
- Composite board
- Composites
- Carpet
- Manure
- Mattresses
- Man-made synthetics
- Metallic waste
- Pesticide containers

Requirements for controlled burning include, but are not limited to the following:

- The burn area must be enclosed on three sides by a berm that is at least 1.8 metres high or enclosed in a metal burn containment vessel or cage. Other burning containment vessels or structures may be approved by the Director upon request;
- The burn area must be graded to prevent the collection of water;
- The burn can occur only during daylight hours; and
- The burn must be under constant supervision and occur when wind direction and speed will prevent smoke and odour from entering nearby properties and roads.

The ashes from the burn area must be regularly removed once completely extinguished and placed into the active area cell for disposal.

Setback distances for burning are listed in Table 8 below.

**Table 8 - Location Requirements for Siting a Burn Area**

<b>FACILITY</b>	<b>SETBACK</b>	<b>REFERENCE</b>
Building not located at the landfill	400 metres	Waste Management Facilities Regulation 111/2016
Active area	50 metres	Waste Management Facilities Regulation 111/2016
Compost or area used to collect flammable materials	50 metres	Waste Management Facilities Regulation 111/2016

If the landfill is authorized to burn, burn records must be maintained that include, but are not limited to the following:

- the date, time and duration of the burn;
- the volume and types of waste burned;

- the weather conditions during the burn;
- any deviations from normal operations in respect to the burn; and
- any complaints received in respect to the burn.

These records must be maintained at the landfill for at least 5 years and must be provided to an Environment Officer or the Director upon request.

If a fire occurs at a waste management facility due to an accident, natural causes, or vandalism, the operator of the facility must report the fire and the actions taken to extinguish it by phoning the Manitoba Sustainable Development Emergency Response Line at 204-944-4888 or 1-855-944-4888 and reporting the information to the person who answers the call.

#### **5.4.4 Composting**

Composting is the breakdown of organic matter in a controlled aerobic manner. The diversion of organic matter from landfilling is beneficial, as it reduces the production of green house gases and landfill leachate and returns valuable nutrients to the soil. However, operators need to be knowledgeable regarding the potential problem areas in the composting of organic matter, in order to create a valuable end product. Some areas for consideration when developing a composting program include the following:

- Type of materials to be composted (i.e., leaf and yard waste only, kitchen waste, other materials such as pet waste, institutional waste);
- Feedstock management (seasonal variations, storage, incorporation of putrescible materials, C:N ratio, bulking materials, etc);
- Access roads;
- Composting base and working surface;
- Leachate management;
- Water supply for moisture control during composting;
- Odour controls;
- Wildlife controls;
- Fire prevention;
- Cold weather operations;
- Equipment and corrosion controls;
- Screening;
- Curing and storing; and
- Ultimate use (i.e., sale, own use, give away).

Any facility that has a composting program will have conditions included in their permit or licence. Any compost that is to be sold must comply with the CCME Guidelines for Compost Quality and CFIA (Canadian Food Inspection Agency) criteria under the Fertilizers Act and Regulations.

#### **5.4.5 Surface Water Drainage**

The control of surface water is required to minimize leachate production from overland flow into the active area and minimize surface water contamination from active area runoff.

A storm water drainage system should also be constructed to control rainfall runoff and limit sediment flow to surface water bodies.

Containment berms around the active area should be designed to control and collect the volumes from a 25 year storm event.

It is also necessary to ensure that waste is not disposed of in water, either in a fill area, or in a trench. All water in contact with the active area waste must be handled and treated as leachate.

#### **5.4.6 Leachate Management and Removal**

Attention to leachate levels is required to prevent uncontrolled discharge to the environment. Regular pumping of leachate from manholes, sumps, and the active area will help reduce leachate head on the liner.

Leachate can be treated onsite or transported offsite for treatment and disposal if approved in writing by the Director. Leachate recirculation over the active area waste or closed cells is not permitted.

