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January 31, 2017

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Alberta Environment and Parks
Regulatory Approvals Centre
Main Floor, 9820 106 Street NW
Edmonton, AB T5K 2J6

Attention: Alberta Environment and Parks

Re: *Environmental Protection and Enhancement Act Amendment Application*
Approval No. 18701-02-00

The Crowsnest/Pincher Creek Landfill Association (CNPC) has retained Integrated Sustainability Consultants Ltd. (Integrated Sustainability) to complete and submit the enclosed *Environmental Protection and Enhancement Act (EPEA)* Amendment Application under the operating Landfill Approval number 18701-02-00.

The attached Application is for the addition of an incinerator at the CNPC Landfill.

If you have any questions or concerns, please contact the undersigned:

Sincerely,

Emile J Saindon
Landfill Manager
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**Environmental Protection and Enhancement Act
Amendment Application
for the Crowsnest-Pincher Creek Regional Landfill**

EPEA Approval Number 18701-02-00

**Prepared for
Alberta Environment & Parks**

Integrated Sustainability Consultants Ltd.

27 January 2017



INTEGRATED SUSTAINABILITY

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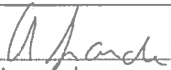

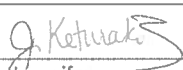
The information presented in this document was compiled and interpreted exclusively for the purposes stated in the Amendment Application Overview Section of the document. Integrated Sustainability Consultants Ltd. provided this report for Crowsnest-Pincher Creek Landfill Association solely for the purpose noted above.

Integrated Sustainability Consultants Ltd. has exercised reasonable skill, care, and diligence to assess the information acquired during the preparation of this report, but makes no guarantees or warranties as to the accuracy or completeness of this information. The information contained in this report is based upon, and limited by, the circumstances and conditions acknowledged herein, and upon information available at the time of its preparation. The information provided by others is believed to be accurate but cannot be guaranteed.

Integrated Sustainability Consultants Ltd. does not accept any responsibility for the use of this report for any purpose other than that stated in the Amendment Application Overview and does not accept responsibility to any third party for the use in whole or in part of the contents of this report. Any alternative use, including that by a third party, or any reliance on, or decisions based on this document, is the responsibility of the alternative user or third party.

Any questions concerning the information or its interpretation should be directed to Amanda Jardine.

Document Revision History

Rev No.	Rev Description	Author	Reviewer	Approver	Rev Date
0	Issued as final	 Amanda Jardine	 Tom Parker	 Jennifer Keturakis	27-Jan-2017

AMENDMENT APPLICATION OVERVIEW

The Crowsnest-Pincher Creek Landfill Association (CNPC) presently owns and operates the CNPC Regional Landfill (the landfill) which was developed in 1976 and occupies approximately 6.5 hectares (16 acres) of land approximately 3 km southwest of the Village of Cowley, Alberta. CNPC retains *Environmental Protection and Enhancement Act* (Province of Alberta 2016) (EPEA) Approval No. 18701-02-00 for the landfill (the Approval).

Currently the landfill receives over 2,000 tonnes per year of animal carcasses and other animal-based biomass, along with an increasing volume of agricultural plastics (over 100 tonnes per year, and clean wood waste). These waste streams are presenting operational challenges to the CNPC, and disposal of animal carcasses is problematic for site employees, and utilizes a significant volume of available landfill capacity.

After careful consideration, the CNPC has selected industry leading incineration technology to enable waste reduction and potential disease elimination. This technology will assist with disease control, methane emission reduction, and general health and safety of staff of the landfill.

The addition of an incinerator will require an EPEA Approval Amendment, with a focus on the air emissions and potential effects resulting from incinerator operation.

The air quality assessment performed for this Amendment Application indicated that the emissions will be within regulatory requirements, and that no individual parameter exceeded 4% of the Alberta Ambient Air Quality Objectives. The assessment concluded that the proposed incinerator is not a risk to air quality.

The CNPC has retained Integrated Sustainability Consultants Ltd. (Integrated Sustainability) to provide regulatory services for the EPEA Approval Amendment Application, and North Shore Environmental Consultants (North Shore) provided the air quality assessment.

The CNPC also conducted public engagement sessions in September 2016, to inform interested citizens of the planned incinerator, and provide information on other news regarding the landfill.

This Amendment Application is prepared in accordance with Part 3 of the *Guide to Content for Industrial Approval Applications* (Government of Alberta 2014-a) (Guide to Content), and the information presented uses the format, Section Headings and Heading numbers provided in the Guide to Content.

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SECTIONS 1-16 INCLUSIVE

These Sections of the Guide to Content are not relevant to the Amendment Application.

17 CONFIRM APPLICANT IDENTIFICATION

Who is the person legally responsible for the activity?

Who is authorized to represent the person responsible?

How can Alberta Environment and Sustainable Resource Development contact the applicant and any representatives?

17.1 Provide the applicant's name using the Authorization of Application for Approval Form (Appendix A). If an agent is authorized to represent person responsible, also provide this full name. If the person responsible or agent is a corporation, provide the full Alberta registered name of the corporation.

The landfill Manager, Mr. Emile Saindon, acts as the agent for the applicant, the Crowsnest-Pincher Creek Landfill Association.

The Authorization of Application for Approval Form is attached as Appendix 1 to this Amendment Application.

17.2 Provide the mailing address of the person responsible; and the agent's office mailing address, if different.

The mailing address of the Crowsnest-Pincher Creek Landfill Association's landfill facility and regional office, is confirmed as:

Crowsnest-Pincher Creek Landfill Association

P.O. Box 668

Pincher Creek, Alberta

T0K 1W0

17.3 Confirm the mailing address of the plant or facility where the activity is conducted, and the regional office of the person responsible, if different.

The mailing address of the Crowsnest-Pincher Creek Landfill Association's landfill facility and regional office, is confirmed as:

Crowsnest-Pincher Creek Landfill Association

P.O. Box 668

Pincher Creek, Alberta

T0K 1W0

17.4 For each contact on the application, provide the following information:

Crowsnest-Pincher Creek Landfill Association:

- Name and signature; Emile Saindon

- Title and corporate department Landfill Manager
- Telephone number; +1 (403) 628-3849
- Fax number; and +1 (403) 628-2258
- Email address. esaindon@toughcountry.net

Integrated Sustainability Consultants Ltd.:

- Name and signature; Amanda Jardine
- Title and corporate department Environment & Regulatory Advisor
- Telephone number; +1 (403) 671-6140
- Fax number; and +1 (587) 331-7917
- Email address. Amanda.jardine@integratedsustainability.ca

17.5 For Amendments that are solely the transfer of responsibility of the approval holder to a new entity fill out the special form in Appendix A.

Not applicable to this Amendment Application.

18 CONFIRM PLANT OF FACILITY IDENTIFICATION

What is the activity and where is it occurring?

18.1 Confirm the mailing address of the plant or facility where the activity is conducted, and the regional office of the person responsible, if different.

The mailing address of the Crowsnest-Pincher Creek Landfill Association's landfill facility and regional office, is confirmed as:

Crowsnest-Pincher Creek Landfill Association
P.O. Box 668
Pincher Creek, Alberta
T0K 1W0

18.2 Describe the main activities of the plant or facility with the most suitable classification referenced in the *Activities Designation Regulation*. If additional activities at the site are also classified as regulated activities, provide this description. Highlight if the proposed changes to the facility affect the classification of the plant or facility

The landfill is classified as a Class II landfill which is approved to accept and dispose of Municipal Solid Waste (MSW) and Non-Hazardous/Non-Dangerous industrial and oilfield waste.

The landfill is engaged in waste management activities as designated under the EPEA Activities Designation Regulation (Alberta Queens Printer 2015), Section 16, Schedule 1, Division 1 Waste Management, sub-sub-section (ii) "more than 10,000 tonnes per year of waste is disposed of, ...".

The proposed incinerator addition is not anticipated to change the facility classification.

18.3 Provide a map showing the direction and distance of the plant or facility to nearby towns, cities, villages, or residences and special areas (e.g., recreation areas, camps or protected areas), other plants and facilities, and wetlands or watercourses or other potential locations of receptors.

An aerial photograph map titled "CNPC Landfill Proximity Map" is provided as Figure 1 in Appendix 2. This map shows the landfill proximity to the above-mentioned areas.

18.4 Provide information about the physical size and capacity of the plant or facility site and the area that has been, or has a reasonable potential to be affected by the activity. Provide maps and scaled diagrams.

Size and Capacity of the landfill

The currently operating MSW landfill (combined Cells 1 & 2) occupies an approximate footprint area of 33 300 m² and has a total capacity of 320 000 m³ (208,000 tonnes), while the currently operating Industrial landfill (combined Cells 1 & 2) occupies an approximate footprint area of 37 800 m² and has a capacity of 240 000 m³ (or 400,000 tonnes).

The addition of the proposed incinerator is expected to have a positive effect on the MSW and Industrial Landfill cells with a reduction of waste in the form of biomass and agricultural plastics that would be entering the landfill cells.

Other areas (approximate) of the landfill and supporting infrastructure include the following:

- Leachate and Stormwater Ponds = 26 000 m²
- Retention Pond (MSW area) = 10 700 m²
- Evaporation Pond = 1 900 m²
- Borrow Area West/East = 45 200 m²
- Old Industrial landfill / Special Waste Cells (capped) = 33 450 m²
- Old MSW landfill (capped) = 54 100 m²
- Scale / Office / Shop & Recycling = 7 850 m²
- Stockpiles = 4 350 m²

A scalable drawing of the site is provided to show the location of the proposed incinerator in shown as Figure 2 in Appendix 2.

Area that has a reasonable potential to be affected by the activity

Based on a review of Sections 20 and 21 of this Amendment Application, the CNPC believes that the area that has a reasonable potential to be affected by the addition of the incinerator is entirely contained within the landfill boundary, and that there are no significant effects predicted outside of the landfill boundary. Furthermore, negative effects within the landfill boundary are anticipated to be restricted to the impact of air emissions from the incinerator, and the ground level concentration of contaminants within the facility boundary is predicted to register as a small fraction of the relevant air quality standards.

Please refer to Sections 20 and 21 for additional information on the anticipated impacts from the operation of the proposed incinerator.

19 PROJECT BACKGROUND FOR THE PROPOSED CHANGES

What new or changes in regional initiatives, plans, or management frameworks will the project need to consider?

What other regulatory decisions and authorizations are required for this proposed project? What is the current status of these decision processes?

What environmental issues or requirements have been identified these other decisions and authorizations?

Update Plans, Public Interest Decisions, and Regulatory Authorizations (Leases, Licenses, Approvals and Permits) In Relation to the Proposed Changes

19.1 Identify all government approved regional initiatives or plans that pertain to the area with requirements that relate to environment and resource management for the proposed changes to the activity, such as Land Use Framework Regional Plans and Management Frameworks, Integrated Resource Plans, Water Management Plans, or Municipal Development Plans.

The identified regional initiatives or plans that pertain to the addition of an incinerator at the landfill includes:

- The South Saskatchewan Regional Plan (Government of Alberta 2014-b)
- The Alberta Ambient Air Quality Objectives (Alberta Environment & Parks 2016)
- The Industrial Release Limits Policy (Alberta Environment 2000).

All isopleth maps and air dispersion reports have been generated to comply within the standards set out in the above-mentioned plans and objectives.

19.2 Related to the proposed changes identified in this application, identify any hearing results or decisions which set or modify the environmental requirements by:

- **The Alberta Energy Regulator (AER);**
 - AER (formally the Alberta Energy and Utilities Board) hearings have neither been conducted nor required for this activity in the past.
- **The Alberta Utilities Commission (AUC);**
 - AUC hearings have neither been conducted nor required for this activity in the past.
- **The Natural Resources Conservation Board (NRCB);**
 - This activity does not fall under NRCB jurisdiction. NRCB hearings have neither been conducted nor required for this activity in the past.
- **The Local Regional Authority or Municipality; or**
 - The CNPC is not aware of any local Regional Authority or Municipality hearings that have been either conducted or required for this activity in the past.

- **The Canadian Environmental Assessment Agency (CEAA)**

- CEAA hearings have neither been conducted nor required for this activity in the past.

19.3 Specify the date an Environmental Impact Assessment (EIA) report was accepted by the Director for the purpose of a Hearing identified in 19.2.

Not applicable – no hearings were identified in 19.2 above.

19.4 Identify any authorizations related to the proposed changes identified in this application and their date of issuance, such as Leases, Permits or Approvals and their amendments by:

- **The Alberta Energy Regulator (AER);**
 - None identified.
- **The Alberta Utilities Commission (AUC);**
 - None identified.
- **The Natural Resources Conservation Board (NRCB);**
 - None identified.
- **The local Regional Authority or Municipality; or**
 - None identified.
- **Alberta Environment and Sustainable Resource Development (ESRD) for authorizations under the *Environmental Protection and Enhancement Act* (including on-site potable water treatment and use and stormwater runoff), the *Water Act*, the *Climate Change and Emissions Management Act*, the *Public Lands Act*, and the *Forests Act*;**
 - EPEA Approval No. 18701-02-00 / Application No. 008-18701, Effective Date: December 14, 2016; Expiry Date: December 14, 2026
- **And identify and reference any terms, conditions or commitments for this project that relate to the environment. Staff may request the submission of this information if it cannot be sourced from public records.**
 - EPEA Approval No. 18701-02-00 / Application No. 008-18701 can be found in Appendix 3 attached to this Amendment Application.

Changes to Financial Security due to the Proposed Changes

Is your financial security sufficient?
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19.5 For activities that require financial security, identify if the amount is affected by the proposed change. Provide an updated calculation for security, and include the assumptions and justification for their use in the calculation. For more information on determining if financial security is required and how to calculate the amount, refer to Appendix A.

The Financial Security Plan (FSP), for planned or unplanned closure was created and submitted to the CNPC on or about March 21, 2013. The FSP was updated on or about February 4, 2016.

The present-day valuation of the cost for planned or unplanned closure for the updated FSP is estimated to be one million, one hundred nine thousand, five hundred sixteen Canadian dollars (CAD \$1,109,516). This FSP can be found in Appendix 4 attached to this Amendment Application.

Appendix A of the Guide to Content describes the closure, and post-closure costs that must be accommodated within a FSP. The addition, and subsequent decommissioning and removal of an incinerator is not anticipated to materially impact these costs for this landfill, and hence the CNPC submits that no change to the FSP is required.

Project Timelines and consultation for the Proposed Changes

When does this proposed project commence, and how long does this proposed project to modify the activity occur?

Have you consulted the public regarding the proposed changes?

19.6 Provide proposed project or estimate timelines and major milestones for the proposed changes. Highlight any significant schedule constraints or considerations. Include:

- **Project duration from initial site preparation through to estimated time of operations ceasing and final closure;**
 - Installation of the incinerator will commence approximately 12 months after receipt of the Amending Approval. Operation of the incinerator will be at a minimum 25 years or until planned closure of the landfill at maturity.
- **Proposed or actual dates for commencement and completion of construction;**
 - Site design is planned to begin approximately 12 months after Amending Approval with a minimum of 12 months for site construction and building install after site design.
- **Proposed or actual dates for commencement of operation;**
 - Proposed dates for commencement of operations will be approximately 24- 30 months from the issuance of the Amending Approval.
- **Expected impacts on the overall activity lifespan; and**
 - The lifespan of the incinerator will be based on continued volumes of feedstock as outlined in the approval, operation of the incinerator may be reduced based on those volumes.
- **Proposed or actual dates for public consultation.**

- It is not expected that public consultation will be required for this Amendment Application.

19.7 If public consultation or stakeholder engagement has been, or will be, conducted outside of this approval amendment process for the proposed changes, provide the following information:

- **Target audience(s);**
 - Local and area non-farming residents, local and area ranchers and farmers, residents of the Municipal District (MD) of Pincher Creek No.9. and residents of the Municipality of Crowsnest Pass
- **Type, purpose, and frequency of consultation or engagement; and**
 - Type: public information sessions;
 - Purpose: to provide information on the proposed addition of the incinerator, including a description of the technology, air emissions predictions, and respond to community questions regarding the proposal; and
 - Frequency: public information sessions were provided at the Pincher Creek Gym on September 12, 2016; Elks Hall in Blairmore on September 13, 2016; and the Lundbreck Citizens Council Hall on September 14, 2016. Each session cycled through two presentation and question and answer segments.

