Landfill Gas Regulation
Policy Intentions Paper for Consultation

1. Introduction

The Ministry of Environment intends to introduce a Landfill Gas Regulation to support fulfillment of the provincial government's commitment to reduce British Columbia's greenhouse gases by at least 33% below current levels by 2020.

This new regulation, under the *Environmental Management Act*, is anticipated to come into effect on January 1, 2009. The *Environmental Management Act*, brought into force in July 2004, is a key environmental statute in British Columbia. Amendments to the Act, currently before the Legislature, would provide enabling powers to regulate the management of greenhouse gases. The proposed Landfill Gas Regulation will set out requirements for the capture of landfill gas and constituent greenhouse gases at applicable landfills under provincial jurisdiction.

The process for establishing the regulation consists of five phases:

1. **Scoping** – including commissioned assessments of specific technical issues and ministry staff assessment of issues and alternatives.
2. **Policy Intentions Paper for Consultation** (intentions paper) **–** outlining the ministry's proposed approach for phasing in requirements for landfill gas capture and associated information.
3. **Consultation** – with affected stakeholders and the general public, using the intentions paper and response forms posted on the ministry website, and other means as required.
4. **Drafting** – preparation of legal language for consideration by the Minister and Lieutenant Governor-in-Council.
5. **Implementation** – informing ministry staff and external stakeholders, and developing guidelines and/or best management practices.

The purpose of this paper is to communicate ministry intentions, and to seek responses and comments from stakeholders and the general public on the proposed regulation.

This paper provides a summary of ministry and government goals, background information concerning landfill and greenhouse gases, and ministry intentions for the proposed regulation. The final section of this paper describes the avenues for providing comment as the proposed regulation is drafted and implemented.

The intentions paper and response form for providing comments to the ministry, and links to related legislation, are posted on the ministry's website: http://www.env.gov.bc.ca/epd/codes/
Additional reports related to the proposed regulation will also be available through links on the ministry's website.

2. Ministry and Government Goals and Objectives

The Ministry of Environment provides leadership in environmental management through innovative legislation and programs, compliance activities and shared stewardship initiatives. The mandate of the ministry is to protect human health and safety, and maintain and restore the diversity of native species, ecosystems and habitats. Through partnerships across government, and with First Nations, the private sector and communities, we work to enhance the protection and stewardship of water, land and air resources, advance sustainable use of environmental resources, and provide exceptional outdoor park and wildlife services and opportunities.

In 2007 the provincial government committed "to reduce B.C.'s greenhouse gas emissions by at least 33 per cent below current levels by 2020."[1] The Minister of Environment introduced a *Greenhouse Gas Reduction Targets Act* in November 2007, committing to this target, as well as "realistic, economically viable interim targets for 2012 and 2016 to be set by the end of 2008."[2] In 2008 the government made a further commitment to regulate the discharge of landfill gas "to foster the capture and conversion of emissions into clean energy" as part of the government's efforts to safeguard the environment and tackle climate change.[3]

[1] British Columbia Legislature Speech from the Throne, February 13 2007. See: www.leg.bc.ca/38th3rd/4-8-38-3.htm
[2] See: www2.news.gov.bc.ca/news_releases_2005-2009/2007OTP0181-001489.htm
[3] British Columbia Legislature Speech from the Throne, February 12 2008. See: www.leg.bc.ca/38th4th/4-8-38-4.htm

The ministry's objectives for the Landfill Gas Regulation are to:

- Maximize reductions in landfill gas emissions, in support of an initial target of reducing British Columbia's greenhouse gas emissions by 33% by 2020;
- Introduce the regulation in a manner that recognizes and addresses economic and technical feasibility of requirements and associated implications for landfill owners; and
- Implement the regulation in a manner that supports and promotes compliance.

3. Background Information

3.1 Landfill gas, greenhouse gas emissions and landfill gas capture

Landfill gas is produced from the bacterial decomposition of degradable organic waste at landfills. It is composed of methane (CH_4) and carbon dioxide (CO_2) in approximately equal concentrations, as well as smaller amounts of non-methane organic compounds. Methane is a very potent greenhouse gas – 21 times stronger than carbon dioxide.

If not collected and combusted or recovered, landfill gas is released over time to the atmosphere. Greenhouse gas emissions from landfills are the largest source of anthropogenic methane emissions in the province.[4]

Landfill gas emissions can be captured through a system of collection wells and headers that direct the gas to either a flare stack or other facilities for processing.[5] The percentage of gas captured can be difficult to determine – with many uncertainties and variables involved.[6] "Beneficial use" of the gas (e.g., use of methane as an energy source for heat or power generation) can further reduce greenhouse gas emissions by replacing fossil fuel based energy sources.