It is recommended that a Leachate Management Plan is included in all facility Operation Manuals.

### **5.5 Nuisances**

Facility operators must take steps to eliminate or reduce odour, noise, and other nuisances resulting from landfill operations. The following subsections detail the requirements for controlling on and off site nuisances associated with landfill operations.

### **5.5.1 Odour and Noise Control**

Odour control can be accomplished by covering the waste in the active area with soil or other approved cover material at the frequency specified in the Regulation. Other odour control measures may include the following:

- keeping segregated materials in a clean, organized area;
- implementing landfill gas control systems; and
- repairing leachate seeps as required.

Noise control measures include the use of buffer zones and barriers, regular and scheduled equipment maintenance, regulated operating hours, and selection of a remote location for the landfill. Access routes for vehicles hauling waste or other materials should be selected to minimize noise impact on property owners.

An odour and noise control plan may be required if multiple written complaints from different affected parties are submitted.

### **5.5.2 Dust Control**

Dust created within the facility should be controlled to prevent public complaints. Control methods and materials must be approved by the Director. Options may include spraying water with a suitable approved dust control agent.

### **5.5.3 Litter Management**

The Operator is responsible for collecting litter on adjacent properties outside the landfill property boundary and litter accumulated at the facility. Suggested measures to reduce the escape of waste or other materials are provided in the following:

- Use natural or artificial barriers;
- maintain a small working face area;
- Increase the frequency of cover over the active area; and
- Conduct regular litter clean up.

Active area fencing should be located close to the working face, and can be relocated in order to accommodate the prevailing winds. It is also recommended that litter fencing be located around the unloading area of the active area. Fencing must be kept clean in order to be an effective litter collection device.

### 5.5.4 Animal and Insect Management

Control options to minimize the presence of animals and insects at the facility include, but are not limited to the following:

- Minimizing the food supply by regular compaction and cover of the working face;
- Preventing opportunities for shelter by mowing grass and weeds regularly;
- Removing bulky items to prevent shelter opportunities;
- Providing positive drainage as rodents and vectors are discouraged by lack of access to a water supply; and
- Implementing a baiting program through an exterminator to reduce the population size (a pesticide permit must be obtained from Manitoba Sustainable Development).

### 5.6 Source Separated Materials

If approved under the Permit or EAL, designated areas to provide storage for the following items may be established. Please note that this list is not exhaustive:

- Tires
- Glass
- Electronic Waste
- Combustibles
- Cardboard/Paper
- Asphalt Shingles
- Metals
- White Goods
- Propane Cylinders
- Recyclables
- Compostables
- Plastics
- Pesticide Containers \*\*
- Household Hazardous \*\*
- Waste Oil \*\*
- Used Oil Filters and Containers \*\*
- Batteries \*\*
- Solvents/Paints\*\*

\*\* These items require additional permitting from Manitoba Sustainable Development under *The Dangerous Goods Handling and Transportation Act*.

All waste is to be stored above grade at the facility and stored for a period no longer than one year prior to making recycling arrangements.

#### 5.6.1 White Goods

White goods are to be stored above grade in a separate area in an upright position. It is recommended that refrigeration and air conditioning equipment not be accepted unless ozone depleting substances (ODS) have been recovered and marked by a certified technician in accordance with the *Ozone Depleting Substances Regulation*.

If white goods are accepted and contain ODS, they are to be stored separate from the remaining white goods above grade and in an upright position. The Operator is required to have a certified technician recover the ODS in a safe manner.

### **5.6.2 Tires**

Tires are to be stored in a separate area above grade at the landfill. Operators must:

- Accept tires that are clean with rims removed;
- Store tires in rows according to size to allow easy loading;
- Store tires in an accessible area and with adequate fire protection; and
- Store tires a minimum of 50 metres away from any burn area

## **5.7 Special Waste**

### **5.7.1 Biomedical Waste**

Biomedical waste should be disposed of in accordance with the *“Guidelines for the Management of Biomedical Waste in Canada”* (CCME, 1992) or any future publications. Untreated biomedical waste is **not** acceptable at WDGs unless approved by the Director.