The CNPC also engaged in dialogue with citizens who phoned or visited the landfill to discuss their concerns.

- **Identified environmental concerns and how they were, or will be, addressed in the project design.**
 - During the public information sessions, to the extent practicable, questions from the community and CNPC representative responses, were noted to help identify environmental concerns of those attending. Additionally, feedback sheets were offered to attendees, and some were returned to the CNPC. Table 1 provided in Appendix 5 groups together environmental concerns that were noted during the public information sessions, and the CNPC's approach to them.

20 UPDATE APPLICABLE ELEMENTS OF THE CURRENT SETTING AND ITS ENVIRONMENTAL CONDITION

What is the setting for the activity and what has changed in the setting?

What are the factors in this setting that will influence the proposed changes to the design, construction, operation or reclamation of the facility or plant?

What changes to, or new, environmental risks or objectives will the proposed changes to the design and operation of the plant or facility need to mitigate or address?

20.1 Identify which aspects of the setting or environmental conditions require updating based on the proposed changes to the activity (for example, new substance of concern, or nature of release).

The installation and operation of an incinerator is expected to require a small physical footprint within the landfill property (please see Figure 2, Appendix 2 for more information). The anticipated impacts of the incinerator to environmental parameters are expected to be restricted to air emission considerations. Therefore, the environmental setting that will require updating based on the addition of an incinerator is air quality.

20.2 Describe the current setting and current environmental conditions for these aspects.

The landfill EPEA Approval does not presently have point-source air-monitoring and reporting requirements. For this Amendment Application for the addition of an incinerator, North Shore Environmental Consultants (North Shore) completed an Air Quality Assessment Report which is provided in Appendix 6. The purpose of this report is to predict ground level concentrations of contaminants potentially emitted during the operation of the proposed incinerator.

The landfill does not have an active wildlife monitoring system however observations made by the CNPC suggests there has not been a change in the nature and condition of wildlife over the last approval period.

Employees of the CNPC regularly observe the presence of species such as deer, coyotes, hawks, crows, various leporids (e.g. jackrabbits), burrowing rodents (e.g. gophers) and other species that typically inhabit grassland regions in southern Alberta.

It is not expected that the addition of an incinerator will have any negative impacts on the current wildlife observed. The landfill currently accepts animal carcasses and buries the carcasses in the landfill, the biodegradation of these carcasses will typically release methane and GHG emissions. Incineration will also remove the potential food source for animals that scavenge the landfill.

20.3 For all government regional initiatives or plans identified in 19.1, approved or under development, identify and comment on changes over the last approval period to any terms, conditions or commitments that relate to the environment.

There are no changes over the last approval period to any terms or conditions that relate to the plans identified in Section 19.1.

20.4 For all government regional initiatives or plans identified in 19.1, approved or under development describe and highlight any changes to the plant or facility's obligations, potential obligations or opportunities.

The CNPC expects that the any amendment Approval for the addition of an incinerator may have conditions attached regarding air monitoring and reporting requirements. The CNPC believes that considerations raised in the initiatives and plans identified in 19.2 are addressed in Section 21. Sub-section 21.23 provides detail regarding the proposed air monitoring.

21 PROPOSED CHANGES TO OPERATION AND DESIGN

What environmental risks must the design of the proposed changes address and how will environmental objectives be achieved?

What performance issues have been identified requiring design resolutions? What equipment or system design improvements are required?

What changes in technology benchmarks must the design now address? What new opportunities for design optimization exist?

21.1 Highlight and describe the proposed changes to the plant or facility's process and provide a process flow diagram of the specific industrial processes related to the proposed change in industrial activity. Include both the processing operations (e.g., distillation, cooling towers, steam generation, compression, sulphur forming) and the control processes (e.g., landfills, storage infrastructure, surface water runoff controls, industrial wastewater treatment facilities, particulate removal). The changes need to be described as both the incremental changes and resulting total releases from the previous application and shall include:

raw materials, products and by-products. Include maximum and normal operating and upset design quantities used or produced per unit of time. Provide all other pertinent capacity measurements for the site;	See below.
major equipment and unit capacities; and	See below.
mass balances.	See below.

Raw Materials, Products and By-Products

Eco Waste Solutions (Eco Waste) determined expected stack emission for products based on the raw materials for three waste mixes featuring various compositions of animal-derived biomass, plastic, and wood waste, details on these mixes can be found in Appendix 7. For this Amendment application, mix 3 provides the "worst case" scenario as it is expected to have the highest relative emissions. The Air Quality Assessment Report provides information and modelling results for the maximum ground level concentrations arising from the incineration process.

Major Equipment and Unit Capacity

The Process Flow Diagram (PFD) of the specific industrial process related to the proposed change (incinerator) is provided in Appendix 8 of this application. The PFD is based on Mix 3 and the unit capabilities are:

- Total system capacity per batch = 10 000 kg
- Total system capacity per 24 hours (1 batch per day) = 10 000 kg

Please note actual capacity may vary depending on the density of the feedstock to the incinerator.

Mass Balances

The calculation summary for energy and mass flow balance for Mix 3 is provided in Appendix 9 of this application. This calculation is based off the suggested waste mix (Mix 3) provided in Appendix 7.

21.2 Describe the proposed changes in the nature or type of substances that will be generated in a typical operating day at the plant or facility, and explain both the incremental change and the projected totals. Include:

for each process stream affected, examine the substances contained within and:	See below.
their characterization, including their nature, fate and transport (physical, chemical or biological properties or characteristics), and potential effects on the environment,	See below.
their quantity used or generated (note range variation in production or due to upsets). Tables in Appendix D and Appendix E can be used as examples for the types of sources of substances, their source of introduction, and the process streams' range of variation due to production changes or upsets;	Air emissions stream and ash - see below.
from on-site operations, the types and quantities of waste that will be generated during operation including the type and nature of the waste (including designated hazardous waste) and potential effects on the environment;	See below.
for waste that will be accepted at this site, identify: the type and nature of the waste (including designated hazardous waste) and potential effects on the environment, the origin of the waste (i.e., in or out of the province), the sector (domestic, commercial, or industrial), and	See below.

the anticipated quantity and duration of the storage.	See below
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Waste Received at Site

Waste relevant to incinerator operations will be;

- 1) Animal-derived biomass– roadkill and deadstock, consisting primarily of beef cattle with some hogs;
- 2) Clean wood waste – broken or whole hardwood/softwood pallets, clean lumber, small tree branches and logs with some dry leaves; and
- 3) Agricultural plastics, definitions of agricultural plastics provided below:
 - Silage bags made from
 - Polyethylene (PE) – HDPE (high density PE), LDPE (low density PE) or LLDPE (linear low density PE)
 - Polypropylene (PP)
 - Bale Twine
 - Natural sisal
 - Polypropylene (PP)
 - Bale Netting
 - Nylon
 - Polypropylene (PP)
 - Polyethylene (PE)

Please note that no polyvinylchloride (PVC) or polychlorinated biphenyl (PCB) will be accepted into the incinerator.

The above waste will be sourced from within Alberta, with potential for material to also be delivered from British Columbia.

Waste Characterization and Quantity

The incineration of waste is expected to result in two waste streams comprising of air emissions, and residual ash. The residual ash will be disposed of in the landfill. The quantity of waste is provided in the air report.

For air emissions, the expected stack emissions for waste Mix 3 was provided by Eco Waste for PM, NO_x, CO, Pb and Cr and was based on averages of several actual measured emission tests.

The principle test data came from the following tests conducted by Environment Canada's Emission Research and Measurement Division

- Characterization of Emissions from an Animal Crematorium EcoWaste CleanAire – Report ERMD 2003-03, March 2004 (Animal Carcasses)
- Characterization of Emissions from the Eco Waste Solutions Thermal Waste Oxidizer Burlington, Ontario – Report ERMD 2002-03, February 2003 (Municipal Solid Waste)

The above reports have been provided for review in Appendix 10 of this application.

Once emitted from the stack, the components in the air stream are expected to either remain entrained within the dispersion plume, or deposit on the ground. The Air Quality Assessment Report (Appendix 6) provides a discussion on the concentrations and fate of relevant components.

21.3 Describe any alternatives examined in the proposed changes to the overall plant or facility processes to optimize efficiency and minimize anticipated substance releases and/or waste generation and criteria used in selection. Include supporting or energy balances.

The CNPC considered other options for dealing with the animal-derived biomass before deciding on the incinerator. These options included: a) composting; b) direct burial; c) 'business as usual' (disposal to landfill) and d) deferment of acceptance of the waste.

The CNPC found that to reduce waste volumes to landfill, incineration provided the best option. Incineration is also a Canadian Food Inspection Agency (CFIA) approved method of destruction for diseases such as Bovine Spongiform Encephalopathy (BSE), Mad Cow disease and associated Specified Risk Material (SRM) For energy and mass balance refer to Appendix 9.

Composting does require less energy than operation of an incinerator, however it requires additional facility footprint to operate a composting facility. The final product of composting may not be saleable (due to prion concerns), hence significant volumes may require landfilling – which is a key concern with the current practice of disposal.

Direct burial of animal biomass requires additional facility footprint for a dedicated burial cell and is likely to have significant operational challenges in achieving successful burial of large volumes of biomass. This option also does not resolve a key challenge associated with the current practice, which is the concern regarding the volume of biomass going to landfill.

Continuing with 'business as usual' also does not solve the key challenge as biomass contributes a significant portion of the waste stream to the landfill, by volume.

Deferment of acceptance of specified waste streams is an option that would remove concerns from the CNPC regarding challenges associated with the management of specific waste streams. However, the CNPC views it as a benefit to the community that biomass and agricultural plastics are accepted at the facility.

After review of the alternatives, the CNPC believes that using appropriate incinerator technology with modeling results for emissions shown as being very low is the most viable option for reducing the volume of weight sent to landfill while ensuring the destruction of prions.

21.4 Describe how the proposed project's overall footprint on the land will be minimized (e.g., shared infrastructure and right-of ways, and /or collaborative land management practices, especially on the boundary of the site and/or waste minimization).

The addition of an incinerator at the landfill will not cause any changes to the overall footprint on the land. The incinerator will be fully enclosed within the current landfill footprint and all existing roads and right of ways will be used to access the incinerator.

21.5 Provide scale diagrams of the plant or facility site and highlight changes required for this amendment application. On the diagrams, identify changes to pollution prevention and control infrastructure and equipment associated with collection and storage of product or feedstock, waste, wastewater, or runoff or permanent disposal (e.g., landfill). Include:

types of buildings and their locations;	See below.
names and locations of all equipment used in manufacturing, processing, storage, and other units;	See below.
location of all aboveground or underground tanks and type of service (e.g., product, feedstock, or waste);	Not applicable.
location of any equipment (e.g., piping) that will be installed subsurface;	Not applicable.
location of all waste management areas (e.g., containment, transfer and acceptance, and processing or treatment areas); and	See below.
location of all wastewater or runoff collection control infrastructure, pre-treatment and post-treatment storage areas.	Not applicable.

Changes Required for this Amendment

The incinerator building and location (at scale) are located within the boundary of the landfill footprint as shown on Figure 2 in Appendix 2. All equipment to be used for incineration is housed fully within the incinerator building and thus is not specifically shown in Figure 2. The specific components of the incinerator are shown on the PFD in Appendix 8.

In regards to waste management areas, all animal carcasses to be incinerated will be brought into the incinerator building to be stored. The agricultural plastics and wood wastes to be used as feedstock in the waste mix will be kept in storage on the landfill site in keeping with current practice.

Proposed Changes to Materials Storage

21.6 Provide and assess design and specification details (not engineering blueprints) of the proposed changes to control systems.

For each materials storage, waste management, transfer, or disposal area, include:

primary containment method (e.g., tanks, containers),	See below.
berms, dykes and/or other secondary containment structures (e.g., waste storage liners),	See below.
special handling or storage methods for hazardous materials,	Not applicable.
run on/run off controls, and	Not applicable.
leak detection systems; and assess the suitability for the quantity and characterization of waste, and identify any design features to manage incompatibility of substances, such as segregation.	Not applicable.

For all aboveground and underground tanks, complete Appendix C Form, and identify:

tank locations, type of service (e.g., produced water), capacity (m ³), material type, type of corrosion protection,	Not applicable.
foundation or basepad preparation, type and capacity of secondary containment,	Not applicable.
measures planned to prevent overfilling of tanks (e.g., automatic shutoff valves, or high-level alarms), and	Not applicable.
method of leak detection; and assess the suitability of each tank and associated control systems for its content.	Not applicable.
For each runoff or wastewater management system, identify: collection and control berms, dykes and/or piping and any lining systems, primary containment method (e.g., tanks, ponds), secondary containment structures such as liners, and	Not applicable.
leak detection systems;	Not applicable.
and assess the suitability for the volume and rate of each wastewater generated during normal and upset conditions (or runoff events), as well as the suitability for each wastewater stream's characterization.	Not applicable.

The incinerator feedstock is not expected to pose material risk in terms of leaks and soil contamination. Animal-derived biomass will be stored within an enclosed building prior to incineration, and the storage will include a drainage and collection system to capture liquids, which will be disposed of via incineration or direction to the landfill.

21.7 Describe any proposed changes to the monitoring to evaluate the performance of collection and storage elements, and any leak detection systems, that will be used for each containment area or tank identified in 21.6. Include both new and impacted existing areas.

The CNPC does not propose any change to the leak detection or monitoring systems in place.

Proposed Changes to Wastewater and Runoff Treatment and Control

What changes in substances or treatment processes are proposed to existing wastewater treatment systems?

What new wastewater process streams (including runoff and domestic wastewater) are proposed and how will they be minimized or treated to meet release requirements?

What new wastewater treatment processes are proposed?

21.8 – 21.14 inclusive

The CNPC considers that these Sections of the Guide to Content are not relevant to this Amendment Application.

Proposed Changes to Air Treatment and Control

What changes in substances or treatment processes or control systems are proposed for air process streams and emission sources?

See Appendix E.

21.15 Referencing 21.1 and 21.2, describe the proposed changes in the nature or types of substances that will be directly or indirectly released to the air in a typical operating day at the plant or facility, and include:

the source of each substance and its change in quantity and total quantity to any component streams that will contribute to the air emission streams including auxiliary or standby process equipment;	See below.
each substances physical, chemical or biological characteristics, fate and transport and potential environmental	See below.

effect(s); and	
the proposed method of treatment or control, and method of release.	See below.

Source of Substance

The source of each substance that will be directly released to the air in a typical operating day of the incinerator can be traced back to;

- 1) Animal-derived biomass– roadkill and deadstock, consisting primarily of beef cattle with some hogs;
- 2) Clean wood waste – broken or whole hardwood/softwood pallets, clean lumber, small tree branches and logs with some dry leaves; and
- 3) 3) Agricultural plastics, definitions of agricultural plastics provided below:
 - Silage bags made from
 - Polyethylene (PE) – HDPE (high density PE), LDPE (low density PE) or LLDPE (linear low density PE)
 - Polypropylene (PP)
 - Bale Twine
 - Natural sisal
 - Polypropylene (PP)
 - Bale Netting
 - Nylon
 - Polypropylene (PP)
 - Polyethylene (PE)

Please note that no polyvinylchloride (PVC) or PCBs will be accepted into the incinerator.

Substance Characteristics, Fate and Transport

The anticipated waste load for the CNPC system would consist of 10,000 kg of animal, wood, and agricultural plastic (the vast majority of which would be animal waste). This load will require a burn cycle in the order of 12 hours followed by a 10-hour cool down cycle. Material reduction will be in the order of 90%, resulting in a residual ash which is non-hazardous, non-leaching and essentially inert which can then be removed, to complete the 24-hour process.

Incinerator emissions are predicted for the following characteristics:

- Total Particulate Matter
- Particulate matter less than 2.5 microns
- Total oxides of Nitrogen that is converted to Nitrogen dioxide
- Carbon Monoxide
- Sulphur Dioxide
- Hydrochloric Acid

- Lead
- Chromium
- Dioxins and Furans
- Polycyclic aromatic hydrocarbons
- Cadmium
- Copper and
- Mercury

Typical expected stack emissions from the incinerator were determined by Eco Waste.