3.2 Greenhouse gas generation from landfills in B.C.

The ministry commissioned a technical assessment and inventory of greenhouse gas generation from landfills in B.C. that was completed in early 2008.[7] The objectives of this assessment were to: develop "first-order kinetic methane generation model parameters for selected landfills;" estimate methane generation from all operating municipal solid waste landfills under provincial jurisdiction that had a disposal rate in 2006 of greater than 10,000 tonnes/year; and estimate methane generation scenarios for woodwaste landfills under wet and dry climates.

The assessment identified 35 landfills with a disposal rate of 10,000 tonnes per year or more in 2006 from approximately 92 municipal solid waste landfills currently operating in the province. These 35 landfills "are estimated to account for more than 90% of all solid waste disposed in 2006 at provincially regulated municipal landfills." Waste composition and moisture content of the waste (related to the precipitation at a landfill) were determined to be "the most important" factors influencing methane gas generation (hence, these factors should be addressed when modeling greenhouse gas emission from the landfills).

The summary table on the following page describes the estimated amount of methane generated by the 35 landfills with a disposal rate of 10,000 tonnes per year or more in 2006.

[4] See Environment Canada "National Inventory Report, 1990-2004 – Greenhouse Gas Sources and Sinks": www.ec.gc.ca/pdb/ghg/inventory_report/2004_report/ta12_20_e.cfm

[5] See Environment Canada, municipal solid waste, landfill gas website for further information and links: www.ec.gc.ca/wmd-dgd/default.asp?lang=En&n=10E36DBA-1

[6] For discussion of technical issues associated with estimating and measuring greenhouse gases associated with waste disposal see Volume 5 of the 2006 Intergovernmental Panel on Climate Change (IPCC) guidelines for national greenhouse gas inventories: www.ipcc-nggip.iges.or.jp/public/2006gl/vol5.htm

[7] Inventory of Greenhouse Gas Generation from Landfills in British Columbia, February 2008. Golder Associates Ltd.

Year	Tonnes of Methane	Equivalent Tonnes of CO_2	Equivalent # of Automobiles
2008	118,000	2,474,000	825,000
2012	137,000	2,872,000	957,000
2016	147,000	3,079,000	1,026,000
2020	153,000	3,204,000	1,068,000

Table 1: Methane generation from B.C. municipal landfills

The technical assessment of methane generated from woodwaste landfills considered that:

- On a per tonne basis, methane generation at woodwaste landfills is much less than that from municipal solid waste landfills;
- Woodwaste landfills are susceptible to air intrusion (due to their small size and composition), and thus a significant portion of such waste may not be anaerobic and generating methane;
- Particle size influences methane generation, with logs and stumps being relatively low generators of methane compared with sawdust or hogfuel; and
- Log yard waste landfills can consist of significant quantities of soil (that does not degrade and produce methane).

Based on these considerations, the authors of the assessment did not recommend that the woodwaste landfills be included in the inventory and assessment. The ministry is not intending to include woodwaste landfills in provisions of the Landfill Gas Regulation at this time.

4. Ministry Intentions

The ministry is introducing the Landfill Gas Regulation under the *Environmental Management Act* for the purpose of achieving the maximum technologically feasible and cost-effective reductions in greenhouse gas emissions from landfills to achieve the 2020 provincial target of a 33% reduction from 2007 levels.

4.1 Scope of the proposed regulation

The proposed regulation will apply to all municipal solid waste landfills under provincial jurisdiction.

At this time, the proposed regulation would ***not*** apply to:

- Woodwaste, or other industrial, landfills;
- Landfills that have been closed in accordance with current requirements as of December 31 2007; or
- Landfills that contain only inert solid waste or hazardous waste.[8]

Note that landfills containing only demolition and construction materials are considered municipal solid waste landfills and would be subject to provisions of the proposed Landfill Gas Regulation.

4.2 Assessment of greenhouse gas generation

Landfills that currently have in excess of 100,000 tonnes of waste in place (i.e., in the landfill) and/or a waste discharge rate exceeding 10,000 tonnes per year will be required under the proposed regulation to undertake an "assessment" of landfill gas and its constituent components generated (and captured, if an existing landfill gas capture system is in place) from each applicable landfill. For existing landfills, 2007 data (the most recent available) will be used for determining the waste discharge rate.