### **5.7.2 Asbestos Waste**

Handling and disposal of asbestos must be carried out in accordance with the following, or any future revisions thereof:

- *“Guideline for Working with Asbestos”* prepared by the Workplace Safety and Health Division of Manitoba Labour and Immigration; and
- *“Asbestos Disposal at Waste Disposal Grounds”* Guideline (June 9, 2015) prepared by Manitoba Sustainable Development.

### **5.7.3 Petroleum Contaminated Soil (PCS)**

If a landfill is approved to accept PCS, handling and disposal should be carried out in accordance with conditions of the permit or licence and the following, or any future revisions thereof:

- *“Criteria for Acceptance of Contaminated Soil at Licensed Waste Disposal Grounds”* Guideline (January 2015) prepared by Manitoba Sustainable Development.

Soils that contain petroleum contamination at a concentration below CCME Canadian Environmental Quality Guidelines (1999) and the Canada Wide Standards for Petroleum Hydrocarbons (PHC) in Soil (2001) for industrial land use can be received at a landfill and used directly as cover material without requiring further treatment.

PCS approved for use as cover material must be stored within an approved waste area.

#### **5.7.4 Liquid Waste**

No liquid waste is to be deposited at a landfill including, but not limited to the following:

- Wastewater sludge;
- Sewage;
- Septage; and
- Industrial liquid waste.

All existing liquid waste pits must be decommissioned.

#### **5.7.5 Hazardous Waste**

No hazardous wastes are to be deposited in a landfill unless the facility is authorized to accept hazardous wastes under *The Dangerous Goods Handling and Transportation Act*.

If a hazardous waste is found when inspecting a vehicle, the Operator should not accept the waste. If a hazardous waste is found within the landfill, the Operator should refer to the Operation and Maintenance Plan, or contact Manitoba Sustainable Development to obtain proper disposal instructions.

## **6.0 MONITORING AND REPORTING PROGRAMS**

The Director may require the operator of a landfill to develop and implement a monitoring and reporting program to detect and report the release of pollutants from the facility.

The monitoring and reporting program requirements may vary depending on site specific conditions, but will encompass, at a minimum, both groundwater and surface water monitoring. Additional monitoring programs for leachate and landfill gas may be required by the Director. The monitoring and reporting program must be submitted to the Director upon request, report on any results, and comply with the program as approved.

If the Director finds that the monitoring and reporting program plans are deficient, the Operator will be notified and required to address in writing all deficiencies as outlined by the Director.

### **6.1 General Information**

Background samples for all monitoring wells and surface water areas should be taken to establish existing concentrations before landfill operations begin (baseline data). If the landfill is already in operation, groundwater concentrations can be approximated using historical data or obtaining groundwater samples in nearby areas not affected by landfill activity.

All water samples should be collected and assessed by a qualified professional and submitted for analysis to a laboratory accredited by the Canadian Association of Laboratories for the selected parameters. While conducting sampling, documentation for all aspects including sample handling and analysis, description of methods used to analyse the samples, proper record keeping of sampling, sample chain of custody, analytical results records, and quality control sample records must be completed and maintained.

The results from all analysis should be compared to background levels or site background concentrations where baseline data is not available. The qualified professional should note any results outside the range of background/baseline results and explain the reason behind the change. This may result in re-sampling the location, and/or implementing the contingency plan.

Monitoring well samples should be collected and analyzed in accordance with the Permit.



Data from the sampling event should include the following:

- Groundwater elevation;
- Stream flow (if pertinent);
- Water temperature;
- Field conductivity;
- Field pH; and
- Dissolved oxygen.