The fate and transport of each substance has been provided in the form of isopleth maps in the Air Quality Report in Appendix 6 of this application.

Treatment and Control – Industry Leading Incinerator Technology

The Eco Waste patented 2-stage incinerator technology utilizes a starved-air combustion process, to process materials in a single batch with a 24 hour cycle. In the primary chamber (first stage) a very low oxygen flow is introduced, in a top down slow burn approach at a sustained temperature of up to 850 °C. This process produces very little disturbance of the material bed, which minimizes particulate air emissions. Particulate emissions are also minimized by not allowing the addition of materials during the incineration process. The Eco Waste secondary chamber (second stage) exposes the gasses from the first stage to 1000 °C for a minimum of 2 seconds. This exposure produces clean air emissions through the destruction and control of Dioxins, Furans and hydrocarbon compounds. In the case where a challenging materials mixture is encountered that doesn't result in complete decomposition to ash, the Eco Waste technology can add an additional burn out cycle to ensure completion of the waste destruction.

21.16 For each air emission stream that is proposed in this application to change, identify:

the volume(s) and concentrations generated, per unit time, of the release substance;	See below.
normal and maximum emission rate per unit time and per unit of production based on the design and throughput of the industrial site;	See below.
whether the emissions are continuous or intermittent, and the frequency (if intermittent); and	See below.
estimates of seasonal and/or monthly variability for each stream	See below.

Volumes and Concentrations

The volumes and concentrations generated per unit of time was modeled by North Shore based on the incinerator emissions and stack parameters provided by Eco Waste for the three waste mixes provided. This information is provided in Table 2 on page 3 of the Air Quality Assessment Report in Appendix 6.

Emission Rates

Waste Mix 3 (described in Appendix 11) is the expected waste mix for the landfill and represents the highest emission rates of all three waste mixes. As such, the emission rates for waste Mix 3 were used as the emission rates in the dispersion modeling assessment. The emission rates are based on the arithmetic average concentration based on previous Eco Waste emission tests, except for CO₂ HCl and SO₂, which were calculated. The emission rate breakdowns for the three waste mixes are provided in Appendix 9.

Emission Frequency

The anticipated waste load for the CNPC system would consist of 10 000 kg of animal, wood, and agricultural plastic (the vast majority of which would be animal waste). This load will require a burn cycle in the order of 12 hours followed by a 10 hour cool down cycle. Material reduction will be in the order of 90%, resulting in a residual ash, which is non-hazardous, non-leaching and essentially inert which can then be removed, to complete the 24 hour process.

Variability

Isopleth maps for specific contaminants show hourly, daily or annual concentrations and have been provided in the in the Air Quality Assessment Report on pages 25-43 located in Appendix 5 of this Application.

21.17 Describe proposed modifications to the application of process technology, environmental control systems, and management practices that will be used to minimize substance release to the environment, and include:

description of the physical size, location and capacity of environmental control units/operations (eg. air pollution control units);	See below.
diagram(s) of the processes, flows, or operation units including engineered drawings, see and update Appendix E;	See below.
alternative processes and technologies for the release of substances that have been evaluated, and a rationale for their exclusion;	See below.
all applicable industry standards, guidelines, and practices, as well as the manner in which	See below.

the design and operation will achieve these; and	
examples of similar, or typical, environmental approvals that have been issued either locally or in other jurisdictions.	See below.

Description

The physical size of the proposed incinerator has been provided in the form of shipping dimensions on the Technical Data Sheet provided in Appendix 12 of this Application. The constructed dimensions will be confirmed during detailed engineering.

Diagrams

The PFD is provided in Appendix 8 of this Application.

Alternative Processes

As discussed in Section 21, Sub-section 21.3, the CNPC has reviewed alternative process for the management and release of substances pertinent to this application. The CNPC has determined that their preferred option is to use the incinerator technology described in this application.

Applicable Industry Standards

The following provides information on the design technology and applicable industry standards.

Incinerator Technology

The Eco Waste batch incineration process provides a Best Available Technology Economically Available (BATEA) system, meeting the Canada Wide Standards for Dioxins and Furans without the requirement of a scrubber (Air Pollution Control (APC) system).

Incinerator technology in Alberta has traditionally utilised one stage combustion at 1000 °C. In some cases, incinerators have utilized a second combustion chamber, however CNPC is not aware of incinerators in operation in Alberta that utilize adequate volume and mixing to provide a 2 second retention time. The incineration temperature in the primary chamber is 800 °C, and the incineration temperature in the secondary chamber is 1000 °C. A second stage burner or small secondary chamber with a less than 2 second retention time does not provide adequate destruction or control of Dioxins, Furans and hydrocarbon compounds, and may require APC as a result. Systems that require APC are more complex, have double the capital cost, increased operating expenses, and greater potential for process upsets.

Conventional, continuous operation incinerators also often allow for the intermittent addition of materials during the incineration cycle that disturbs the waste bed and contributes to particulate emissions.

The proposed incinerator provides significant technological advancement over conventional incineration technologies, via batch processing using the two-stage

combustion process, that focuses on retention time in the secondary combustion chamber. The proposed incinerator is designed with addition of PLCs, temperature and flow control, safety interlocks, and the monitoring and recording of process parameters. The Eco Waste keys to clean combustion revolve around the control and monitoring of: Time, Temperature and Turbulence in the secondary combustion chamber. The CNPC contends that the Air Quality Assessment Report (in Appendix 6) demonstrates that the emissions from the incinerator achieve a very high performance standard that is indicative of BATEA.

Industry Standards

Applicable industry standards for Air Quality include:

- The South Saskatchewan Regional Plan (Government of Alberta 2014-b)
- The Alberta Ambient Air Quality Objectives (Alberta Environment and Parks 2016)
- The Industrial Release Limits Policy (Alberta Environment 2000)

The CNPC submits that the proposed technology meets or exceeds the standards identified in the above-mentioned documents, and that the predicted emissions from the incinerator demonstrates BATEA.

Environmental Approvals

The CNPC is not aware of any incinerators in the province that are similar or comparable with the technology and use that is being presented for this specific proposed incinerator.

21.18 Using tables as required, provide the update the following details for all:

reciprocating or turbine engines;	Not applicable.
all fired heaters (including space heaters), treaters, and boilers;	Not applicable.
incinerators; and	See table below.
flare stacks	Not applicable.

Incinerator	
Make and model number	Controlled-Air Two-Stage, Thermal Oxidation ECO 10TN2PV
Fuel type	Diesel
Exhaust Stack diameter (m) (outside diameter)	1.28

Exhaust stack height above grade (m)	11.201
Exit temperature (°C)	1000
Exit gas velocity (m/s)	13.4
NO _x emissions (ppm and g/GJ)	80 ppmv (%v)
SO _x	20 ppmv (%v) ¹
NPRI ² – Dioxins and Furans (combined)	6.87E-09 (kg/yr)
NPRI ² – Carbon Monoxide:	n/a (<20 tonnes air release/year)
NPRI ² – Nitrogen Oxides:	n/a (<20 tonnes air release/year)
NPRI ² – PM _{2.5}	1.6 tonnes air release/year ³
NPRI ² – PM ₁₀	n/a (<20 tonnes air release/year) ³
NPRI ² – Sulphur dioxide	n/a (<20 tonnes air release/year)
NPRI ² – TPM	n/a (<20 tonnes air release/year)
NPRI ² – VOCs	n/a (<10 tonnes air release/year)
COPC ²	
GHG	8% ¹

Note:

1. The volume concentration of carbon dioxide, HCl, SO₂, expressed in [% vol] & ppm, is not usually obtained by direct measurement, the value in the above table was obtained by calculation.

2. The CNPC intends to establish all relevant NPRI and COPC (Chemicals of Potential Concern) values once the incinerator is operational. However, some pertinent values are provided, and more detailed data is provided within Appendix 11 (Waste Characterization).

3. There were no emissions rates available for PM_{2.5} and PM₁₀. However, to include it in the assessment, it was conservatively assumed to be equal to TPM emissions.

The Eco Waste PRODUCT TECHNICAL DATA SHEET - ECO 10TN2PV is provided in Appendix 8.

21.19 Provide the following details for any changes to flare pits on site:

The landfill does not have any flare pits operating onsite, and the proposed incinerator does not have any flare pits associated with the install or operation.

21.20 Describe all proposed changes in fugitive emissions related to the site. Include:

types of substances released;	See below.
source identification	Not applicable.
measured and estimated volumes;	Not applicable.
method of measuring and estimating fugitive emissions; and	Not applicable.
management approach.	Not applicable.

It is anticipated that there will be less biological degradation of animal carcasses in the landfill than the current conditions and therefore the fugitive emissions are expected to be reduced across the site in regards to the burial of carcasses in the landfill

21.21 Describe all changes in area, or non-point, emission sources related to the industrial site (e.g., vehicle fleets, ponds, or onsite incineration). Include:

types of substance released;	Not applicable.
source identification;	Not applicable.
measured and estimated volumes;	Not applicable.
method of measuring and estimating associated emissions; and	Not applicable.
management approach.	Not applicable.

Please note that in the context of this question, the incinerator is viewed as a point source emitter.

21.22 Assess the suitability and capacity of the proposed changes to treatment and release control systems using a dispersion-modelling run to show the maximum ground level concentration:

for substances of concern under both normal operating conditions, and upset conditions;

types of substance released;	Not applicable.
source identification;	Not applicable.
measured and estimated volumes;	See below.

for substances of concern under both normal operating conditions, and upset

conditions;	
for emergency flaring scenarios, including:	Not applicable.
rates and composition of flared streams (e.g., inlet stream, acid gas before sulphur recovery unit, tail gas after sulphur recovery unit), and	Not applicable.
dispersion-modelling run depicting the maximum ground level concentration;	See below.
and describe any temporary or permanent environmental effects that may, or will, result from the substances being released to air, include:	
consideration of any unique situations arising from the plant location, size, or capacity, and	Not applicable.
comparison to applicable ambient objectives, guidelines, or standards.	See below.

Dispersion Modelling

North Shore has prepared an Air Quality Assessment Report for the CNPC in support of the EPEA Approval Amendment Application. As part of this report, dispersion modelling was performed to predict ground-level concentrations of the following contaminants resulting from the operation of the incinerator.

- Total Particulate Matter
- Particulate matter less than 2.5 microns
- Total oxides of Nitrogen that is converted to Nitrogen dioxide
- Carbon Monoxide
- Sulphur Dioxide
- Hydrochloric Acid
- Lead
- Chromium
- Dioxins and Furans
- Polycyclic aromatic hydrocarbons
- Cadmium
- Copper and
- Mercury

The dispersion modelling was performed per the requirements of the Alberta Air Quality Model Guideline (AQMG) and used the AERMOD V15181 dispersion model. This report was prepared in accordance with the requirements outlined in the AQMG (October 2013). The maximum ground level concentration (MGLC) is the sum of predicted concentrations from dispersion modelling and ambient background.

Comparison to Objectives

The results of the dispersion modelling were compared to applicable Air Quality Standards (AQS) from various jurisdictions. AQS were obtained from Alberta Ambient Air Quality Objectives (AAAQO) (Alberta Environment & Parks 2016), Ontario Ambient Air Quality Criteria (OAAQC) (Ontario Ministry of the Environment 2012), and the Canada Ambient Air Quality Standards (CAAQS) (Government of Canada 2013). The results of the dispersion modelling indicate that MGLC of all contaminants emitted from the incinerator are predicted to be well within the AQS. The Air Quality Assessment Report is provided in Appendix 6.

21.23 Provide updated scale diagrams of the plant, plant site, and the surrounding area (highlighting changes) with regard to air emissions, and include the location and distance between all:

air emission point sources, including stacks, exhaust stacks, all other discharge points; and	See below.
monitoring and sampling equipment.	See below.

Point Sources

The updated scale diagram of the site is provided as Figure 2 in Appendix 2. This diagram shows the placement of the proposed incinerator within the landfill footprint. The proposed incinerator would be the only point source of air emissions at the landfill.

Monitoring & Sampling Equipment

As indicated in the dispersion modelling report (Appendix 6), all ground-level concentrations are well within the specified ambient AQS. Ground-level concentrations of particulate matter less than 2.5 microns (PM_{2.5}) is evaluated to be the highest in comparison to its applicable ambient air quality standard at 3.96% of the AQS. Overall ground-level concentrations are very low and indicate there is no risk to air quality. Furthermore, MGLCs are predicted to occur within the landfill fence line itself. The assessment indicates that there are no on-site or off-site risks to air quality. As such, ambient air monitoring is not recommended at this time as primary concentration plumes are located within the landfill fence line and overall concentrations are predicted to be low. Off-site ambient monitoring would provide no value at this time. To provide assurances that air quality resulting from the proposed incinerator does not pose a risk to air quality, North Shore recommends the following monitoring for the incinerator:

1) Process Control & Monitoring

Emissions from the incinerator are quite low because of the specialized design of the primary and secondary combustion chambers. It is recommended that the incinerator is designed and equipped with continuous process monitoring in the primary and secondary combustion chambers to ensure that operating temperatures are being

maintained for the incinerator to meet the design performance requirements. The continuous process monitoring in the combustion chambers should include a data acquisition system that logs hourly data that is retrievable and auditable.

This level of process control and monitoring will ensure that combustion is complete and within design specification, thereby ensuring that emissions meet those specified in the design.

2) Manual Stack Survey

To provide additional assurance that there is no inherent risk to air quality it is recommended that annual Manual Stack Surveys are conducted for particulate matter, as well as NO_x. Annual Manual Stack Surveys will ensure that mass emission rates resulting from incinerator operations are within the design rates and are therefore well within the AQS and pose no risk to air quality. Specifically, the following Stack Testing Methods are recommended to be performed on an annual basis:

- Methods 2-4 (Velocity/Flow Rate, Molecular Weight, Moisture)
- Method 5 (Particulate Emissions)
- Method 7 (NO_x Emissions)

21.24 For 21.17 to 21.22, describe proposed changes to the existing monitoring or proposal for new monitoring for performance evaluation of the modified or new treatment and control equipment (source) systems.

Currently, conditions are not included in the Approval for the monitoring and evaluation of ambient air quality.

With the addition of the proposed incinerator, predetermined stack emission and ambient air quality tests provide quantifiable values of gas from the system and in the vicinity. These tests are performed on a planned basis to demonstrate the system's performance and its compliance with the permit.

The system can also be equipped at any time with continuous monitoring equipment (CO/O₂ and Opacity) which represent the effectiveness of the combustion process. Adding CEMS increases the complexity and maintenance of the system, and typically source and ambient testing on a recurring basis (EG.. 1-3 years) provides sufficient data.

Given that the waste stream is very specific and definable, based on the predicted emissions, the CNPC submits that Dioxins and Furans will be below the Canada Wide Standard of 80 pg/m³ I-TEQ.

21.25 Identify and describe any proposed changes to the location or to the monitoring and evaluation of the ambient air quality.

Currently, conditions are not included in the Approval for the monitoring and evaluation of ambient air quality.

21.26 For air emissions, provide data, calculations, models, and reliable literature sources for each wastewater stream you propose to release for the associated release or disposal method. Include:

The information required in this sub-section is provided in the Air Quality Assessment Report located in Appendix 6 of this Application. Below are the corresponding report page numbers for quick reference.

the volume(s), generated per unit of time, of the release substance;	Page 3 of the Air Quality Assessment Report
concentration of substance(s), and their physical or biological characteristics;	Page 3 of the Air Quality Assessment Report.
fate and transport and potential environmental effect(s) of the substance(s);	Page 3 of the Air Quality Assessment Report.
discharge rate per unit of time and per unit of production;	Page 3 of the Air Quality Assessment Report.
maximum emission rates based on the design of the industrial site;	Page 7 of the Air Quality Assessment Report.
typical emission rates based on current operations and throughput of the industrial site;	Page 3 of the Air Quality Assessment Report.
whether the discharge or emissions are continuous or intermittent, and the frequency (if intermittent); and	Page 3 of the Air Quality Assessment Report.
estimates of seasonal and/or monthly variability for each stream.	Page 3 of the Air Quality Assessment Report.

Assessment of Proposed Construction Considerations

What environmental risks or objectives must be addressed solely during project's construction phase?
How will they be addressed or achieved?
How will reclamation materials be conserved and stored for future reclamation of the

The CNPC considers this to be a minor construction project that will not pose significant spill, reclamation or waste management concerns.

