



REGIONAL DISTRICT of Fraser-Fort George

INVITATION TO TENDER ES-25-13

Compaction and Cover of Demolition Materials Mackenzie Select Waste Landfill

Date Issued: October 9, 2025

Closing Location: Regional District Office
3rd Floor, 155 George Street,
Prince George, BC V2L 1P8
purchasing@rdffg.bc.ca

Mandatory Site Meeting: October 20, 2025, at 10:30 a.m.

Closing Date: October 30, 2025
2:00 p.m. (Pacific Standard Time)
No Public Opening

Inquiries: Email Darren Wahl at darren.wahl@rdffg.bc.ca
Inquiries Deadline: October 24, 2025, at 4:00 p.m.

Note: Late submissions will not be considered

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INVITATION TO TENDER

PART A – INTRODUCTION

The Regional District of Fraser-Fort George (Regional District) invites tenders from qualified contractors to provide compaction and cover of demolition materials at the Mackenzie Select Waste Landfill (Mackenzie Landfill), Mackenzie, BC. The Contractor will provide personnel, supervision, labour, and heavy equipment to complete the compaction and cover specified in Part C, Section 3 Work, contained herein.

The contract term is **January 1, 2026 – December 31, 2028**

TENDER DOCUMENTS

The Invitation to Tender (ITT) documents may be obtained on or after **October 9, 2025**.

- (a) in a PDF (Public Document Format) file format from the Regional District's website at www.rdffg.ca;
- (b) on the BCBid® website at www.bcbid.gov.bc.ca.

All subsequent information regarding this ITT, including amendments, Addendum(s) and answers to questions will also be available as above.

It is the sole responsibility of the tenderer to ascertain that they have received a full set of Tender Documents. Upon submission of their bid, the tenderer will be deemed conclusively to have been in possession of a full set of Tender Documents (listed in Part B, Section 2.1).

Tenders not submitted in strict accordance with these instructions or not complying with the requirements in this ITT may be rejected.

To be considered, Tenders must be signed by an authorized signatory of the Tenderer. By signing the Tender, the Tenderer is bound to statements made in response to this ITT. Any Tender received by the Regional District that is unsigned will be rejected.

The lowest of any Tender will not necessarily be accepted. The Regional District of Fraser-Fort George reserves the right to accept or reject any or all Tenders.

TENDER SUBMISSION AND CLOSING LOCATION AND TIME:

The Regional District will accept Tenders submitted either by direct delivery (hand delivery, courier or by post/mail) or electronically to the Closing Location and Time as outlined below.

Tenders will be received by the General Manager of Financial Services at the Regional District of Fraser-Fort George, 3rd floor, 155 George Street, Prince George, BC (the "**Closing Location**") not later than 2:00 p.m. local time on **October 30, 2025** (the "**Closing Date**") or by email to purchasing@rdffg.bc.ca. There will not be a public opening for this Tender.

Tenders must be in English and must be submitted using the submission methods below.

The Closing Time for this Tender is October 30, 2025, at 2:00 p.m. local Prince George time.

For Tenders to be submitted by hard copy direct delivery:

Two complete copies of your Tender must be submitted in a sealed envelope with the following information written on the outside of the envelope containing the tender, as well as on the outside of the courier envelope/box (if sending by courier):

1. Attention: General Manager of Financial Services
Regional District of Fraser-Fort George
3rd Floor, 155 George Street
Prince George, BC V2L 1P8
2. Invitation to Tender, ES-25-13
Compaction and Cover of Demolition Materials – Mackenzie Landfill
3. Responding Tenderer's name and address

Facsimile Tenders will NOT be accepted.

For Tenders to be submitted Electronically, with Bid Security:

"Prince George Time" will be conclusively deemed to be the time indicated in the electronic timestamp the Tender receives upon delivery to the email address specified herein.