## **6.2 Groundwater Monitoring Program**

The groundwater monitoring program shall include a report that contains, but may not be limited to the following:

- Background groundwater data for each monitoring well;
- Establishment of groundwater quality control limits for each naturally occurring parameter;
- A detailed program for sampling frequency and analysis; and
- A Groundwater Contingency Plan.

### **6.2.1 Monitoring Well Requirements**

The Operator must protect each monitoring well installed at the landfill from damage and keep it locked except when samples are being taken. The Operator must also clean, repair, or replace a monitoring well that is damaged or is no longer able to produce representative groundwater samples. Any wells that are no longer in use are required to be decommissioned in an environmentally sound manner.

### **6.2.2 Sampling Frequency, Analysis, and Reporting**

Sampling of groundwater monitoring wells must be conducted by a qualified professional on behalf of the owner of a facility once per year or at the frequency specified in a Permit or EAL. The parameters tested should be those indicated in the Appendix of the Permit, EAL, or selected parameters as approved by the Director.

The groundwater monitoring well samples shall be collected, stored, and analyzed using approved field and laboratory techniques. The samples shall be analyzed at an accredited laboratory.

The Operator shall submit an annual report in a format acceptable to the Director, detailing the results of the groundwater sampling, complete with previous results and trends. The report shall be prepared by a qualified professional to ensure the results

comply with the guidelines published in CCME or other recognized standard organizations. The following guidelines may be considered during the review:

- *Guidelines for Canadian Drinking Water Quality Summary Table - August 2012*
- *CCME Canadian Environmental Quality Guidelines Summary Table*
- *Alberta Tier I Soil and Groundwater Remediation Guidelines – December 2010*
- *Alberta Tier II Soil and Groundwater Remediation Guidelines – December 2010*
- *Ontario Ministry of the Environment – Soil, Ground Water and Sediment Standards – April 2011*

The report shall be submitted to the designated Environment Officer no later than December 31 annually or as specified in the Permit or EAL.

### **6.2.3 Groundwater Contingency Plan**

As part of the monitoring program, the Director may require the operator to develop a contingency plan to implement in the event of a parameter exceedance at the boundary of a facility.

In the event of an exceedance, re-sampling of the monitoring wells may be required, along with an amended monitoring program suitable to the Director.

Where an exceedance is deemed to be a risk to human health and the environment, the operator may be required to submit a report prepared by a qualified third party environmental professional to Manitoba Sustainable Development. The report shall address the results and propose a plan to control the offsite migration of the pollutant.

## **6.3 Surface Water Monitoring Program**

### **6.3.1 General Information**

A surface water monitoring program may be required at the request of the director. The program may include, but not be limited to the following:

- Sample points from the runoff control system at the facility;
- Identification of potential sources of contamination, leaks or spills at the landfill;
- Identification of any receiving surface water bodies at the boundary of the facility that could be impacted by a release of surface water from the facility; and
- Sample points in the receiving surface water bodies both upstream and downstream from the landfill.

The surface water samples must be collected, stored, and analyzed in accordance with the *Standard Methods for the Examination of Water and Wastewater*, or other field and

laboratory techniques as approved by the Director. The samples must be analyzed at an accredited laboratory.

If required in writing by the Director, the permit or the licence, the operator must submit an annual monitoring report in a format acceptable to the Director. This report shall include the results of the most recent sampling analyses, a comparison with previous analytical results, and identification of trends in the data. The report must be prepared by a qualified professional to ensure the results comply with applicable guidelines published by CCME or other recognized standard organizations.

### **6.3.2 Surface Water Contingency Plan**

In conjunction with the monitoring and reporting program, the Director may require the Operator to develop a contingency plan to implement in the event that a parameter in surface water at the boundary of the facility exceeds levels acceptable to the Director. The surface water contingency plan shall identify actions to be implemented to contain and mitigate impacts from a release of surface water. The Operator must submit the plan as requested and comply with the plan as approved.