Proposed Changes to Operations

What new, or changes to existing, operating and environmental management systems are proposed?

21.27 Describe and evaluate proposed changes to be made to the identified existing monitoring programs, operating procedures, management systems, emergency preparation, and contingency plans.

The CNPC will review and update operating procedures, emergency preparation and contingency plans as appropriate, to accommodate the inclusion of an operating incinerator at the landfill. Any updates will include consideration of:

- Management of animal-derived biomass
- Ash management
- Process upsets
- Emergency preparation

The CNPC does not anticipate any changes to existing monitoring programs, as they aren't affected by the addition of the incinerator.

21.28 Describe and evaluate any new proposed monitoring programs, operating procedures, management systems, emergency preparation, and contingency plans.

The CNPC anticipates that air emissions monitoring will be added to EPEA Approval monitoring requirements. Sections 21.23 and 21.24 describe the proposed air emissions monitoring program for the addition of the incinerator.

22 AMENDED FOR FINAL RECLAMATION PLAN

Within 180 days of the landfill ceasing operations, the CNPC will apply for an amendment to the Approval for the landfill closure and submit to the Director as per EPEA Approval No. 18701-02-00. At that time, the Detailed Final Closure Plan will include the conditions detailed in the Amendment Approval for the addition of an incinerator.

CLOSURE

Integrated Sustainability would like to thank the CNPC for the opportunity to support the EPEA Amendment Application. We trust that this report meets the needs and expectations of the CNPC. If you have any questions, please contact the undersigned at any time.

Sincerely,

Integrated Sustainability Consultants Ltd.



Amanda Jardine, P.Ag.
Environment & Regulatory Advisor



Jennifer Keturakis, P.Eng.
Vice President of Environmental Sciences and Regulatory

REFERENCES

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Appendices

Appendix 1 Authorization Form

Forms

Authorization of Application for Approval By Owner/Agent

This application must be submitted in accordance with the Environmental Protection and Enhancement Act.

An application for an Approval shall not be deemed to be filed until all the information, documents, and authorizations referenced in the application submission, and, the appropriate fee has been received by the Regulatory Approvals Centre, Alberta Environment and Sustainable Resource Development.

The application must be complete before review and processing of the application takes place.

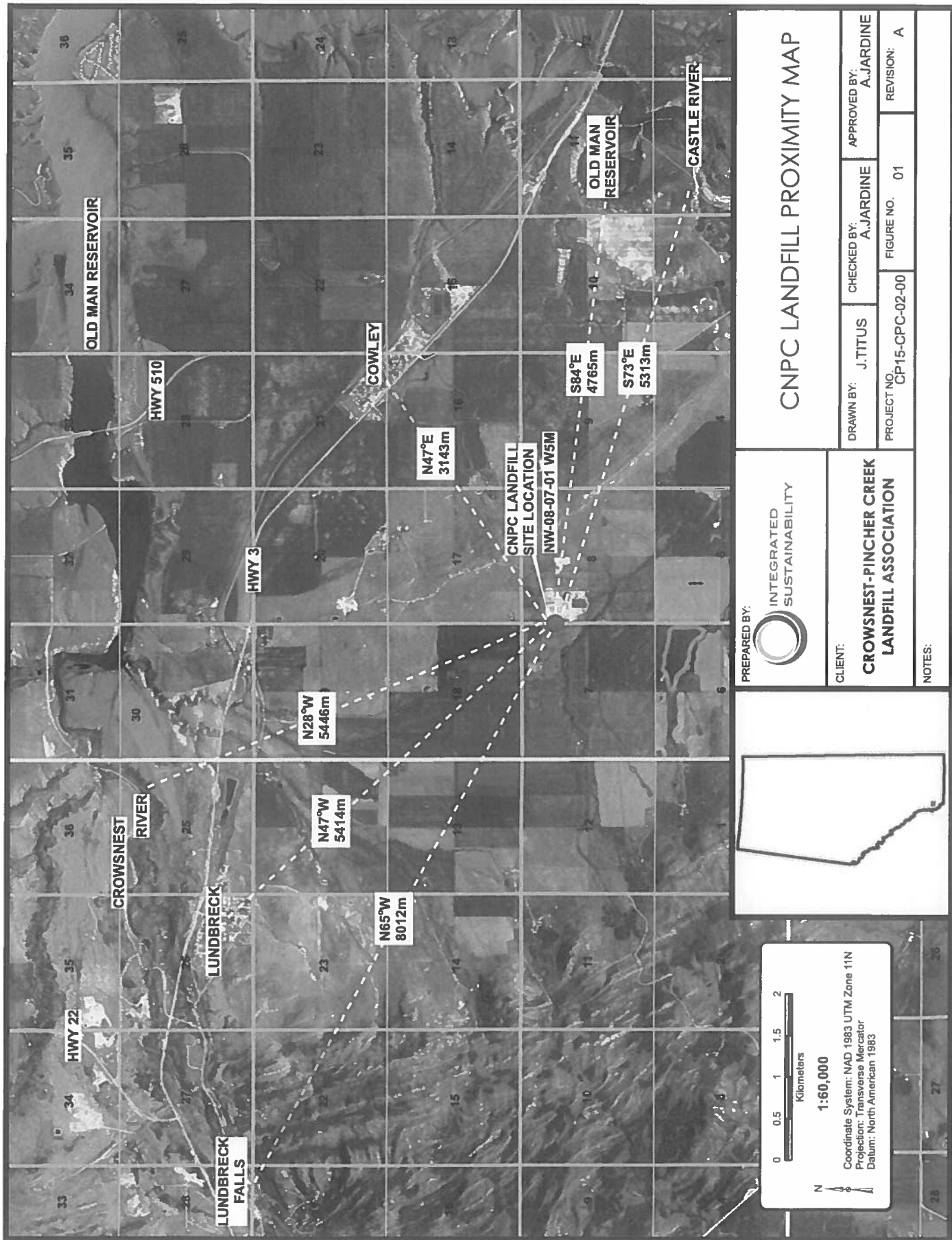
The application **MUST** be signed by the owner or his agent, using the following signature block.

01/25/2017
(Date)

Chad Sander
(Signature)

LANDFILL MANAGER
(Title of Applicant)

Appendix 2 Landfill Figures



CNPC LANDFILL PROXIMITY MAP

PREPARED BY:
INTEGRATED SUSTAINABILITY

CLIENT:
**CROWSNEST-PINCHER CREEK
LANDFILL ASSOCIATION**

DRAWN BY: J. TITUS	CHECKED BY: A. JARDINE	APPROVED BY: A. JARDINE
PROJECT NO. CP15-CPC-02-00	FIGURE NO. 01	REVISION: A

NOTES:

Appendix 3 Renewal Approval



Environment
and Parks

APPROVAL

PROVINCE OF ALBERTA

ENVIRONMENTAL PROTECTION AND ENHANCEMENT ACT **R.S.A. 2000, c.E-12, as amended.**

APPROVAL NO.: 18701-02-00

APPLICATION NO.: 008-18701

EFFECTIVE DATE: DEC 14 2016

EXPIRY DATE: December 14, 2026

APPROVAL HOLDER: CROWSNEST/PINCHER CREEK LANDFILL ASSOCIATION

ACTIVITY: **CONSTRUCTION, OPERATION AND RECLAMATION OF**

the Crowsnest/Pincher Creek Class II Landfill where more than 10,000 tonnes per year of non-hazardous waste is disposed of

is subject to the attached terms and conditions.

Designated Director under the Act:

Kathleen Murphy

Date Signed: DEC 14 2016

TERMS AND CONDITIONS ATTACHED TO APPROVAL

PART 1: DEFINITIONS

SECTION 1.1: DEFINITIONS

- 1.1.1 All definitions from the Act and the regulations apply except where expressly defined in this approval.
- 1.1.2 In all PARTS of this approval:
- (a) "Act" means the *Environmental Protection and Enhancement Act*, R.S.A. 2000, c.E-12, as amended;
 - (b) "active landfill area" means the portion of the landfill that has received or is receiving waste for disposal, where final cover has not been placed and includes areas that are being used for interim management of waste and recyclable prior to disposition;
 - (c) "APEGA" means the Association of Professional Engineers and Geoscientists of Alberta;
 - (d) "application" means the written submissions from the approval holder to the Director in respect of application number 008-18701 and any subsequent applications where amendments are issued for this approval;
 - (e) "biomedical waste" means biomedical waste as defined in the *Waste Control Regulation* (AR 192/1996), as amended;
 - (f) "bulk liquid" means a liquid transported in a vehicle tank or body that is not contained in barrels or other such containers;
 - (g) "certified operator" means a person who holds a valid Certificate of Qualification recognized by the Director;
 - (h) "Class II landfill" means a Class II landfill as defined in the *Waste Control Regulation* (AR 192/1996), as amended;
 - (i) "compliance boundary" means the location or locations where measurements of groundwater quality or subsurface landfill gas for regulatory purposes are taken to assess the landfill's performance;
 - (j) "construction quality assurance" means an integrated system of management activities involving planning, implementation, documentation, assessment, reporting and quality improvement to identify the level to which construction is in compliance with the specifications;
 - (k) "construction quality control" means the overall system of technical activities that measures the attributes and performance of construction to verify that the construction meets the specifications;

KM

TERMS AND CONDITIONS ATTACHED TO APPROVAL

- (l) "container" means any portable device in which a substance is kept, including but not limited to drums, barrels and pails;
- (m) "control chart" means a graph plotting analytical concentrations versus time, with control points designed to alert the analyst to trends beyond normal sampling variability, before established criteria are exceeded;
- (n) "cover" means soil or other approved material that is used to cover compacted waste in a landfill cell;
- (o) "daily cover" means a cover placed on compacted waste on the working face;
- (p) "day", when referring to sampling, means any sampling period of 24 consecutive hours;
- (q) "decommissioning" means the dismantling and decontamination undertaken subsequent to the termination or abandonment of any activity or any part of any activity regulated under the Act;
- (r) "decontamination" means the treatment or removal of substances from the landfill and affected lands, excluding waste that is buried in landfill cells for final disposal;
- (s) "Detailed Construction Plan and Specifications" means the plan and specifications, signed and stamped by a professional registered with APEGA, that are issued for construction or tendering;
- (t) "Director" means an employee of the Government of Alberta designated as a Director under the Act;
- (u) "disease vectors" means animals capable of transmitting disease to humans;
- (v) "dismantling" means the removal of buildings, structures, process and pollution abatement equipment, vessels, storage facilities, material handling facilities, railways, roadways, pipelines and any other installations that are being or have been used or held for or in connection with the landfill;
- (w) "dispose", when used with reference to the disposal of waste at a landfill, means dispose as defined in the *Waste Control Regulation* (AR 192/1996), as amended;
- (x) "domestic wastewater" means wastewater that is the composite of liquid and water-carried wastes associated with the use of water for drinking, cooking, cleaning, washing, hygiene, sanitation or other domestic

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purposes, together with any infiltration and inflow wastewater, that is released into a wastewater collection system;

- (y) "domestic wastewater system" means the parts of the landfill that collect, store or treat domestic wastewater generated at the landfill;
- (z) "effective distance downwind" means at a distance and orientation downwind from the working face where the most amount of fugitive waste is captured by the litter catch fence;
- (aa) "effective distance upwind" means at a distance and orientation upwind from the working face where the wind screen provides the most amount of wind protection for the working face;
- (bb) "explosive" means explosive as defined in the *Explosives Act* R.S.C., 1985, c. E-17, as amended;
- (cc) "final cover" means a designed system, natural or manmade, that is placed on the surface of a landfill or a landfill cell that has reached its maximum designated waste elevation to control transmission of moisture and gas, and that conforms to the end use plan;
- (dd) "final landfill closure" means the period of time when waste is no longer accepted for disposal in the landfill and activities are undertaken to complete the final cover system and decommissioning, and includes the construction of any additional components or monitoring systems that are necessary for landfill post-closure care;
- (ee) "fugitive emissions" means emissions of substances to the atmosphere other than ozone depleting substances, originating from a landfill source other than a flue, vent, or stack but does not include sources which may occur due to breaks or ruptures in process equipment;
- (ff) "fugitive waste" means substances originating from the landfill that are moved by natural forces, including but not limited to the following:
 - (i) styrofoam,
 - (ii) paper,
 - (iii) cardboard, or
 - (iv) plastic;
- (gg) "geomembrane" means a sheet of manufactured synthetic material designed to control the migration of liquid and gas;

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- (hh) "grab", when referring to a sample, means an individual sample collected in less than 30 minutes and which is representative of the substance sampled;
- (ii) "groundwater" means groundwater as defined in the *Water Act*;
- (jj) "groundwater control underdrain system" means a system that is located underneath a liner in a landfill cell and includes a permeable drainage layer, a network of perforated pipes, and underdrain collection wells from which groundwater can be gathered and removed;
- (kk) "hydrocarbon contaminated soil" means soil contaminated with hydrocarbon but does not include soil containing hydrocarbons;
- (ll) "ISO/IEC 17025" means the international standard, developed and published by International Organization for Standardization (ISO), specifying management and technical requirements for laboratories;
- (mm) "incompatible wastes" means substances which, when mixed, can produce effects which are harmful to human health or the environment such as heat, pressure, fire, explosion, violent reaction, toxic dusts, mists, fumes or gases, or flammable fumes or gases;
- (nn) "industrial landfill cell" means the landfill cell where non-hazardous industrial solid waste, asbestos waste, off-spec sulphur, soil contaminated with sulphur, hydrocarbon contaminated soil, soil containing hydrocarbons and non-dangerous oilfield wastes are disposed of;
- (oo) "industrial landfill cell composite liner" means a liner comprised of:
- (l) clay material that:
 - (A) has been compacted to achieve an in-place hydraulic conductivity of 1×10^{-9} metres/second or less, and
 - (B) has a minimum thickness of 1.0 metre at all points, measured perpendicular to the slope,
 - (ii) with or without a geosynthetic clay liner overlaid on the top of the clay material, and
 - (iii) a high density polyethylene geomembrane that:
 - (A) has a minimum thickness of 60 mil, and
 - (B) has been placed directly on the top surface of the compacted clay or the geosynthetic clay liner;

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- (pp) "industrial solid waste" means solid waste resulting from or incidental to any process of industry;
- (qq) "intermediate cover" means a cover placed where a working face will not be located for 15 days or more;
- (rr) "landfill" means all buildings, structures, landfill cells, storage facilities, waste or material handling facilities, process and pollution abatement equipment, vessels, trenches, roadways, railways, berms, monitoring wells, pipelines and other installations, and includes the land, located on the W ½ of Section 8, Township 7, Range 1, West of the 5th Meridian that is being or has been used or held for or in connection with the Crowsnest/Pincher Creek Class II landfill;
- (ss) "landfill cell" means a designed or designated area of the landfill comprised of an excavation or earthen structure in which waste is enclosed;
- (tt) "landfill gas" means a mixture of gases generated by the microbial decomposition of and chemical reactions between wastes in the landfill;
- (uu) "landfill gas collection system" means a system that gathers landfill gas so that landfill gas may be removed from the landfill and includes landfill gas collection wells, piping, vacuums or pumps to move landfill gas out of the landfill;
- (vv) "leachate" means a liquid that has been in contact with waste and has undergone chemical or physical changes;
- (ww) "leachate collection system" means a system that gathers leachate so that leachate may be removed from the landfill and includes a permeable drainage layer, a network of perforated pipes, and sumps or manholes from which leachate can be removed;
- (xx) "leachate pond" means a pond that is designed for the temporary storage of leachate;
- (yy) "LEL" means a lower explosive limit that is the lowest percentage by volume of explosive vapour or gas in air that will propagate a flame at 25 degrees Celsius at atmospheric pressure when the mixture is ignited;
- (zz) "liner" means a continuous layer placed beneath and at the sides of a landfill cell that is compatible with the waste and restricts the migration of leachate, or landfill gas or both;
- (aaa) "local environmental authority" means the Department of Environment and Parks, in the Province of Alberta, or the agency that has the equivalent responsibilities for any jurisdiction outside the Province;