Other than the Security Deposit, Tenderers must submit all portions of their Tender by email in accordance with the following:

Subject of the file to be ES-25-13 - Compaction and Cover of Demolition Materials – Mackenzie Landfill – (Insert Responding Tenderer's Name)

All emailed documents must be in PDF format and should be in one combined file. Tenderers should ensure that the files should not collectively exceed 30MB. Zip the files to reduce the size if needed. **Submitting the files via Drop Box, FTP, or similar programs, is not acceptable.**

Tenders must be submitted to purchasing@rddfg.bc.ca. Other than the Security Deposit, do not deliver a physical copy of the tender package to the Regional District of Fraser Fort George.

The Security Deposit must not be sent by email. The Security Deposit must be received by the General Manager of Financial Services, at the Regional District of Fraser-Fort George, 3rd Floor, 155 George Street, Prince George, BC on or before the Closing Date. The Security Deposit must be submitted in a sealed envelope with the following information written on the outside of the envelope containing the security deposit, as well as on the outside of the Courier envelope, if sent by courier.

1. Attention: General Manager of Financial Services
Regional District of Fraser-Fort George
3rd Floor, 155 George Street
Prince George, BC V2L 1P8
2. Invitation to Tender, ES-25-13
Compaction and Cover of Demolition Materials – Mackenzie Landfill
3. Responding Tenderer's name and address

The Regional District does not assume any risk or responsibility or liability, including in contract or tort (including negligence), whatsoever to any Tenderer:

1. to ensure that any electronic email system being operated by or for the Regional District is in good working order, able to receive transmissions, or not engaged in receiving other transmissions such that a Tenderer's electronic transmission, including the transmission of an electronic copy of its Tender, cannot be received.
2. for errors, problems or technical difficulties with respect to a Tenderer's electronic transmission, including the transmission of an electronic copy of its Tender.
3. that a Tenderer's electronic transmission, including the transmission of an electronic copy of its Tender, is received by the Regional District of Fraser-Fort George in its entirety or within any time limit specified by this Tender.

PART B – INSTRUCTIONS TO TENDERERS

The Regional District of Fraser-Fort George, hereinafter referred to as the Regional District, invites Tenders for ES-25-13 Compaction and Cover of Demolition Materials – Mackenzie Landfill.

Instructions regarding obtaining the Tender Documents are contained in Part A: Introduction.

Questions relating to the tender or project must be directed to:

Darren Wahl, Manager of Solid Waste Operations
Regional District of Fraser-Fort George
155 George Street
Prince George, BC V2L 1P8
Phone: 250-960-4400
Email: darren.wahl@rdffg.bc.ca

Deadline for question submissions is 4:00 p.m. (local time) October 24, 2025.

Those questions that are determined to be of a common interest to all potential Tenderer's will be summarized and posted as Addendum(s) on the Regional District's website as well as the BCBid® website.

ACKNOWLEDGEMENT LETTER

Upon receipt of this Invitation to Tender, a potential Tenderer should complete and sign the Acknowledgement Letter at Appendix A, and email the signed Acknowledgement Letter to, Project Manager, darren.wahl@rdffg.bc.ca. A Tenderer who signs and returns the Acknowledgement Letter is not obligated to submit a Tender.

Any Tenderer who does not submit the Acknowledgement Letter will not be sent any Addendum(s), or answers to questions and may be disqualified.

SITE MEETING

All prospective Tenderers must attend the site meeting. The Project Manager or delegate will provide an overview of the contract expectations and be available for questions pertaining to this ITT. The purpose of the site meeting is for Tenderers to satisfy themselves as to the nature of the work in general, to clarify their understanding of the scope of work, to view the sites, to determine specifications, and to have the opportunity to ask questions regarding the project and any other circumstances which may influence their Tender.

Oral questions will be allowed at the Tenderers' meeting. However, questions of a complex nature, or questions where the Tenderer requires anonymity, should be forwarded in writing, prior to the meeting, to the Project Manager.

The Regional District will not, under any circumstances, make accommodations for rescheduling, or holding any additional site meetings or providing individuals access to the sites.

The mandatory site visit will be held at the Mackenzie Landfill, in Mackenzie BC on October 20, 2025, at 10:30 a.m.