If there is an accidental or unauthorized release of surface water from the runoff control system to a location outside of the property boundary, the Operator shall immediately notify the Director and implement the surface water contingency plan as approved.

## **6.4 Leachate Monitoring Program**

### **6.4.1 General Information**

All water in contact with waste is considered leachate and must be retained in an approved location until it can be treated or sent for disposal.

The most effective way to control leachate is to prevent leachate generation. This includes controlling surface and storm water flows, use of proper cover materials to prevent infiltration, and preventing high liquid content material from entering the landfill. If prevention and management is insufficient, liner systems, removal systems and operational practices can also be implemented.

Operators are responsible for the storage, treatment, and handling of leachate in accordance with the Regulation and the facility Permit or EAL.

The contaminants of concern in leachate typically consist of trace metals, major elements, organic compounds and microbiological components carrying both dissolved and suspended materials. The typical composition of leachate from new and mature landfills is provided in Table 9 below.

**Table 9 – Leachate Composition from New or Mature Landfills**

• 5-day biochemical oxygen demand (BOD <sub>5</sub> )	• pH
• Total organic carbon (TOC)	• Total hardness as CaCO <sub>3</sub>
• Chemical oxygen demand (COD)	• Calcium
• Total suspended solids (TSS)	• Magnesium
• Organic nitrogen	• Potassium
• Ammonia nitrogen	• Sodium
• Nitrate	• Chloride
• Total phosphorous	• Sulphate
• Ortho phosphorous	• Total iron
• Alkalinity as CaCO <sub>3</sub>	

(McGraw-Hill, 1993, p 418)

#### **6.4.2 Leachate Monitoring Program**

If identified by the permit or licence, the leachate monitoring program shall be required during the active landfill lifespan, the final closure of the facility, and remain in effect post closure. The program shall include, but not be limited to the following:

- A detailed plan for a leachate collection system or leachate pond system; and
- Policies and procedures for sample collection and analysis that includes:
  - Measurement of the depth of leachate head in the cells,
  - Collection of representative samples at the frequency outlined in the Permit or EAL, and
  - Submission of samples for laboratory analysis of parameters listed in the Permit or EAL.

#### **6.4.3 Treatment and Disposal**

All proposed forms of leachate treatment or disposal must be approved in advance by a Director of Manitoba Sustainable Development. Other options for cells, liners, or advanced technologies for use and disposal may be authorized in writing and accepted at the discretion of the Director.

Leachate treatment methods include evaporation, onsite treatment for disposal, transporting the leachate to a wastewater treatment plant (WWTP) and leachate recycling.

When removing leachate for treatment and disposal, it must be removed at a frequency that maintains the level at or below the approved acceptable leachate head.

### 6.4.4 Reporting

If the preferred method of leachate disposal is discharge to the environment or to a WWTP, a written request must be submitted to the Director of Manitoba Sustainable Development and approval must be granted prior to the discharge. Sampling results and interpretation shall be submitted to Manitoba Sustainable Development as required in the Permit or EAL. Leachate should be analyzed annually for the typical leachate parameters listed in Table 10.

**Table 10: Typical Leachate Parameters**

Physical	Organic Constituents	Inorganic Constituents	Biological
Appearance	Organic chemicals	Suspended solids (SS), Total Dissolved Solids (TDS)	Biochemical oxygen demand (BOD)
pH	Phenols	Volatile suspended solids (VSS), volatile dissolved solids (VDS)	Coliform bacteria (total, fecal; fecal streptococci)
Conductivity	Chemical oxygen demand (COD)	Chloride	Standard plate count
Oxidation-Reduction Potential	Total organic carbon (TOC)	Sulphate	
		Phosphate	
Color	Volatile acids	Alkalinity and acidity	
		Nitrate-N	
Turbidity	Tannins, lignins	Nitrite-N	
Temperature	Organic-N	Ammonia-N	
Odour	Ether soluble (oil and grease)	Sodium	
	Methylene blue active substances (MBAS)	Potassium	
		Calcium	
	Organic functional groups as required	Magnesium	
		Hardness	
	Chlorinated hydrocarbons	Heavy metals (Pb, Cu, Ni, Cr, Zn, Cd, Fe, Mn, Hg, Ba, Ag)	
			Arsenic
			Cyanide
			Fluoride
Selenium			