The assessment would be expected to follow relevant guidelines and best management practices and include:

- The approved design capacity of the landfill;
- Records and projections of annual tonnage of waste received at the landfill;
- A description of the methodology used for the landfill gas generation assessment and results of that assessment;
- Identification and description of existing or planned methods for capturing landfill gas emissions;
- An assessment of alternative methods and recommendations for maximizing the capture of landfill gas emissions; and
- Assessment and recommendations for beneficial use of generated gas.

[8] Landfills containing hazardous waste are governed under provisions of the Hazardous Waste Regulation. See: www.env.gov.bc.ca/epd/hazwaste

The ministry will be developing guidelines that address the expected/desired content and conduct of an assessment report. These guidelines will be developed with relevant technical and professional input, and in consultation with landfill operators. Comments and suggestions regarding appropriate content for the guidelines, as well as the process for developing them, are welcomed.

For existing landfills, the assessment will have to be submitted to the ministry by January 1, 2010. For new and proposed landfills, or landfills that are proposing expansion beyond the approved site and design parameters under which they operate, the assessment will be required as a component of design and approval requirements.

The assessment will have to be conducted by a recognized "qualified professional" and in accordance with the ministry's recognized procedures and guidelines. The regulation will define a qualified professional as: "an applied scientist or technologist specializing in a particular applied science or technology including (but not necessarily limited to) agrology, biology, chemistry, engineering, geology or hydrogeology, *and* (a) who is registered in British Columbia with their appropriate professional organization, acting under that association's code of ethics and subject to disciplinary action by that association, *and* (b) who, through suitable education, experience, accreditation and knowledge, may be reasonably relied on to provide advice within their area of expertise, which area of expertise is applicable to the duty or function under this regulation."

The proposed regulation would include provision for the ministry to request additional information or assessment actions following receipt of an assessment. If no correspondence or written request is made by the ministry within 90 days of receipt of a submitted assessment, or following submission of additional requested information, the assessment would be considered to be "accepted."

4.3 Submission of a design plan

The ministry is considering setting a methane emission threshold that will be no higher than 1000 tonnes/year. If the assessment accepted by the ministry indicates that a landfill generates methane gas in excess of this emission threshold, the landfill operator will be required to submit an appropriate gas collection system design plan developed by a recognized "qualified professional" to the ministry before January 1, 2012.

4.4 Installation and maintenance of gas capture equipment

By January 1, 2016, all landfills that generate methane in excess of the emission threshold will be required to have installed (and to ensure proper operation of) gas capture equipment with a capture efficiency target of at least 75% of generated gas.

The ministry will be developing guidelines for monitoring and assessing the efficiency of gas capture – in part to establish a common methodology that enables fair comparison of gas capture efficiency for landfills in British Columbia. These guidelines will be developed with relevant technical and professional input, and in consultation with landfill operators. Comments and suggestions regarding appropriate content for the guidelines, as well as the process for developing them, are welcomed.

During the operational phase of the landfill collection of gas will be required from uncontrolled areas of the landfill where waste has been placed for two years or more, or at final grade. The ministry's objective will be to support capture of generated methane, and other greenhouse gases, on an incremental basis as early as feasible, and on a continuous basis through the operational phase of each landfill.

Following closure, effective operation of the landfill gas capture system would be required until methane emissions are below 500 tonnes/year. At least 90 days prior to planned shutdown of the landfill gas capture system, a report should be submitted to the ministry documenting the monitoring information used to confirm the decrease in landfill gas generation over time.

Security requirements for post-closure operation and monitoring of the gas capture system may be required as a component of a landfill's closure plan.

4.5 Beneficial use of landfill gas

Although the proposed regulation would not require "beneficial use" of captured gas, other than consideration and review in the assessment, the ministry encourages efforts that could reduce greenhouse gas emissions. Comments and suggestions for appropriate incentives to promote beneficial use of captured landfill gas are welcomed.

4.6 Monitoring, review and reporting requirements

Reporting requirements associated with the proposed regulation will be based on the size of the landfill (using waste in place and waste discharge rate values) and the amount of methane gas generated. All landfill operators within the scope of the regulation will be required to maintain monitoring records and to submit an annual report to the ministry of quantity and quality of waste received (tonnage, sources, composition, projections) and nature of any organic diversion programs. Landfills above the specified size or with methane gas emissions that exceed the specified level will be subject to additional monitoring, review and reporting provisions. The proposed requirements are summarized in table 2 below.