TENDER PROCESS

1.0 Definitions

- 1.1 **"Addendum(s)"** means all additional information regarding this ITT including amendments to the ITT.
- 1.2 **"BC Bid"** means the BC Bid website located at www.bcbid.ca.
- 1.3 **"Board"** means the Board of the Regional District.
- 1.4 **"Bulky Waste"** means manufactured items or materials with a volume greater than one- and one-half cubic meters and manufactured items or materials greater than two- and one-half meters in length; Special handling fees and requirements may apply as specified in Schedules "B" (fees) and "C" (requirements) as referred to in Bylaw No. 3166, 2020, Amended Bylaw No. 3330, 2023.
- 1.5 **"Closing Location"** means the location specified in Part A - Introduction.
- 1.6 **"Closing Time"** means the closing time and date specified in Part A - Introduction.
- 1.7 **"Contract"** means the contract substantially in the form attached to this ITT.
- 1.8 **"Contractor"** means the successful Tenderer to the ITT who enters into a Contract with the Regional District.
- 1.9 **"Cover"** means soil, ADC, or other suitable material for covering solid waste and exhibiting characteristics that reduce odour, vectors, vermin, fire, and litter, as referred to in Bylaw No. 3166, 2020.
- 1.10 **"Demolition, Land Clearing and Construction Waste (DLC)"** means waste that may include scrap metal, asphalt, asphalt shingles, clean wood waste, painted and/or treated wood waste, masonry and/or rubble, stumps and/or large branches, and shall not contain Prohibited Waste, Controlled Waste, Recyclable Materials or Hazardous Waste as referred to in Bylaw No. 31,66, 202.
- 1.11 **"Equipment"** means anything and everything except persons used by the Contractor in performance of the work.
- 1.12 **"Facility Property"** means the property owned by the Regional District of Fraser-Fort George operating as the Mackenzie Select Waste Landfill.
- 1.13 **"Form of Tender"** means the form of tender attached to this ITT.
- 1.14 **"Heavy Equipment"** means heavy-duty mobile vehicles specially designed to execute construction tasks, most frequently involving earthwork operations or other large construction tasks.
- 1.15 **"Irrevocable Commercial Letter of Credit"** means the irrevocable commercial letter of credit required by and in the form attached to this ITT.

- 1.16 **"ITT"** means the solicitation described in this document, including any attached or referenced appendices, schedules or exhibits and as may be modified in writing from time to time by the Regional District by Addendum(s).
- 1.17 **"Landfill"** means the Mackenzie Select Waste Landfill which is used for the deposit of Refuse and additional waste and is used for the temporary storage of source separated residual material.
- 1.18 **"Landing "** means an elevated area covered with road material which is used to turn vehicles, and from which to push Only DLC to the Active Area.
- 1.19 **"Lift"** means the maximum horizontal height of landfilled waste completed in a given area at one time.
- 1.20 **"Must"** means a requirement that must be met in order for a Tender to receive consideration.
- 1.21 **"Primary Road"** means the designated areas within the Landfill with surfaces that have been prepared for vehicular traffic.
- 1.22 **"Project Manager"** means the Regional District's representative.
- 1.23 **"Refuse"** means discarded or abandoned materials, substances or objects.
- 1.24 **"Regional District"** means the Regional District of Fraser-Fort George.
- 1.25 **"Secondary Road"** means any temporary access service road that may be found within the Landfill.
- 1.26 **"Should"**, or **"May"** means a requirement having a significant degree of importance to the objective of the ITT, but which the Regional District would strongly prefer to be fulfilled, and which the Regional District may in its sole discretion elect to treat the failure to fulfill as a ground for rejection of a Tender.
- 1.27 **"Starter Berm"** means a berm constructed of soil or waste on the outside edge of the Landfill slope to assist in commencing a new Lift of landfilling.
- 1.28 **"Tender"** means a submission in response to this ITT.
- 1.29 **"Tender Documents"** means the documents listed in Section 2.1.
- 1.30 **"Tenderer"** means the person or company submitting a Tender.
- 1.31 **"Work"** means the total construction and related services required by the Tender documents.