(McGraw-Hill, 1993, p 419)

#### **6.4.5 Leachate Contingency Plan**

The Director may require the Operator to develop a contingency plan to implement in the event that a parameter in the leachate has impacted soils or other discharges from the facility exceed levels acceptable to the Director. The operator must submit the plan and comply with the approved plan.

If there is an accidental or unauthorized release of leachate off the property, the operator shall immediately notify the Director and implement the approved leachate contingency plan.

### **6.5 Landfill Gas Monitoring Program**

#### **6.5.1 General Information**

Any installation of a landfill gas system, regardless of facility type, requires an EAL. Note that monitoring for landfill gas in any structure on any landfill or within 400 m of any landfill is recommended.

A landfill gas monitoring plan must be prepared for any facility that monitors landfill gas. The plan must specify all monitoring probe installation and maintenance procedures, as well as sampling and analysis procedures including quality assurance/quality control procedures.

Landfill gas monitoring typically consists of measuring the combustible gas concentrations using constructed gas probes. All landfills should be designed, constructed, and operated ensuring the maximum concentration of explosive gases does not exceed 20% of the lower explosive limit (LEL) in any landfill structure or at the property boundary.

#### **6.5.2 Landfill Gas Monitoring Program**

All landfill gas monitoring programs shall include, but not be limited to the following:

- A description of the landfill gas monitoring sites and their locations;
- The methods used for measurement and detection of the migration of subsurface landfill gas;
- The frequency of measurement of subsurface landfill gas; and
- A landfill gas contingency plan for the mitigation of subsurface landfill gas migration.

The data must be interpreted by a qualified professional authorized by the Director to determine the potential impacts from the migration of landfill gas.

### 6.5.3 Landfill Gas Contingency Plan

Throughout the active life, final closure, and post closure of a landfill, the landfill gas shall not exceed the landfill gas explosive limits as described in Table 11 below. If the explosive gas limits are exceeded, the Operator is to immediately notify the Director and implement the approved landfill gas contingency plan.

**Table 11: Subsurface Landfill Gas Explosive Limits**

<b>Sample Location</b>	<b>Explosive Gas Limits</b>
In the subsurface at the property boundary	50% LEL
In an on-site building or enclosed structure or in the area immediately outside the foundation of the building or structure	20% LEL
In an off-site building or enclosed structure or in the area immediately outside the foundation of the building or structure	1% LEL

(Standards for Landfills in Alberta, Feb 2010)

## **7.0 LANDFILL CLOSURE AND POST-CLOSURE REQUIREMENTS**

Landfill closures are required when part or the entire landfill has been filled with waste. Proper landfill closures ensure that the long term sustainability and security of the site is maintained and that human health and the environment are protected.

### **7.1 Preliminary Closure Plan**

A preliminary closure plan is required for any landfill, or portion thereof, preparing to cease full or partial operation. The preliminary closure plan shall include, but not be limited to the following:

- A site plan illustrating the location of WDG/WTS areas, collection basins, wells, sinkholes, watercourses, monitoring wells, and property boundaries;
- A schedule for decommissioning and removal of buildings, storage areas, processing areas or any other facilities on the property that will no longer be required;
- A description of the final cover system, as well as the installation methods and procedures used;
- An estimated volume of waste deposited at the landfill during its active life; and
- A description of how the following elements have been or will be addressed:
  - the final use of the site;
  - drainage restoration;
  - soil replacement;
  - final cover slopes;
  - erosion control;
  - revegetation and conditioning of the site;
  - subsidence remediation;
  - environmental monitoring; and
  - a post closure plan.