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- (bbb) "maximum acceptable leachate head" means the maximum depth of leachate above the primary liner, not including the sumps or leachate pipe trenches;
- (ccc) "maximum designated waste elevation" means the maximum elevation of waste in metres above sea level as described in the application;
- (ddd) "monitoring system" means all equipment used for sampling, conditioning, analyzing or recording data in respect of any parameter listed or referred to in this approval including equipment used for continuous monitoring;
- (eee) "month" means calendar month;
- (fff) "moveable litter catch fence" means a framed mesh fence that can be moved to a position downwind of the working face for the purpose of catching wind-blown waste;
- (ggg) "movable wind screen" means a barrier that can be moved to a position upwind of the working face for the purpose of reducing the wind velocity and turbulence at the working face;
- (hhh) "municipal solid waste" means solid waste resulting from or incidental to municipal, community, commercial, institutional and recreation activities, and includes garbage, rubbish, ashes, street cleanings, abandoned automobiles and all other solid wastes except hazardous waste, industrial solid waste, oilfield waste and biomedical wastes;
- (iii) "municipal landfill cell" means the landfill cell where municipal solid waste is disposed of;
- (jjj) "municipal landfill cell composite liner" means a liner comprised of:
- (i) clay material that:
 - (A) has been compacted to achieve an in-place hydraulic conductivity of 1×10^{-9} metres/second or less, and
 - (B) has a minimum thickness of 0.6 metres at all points, measured perpendicular to the slope,
 - (ii) with or without a geosynthetic clay liner overlaid on the top of the clay material, and
 - (iii) a high density polyethylene geomembrane that:
 - (A) has a minimum thickness of 60 mil, and

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- (B) has been placed directly on the top surface of the compacted clay or the geosynthetic clay liner;
- (kkk) "new landfill cell" means any landfill cell that is constructed following the issuance of this approval;
- (lll) "NORM Waste" means any waste material with concentrations of NORM above the limits specified in Tables 5.1, 5.2, or 5.3 of the *Canadian Guidelines for the Management of Naturally Occurring Radioactive Materials* (NORM), Health Canada, 2011, as amended;
- (mmm) "nuisance" means litter, odour, dust, fire and disease vectors;
- (nnn) "off-spec sulphur" means elemental sulphur (typically greater than 95% sulphur) that is contaminated with an impurity that makes it a waste because it is not marketable;
- (ooo) "oilfield waste" means oilfield waste as defined in the *Waste Control Regulation* (AR 192/1996), as amended;
- (ppp) "post-closure" means the period of time after completion of the final landfill closure;
- (qqq) "primary liner" means the uppermost liner;
- (rrr) "record drawing/document" means a document prepared by a professional member of APEGA to record design changes to an initial design for which he or she has accepted responsibility and which represents the final design of the project that were either approved or authorized according to the terms and conditions of this approval. This document typically is issued or retained as verification that on-site conditions are in accordance with the final design;
- (sss) "regulations" means the regulations enacted pursuant to the Act, as amended;
- (ttt) "representative grab" means a sample consisting of equal volume portions of water collected from at least four sites between 0.20-0.30 metres below the water surface within a pond;
- (uuu) "run-off" means any rainwater or melt water that drains as surface flow from the active landfill area, excluding leachate;
- (vvv) "run-off control system" means the parts of the landfill that collect, store or treat run-off from the landfill;
- (www) "run-on" means any rainwater or melt water that drains or may drain as surface flow onto the active landfill area;

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- (xxx) "run-on control system" means parts of the landfill that divert landfill run-on away from the active landfill area;
- (yyy) "secondary leachate collection system" means a system that gathers and monitors liquids between a primary liner and a secondary liner system;
- (zzz) "secondary liner" means the lowermost liner of a double liner system;
- (aaaa) "soil" means mineral or organic earthen materials that can, have, or are being altered by weathering, biological processes, or human activity;
- (bbbb) "soil containing hydrocarbons" means soil containing hydrocarbon as defined in the *Waste Control Regulation* (AR 192/1996), as amended;
- (cccc) "Standards" means *Standards for Landfills in Alberta*, Alberta Environment, 2010, as amended;
- (dddd) "subsoil" means a layer of soil directly below the topsoil layer that
- (i) contains roots or the root zone,
 - (ii) is typically lighter in colour than the topsoil layer, and
 - (iii) consists of the B and C horizons as defined in *The Canadian System of Soil Classification* (Third Edition), Agriculture and Agri-Food Canada, Publication 1646, 1998, as amended;
- (eeee) "tank" means a stationary device, designed to contain an accumulation of a substance, which is constructed primarily of non-earthen materials that provide structural support including wood, concrete, steel, and plastic;
- (ffff) "topsoil" means the uppermost layer of soil and consists of:
- (i) the A-horizons and all organic horizons as defined in *The Canadian System of Soil Classification* (Third Edition), Agriculture and Agri-Food Canada, Publication 1646, 1998, as amended, and
 - (ii) the soil ordinarily moved during tillage;
- (gggg) "upper subsoil" means the layer of soil directly below the topsoil layer that consists of the B-horizons as defined in *The Canadian System of Soil Classification*, (Third Edition), Agriculture and Agri-Food Canada, Publication 1646, 1998, as amended;
- (hhhh) "week" means any consecutive 7-day period;
- (iiii) "working face" means that portion of the active landfill area where waste is currently being placed, deposited, spread and compacted; and

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(jjjj) "year" means calendar year, unless otherwise specified.

PART 2: GENERAL

SECTION 2.1: REPORTING

- 2.1.1 The approval holder shall immediately report to the Director by telephone any contravention of the terms and conditions of this approval at 1-780-422-4505.
- 2.1.2 The approval holder shall submit a written report to the Director within 7 days of the reporting pursuant to 2.1.1.
- 2.1.3 The approval holder shall immediately notify the Director in writing if any of the following events occurs:
- (a) the approval holder is served with a petition into bankruptcy;
 - (b) the approval holder files an assignment in bankruptcy or Notice of Intent to make a proposal;
 - (c) a receiver or receiver-manager is appointed;
 - (d) an application for protection from creditors is filed for the benefit of the approval holder under any creditor protection legislation; or
 - (e) any of the assets which are the subject matter of this approval are seized for any reason.
- 2.1.4 If the approval holder monitors for any substances or parameters which are the subject of operational limits as set out in this approval more frequently than is required and uses procedures authorized in this approval, then the approval holder shall provide the results of such monitoring as an addendum to the reports required by this approval.
- 2.1.5 The approval holder shall submit all annual reports required by this approval to be compiled or submitted to the Director on or before March 31 of the year following the year in which the information was collected, unless otherwise specified in this approval.

SECTION 2.2: RECORD KEEPING

- 2.2.1 The approval holder shall:
- (a) record; and
 - (b) retain

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all the following information in respect of any sampling conducted or analyses performed in accordance with this approval for a minimum of ten years, unless otherwise authorized in writing by the Director:

- (i) the place, date and time of sampling,
- (ii) the dates the analyses were performed,
- (iii) the analytical techniques, methods or procedures used in the analyses,
- (iv) the names of the persons who collected and analysed each sample, and
- (v) the results of the analyses.

SECTION 2.3: ANALYTICAL REQUIREMENTS

2.3.1 With respect to any sample required to be taken pursuant to this approval, the approval holder shall ensure that:

- (a) collection;
- (b) preservation;
- (c) storage;
- (d) handling; and
- (e) analysis

shall be conducted in accordance with the following unless otherwise authorized in writing by the Director:

- (i) for air:
 - (A) the *Air Monitoring Directive*, Alberta Environment, 1989, as amended;
- (ii) for leachate, run-off and groundwater:
 - (A) the *Standard Methods for the Examination of Water and Wastewater*, published jointly by the American Public Health Association, American Water Works Association, and the Water Environment Federation, 2012, as amended;
- (iii) for whole effluent toxicity tests:

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- (A) the *Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout*, Environment Canada, Environmental Protection Series 1/RM/13, December 2000, as amended,
 - (B) the *Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Daphnia Magna*, Environment Canada, Environmental Protection Series 1/RM/14, December 2000, as amended,
 - (C) the *Biological Test Method: Growth Inhibition Test Using the Freshwater Alga Selenastrum capricornutum*, Environment Canada, Environmental Protection Series, November 1992, as amended,
 - (D) the *Biological Test Method: Test of Reproduction and Survival Using the Cladoceran Ceriodaphnia dubia*, Environment Canada, Environmental Protection Series 1/RM/21, February 1992, as amended,
 - (E) the *Biological Test Method: Test of Larval Growth and Survival Using Fathead Minnows*, Environment Canada, Environmental Protection Series 1/RM/22, February 1992, as amended, and
 - (F) the *Biological Test Method: Toxicity Test Using Luminescent Bacteria (Photobacterium phosphoreum)*, Environment Canada, Environmental Protection Series, 1/RM/24, November 1992, as amended;
- (iv) for soil:
- (A) the *Soil Monitoring Directive*, Alberta Environment, May 2009, as amended, and
 - (B) the *Soil Quality Criteria Relative to Disturbance and Reclamation*, Alberta Agriculture, March 1987, as amended;
- (v) for waste:
- (A) the *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, USEPA, SW-846, September 1986, as amended,
 - (B) the *Methods Manual for Chemical Analysis of Water and Wastes*, Alberta Environmental Centre, Vegreville, Alberta, 1996, AECV96-M1, as amended,

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- (C) the *Toxicity Characteristic Leaching Procedure (TCLP)* USEPA Regulation 40 CFR261, Appendix II, Method No. 1311, as amended, or
- (D) the *Standard Methods for the Examination of Water and Wastewater*, published jointly by the American Public Health Association, American Water Works Association, and the Water Environment Federation, 2012, as amended.

- 2.3.2 The approval holder shall analyse all samples that are required to be obtained by this approval in a laboratory accredited pursuant to ISO/IEC 17025, as amended, for the specific parameter(s) to be analysed, unless otherwise authorized in writing by the Director.
- 2.3.3 The term sample used in 2.3.2 does not include samples directed to continuous monitoring equipment, unless specifically required in writing by the Director.
- 2.3.4 The approval holder shall comply with the terms and conditions of any written authorization issued by the Director under 2.3.2.

SECTION 2.4: OTHER

- 2.4.1 The terms and conditions of this approval are severable. If any term or condition of this approval or the application of any term or condition is held invalid, the application of such term or condition to other circumstances and the remainder of this approval shall not be affected thereby.
- 2.4.2 Any conflict between the Standards and the terms and conditions of this approval shall be resolved in favour of this approval.
- 2.4.3 *Environmental Protection and Enhancement Act* Approval No. 18701-01-00, as amended, is cancelled.
- 2.4.4 All tanks shall conform to the *Guidelines for Secondary Containment for Above Ground Storage Tanks*, Alberta Environmental Protection, 1997, as amended, unless otherwise authorized in writing by the Director.
- 2.4.5 All above ground storage tanks containing liquid hydrocarbons or organic compounds shall conform to the *Environmental Guidelines for Controlling Emissions of Volatile Organic Compounds from Aboveground Storage Tanks*, Canadian Council of Ministers of the Environment, PN 1180, 1995, as amended.

PART 3: LANDFILL CONSTRUCTION

SECTION 3.1: GENERAL

- 3.1.1. The approval holder shall construct the landfill as described in the application, unless otherwise specified in this approval.

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3.1.2 At least three months prior to the commencement of construction of any of the following:

- (a) a new landfill cell;
- (b) a landfill cell final cover;
- (c) a run-off control system;
- (d) a run-on control system;
- (e) a landfill gas collection system;
- (f) a leachate pond; or
- (g) a leachate collection system for any closed landfill cell

the approval holder shall submit to the Director, the following documents for the proposed construction, signed and stamped by a professional registered with APEGA:

- (i) a Detailed Construction Plan and Specifications prepared in accordance with the application and this approval,
- (ii) a Construction Quality Assurance Plan, and
- (iii) a Construction Quality Control Plan.

3.1.3 If any Detailed Construction Plan and Specifications in 3.1.2 is found deficient by the Director, the approval holder shall correct all deficiencies as outlined in writing by the Director, within the timeline specified in writing by the Director.

3.1.4 The approval holder shall implement the Detailed Construction Plan and Specifications in 3.1.2 as authorized in writing by the Director.

3.1.5 During construction of any of the items listed in 3.1.2, the approval holder shall not deviate from the Detailed Construction Plan and Specifications, as authorized in 3.1.4, unless the following conditions are met:

- (a) the deviation results in a minor adjustment to the Detailed Construction Plan and Specifications in order to suit field conditions encountered; and
- (b) the deviation will result in an equivalent design performance of the landfill.

3.1.6 The approval holder shall submit to the Director a summary report of the Construction Quality Assurance and Construction Quality Control results, signed and stamped by a professional registered with APEGA, in accordance with the following schedule:

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- (a) for a new landfill cell, at least one month prior to commencing the operation of the landfill cell, excluding the placement of waste as a protective layer; and
- (b) for any items in 3.1.2 other than a new landfill cell, within three months after the completion of construction.

3.1.7 The summary report in 3.1.6 shall contain the following information, at a minimum:

- (a) confirmation that the landfill has been constructed according to:
 - (i) the Construction Quality Assurance Plan,
 - (ii) the Construction Quality Control Plan, and
 - (iii) the Detailed Construction Plan and Specifications subject to the deviations as per 3.1.5;
- (b) a description of any deviations as per 3.1.5;
- (c) confirmation by the professional registered with APEGA, that deviations as per 3.1.5 will result in an equivalent design performance of the landfill;
- (d) record drawing/document; and
- (e) any other information as required in writing by the Director.

3.1.8 The Detailed Construction Plan and Specifications in 3.1.2 for any new landfill cell shall include, at a minimum, all of the following:

- (a) an industrial landfill cell composite liner or a municipal landfill cell composite liner;
- (b) a leachate collection system capable of meeting the maximum acceptable leachate head;
- (c) liner elevations;
- (d) a run-off control system to collect and store run-off for events up to at least the peak discharge from a 1 in 25 year – 24 hour duration rainfall event; and
- (e) a run-on control system to prevent flow onto the active landfill area for events up to at least the peak discharge from a 1 in 25 year – 24 hour duration rainfall event.

3.1.9 The Detailed Construction Plan and Specifications in 3.1.2 for any landfill cell final cover shall include, at a minimum, all of the following:

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- (a) a geometry of the final cover, which shall have a slope at a minimum of 5 percent and a maximum of 30 percent;
- (b) a barrier layer that:
 - (i) has been compacted to achieve an in-place hydraulic conductivity of 1×10^{-7} metres/second or less, and
 - (ii) has a minimum thickness of 0.6 metres at all points, measured perpendicular to the slope;
- (c) a subsoil layer that overlying the clay barrier with a minimum thickness of:
 - (i) 0.35 metres for pasture or recreational use, or
 - (ii) 0.80 metres for cultivated land use or forestry;
- (d) a topsoil layer overlying the subsoil layer with a minimum thickness of 0.20 metres; and
- (e) vegetation establishment that meets the land end use plan

unless otherwise authorized in writing by the Director.

3.1.10 The Detailed Construction Plan and Specifications in 3.1.2 for any leachate pond shall include, at a minimum, all of the following:

- (a) a primary liner constructed with high density polyethylene geomembrane that has a minimum thickness of 60 mil;
- (b) a secondary liner constructed with high density polyethylene geomembrane that has a minimum thickness of 60 mil;
- (c) a secondary leachate collection system; and
- (d) a prepared clay subgrade suitable to protect the integrity of the liner systems in 3.1.10 (a) and 3.1.10 (b).

SECTION 3.2: SOIL CONSERVATION

3.2.1 The approval holder shall not use:

- (a) topsoil; or
- (b) upper subsoil

for the daily cover.

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3.2.2 The approval holder shall:

- (a) salvage; and
- (b) conserve

all topsoil from disturbed land at the landfill for reclamation of the landfill.

3.2.3 The approval holder shall:

- (a) salvage; and
- (b) conserve

sufficient upper subsoil from the disturbed land at the landfill for reclamation of the landfill.

3.2.4 The approval holder shall:

- (a) conserve; and
- (b) stockpile

all topsoil separately from the upper subsoil.

3.2.5 The approval holder shall place all:

- (a) topsoil stockpiles; and
- (b) upper subsoil stockpiles

at the landfill.

3.2.6 The approval holder shall stockpile all topsoil as follows:

- (a) on stable foundations; and
- (b) on undisturbed topsoil.