2.0 Tender Documents

- 2.1 The Tender Documents are:
- (a) Part A – Introduction;
 - (b) Part B – Instructions to Tenderers;
 - (c) Part C - Contract Details; and
 - (d) Appendices

- 2.2 If there is a conflict between or among the Specifications and the other Tender Documents, the other Tender Documents shall prevail over the Specifications.

3.0 Acceptance of Terms and Conditions

Submitting a Tender indicates acceptance of all the terms and conditions set out in the ITT, including those that follow and that are included in all appendices and any Addendum(s).

4.0 Submission Instructions

- 4.1 Each Tenderer must complete and provide Appendix A and C1 through C9.
- 4.2 All prices and notations should be legibly written in a non-erasable medium. Erasures, interlineations, or other corrections should be initialed by an authorized signatory of the Tenderer.
- 4.3 Subject to any alternatives or options in respect of which the Regional District requests pricing or other information in an Appendix to the ITT, Tenders are to be all inclusive and without qualification or condition.
- 4.4 The Regional District may, at any time and for any reason, extend the Closing Time by means of a written amendment published on the Regional District's website, at www.rdffg.ca and at BC Bid.
- 4.5 Each Tender must be signed by an authorized signatory or authorized signatories of the Tenderer, as is necessary for due execution on behalf of the Tenderer. Each Tender by a company or partnership should specify the full name of the legal entity submitting the Tender.
- 4.6 It is the sole responsibility of the Tenderer to ascertain that they have received a full set of the Tender Documents. Upon submission of their Tender, the Tender will be deemed conclusively to have been in possession of a full set of the Tender Documents.
- 4.7 If the Regional District, in the Regional District's sole discretion, determines that a clarification, addition, deletion, or revision of the ITT is required then the Regional District will issue an addendum, and the addendum will be posted on the Regional District website and BC Bid.
- 4.8 It is the sole responsibility of the Tenderer to check for Addendum(s). Addendum(s) issued during the time of Tendering must be signed by the Tenderer and included with the Tender and will become a part of the Tender documents.
- 4.9 The Regional District will not be responsible for any costs incurred by the respondent which may result from the preparation or submission of documents pertaining to this Tender. Accuracy and completeness of a Tender is the Tenderer's responsibility.

5.0 Discrepancies or Omissions

- 5.1 Tenderers finding discrepancies or omissions in the specifications or other documents herein or having doubts on the meaning or intent of any part thereof, should immediately request in

written form, either by email or by mail, clarification from the Project Manager. Upon receipt of the written request for clarification, The Project Manager may, in the person's sole discretion, send written instructions or explanations to all parties registered as having returned the acknowledgement letter, and make amendments to this ITT. No responsibility will be accepted for oral instructions. Any request must be received prior to October 24, 2025, at 4:00 p.m.

- 5.2 It is the responsibility of each Tenderer to thoroughly examine the Tender Documents and satisfy itself as to the full requirements of this ITT and their acceptability to the Tenderer.

6.0 Late Submissions

Tenders will be marked with their receipt time upon receipt. Only complete Tenders received before the Closing Time will be considered to have been received on time. Tenders received late will be marked late and not considered or evaluated. In case of a dispute, the Tender receipt time as recorded by the Regional District will prevail whether accurate or not.

7.0 Changes to Tenders

A Tenderer that has already submitted a Tender may amend its Tender prior to the Closing Time:

- (a) For changes to price only, by submitting an amendment via email or mail at the address identified at the beginning of Part B of this Invitation to Tender, identifying a plus or minus variance to the Tenderer's Tender Price; or
- (b) In all cases, by delivering a completely new Tender in accordance with Part A to this Invitation to Tender, clearly indicating it replaces the previously submitted Tender.

Any such revision must clearly identify the ITT number and the Closing Time. A Tender revision submitted as aforesaid shall effectively amend the Tender and the Regional District shall only review and evaluate the Tender as amended.

8.0 Tender Prices

- 8.1 The Tenderer will be deemed to have satisfied themselves as to the sufficiency of the Tender for the work and the price stated in the Schedule of Prices. These prices will cover all their obligations under the Contract, and all matters necessary to the proper completion and maintenance of the work, and will include the supply of all labour, equipment material, supervision, services, taxes and assessments, together with the Tenderer's overhead and profit, except where otherwise provided elsewhere in this ITT.