Landfills that are required under the proposed regulation to install and operate gas capture systems will be required to maintain monitoring records available for inspection by ministry staff in accordance with current standards and best practices, and to submit an annual monitoring report to the ministry, including:

- Waste received (tonnage, sources and composition);
- Volume and composition of gases captured;
- Volume and composition of gases utilized for "beneficial use" (and the nature of these uses);
- Efficiency of landfill gas collection systems – including evaluation of the existing numbers, and the ways, measures and plans to increase the existing efficiency; and
- Other relevant information – e.g., modifications made for landfill gas collection/utilization facilities, gas collection system downtime, equipment or operational changes anticipated in the future, community recycling and organic diversion programs and waste composition studies.

Landfill Size and Amount of Methane Emissions	Reporting Requirements
100,000 tonnes or less of waste in place and 10,000 tonnes or lower annual waste discharge rate	◆ Annual reporting of quantity and quality of waste received (tonnage, sources, composition, projections) and nature of any organic diversion programs
More than100,000 tonnes of waste in place or 10,000 tonnes annual waste discharge rate, and initial assessment of methane emissions below the emission threshold	◆ Annual reporting (as above) ◆ Landfill gas assessment by a qualified professional every 5 years
More than100,000 tonnes of waste in place or 10,000 tonnes annual waste discharge rate, and initial assessment of methane emissions above the emission threshold	◆ Annual reporting (as above) ◆ Reporting of landfill gas capture (volume, composition, use, efficiency) as described in section 4.6

Table 2: Reporting requirements by landfill size and amount of methane emissions

The ministry intends to compile and post for public information annual summaries of types and amounts of landfill gas captured (including specifically, methane gas emissions) and amounts and types of beneficial uses.

4.7 Implementation

The ministry intends to implement the regulation in a manner that allows for the design and installation of landfill gas collection systems in an expedient and timely manner – while recognizing the planning and operational constraints that may be involved for landfill operators.

The ministry is seeking comments and suggestions on an appropriate timeframe, and suitable guidance for, implementation of the landfill gas assessment and collection measures called for under the regulation. For example, landfill owners undertaking energy utilization of recovered landfill gas may require additional time for acquisition and installation of equipment and/or "interim measures" for collection of landfill gas may be required in some situations.

4.8 Best Management Practices

The ministry intends to prepare and disseminate additional guidance for government agencies and stakeholders to further clarify intentions and emerging "best management practices" in guidelines that will complement the regulation.

The first priority for the ministry would be to confirm expected standards and current best practices for assessments – including assessment methodology appropriate for use in British Columbia, assessment of gas capture efficiency and technologies for maximizing the efficiency of gas capture.

The ministry is seeking comments and suggestions regarding the type of information that would assist stakeholders with understanding and applying the proposed regulation, and the best means of disseminating this information. Also, the ministry is seeking comment on appropriate training topics and requirements for operators and/or technical specialists responsible for ensuring compliance with proposed provisions of the regulation.

4.9 Additional considerations not explicitly addressed in the proposed regulation

The proposed regulation does not, at this time, explicitly address:

- Organic waste diversion programs;
- Emission credits; or
- Non-methane organic compounds – odours and air quality.

The ministry is interested in receiving all comments and suggestions related to the proposed regulation – including potential actions to support waste reduction and/or reduction of greenhouse gas emissions, or opportunities for improving air quality associated with landfill emissions.

4.10 Consultation with First Nations

Consultations with First Nations with respect to the proposed Landfill Gas Regulation will be conducted in accordance with legal requirements, ministry policy and government direction.

5. Providing Comment

The ministry is intending to draft and enact the Landfill Gas Regulation by January 1, 2009, pending approval by the Legislature of amendments to the *Environmental Management Act*. Comments regarding the ministry's intentions are being solicited and will be carefully considered in drafting the proposed regulation.

Those interested are invited to submit comments on the ministry's intentions – using the instructions and questions provided on the response form that accompanies this intentions paper, posted at: www.env.gov.bc.ca/epd/codes
Individuals or organizations may also make written submissions to the ministry without following the format set out in the response form.

Comments to the ministry should be made on or before September 30 2008.

The ministry will review comments and submissions, when drafting the proposed regulation and accompanying implementation actions. Submissions will also be compiled and summarized, without specific attribution, and the summary posted on the ministry website.

Comments received will be treated with confidentiality by ministry staff and contractors when preparing consultation reports. Please note that comments you provide and information that identified you as the source of those comments may be made publicly available if a freedom of information (FOI) request is made under the *Freedom of Information and Protection of Privacy Act*.

If you have any questions or comments regarding the consultation process, review the information posted on the ministry's website, or contact Cindy Bertram of C. Rankin & Associates, who has been contracted to manage consultation comments, at:

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Thank you for your time and comments!