3.2.7 The approval holder shall stockpile all upper subsoil as follows:

- (a) on stable foundations; and
- (b) on areas where the topsoil has been removed.

3.2.8 The approval holder shall take all steps necessary to prevent erosion, including but not limited to, all of the following:

- (a) revegetating the stockpiles; and

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(b) any other steps as authorized in writing by the Director.

3.2.9 The approval holder shall immediately suspend conservation of:

(a) topsoil; and

(b) upper subsoil

when

(i) wet or frozen conditions will result in mixing, degradation or compaction of topsoil or upper subsoil, and

(ii) high wind velocities, any other field conditions or landfill operations will result in mixing, degradation, or loss of topsoil or subsoil.

3.2.10 The approval holder shall recommence conservation of:

(a) topsoil; and

(b) upper subsoil

only when conditions in 3.2.9 no longer exist.

PART 4: LANDFILL OPERATIONS, LIMITS, MONITORING AND REPORTING

SECTION 4.1: GENERAL

4.1.1 The approval holder shall limit the perimeter boundary of the landfill to the land located within W 1/2 of Section 8, Township 7, Range 1, West of the 5th Meridian, as described in the application.

4.1.2 The approval holder shall limit the maximum designated waste elevation to no more than 1244 metres above sea level.

4.1.3 The approval holder shall:

(a) operate; and

(b) maintain

the following at the landfill:

(i) class II municipal landfill cells,

(ii) class II industrial landfill cells,

(iii) leachate collection systems,

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- (iv) municipal landfill cell composite liner,
- (v) industrial landfill cell composite liner,
- (vi) leachate ponds,
- (vii) run-on control systems,
- (viii) run-off control systems,
- (ix) groundwater monitoring systems,
- (x) subsurface landfill gas monitoring systems,
- (xi) groundwater control underdrain systems,
- (xii) recycling drop-off area,
- (xiii) recyclables and hazardous recyclables storages,
- (xiv) household hazardous waste storages,
- (xv) weigh scale,
- (xvi) site entrance, and
- (xvii) fences along the entire perimeter of the operational footprint of the landfill.

4.1.4 The approval holder shall take all steps necessary to restrict wildlife from the landfill.

LANDFILL OPERATOR CERTIFICATION

4.1.5 The operation of the landfill shall be supervised by a Certified Operator in accordance with:

- (a) the *Waste Control Regulation (AR192/96)*, as amended; and
- (b) the *Alberta Landfill and Composting Facility Operator Certification Guideline*, Government of Alberta, 2016, as amended.

CLOSED LANDFILL CELL MANAGEMENT

4.1.6 The approval holder shall manage the closed landfill cells to:

- (a) maintain the integrity of the landfill cell final cover;
- (b) take all steps necessary to prevent erosion;

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- (c) take all steps necessary to prevent surface water ponding;
- (d) remediate areas affected by subsidence and differential settlement; and
- (e) take all steps necessary to prevent leachate break out.

SECTION 4.2: OPERATIONS PLAN

4.2.1 The approval holder shall:

- (a) maintain; and
- (b) implement

the Operations Plan in accordance with:

- (i) this approval,
- (ii) the Standards, and
- (iii) the application.

4.2.2 The approval holder shall:

- (a) review the Operations Plan annually, at a minimum; and
- (b) update the Operations Plan when there is any:
 - (i) change in site operation and equipment,
 - (ii) change in the Standards, or
 - (iii) update as required in writing by the Director.

4.2.3 The approval holder shall retain a copy of the up-to-date Operations Plan at the landfill.

4.2.4 The approval holder shall submit to the Director an up-to-date Operations Plan when requested in writing by the Director.

4.2.5 The approval holder shall correct all deficiencies in the Operations Plan as outlined in writing by the Director, within the timeline specified in writing by the Director.

SECTION 4.3: WASTE ACCEPTANCE

4.3.1 The approval holder shall develop waste acceptance policies and procedures in accordance with all of the following:

- (a) the *Waste Control Regulation* (AR192/96), as amended;

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- (b) this approval; and
- (c) as specified in writing by the Director.

4.3.2 The approval holder shall obtain, at a minimum, a detailed chemical and physical representative analysis of all industrial solid waste prior to disposing it into the landfill at the following times:

- (a) the first time an industrial solid waste is received from a different process;
- (b) the first time an industrial solid waste is received from a different location; or
- (c) when the nature or composition of the industrial solid waste that was previously characterized changes.

4.3.3 The approval holder shall not dispose of the following at the landfill:

- (a) hazardous waste;
- (b) bulk liquid;
- (c) container(s) containing liquid waste greater than 5 litres;
- (d) domestic wastewater;
- (e) explosive(s);
- (f) radioactive materials as defined under the *Transportation of Dangerous Goods Regulations* as Class 7;
- (g) dangerous oilfield waste;
- (h) untreated biomedical waste;
- (i) NORM waste; and
- (j) ozone depleting substances.

4.3.4 Except as provided for 4.3.5, if any waste listed in 4.3.3 is received at the landfill, the approval holder shall remove it from the landfill within:

- (a) seven days of receipt; or
- (b) another time period as authorized in writing by the Director.

4.3.5 The approval holder shall remove the following from designated storage areas within 365 days of acceptance:

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- (a) hazardous recyclables;
- (b) household hazardous waste; and
- (c) ozone depleting substances.

4.3.6 The approval holder shall store:

- (a) hazardous recyclables; and
- (b) household hazardous waste

in accordance with the *Hazardous Waste Storage Guidelines*, Alberta Environment, June 1988, as amended.

4.3.7 The approval holder shall release waste that the landfill is not authorized to dispose of:

- (a) to facilities holding a current Approval or Registration under the Act;
- (b) to facilities approved by a local environmental authority outside of Alberta; or
- (c) as otherwise authorized in writing by the Director.

4.3.8 The approval holder shall take all steps necessary to prevent direct contact of incompatible waste with one another.

SPECIAL WASTES

4.3.9 The approval holder shall dispose of asbestos wastes in accordance with *Guidelines for the Disposal of Asbestos Waste*, Alberta Environment, 1989, as amended.

4.3.10 The approval holder shall dispose of contaminated sulphur and sulphur containing wastes in accordance with *Guidelines for Landfill Disposal of Sulphur Waste and Remediation of Sulphur Containing Soils*, Alberta Environmental, 2011, as amended.

4.3.11 The approval holder shall cover the following immediately with waste or soil after disposal of:

- (a) dead animals;
- (b) animal parts; and
- (c) meat and bone meal

at the landfill.

4.3.12 The approval holder shall only use hydrocarbon contaminated soil as alternative daily cover or intermediate cover if hydrocarbon contaminated soil:

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- (a) meets the limits specified in TABLE 4.3-A;
- (b) is not a hazardous waste; and
- (c) is not a dangerous oilfield waste.

TABLE 4.3-A HYDROCARBON CONTAMINATED SOIL LIMITS WHEN USED AS ALTERNATIVE DAILY OR INTERMEDIATE COVER

Parameters	Limits
Total Petroleum Hydrocarbons	< 20,000 mg/kg
Chloride	< 3,000 mg/kg
Flashpoint	> 61°C
pH	≥ 6.0 and ≤ 9.0 pH units

SECTION 4.4: NUISANCE MANAGEMENT

- 4.4.1 The approval holder shall take all steps necessary to prevent fugitive waste from leaving the landfill boundary.
- 4.4.2 The approval holder shall retrieve fugitive waste outside of the landfill boundary as described in the Operations Plan, as amended.
- 4.4.3 The approval holder shall implement the operating procedures for nuisance management as described in the Operations Plan, as amended.
- 4.4.4 The approval holder shall not operate the landfill unless and until the following fugitive waste and nuisance control processes and measures are adhered to:
 - (a) the working face width does not exceed 35 metres;
 - (b) the working face length does not exceed 35 metres;
 - (c) waste is placed and compacted immediately after it is deposited on the working face;
 - (d) movable wind screens are in place at an effective distance upwind of the working face;
 - (e) movable litter catch fences are in place at an effective distance downwind of the working face; and
 - (f) daily cover is:
 - (i) located at the working face at all times,

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(ii) used to cover the working face immediately after closing at the end of each day, at a minimum, and

(iii) of sufficient quantity to control fugitive waste and nuisance.

4.4.5 The approval holder shall not deposit, at the landfill, waste that may become fugitive waste by any method when wind gusts exceed 70 kilometres per hour.

4.4.6 Notwithstanding 4.4.5, the approval holder shall not deposit, at the landfill, waste that may become fugitive waste when fugitive waste cannot be controlled within the landfill boundary.

4.4.7 With respect to fugitive emissions, the approval holder shall not release any substance that causes or may cause any of the following:

- (a) impairment, degradation or alteration of the quality of natural resources;
- (b) material discomfort, harm or adverse effect to the well-being or health of a person; or
- (c) harm to property or to plant or animal life.

SECTION 4.5: LEACHATE MANAGEMENT

4.5.1 The approval holder shall only release leachate removed from the leachate collection system as follows:

- (a) to a wastewater treatment facility holding a current Approval or Registration under the Act;
- (b) to an onsite leachate pond;
- (c) to an Alberta Energy Regulator approved disposal well;
- (d) recirculation through landfill cells as described in the Operations Plan, as amended; or
- (e) as otherwise authorized in writing by the Director.

4.5.2 Subject to 4.5.3, during landfill operations, final landfill closure and post-closure, the maximum acceptable leachate head in a landfill cell with a liner shall not exceed the limits specified in TABLE 4.5-A.

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TERMS AND CONDITIONS ATTACHED TO APPROVAL**TABLE 4.5-A MAXIMUM ACCEPTABLE LEACHATE HEAD LIMIT**

Parameter	Limit
Maximum Acceptable Leachate Head	300 mm

- 4.5.3 Upon detection of any exceedance of the maximum acceptable leachate head limit, the approval holder shall reduce the leachate head to below 300 mm within a maximum of 14 days subsequent to the detection.

SECTION 4.6: LANDFILL RUN-ON AND RUN-OFF MANAGEMENT

- 4.6.1 The approval holder shall not release any substances from the landfill to the surrounding watershed except as authorized by this approval.
- 4.6.2 The approval holder shall manage run-off and run-on as described in the application, unless otherwise authorized in writing by the Director.
- 4.6.3 The approval holder shall not allow landfill run-on to enter the active landfill area.
- 4.6.4 The approval holder shall direct all landfill run-off from the active landfill area to the landfill run-off control systems.
- 4.6.5 Releases from the landfill run-off control systems to the surrounding watershed shall meet the limits for the parameters specified in TABLE 4.6-A.

TABLE 4.6-A LANDFILL RUN-OFF RELEASE LIMITS

Parameter	Concentration Limits
pH	≥ 6.0 and ≤ 9.5 pH units
Oil and Grease	No visible sheen
Total Dissolved Solids	≤ 2500 mg/L
Total Suspended Solids	≤ 25 mg/L
Chemical Oxygen Demand	≤ 50 mg/L
Total Ammonia Nitrogen	≤ 5 mg/L
Chloride	≤ 250 mg/L
Sulphate	≤ 500 mg/L
Sodium	≤ 200 mg/L

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TERMS AND CONDITIONS ATTACHED TO APPROVAL**SECTION 4.7: SUBSURFACE LANDFILL GAS MANAGEMENT**

- 4.7.1 The approval holder shall implement the Subsurface Landfill Gas Monitoring Program as described in the application, unless otherwise specified in this approval.
- 4.7.2 Throughout the active landfill life, final landfill closure and post-closure, the methane concentration in the subsurface landfill gas shall not exceed the limits specified in TABLE 4.7-A.

TABLE 4.7-A SUBSURFACE LANDFILL GAS EXPLOSIVE LIMITS

SAMPLING LOCATION	LIMITS
In the subsurface at the landfill 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

SECTION 4.8: DOMESTIC WASTEWATER

- 4.8.1 The approval holder shall release domestic wastewater only to the domestic wastewater system with subsequent disposal to:
- (a) a wastewater treatment facility holding a current Approval or Registration under the Act; or
 - (b) the onsite weeping tile septic field system.
- 4.8.2 The approval holder shall release sludge from the domestic wastewater system to a facility holding a current Approval or Registration under the Act.

SECTION 4.9: LANDFILL MONITORING AND REPORTING**LANDFILL OPERATIONS**

- 4.9.1 The approval holder shall monitor the landfill operations as required in TABLE 4.9-A.
- 4.9.2 The approval holder shall report to the Director the results of the landfill operations monitoring as required in TABLE 4.9-A.

TERMS AND CONDITIONS ATTACHED TO APPROVAL**TABLE 4.9-A LANDFILL OPERATIONS MONITORING AND REPORTING REQUIREMENTS**

MONITORING				REPORTING
Monitoring Activity	Frequency	Method	Sampling Location	
Weighing and observing type of waste received	Continuously (when operating)	Measurement	At entrance to landfill	Annually
Weighing and observing type of material removed	Continuously (when operating)	Measurement	At entrance to landfill	
Detecting hazardous and prohibited waste	Continuously (when operating)	Observation, analytical results, or load inspections	At entrance to landfill and at all disposal or storage locations	
Tracking general location of waste deposited	Daily (when operating)	As per survey, or by estimation	At working face or survey co-ordinates	
Observing cover material for nuisance management	Continuously (when operating)	Observation	At active landfill area	
Tracking public complaints regarding nuisances and responses	Daily	Recording in daily log	At landfill	
Tracking fugitive waste retrieval	When fugitive waste is retrieved	Recording in daily log	At landfill or outside landfill	
Inspecting intermediate cover	When intermediate cover is applied	Observation	At any landfill cell with an intermediate cover	
Inspecting final cover	When final cover is constructed	Survey or test core	At any closed landfill cell	
Tracking wind speed and direction	Continuously (when operating)	Measurement	At landfill	
Observing working face width and length	Daily	Observation	At working face	

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TERMS AND CONDITIONS ATTACHED TO APPROVAL**LEACHATE**

4.9.3 The approval holder shall monitor leachate at the landfill as required in TABLE 4.9-B.

4.9.4 The approval holder shall report to the Director the results of the leachate monitoring as required in TABLE 4.9-B.

TABLE 4.9-B LEACHATE MONITORING AND REPORTING REQUIREMENTS

MONITORING				REPORTING
Parameters	Frequency	Sampling Method	Sampling Location	
Maximum acceptable leachate head	Weekly from April to October and monthly from November to March	Measurement	At each leachate manhole, pond or sump	Annually
Leachate parameters: pH Total Dissolved Solids Total Suspended Solids Ammonia (total) Total Kjeldahl Nitrogen Chloride Sodium Sulphate Chemical Oxygen Demand Biological Oxygen Demand Benzene Toluene Ethylbenzene Xylene F1 and F2 phenols Metals	Annually	(a) grab; or (b) representative grab		
Volume of leachate removed	As removed	Measurement or estimate		

SUBSURFACE LANDFILL GAS

4.9.5 The approval holder shall monitor subsurface landfill gas as required in TABLE 4.9-C.

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TERMS AND CONDITIONS ATTACHED TO APPROVAL

- 4.9.6 The approval holder shall compile an Annual Subsurface Landfill Gas Migration Monitoring Report which shall include, at a minimum, all of the following:
- (a) the monitoring results as required in TABLE 4.9-C;
 - (b) an assessment of the monitoring results relative to the limits in TABLE 4.7-A;
 - (c) a map showing locations of subsurface landfill gas monitoring wells or probes;
 - (d) any information used to assess monitoring results including water level in the monitoring wells or probes and oxygen concentration in the soil gas;
 - (e) a recommendation for changes to the subsurface landfill gas monitoring program to make it more effective; and
 - (f) any other information as required in writing by the Director.
- 4.9.7 The Annual Subsurface Landfill Gas Monitoring Report shall be prepared by a professional registered with APEGA, or other professional authorized in writing by the Director.

TABLE 4.9-C SUBSURFACE LANDFILL GAS MONITORING AND REPORTING REQUIREMENTS

MONITORING				REPORTING
Parameters	Frequency	Sampling Location	Analytical Method	
Methane Concentration in the Soil Gas	Once per year	Subsurface landfill gas monitoring wells or probe	Field measurement with suitable portable meters or laboratory analyses	Annually
Soil Gas Pressure			Field measurement with suitable portable meters	

LANDFILL RUN-OFF

- 4.9.8 The approval holder shall monitor the landfill run-off control system as required in TABLE 4.9-D prior to release.
- 4.9.9 The approval holder shall monitor the release of landfill run-off from the landfill run-off control system as required in TABLE 4.9-D throughout the release period.