- 8.2 Tender prices must remain open for acceptance for a period of 90 days from the Closing Date unless otherwise stated by the Regional District.

9.0 Subcontractors

All Subcontractors, including affiliates of the Tenderer, should be clearly identified in the Tender as per the form attached as Appendix C4.

A Tenderer may not subcontract to a firm or individual whose current or past corporate or other interests, may, in the Regional District's opinion, give rise to an actual, perceived or potential

conflict of interest in connection with the services described in the Tender. This includes, but is not limited to, involvement by the firm or individual in the preparation of the Tender or a relationship with any employee, contractor or representative of the Regional District involved in preparation of the Tender, participating in evaluation or in the administration of the Contract. If a Tenderer is in doubt as to whether a proposed Subcontractor might be in a conflict of interest, the Tenderer should consult with the Project Manager prior to submitting a Tender. By submitting a Tender, the Tenderer represents that it is not aware of any circumstances that would give rise to a conflict of interest that is actual, perceived or potential, in respect of the Tender.

10.0 Rejection of a Tender

- 10.1 The Regional District may, in its sole discretion, reject any and all Tenders, or accept the Tender deemed most favourable in the interests of the Regional District. The lowest, or any Tender, will not necessarily be awarded.
- 10.2 Tenders which contain qualifying conditions or otherwise fail to conform to the instructions contained in this ITT may be disqualified or rejected. The Regional District may, however, in its sole discretion, reject or retain for its consideration Tenders which are non-conforming because they do not contain the content or form required by the ITT, or for failure to comply with the process for submission set out in this ITT, whether or not such non-compliance is material.
- 10.3 The Regional District's intent is to enter into a Contract with the Tenderer who has submitted the best offer. The Regional District reserves the right to accept any or none of the Tenders submitted and will evaluate Tenders based on the best value offered to the Regional District and not necessarily the lowest price. The Regional District reserves the right in its sole unrestricted discretion to:
- (a) accept any Tender which the Regional District deems most advantageous to itself;
 - (b) reject any and/or all irregularities in a Tender submitted;
 - (c) waive any defect or deficiency in a Tender whether or not that defect or deficiency materially or substantially affects the Tender and accept that Tender;
 - (d) reject any and/or all Tender for any reason, without discussion with the Tenderer(s);
 - (e) accept a Tender which is not the lowest Tender; and
 - (f) cancel or reissue the Tender without any changes.
- 10.4 Without limiting any other provision of this Tender, the Regional District may, in its sole discretion, reject a Tender submitted by a Tenderer, if the Tenderer or any officer or director of a corporate Tenderer, is, or has been within a period of two years prior to the Closing Time, engaged either directly or indirectly through another corporation or legal entity in a legal proceeding initiated in any court against the Regional District in relation to any contract with, or works or services provided to the Regional District.

11.0 Conflict of Interest

- 11.1 When submitting a Tender, the Tenderer must complete, sign and include with their Tender a conflict of interest disclosure statement (Appendix C8).
- 11.2 Without limiting any other provision of this ITT, the Regional District may reject a Tender based on an actual, potential or perceived conflict of interest.

The Regional District may reject any Tender where:

- a. one or more of the directors, officers, principals, partners, senior management employees, shareholders or owners of the Tenderer, is an officer, employee or director of the Regional District or a consultant involved in the procurement process, or is a member of the immediate family of an officer, employee or director of the Regional District or a consultant involved in the procurement process; or
- b. in the case of a Tender submitted by a Tenderer who is an individual person, where that individual is an officer, employee or director of the Regional District or a consultant involved in the procurement process, or is a member of the immediate family of an officer, employee or director of the Regional District or a consultant involved in the procurement process.

A Tenderer who has any concerns regarding whether a current or prospective employee, advisor or member of that Tenderer is, or may be, a Restricted Party, is encouraged to request an advance decision by submitting to the Project Manager, not less than ten working days prior to the Closing Time, by email, the following information:

- (a) names and contact information of the Tenderer and the person for which the advance opinion is requested;
- (b) a description of the relationship that raises the possibility or perception of a conflict of interest or unfair advantage; and
- (c) copies of any relevant documentation.