### **7.2 Final Closure Notification and Plan**

The Operator of a landfill shall submit a final closure notification and plan in writing to the Director a minimum of six months prior to the permanent closure of the landfill or portion thereof.

Closure notification requirements may include but not be limited to the following:

- A schedule for completion of the final closure;
- Details regarding the removal of all solid waste that is not buried at the facility;
- Details regarding the removal of all finished compost and bulky metallic waste from the facility;
- Confirmation that waste will be compacted and graded prior to placement of final cover;
- Design for final cover with a minimum final clay cap (less than or equal to  $1 \times 10^{-7}$  cm/s) compacted to a thickness of 0.5 metres to the surface of the active area, or an alternative soil/geosynthetic liner system approved by the Director;



- The final slope for the site. (A final slope of 3:1 over the area is encouraged to allow for site drainage. If the active area is above ground, a 4:1 slope is recommended);
- Confirmation that capping of the sides and the top of the active area will be maintained with a minimum topping of 150mm of organic soil and that the caps will be seeded with vegetation;
- Description of the revegetation of the facility site. Vegetation should be shallow rooted, gas resistant, drought tolerant and hardy;
- Design for erosion control and restoration of surface water drainage;
- Designs for any changes to the groundwater, surface water, leachate or landfill gas collection systems;
- A schedule for decommissioning and removal of buildings, storage areas, processing areas or any other facilities on the property that will no longer be required;
- Confirmation that access will be blocked to the site after closure, or explanation of why access will not be blocked;
- Confirmation that signs will be posted indicating that the landfill is closed, and noting the location of the nearest landfill or transfer station with a contact number for reporting;
- Indication of the end use of the facility (e.g., recreation); and
- Provision of a Post Closure Plan.

Once approved, the closure must be completed no later than 12 months after the date on which the closure began.

### **7.3 Closure Report**

Once the landfill has been closed, the Operator must submit a closure report to the Director that includes a summary of events and any deviations from the authorized final closure plan.

### **7.4 Post Closure Plan**

The post closure plan may provide a description of the operational activities that will occur after the landfill is closed. This plan may include, but not be limited to the following:

- Explanation of how the final cover system and diversion and drainage structures will be maintained;
- Details about how areas affected by settling, subsidence, erosion, or other events will be remediated;
- Explanation of how the groundwater monitoring, leak detection, leachate collection and gas venting systems or structures will be maintained, operated, and monitored; and
- A plan to protect and maintain surveyed benchmarks.

## 7.5 Post Closure Requirements

The following post closure requirements will come into effect once final closure has been completed and shall remain in place to protect, maintain, and monitor the environment at the site for the duration specified below and/or as approved in the post-closure plan:

- Groundwater monitoring as specified in the plan. A reduced sampling frequency may be considered if samples are within compliance limits over an approved period of time;
- Landfill gas control systems and monitoring until concentrations are below explosive limits over an approved period of time;
- Leachate collection systems until such time as samples until the parameters are not detected in three consecutive sampling events;
- Maintenance of surface water control ditches and structures, access roads, fencing and gates; and
- Regrading and repair of the final cap as needed. During post closure, the owner of the facility is responsible for inspecting the final cover system a minimum of two times per year.

## 7.6 Final Use

**Construction of buildings on landfills, or abandoned landfills, or within 400 metres of an active or closed landfill is prohibited under the regulation.**

In the event an interested party wishes to construct within the prohibited area noted above, a variance may be issued by the Director. To obtain a variance, an assessment, supporting documentation, lab results and a report by a qualified professional is required to be submitted. The report submitted for the Director's review and consideration must evaluate the risks, recommended mitigation measures and alternatives (if appropriate).

No construction activity may begin prior to obtaining written Director authorization.