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TERMS AND CONDITIONS ATTACHED TO APPROVAL

- 4.9.10 The approval holder shall report to the Director the monitoring results as required in TABLE 4.9-D.

TABLE 4.9-D RUN-OFF MONITORING AND REPORTING REQUIREMENTS

MONITORING				REPORTING
Parameters	Frequency	Sampling Method	Sampling Location	
pH	a) prior to each release; and b) during any unanticipated release from the run-off control system	Representative grab	Each run-off control system pond from which a release (a) is to occur; or (b) is occurring	Annually
Total Dissolved Solids				
Total Suspended Solids				
Total Ammonia Nitrogen				
Chloride				
Sodium				
Sulphate				
Chemical Oxygen Demand				
Oil and Grease	When released	Measured	Discharge point	
Volume				

TONNAGE REPORTING

- 4.9.11 The approval holder shall submit annual tonnage records electronically to the Alberta Environment and Parks' online Waste Measurement System by March 31st of the year following the year in which the waste was accepted.

LANDFILL ANNUAL REPORT

- 4.9.12 The approval holder shall submit to the Director an Annual Landfill Operation Report which shall include, at a minimum, all of the following:
- (a) the monitoring results required in TABLE 4.9-A, TABLE 4.9-B and TABLE 4.9-D;
 - (b) an assessment of the monitoring results required in TABLE 4.9-B relative to the limit specified in TABLE 4.5-A;



TERMS AND CONDITIONS ATTACHED TO APPROVAL

- (c) a summary of the performance of run-off and run-on control systems;
- (d) a summary of the dates that wind gusts at the landfill exceeded 70 kilometres per hour;
- (e) a summary of the dates when the landfill closed or restricted access to the working face due to wind conditions;
- (f) a summary of the waste types stored pursuant to 4.3.4, including their origin;
- (g) a summary of the changes to the landfill Operations Plan from the previous year;
- (h) a summary of all records of landfill inspections conducted by the approval holder;
- (i) a summary of landfill survey results;
- (j) a summary of remedial actions taken for any subsidence and differential settlement of the closed landfill cells;
- (k) a summary of any maintenance and repairs carried out for the closed landfill cells;
- (l) the results of any environmental or compliance audits for the year;
- (m) all the contraventions reported pursuant to 2.1.1; and
- (n) any other information as required in writing by the Director.

SECTION 4.10: GROUNDWATER MANAGEMENT

- 4.10.1 The approval holder shall implement the Groundwater Monitoring Program as described in the Application.
- 4.10.2 The approval holder shall:
 - (a) protect from damage; and
 - (b) keep locked except when being sampled

all groundwater monitoring wells unless otherwise authorized in writing by the Director.
- 4.10.3 If a representative groundwater sample cannot be collected because the groundwater monitoring well is damaged or is no longer capable of producing a representative groundwater sample, the approval holder shall:

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TERMS AND CONDITIONS ATTACHED TO APPROVAL

- (a) clean, repair or replace the groundwater monitoring well; and
- (b) collect and analyse a representative groundwater sample prior to the next scheduled sampling event

unless otherwise authorized in writing by the Director.

4.10.4 In addition to the sampling information recorded in 2.2.1, the approval holder shall record the following sampling information for all groundwater samples collected:

- (a) a description of purging and sampling procedures;
- (b) the static elevations above sea level, and depth below ground surface of fluid phases in the groundwater monitoring well prior to purging;
- (c) the temperature of each sample at the time of sampling;
- (d) the pH of each sample at the time of sampling; and
- (e) the specific conductance of each sample at the time of sampling.

4.10.5 The approval holder shall carry out remediation of the groundwater in accordance with the following:

- (a) *Alberta Tier 1 Soil and Groundwater Remediation Guidelines*, Alberta Environment, February 2016, as amended; and
- (b) *Alberta Tier 2 Soil and Groundwater Remediation Guidelines*, Alberta Environment, February 2016, as amended.

4.10.6 The approval holder shall:

- (a) install; and
- (b) maintain:
 - (i) groundwater monitoring wells along the compliance boundary in accordance with sections 5.5 and 5.6 of the Standards, or
 - (ii) as otherwise specified in writing by the Director.

GROUNDWATER PERFORMANCE STANDARDS

4.10.7 The approval holder shall assess groundwater monitoring data in accordance with section 5.3 of the Standards, unless otherwise specified in writing by the Director.

4.10.8 The approval holder shall immediately implement the Groundwater Contingency Plan in accordance with the application, if at any time until the End of Post-Closure the

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TERMS AND CONDITIONS ATTACHED TO APPROVAL

groundwater fails to meet the groundwater performance standards as specified in section 5.3 of the Standards.

GROUNDWATER MONITORING REPORTING

- 4.10.9 The approval holder shall compile an Annual Groundwater Monitoring Report which shall include, at a minimum, all of the following information:
- (a) a completed *Record of Site Condition Form*, Alberta Environment, 2009, as amended;
 - (b) a legal description of the landfill and a map illustrating the landfill boundaries;
 - (c) a topographic map of the landfill;
 - (d) a description of the activities and processes at the landfill;
 - (e) a map showing the location of all surface and groundwater users, and, a listing describing surface water and water well use details, within at least a three kilometre radius of the landfill;
 - (f) a general hydrogeological characterization of the region within a five kilometre radius of the landfill;
 - (g) a detailed hydrogeological characterization of the landfill, including an interpretation of groundwater flow patterns;
 - (h) a cross-section(s) showing depth to water table, patterns of groundwater movement and hydraulic gradients at the landfill;
 - (i) borehole logs and completion details for groundwater monitoring wells;
 - (j) a map showing locations of all known buried channels within at least five kilometres of the landfill;
 - (k) a map of surface drainage within the landfill and surrounding area to include nearby water bodies;
 - (l) a map of groundwater monitoring well locations and a table summarizing the existing groundwater monitoring program for the landfill;
 - (m) a summary of any changes to the groundwater monitoring program made since the last groundwater monitoring report;
 - (n) analytical data recorded as required in 4.10.1 and 4.10.3 (b);
 - (o) a summary of fluid elevations recorded as required in 4.10.4 (b) and an interpretation of changes in fluid elevations;

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TERMS AND CONDITIONS ATTACHED TO APPROVAL

- (p) an interpretation of the quality assurance/quality control program results;
- (q) an interpretation of all the data in this report, including the following:
 - (i) diagrams indicating the location and extent of any contamination,
 - (ii) a description of probable sources of contamination, and
 - (iii) a site map showing the location and type of current and historical potential sources of groundwater contamination;
- (r) a summary and interpretation of the data collected since the groundwater monitoring program began including:
 - (i) control charts which indicate trends in concentrations of parameters, and
 - (ii) the migration of contaminants;
- (s) a description of the following:
 - (i) contaminated groundwater remediation techniques employed,
 - (ii) source elimination measures employed,
 - (iii) risk assessment studies undertaken, and
 - (iv) risk management studies undertaken;
- (t) a sampling schedule for the following year(s);
- (u) a description of any contaminant remediation, risk assessment or risk management action conducted at the landfill; and
- (v) recommendations for changes to the groundwater monitoring program to make it more effective.

4.10.10 If the Groundwater Monitoring Report is found deficient by the Director, the approval holder shall correct all deficiencies identified in writing by the Director, within the timeline specified in writing by the Director.

PART 5: FINAL LANDFILL CLOSURE AND POST-CLOSURE

- 5.1.1 The approval holder shall apply for an amendment to this approval for the final landfill closure by submitting to the Director :
- (a) a Detailed Final Landfill Closure Plan; and
 - (b) a Landfill Post-Closure Plan.

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TERMS AND CONDITIONS ATTACHED TO APPROVAL

- 5.1.2 The approval holder shall submit the amendment application referred to in 5.1.1 within 180 days of the landfill ceasing operations, unless otherwise authorized in writing by the Director.
- 5.1.3 The Detailed Final Landfill Closure Plan shall be developed in accordance with sections 6.1(b) and 6.1(c) of the Standards.
- 5.1.4 In addition to 5.1.3, the Detailed Final Landfill Closure Plan shall include all of the following:
- (a) a plan for replacement of soil;
 - (b) a quality assurance/quality control program;
 - (c) any deviations from the most recently submitted closure plan; and
 - (d) any other information as required in writing by the Director.
- 5.1.5 The Detailed Final Landfill Closure Plan shall be signed and stamped by a professional registered with APEGA.
- 5.1.6 The Landfill Post-Closure Plan shall be developed in accordance with sections 6.2 and 6.3 of the Standards.
- 5.1.7 In addition to 5.1.6, the Landfill Post-Closure Plan shall include all of the following:
- (a) a groundwater monitoring program including performance standards and points of compliance;
 - (b) a leachate monitoring program including leachate quantity and quality performance standards;
 - (c) a subsurface landfill gas monitoring program including performance standards and points of compliance;
 - (d) a plan for soil erosion control; and
 - (e) any other information as required in writing by the Director.

DEC 14 2016

DATE



DESIGNATED DIRECTOR UNDER THE ACT

Appendix 4 Financial Security Plan



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CROWSNEST/PINCHER CREEK LANDFILL ASSOCIATION

Financial Security Plan - Unplanned or Planned Closure

Crowsnest Pincher Creek Landfill

307074-02060 – CI-PLN-0001

13 May 2016

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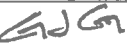

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**CROWSNEST/PINCHER CREEK LANDFILL ASSOCIATION
FINANCIAL SECURITY PLAN - UNPLANNED OR PLANNED CLOSURE
CROWSNEST PINCHER CREEK LANDFILL**

PROJECT 307074-02060 - FINANCIAL SECURITY PLAN - UNPLANNED OR PLANNED CLOSURE							
REV	DESCRIPTION	ORIG	REVIEW	WORLEY – PARSONS APPROVAL	DATE	CLIENT APPROVAL	DATE
0	Issued as final	K. Hunn	G. Gagnon	H. Taher	04-Feb-16		
1	Re-issued as final	 K. Hunn	 G. Gagnon	 H. Taher	13-May-16		

**CROWSNEST/PINCHER CREEK LANDFILL ASSOCIATION
FINANCIAL SECURITY PLAN - UNPLANNED OR PLANNED CLOSURE
CROWSNEST PINCHER CREEK LANDFILL**

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**CROWSNEST/PINCHER CREEK LANDFILL ASSOCIATION
FINANCIAL SECURITY PLAN - UNPLANNED OR PLANNED CLOSURE
CROWSNEST PINCHER CREEK LANDFILL**

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**CROWSNEST/PINCHER CREEK LANDFILL ASSOCIATION
FINANCIAL SECURITY PLAN - UNPLANNED OR PLANNED CLOSURE
CROWSNEST PINCHER CREEK LANDFILL**

**FIGURE 3 GROUNDWATER MONITORING WELL SYSTEM AND SUB-SURFACE
LANDFILL GAS (LFG) WELLS**

1. INTRODUCTION

1.1 Background

The Crowsnest/Pincher Creek Landfill Association (the CNPC Landfill Association) operates the Crowsnest Pincher Creek Landfill (the CNPC Landfill) located approximately 10 kilometers west of Pincher Creek, Alberta and approximately 3 km southwest of the village of Cowley, Alberta at legal site description (LSD) W ½ 08-07-01 W5M.

The Landfill has several waste management components including:

- Class II Municipal Soil Waste (MSW) Landfill Cell 1 (2011) and Cell 2 (2013);
- Class II Municipal Solid Waste (MSW) Landfill Cell (Old Pre-2011 [capped]);
- Class II Industrial Waste Landfill Cells 1 (2012) and Cell 2 (2015);
- Class II Industrial Waste Landfill Cell (old pre-2012 [capped]);
- a recycling drop-off area;
- a building for temporary storage of house hold hazardous waste, paint/pesticide and herbicide containers; and
- pits, berms and fences area(s) for used oil/glycols and spent batteries.

The CNPC Landfill site also has several ponds including:

- a storm water retention pond (MSW and Industrial);
- a retention pond (MSW);
- an evaporation pond (Industrial);
- a leachate storage pond (Industrial); and
- a leachate storage pond (MSW).

Figure 1 (attached) illustrates the various waste management components and ponds located within the CNPC Landfill. The CNPC Landfill is operated under AEP (Alberta Environment and Parks) Approval Number 18701-01-00 (2006), and Amending Approval Numbers 18701-01-01 (2009), and 18701-01-02 (2011) (the Approval/Amending Approvals).

The contents of the Financial Security Plan (FSP) are based on industry standards of practice, Standards for Landfills in Alberta (AENV 2010), regulatory requirements and the existing Approval/Amending Approvals. The FSP will become part of the CNPC Landfill operating record.



1.2 Scope and Purpose

WorleyParsons Canada Services Ltd., operating as Advisian¹ (Advisian) was requested by the CNPC Landfill Association to prepare this FSP.

The scope of the FSP will include:

- a proposed framework for unplanned or planned closure of the CNPC Landfill, or any part of it, at any point during its active life;
- a proposed framework for post-closure monitoring;
- a cost estimate for the final closure and post-closure periods of the CNPC Landfill; and
- the type of financial assurance instrument to be provided by the CNPC Landfill Association.

The purpose of the FSP is to provide a preliminary cost estimate for the final closure and post-closure (unplanned or planned) of the CNPC Landfill for purposes of a financial assurance instrument. The FSP will provide the template to be used for future cost estimate updates. The cost estimate detailed herein will be subject to change depending on current market prices for required goods and services. The cost estimate reflects current industry prices at the time of submission.

1.3 Supporting Information

The cost estimate for the financial security of the CNPC Landfill is based on the technical requirements for final closure and post-closure, as described in the following documents (may include but not limited to Approval/Amending Approvals, Standards, Guidelines, and Codes of Practices):

- Standards for Landfills in Alberta (AENV 2010);
- Environmental Protection and Enhancement Act (EPEA 2010);
- Government of Alberta (2010), Landfill Application V1.2, 2010-25-02;
- Guidelines for Landfills in Alberta (AENV 2001); and
- the Approval/Amending Approvals.

These documents describe the proposed design standards and anticipated regulatory requirements associated with the CNPC Landfill final closure and post-closure care.

¹ As of July 1, 2015, Advisian became the independent consulting business line of WorleyParsons.

2. FINANCIAL SECURITY REQUIREMENTS

2.1 General – Cost Estimates

The cost estimate for the CNPC Landfill has been divided into three time periods (some overlapping of activities/tasks may occur):

- preparation for landfill closure (minimum 180 days prior to final closure);
- final closure (assumed work plan completed within a 18-month period); and
- post-closure (minimum 25 years, annual maintenance and monitoring).

Table 1 – Financial Security Plan (Unplanned or Planned Closure) Cost Estimate (attached) addresses the work activities and the associated costs for the unplanned or planned closure of the CNPC Landfill for the three time periods.

The FSP provides a cost estimate for an unplanned or planned closure for purposes of financial security. The cost estimates for preparation for landfill closure, final closure and post-closure are based on the expected end of 2015 landfill configuration as shown on Figure 1 (attached) and requirements in the Approval/Amending Approvals. If, and when, the CNPC Landfill is further expanded or partially closed, the cost estimate will be adjusted to reflect these changes (the FSP will be updated at least every five years to reflect current conditions).

2.1.1 Cost Estimates – Assumptions

Cost estimates for project management, planning, coordination and reporting are provided in all three time periods.

Groundwater, surface water, leachate, and leak detection systems will continue to be monitored and maintained and liquids disposed of during the preparation for landfill closure, final closure and post-closure periods, but cost estimates for these are only attributed to the final closure and post closure periods.

A groundwater control underdrain system has been installed at the MSW Landfill Cells 1 and 2 and the Industrial Landfill Cells 1 and 2. The underdrain systems will continue to be monitored, maintained and liquids disposed of during the preparation for landfill closure and final closure periods. It is anticipated that the underdrain system will not be required for the post-closure period; thus, cost estimates for the underdrain system are attributed to the final closure period only.