The Regional District may make an advanced decision regarding whether the person is a Restricted Party, and whether the Regional District will reject a Tender based on the information provided.

12.0 Tender Evaluation

- 12.1 The purpose of this ITT is to select a Tenderer with the capability and experience to efficiently and cost effectively complete the work described in this ITT.
- 12.2 The Regional District shall be the sole judge of a Tender and its decision shall be final. The Regional District staff shall use the following criteria to evaluate tenders received:

Mandatory Requirements

The Tenderer's submission must meet the mandatory requirements in order to be evaluated.

The mandatory requirements include:

- a. Complete Tender submission including completed forms and all signed addendums.
- b. Security Deposit.
- c. Tenderer's Equipment requirements, hours, mass, horsepower and service records.

Evaluation Criteria

Tenders that meet the mandatory requirements will be evaluated based on the following, as evidenced by the information provided in the executed forms provided as part of the submission.

- a. tender's qualifications and experience;
- b. past work experience with similar projects;
- c. acceptability of reference checks;
- d. tender price.

Preference will be given to the submissions where personnel meet the experience and training requirements.

12.3 The Tenderer acknowledges that the Regional District may rely upon criteria that the Regional District deems relevant even though such criteria may not have been disclosed to the Tenderer. By submitting a Tender, the Tenderer acknowledges the Regional District's right under this clause and absolutely waives any right of action against the Regional District for the Regional District's failure to accept the Tenderer's Tender, whether or not such right of action arises in contract, negligence, bad faith or any other cause of action.

12.4 Notwithstanding any other provision in this ITT, the award of a Contract by the Regional District may be subject to the availability of funding and the approval of the Board.

13.0 Proof of Ability

The Tenderer will be competent and capable of performing the Work. The Tenderer is required to provide evidence of previous experience and financial responsibility before the contract is awarded.

14.0 Equipment

A complete list of the equipment, which the Tenderer will make available for the completion of the Contract, will be included with each Tender.

15.0 Security Deposit

A certified cheque, bank draft or money order in the amount of \$5,000 must accompany the Tender. This security deposit will be returned to all unsuccessful bidders within 90 days of Tender opening and to the successful bidder when a contract has been executed. Failure of the successful bidder to execute the contract upon award by the Regional Board will result in forfeiture of the Security Deposit.

16.0 Irrevocable Commercial Letter of Credit

Upon written notice of award of Contract by the Regional District the successful bidder will provide an Irrevocable Commercial Letter of Credit in the amount of \$25,000. The Regional District will not execute a Contract until it is in possession of the required Irrevocable Letter of Credit. The Irrevocable Commercial Letter of Credit will be kept current for the life of the Contract plus 90 days as specified in the Contract Documents. Failure to provide the required Irrevocable Commercial Letter of Credit will result in forfeiture of the Security Deposit.

17.0 Examination of Contract Documents and Site

- 17.1 The Tenderer will satisfy themselves as to the practicality of executing the work in accordance with the Contract, and they will be held to have satisfied themselves in every particular before making up their Tender by inquiry, measurement, calculation and inspection of the site.
- 17.2 The Tenderer will examine the site and its surroundings and, before submitting their Tender will satisfy themselves as to the nature of the site, the quantities and nature of the work and equipment necessary for the completion of the work, and the means to access to the site, the accommodation they may require, and in general, will obtain all relevant information as to risks, contingencies and other circumstances which may influence their Tender.
- 17.3 Tenders will only have access to the site during the Mandatory site Meeting. No exceptions will be made.

18.0 Liability for Errors

- 18.1 The Regional District will not be responsible for any costs incurred by Tenderers as a result of the preparation or submission of a Tender pertaining to this ITT. The accuracy and completeness of the Tender is the Tenderer's responsibility. If errors are discovered, they will be corrected by the Tenderer at their expense.
- 18.2 Tenderers acknowledge that the Regional District, in the preparation of the ITT supply of oral or written information to Tenderers, review of Tenders or the carrying out the Regional District's responsibilities under this ITT, does not owe a duty of care to Tenderers.