Indication of the final use of the facility should be included in the final closure plan. Closed landfills can be used for passive recreational activities such as green space, public parks, golf courses, ski hills and picnic areas. Areas with the highest public use may need additional cover or maintenance to ensure that the public is protected from any safety hazards due to waste settlement, erosion of cover or venting of landfill gas. The following end uses are prohibited unless approved by the Director:

- Use for agricultural purposes;
- Construction of buildings; and
- Excavation of final cover or waste material.

## **8.0 BUILDING RESTRICTIONS NEAR LANDFILLS**

An Operator or an adjacent landowner cannot construct a dwelling on the site of an operating landfill, closed, or abandoned landfill or within 400 metres of the site of an operating, closed, or abandoned landfill except with the written approval of the Director.

### **8.1 Site Assessment**

If a proponent wishes to develop a property within 400 metres of an existing active or abandoned landfill, the proponent (developer) is responsible for assessing the potential for landfill gas generation, determining the presence of landfill gas as well as identifying other contaminants and incorporating mitigative measures into the development plan. Exceptions may be granted if the proponent for the development is prepared to install appropriate gas control measures as recommended by a qualified third party environmental professional. Other requests for a variance may be entertained at the discretion of the Director.

If interested in obtaining a variance, the proponent must provide a written request to the Director of Manitoba Sustainable Development. This shall include but not be limited to the following:

- A cover letter from the proponent requesting the variance;
- A map of the site for development indicating the setback distances; and
- An engineering report completed by a qualified third party environmental professional to ensure the results comply with the procedures published in CCME or other recognized standards organization. The report shall include, but not be limited to the following:
  - a) Confirmation that there is no waste under the proposed building site obtained by drilling or excavating;
  - b) A risk assessment including hazard identification, exposure assessment of the risks to human health and/or the environment posed by the contaminants present on a property. This includes an analysis of the potential pathways for contaminants to affect potential receptors;
  - c) Interpretation of the landfill gas monitoring data collected by a qualified environmental professional to determine the potential impacts from the subsurface migration of landfill gas or other contaminants; and
  - d) A recommendation to Manitoba Sustainable Development characterizing the risks and any measures needed to mitigate present gas.

If methane gas levels are less than 10,000 ppm (20% LEL) in the subsurface outside the property boundary of the landfill, an evaluation on a site specific basis may be considered for the development. A variance will not be authorized if methane gas levels are above 10,000 ppm (20% LEL). However, a remedial action plan by a qualified third party qualified professional may be considered if the documentation can demonstrate the site is safe for development.

## **9.0 INSPECTION AND ENFORCEMENT**

Inspection and enforcement is an important aspect of waste management and is carried out by Manitoba Sustainable Development. Environment Officers inspect all landfills on a periodic basis to determine compliance with the Permit or EAL, the most recent version of the Regulation, as well as other applicable legislation.

The frequency of inspection depends on a number of criteria. Class 1 Waste Disposal Grounds (WDG) typically undergo annual inspection, whereas the smaller Class 2 and 3 WDGs may be subject to less frequent inspection. Inspections may also be more frequent if issues of recurring noncompliance or complaints arise from the WDG operations. Inspections may be announced or unannounced at the discretion of the Environment Officer. After an inspection any deficiencies are noted and brought forward to the owner and Operator of the landfill to take corrective action, usually within a specified timeframe. If the deficiency poses a significant risk or is a recurring non-compliance issue, enforcement actions may be taken against the owner or operators.

Failure to comply with a condition under a Regulation, Permit or EAL may be an offence and a range of penalties may be assessed on the owner of the Facility. Enforcement actions can include, but not be limited to Warnings, Emergency Action Notice Director's Orders, or Offence Notices. Manitoba Sustainable Development also has the power to take immediate action to prevent, contain and/or mitigate any emergent situation at the facility that has the potential to cause harm to human health or the environment.