Cost estimates for site infrastructure removal and disposal are attributed to the preparation for landfill closure and post-closure periods. The cost estimate for remaining site infrastructure maintenance is attributed to the final closure and post-closure time periods.



2.1.2 Cost Estimates – Areas

The cost estimates are based on site areas as presented in Table A.

Table A Areas Used for Cost Estimate

Item as Identified on Figure 1	Disturbed Area Outside Landfill Area, m ²	Landfill Cell Area (Disturbed), m ²	Active MSW Landfill Cell Area, m ²	Active Industrial Landfill Cell Area, m ²
Old (Pre-2011) Municipal Solid Waste (MSW) Landfill		54,087	5,409	
MSW Cell 1 (2011) & Cell 2 (2013)		31,126	28,013	
Loam Pile	2,300			
Loam Pile	243			
Gravel Stockpile	1,273			
Gravel Stockpile	541			
Existing Borrow Areas	45,183			
Access Road System	11,952			
Office/Shop Building	300			
Paint/Herbicide Storage Building	149			
Recycling Facilities Area	6,777			
Old (Pre-2012) Industrial Landfill		13,668		
Evaporation Pond	1,893			
Retention Pond	10,686			
Storm Water Retention Pond (2012)	10,761			
MSW Leachate Storage Pond	7,809			
Industrial Leachate Storage Pond	7,500			
Special Waste Cell		19,770		
Industrial Landfill Cell 1 (2012) & Cell 2 (2015)		37,808		17,762.3
Totals, m² (ha)	107,367 (10.8)	156,459 (15.7)	33,422 (3.4)	17,762 (1.8)

2.2 Time Frame

As the CNPC Landfill reaches its approved waste levels for the entire site, the CNPC Landfill Association will initiate the procedure outlined in the Approval/Amending Approvals for closure of the Landfill. The anticipated time frame is as follows:

- a Detailed Final Landfill Closure Plan will be submitted to AEP at least 180 calendar days prior to implementing the final landfill closure;
- a Final Landfill Closure Report will be submitted to AEP within 60 days of the completion of the Final Landfill Closure Plan implementation. It has been assumed that tasks outlined in the Detailed Final Landfill Closure Plan will be completed in 18 months;
- post-closure starts 30 days following the submission of the Final Landfill Closure Report; and
- the post-closure period for maintenance and monitoring is a minimum of 25 years (AENV 2010) after final landfill closure.

Given the property boundaries of the CNPC Landfill (W ½ 08-07-01-W5M), there is sufficient capacity for an additional 20 to 25 years of operation based on current depletion rates and assuming that the property area can support additional expansions. The limit of the elevation of waste in any cell in the Landfill is less than or equal to 1,244 metres above sea level (masl) prior to placement of the final cover (as per the Approval).



3. PREPARATION FOR LANDFILL CLOSURE WORK PLAN

3.1 General

The CNPC Landfill has been progressively capping landfill cells over the years as waste is placed. This proactive approach to landfiling will continue, and as final approved waste grades for the entire site are approached a Detailed Final Landfill Closure Plan (DFLCP) will be completed and submitted as per the Approval (a minimum of 180 days prior to final closure). The DFLCP will include, but is not limited to:

- a final landfill closure and decommissioning schedule;
- the reclamation design plan (erosion, surface water drainage);
- design of the final cover system;
- design plan of monitoring systems (groundwater, leak detection and gas);
- design plan for changes in collection systems (leachate, underdrain, gas); and
- a Post-Closure Plan.

When final approved waste elevations are reached and the area approved for waste placement filled, waste acceptance will cease. A topographic survey will be completed of the waste elevation, grades and placement area.

The CNPC Landfill cells and its associated facilities will be secured from unauthorized use. At a minimum, concrete barricade(s) and locked gate(s) will be required to secure the CNPC Landfill.

The cost estimate includes preparation of the DFLCP, completion of the topographic survey and securing the facility from unauthorized disposal of wastes.

Where possible it has been assumed that the majority of the work will be completed by landfill staff and equipment. Outside contractors or work by others will need to be conducted in some circumstances.

3.2 Site Assessment (Soils and Stored Materials)

Prior to reaching final waste elevations, a soil sampling program will be undertaken around the perimeter of the CNPC Landfill cells and its related infrastructure. If results indicate that surface soils are impacted from landfiling activities, remedial action will be undertaken. The impacted soil will be removed and treated as waste for disposal in the remaining portion of an active landfill cell held in reserve for this purpose. If the soil results show no impact, the disturbed area will be re-graded consistent with the surrounding natural grade. Due to the landfill operations (tracking tire residual, site inspections) and waste handling procedures, it is likely that any impacts to soil quality would have been dealt with during ongoing landfill operations. It is therefore, assumed that no soil removal will be required.

The cost estimate includes the site assessment program as described above.

3.3 Site Infrastructure

All site infrastructure that is related to the CNPC Landfill and not required for final closure and post-closure activities will be dismantled, removed and disposed of appropriately.

Infrastructure not required during the final closure and post-closure periods include:

- weigh scale;
- office/shop building;
- septic system;
- paint/herbicide container storage building;
- recycling drop off area;
- storage area for oils/glycols and batteries; and
- evaporation pond.

Liquids within the evaporation pond will be tested and disposed of (assumed disposal to the industrial leachate storage pond) and the underlying soils will be tested and disposed of (assumed disposal to the industrial landfill).

Perimeter fencing (barb wire and chain link), barricade and gates will be removed and disposed of as part of post-closure activities, only after the final cover system has been placed, in order to prevent unauthorized access during the closure capping phase of the work. Remediation work may be required in some of the areas such as the recycling and the temporary storage pad. Ditches, berms and perimeter access road will be maintained as required for final closure and post-closure activities.

The evaporation pond will be reclaimed to the Landfill final end use. The CNPC Landfill end use will be agricultural/pasture.

The cost estimate includes the removal and disposal of the infrastructure described above. Costs of reclamation of these areas to final end use configuration will be attributed to the final closure costs.



4. FINAL CLOSURE WORK PLAN

4.1 General

The final closure work plan will include:

- implementation of the Detailed Final Landfill Closure Plan (DFLCP);
- maintenance of required site infrastructure (gates, barricade and roads) and surface water (retention ponds, ditches and berms), groundwater, leachate (including storage ponds), leak detection and underdrain systems;
- monitoring the groundwater quality;
- disposing of collected MSW and Industrial leachate (onsite leachate storage ponds and offsite disposal as required);
- disposing of collected underdrain water (retention pond); and
- completing the Final Landfill Closure Report (as per the Approval).

The cost estimate includes the above work plan items. Implementation costs of the DFLCP include engineering, contract administration, construction supervision, mobilization/demobilization, quality control and quality assurance (QA/QC) programs and reporting, drafting, and clerical.

The following activities comply with Sections 6.1(b), 6.1(c) and 6.2(a) of the Standards for Landfills (AENV 2010).

4.2 Capping Landfill Cells

The CNPC Landfill cells are being progressively capped as waste is placed to the final outside grades. As areas reach final waste elevations the barrier layer of the cap structure has been placed in order to reduce infiltration of precipitation water (and hence reduce leachate generation). The placement of the subsoil / topsoil layers and establishment of vegetation to conform to the end use plan has not been completed in the remaining active CNPC Landfill cell areas.

As of January 2016, the final cap barrier layer has been placed as follows (as identified on Figure 1):

- Pre-2011 old MSW landfill, west, south and north faces (approximately 90%);
- Pre-2012 old Industrial landfill;
- 2012 Industrial Landfill Cell 1 south face; and
- 2011 MSW landfill Cell 1 (east and south slopes).

Prior to the placement of the cap structure, the landfill area has been / will be surveyed to ensure waste placement is within the limits stated in the approved design.

The geometry of the final external cover shall have a slope of a minimum of 5% (to maintain drainage) and a maximum of 30% (to prevent erosion). Passive Landfill Gas (LFG) venting in the MSW Landfill

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cells will be required as the CNPC Landfill accepts various types of organic wastes (WorleyParsons 2009). Costs associated with LFG management (with the exception of the passive vents installed during cap placement) will be part of the post-closure period.

The CNPC Landfill will be progressively capped with three layers (from top of waste):

- a) Compacted soil barrier layer (minimum 0.6 m).
- b) Subsoil layer equal to the depth at the landfill site prior to construction (pre-existing conditions).
- c) Topsoil layer equal to the depth at the landfill site prior to construction (pre-existing conditions).

The compacted soil barrier layer will consist of 0.6 m of material exhibiting a maximum hydraulic conductivity of 1×10^{-7} m/s. The barrier layer's function is to reduce infiltration of precipitation into the landfill cell.

The subsoil layer will be equal to the depth of subsoil at the landfill site prior to construction as identified in Crowsnest Pincher Creek Regional Waste Management Association report (CNPC-RWMA 2007). The subsoil layer's function is to provide depth for root growth and protect the barrier layer from erosion and desiccation.

The topsoil layer will be equal to the depth of topsoil at the landfill site prior to construction as identified in CNPC-RWMA (2007). The topsoil layer's function is to establish vegetation and prevent erosion. The topsoil layer of the landfill cap will be seeded with native grass to prevent erosion, consistent with the CNPC Landfill Association's Re-vegetation Plan. The re-vegetation program will involve the propagation and planting of native grasses. The use of native plants means considerably less maintenance in the future and a natural appearance to the site.

The CNPC Landfill end use will be agricultural/pasture, as such the Standards for Landfills recommend that the subsoil layer should be placed at a thickness of 0.35 m and the topsoil should be placed at a thickness of 0.20 m (AENV 2010). However, as per the Approval, the subsoil and topsoil layers will be placed at pre-existing site conditions which may not meet the recommended depths.

The cost estimate for construction of the landfill cover system assumes that the remaining final cover layers and vegetation establishment will be completed over two construction seasons.

The cost estimate assumes that suitable material for the barrier layer has been stockpiled during landfill cell construction, and suitable material for the subsoil and topsoil layers have been stockpiled during the course of operating the CNPC Landfill. Cost estimates include preparation of waste grade for cap placement, construction of soil barrier/subsoil/topsoil layers, installation of passive LFG vents, seeding/vegetation, QA/QC (barrier layer – cores) and topographic survey of completed final cover system.



4.3 Groundwater Management

During the final closure period, the groundwater system will be monitored, sampled and maintained annually. The cost estimate assumes that no additional monitoring wells are required and none are decommissioned during the final closure period.

The cost estimate includes field work, laboratory analysis and reporting as per the Approval/Amending Approvals. The cost estimate is based on semi-annual monitoring during the final closure period.

4.4 Surface Water Management

The surface water system consists of ditches, berms, retention pond (MSW) and stormwater retention pond (MSW and Industrial) and it is suggested that it be inspected and maintained on a monthly basis in the final closure and post-closure periods (rather than weekly as is conducted during operations, Approval Section 4.6.4) with additional monitoring after large storm events. The surface water system will be sampled on an annual basis or prior to a release. Any deficiencies such as ponding water, erosion, and siltation will be identified, corrected and documented. As required under the Approval/Amending Approvals, any receiving water body (creek) down gradient of the CNPC Landfill will be sampled three times annually in accordance to the Retention and Evaporation Ponds Management Plan and Approval Section 4.6.9(e). Sampling will be conducted in conjunction with monthly inspections, thus the cost estimates includes the laboratory costs only.

If either retention pond stores greater than 50% of its holding capacity it requires monthly monitoring (Approval/ Amending Approvals). The cost estimate assumes that the surface water inspections be conducted in conjunction with the leachate system monthly monitoring events.

The cost estimate assumes monthly inspections, sampling and minimal maintenance.

4.5 Leachate Management

The leachate management system at the CNPC Landfill will consist of the following at the end of the final closure time period:

- leachate collection and removal system in the MSW Landfill Cells 1 & 2;
- leachate collection and removal system in the Industrial Landfill Cells 1 & 2;
- leachate collection and removal system in the old Industrial (pre-2012);
- leachate extraction wells in the Old MSW (pre-2011) landfill cell (to be installed during final closure period);
- MSW landfill leachate storage pond;
- Industrial landfill leachate storage pond; and
- the evaporation pond which is no longer being used to receive industrial leachate from the old Industrial landfill cell (pre-2012) will be reclaimed.

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Leachate will be generated in the MSW and Industrial Landfill Cells; however, no leachate collection and removal system currently exists in the Old MSW Landfill. The Old MSW Landfill will require leachate extraction wells to be installed. For the cost estimate it has been assumed the two 100 mm (min.) diameter leachate collection wells (with wide screens intervals), approximately 25 m deep (to bottom of waste) at the low point (south portion) and mid-point in the Old MSW landfill will be installed. Initially it is recommended to install just the two wells to determine the extent of leachate in the Old MSW landfill.

During the final closure period, the leachate collection and removal system will be protected, monitored (levels and for leachate breakouts), maintained (components) and accumulated leachate disposed of on a monthly basis. Leachate sampling will be undertaken on an annual basis during the final closure period at each sump, at one of the extraction wells and at the two leachate storage ponds.

During final closure period, the leachate storage ponds (MSW and Industrial) will be monitored (levels), maintained and if leachate levels in the respective pond exceeds the 0.5 m minimum freeboard the leachate will be disposed of offsite. The cost estimate includes inspections, monitoring, field work, laboratory analysis and general maintenance of the leachate storage ponds.

The cost estimate assumes that the evaporation pond is reclaimed as part of the infrastructure removal and disposal task during the preparation for landfill closure time period. The cost estimate assumes that MSW leachate (from all three MSW cells) will be disposed of in the MSW Leachate Storage Pond. The cost estimate assumes that industrial leachate (from both industrial cells) will be disposed of in the Industrial Leachate Storage Pond. It has been assumed that offsite disposal will only be required periodically.

4.5.1 Leachate Generation Rates

The CNPC Landfill Association provided historical leachate volumes for the Industrial and MSW landfill cells. These historical rates were used to estimate the leachate generation rate for final closure and post-closure periods. The leachate generation rate is based on the current configuration, the historical leachate generation rates are provided in Table B below.

Table B Historical Leachate Generation Rates, m³/time Period

Landfill Cell	Time Period	Description of Capping in Place	Leachate Generated m³
Old MSW	unknown	Capped	Unknown
MSW Cells 1 & 2	2015	Partial cap	1,200 m ³
Old Industrial	2011	2/3 capped	620 m ³
Old Industrial	2012	Capped	143 m ³



Landfill Cell	Time Period	Description of Capping in Place	Leachate Generated m ³
Industrial Cells 1 & 2	2015	Partial cap	1,756 m ³

The historical leachate generation rates from Table B were used to estimate leachate generation rates for the post-closure time period. Table C presents the leachate generation rate estimates used for the cost estimate.

Table C Estimated Leachate Generation Rates, m³ Post-closure Periods

Years	MSW Landfill	Industrial Landfill
1 – 5	4,033 m ³	5,903 m ³
6 – 10	1,573 m ³	2,402 m ³
11-15	869 m ³	1,211 m ³
16-20	437 m ³	590 m ³
21 - 25	201 m ³	305 m ³
Total (1-25)	7,113 m³	10,411 m³

Leachate from the MSW Landfill will be pumped to the MSW leachate storage pond. Based on the calculated leachate generation rate estimates it has been assumed that offsite disposal will only be required periodically. Leachate from the Industrial Landfill will be pumped to the industrial leachate storage pond. Based on calculated leachate generation rate estimates it has been assumed that offsite disposal to a deep well will only be required periodically.

It is anticipated that the Old MSW landfill leachate extraction well volumes will initially be greater than that expected for post-closure leachate generation, since leachate has been accumulating in the Old MSW since its inception. The initial leachate volume during the final closure period (180 days) may require additional offsite disposal. For cost estimates the estimated generation rate based on historical data from MSW Cells 1 and 2 is assumed.

The Approval/Amending Approvals require 0.5 m of freeboard within the leachate storage ponds be maintained. The available leachate storage volume for the MSW and Industrial leachate storage pond are approximately 5,800 m³ and 5,900 m³, respectively (takes into account the requirement to maintain a 0.5 m of freeboard). Based on historical leachate generation rates the assumption has been made that offsite disposal will be required during the final closure period and periodically during the post-closure period, to reduce the volume of leachate and maintain holding capacity within each of the ponds. As additional leachate data is collected from the MSW and industrial landfill cells the rates can be adjusted.