19.0 Limitation of Liability

Except for claims for costs of preparation of its Tender, each Tenderer, by submitting a Tender, irrevocably waives any claim, action, or proceeding against the Regional District including without limitation any judicial review or injunction application or against any of the Regional District's employees, advisors or representatives for damages, expenses or costs including costs of Tender preparation, loss of profits, loss of opportunity or any consequential loss for any reason including: any actual or alleged unfairness on the part of the Regional District at any stage of the Tender process; if the Regional District does not award or execute a contract; or, if the Regional District is subsequently determined to have accepted a noncompliant Tender or otherwise breached or fundamentally breached the terms of this ITT.

20.0 Ownership of Tenders and Freedom of Information

- 20.1 Tenders will be received and held in confidence by the Regional District, subject to the provisions of the Freedom of Information and Protection of Privacy Act and this ITT. Each Tender should clearly identify any information that is considered to be confidential or proprietary information.
- 20.2 As an exception to Tenders being received and held in confidence, Tenderers are advised and acknowledge that any contract entered into as a result of this Tender may be subject to Board approval, which may be discussed and voted on at a meeting of the Board that is open to the public. If Board approval is required, details of Tenders, including but not limited to proposed or negotiated fees, may be provided to the Board in a publicly available staff report, discussed at a Council meeting that is open to the public, and posted on a publicly available electronic agenda on the Regional District's website.

21.0 Confidentiality

In accordance with the *Freedom of Information and Protection of Privacy Act*, Tenderers will treat as confidential and will not, without prior written consent of the Regional District, publish, release, or disclose, or permit to be published, released, or disclosed, any information supplied to, obtained by, or which comes to the knowledge of a Tenderer as a result of this ITT except insofar as such publication, release or disclosure is required by the laws of British Columbia.

PART C – CONTRACT DETAILS

1. BACKGROUND

The Regional District has issued this Invitation to Tender as part of its mandate to operate the Mackenzie Landfill in a manner that protects the environment and is consistent with the conditions of Operational Certificate #100206 included in Appendix E. The conditions of Operational Certificate #100206 that are relevant to the Compaction and Cover Services at Mackenzie Landfill are as follows:

4.2.3 The facilities must be developed and operated in accordance with the Design and Operation Plan.

5.1 At a minimum, the Regional District will ensure that operating personnel are trained to industry standards and at least one member of the on-site personnel are trained and current in a SWANA recognized landfill operator course, or equivalent.

The “Design and Operation Plan” for the Mackenzie Landfill is represented by the following documents.

- The “Mackenzie Select Waste Landfill, Operations and Closure Plan by Morrison Hershfield, (April 3, 2024) provides Landfill development plans for current fill stages, included in Appendix G.

Landfilling for the Contract will commence in the Active Fill Area as directed by the Owner.

Further it is noted that, once established, an operational fill plan may be executed and updated by the Regional District as required, and the Contractor will be required to make the necessary adjustments to accommodate these changes.

2. START AND DURATION OF CONTRACT

The term of the Contract will begin on January 1, 2026, at 12:01 a.m., and the Contract will remain in force until midnight on December 31, 2028. The Contract may be renewed on a period-by-period basis at the Regional District’s discretion. Each extension of renewal will be as per the Schedule of Prices at the tendered rates. Each extension will be for a one-year period, and the total Contract duration will not exceed five years.

3. WORK

The Works will include the following three items as per the Schedule of Prices – Tendered Price.

- a) Compaction and Cover Services; and
- b) Cover Extraction and Borrow Pit Operations
- c) Forced work – equipment rate by the hour

3.1 Compaction and Cover Services

While on site conducting service, the Contractor will not permit any waste to be removed from the Facility unless otherwise directed by the Regional District.

3.1.1 Working Face Operation and Maintenance

The Project Manager will provide direction to the Contractor as to the areas of the Landfill that will be used for disposal and determine the number and location of Working Face(s) and the types of Acceptable Waste to be compacted and covered at a Working Face. On site Regional District staff will undertake the staging of Material at the active face.

The Project Manager will establish grades and elevations that the Contractor will achieve through compaction and cover. The height of Lifts should typically not exceed five metres and typically not be less than three metres. Inclined slopes of the Working Face will typically be no steeper than 3:1 (horizontal: vertical). Horizontal surface grades will be maintained to manage surface run-off between 2% and 4% unless directed otherwise by the Project Manager.

In certain instances, the Project Manager may direct the Contractor to construct Starter Berms. The Contractor will shape, grade and compact all Starter Berms required on the outer edge of new Lifts. The Starter Berms will be constructed of waste and/or soil as directed by the Project Manager. Starter Berms will be the same height as the Lift and will have an outside slope not greater than 3:1 (horizontal: vertical). The Project Manager will direct where and how the Starter Berm will be developed

3.1.2 Traffic Control

The potential for collision between heavy Equipment and other vehicles exists at the Facility. The Contractor will be responsible for ensuring collision avoidance. The Contractor will have only one company vehicle at the Active Face area at one time and safely parked away from any Equipment activity.

- The Contractor will ensure that heavy Equipment does not operate within 10 metres of vehicle(s) or person(s). If a vehicle enters the Working Face, the operator will move their machine at least 10 metres away from the vehicle and park until the area is clear.
- The Equipment operator must operate their machine in a manner that ensures they have a clear and unobstructed view. The Equipment operator will always have a clear and unobstructed view of the pad and active face.

If it is not possible for the Equipment operator to maintain a clear and unobstructed view then the Contractor, or at the direction of the Regional District, will provide a spotter to direct traffic. When a spotter is employed, the spotter will be responsible for directing vehicles to appropriate areas to avoid interference with the Contractor's Equipment and operations. The spotter must have verbal contact with the Equipment operators. The spotter must be trained in traffic control /avoidance roles and responsibilities must follow all WorkSafeBC requirements while engaged in spotting duties around mobile Equipment and or vehicle(s). Proof of training in traffic control must be provided by the Contractor.

The Contractor will be responsible for any damage caused by the Contractor to Facility survey reference points as set or established. These survey reference points will be repaired and/or replaced at the expense of the Contractor.

The Contractor will be responsible for any damage caused by the Contractor to Facility environmental monitoring wells, control points and infrastructure, as set or established. Any damage will be the responsibility of the contractor and will be repaired and/or replaced at the expense of the Contractor.

3.1.3 Traffic Control Devices

The Regional District will erect and maintain information signs at the entrance to the Facility. The Regional District will initially provide all signs, directional devices, barricades and fencing for directing traffic to the Working Face.

The Contractor will be responsible for the preservation of all signs, directional devices, barricades and fencing used at the Working Face to direct and control traffic. The Contractor will also move these signs, directional devices, barricades and fencing as required. Where the Contractor fails to preserve these traffic control devices, the Contractor will, at their expense, replace these with products of design and materials from a reputable company previously approved by the Project Manager.

3.1.4 Compaction

The Contractor will operate the heavy equipment in such a manner as to achieve or as close to an in-place density of at least seven hundred fifty kilograms per cubic metre (750 kg/m³).

- The heavy equipment will make a minimum of five passes over the entire area of the active face.
- Each compaction service will take place when the Project Manager or their designate is on site.
- On each pass, the heavy equipment will drive beyond the spread layer of waste to ensure complete compaction of all waste within the layer. The Contractor will complete the minimum five passes with the heavy equipment prior to spreading subsequent layers of demolition, land clearing, and construction waste (DCL).
- At the end of each service, the Contractor will grade the surface of compacted DLC and the receiving area, fill settled areas and trim any high spots to ensure a smooth grade and adjust if necessary, prior to placing intermediate Cover.
- Slopes will not exceed a slope of 3:1 (horizontal: vertical) unless otherwise directed by the Project Manager. The Contractor will grade and maintain the top of all DLC Lifts with a minimum two percent grade across the area, unless otherwise directed by Project Manager.

3.1.5 Cover Material

The Contractor will be responsible for placement of cover material at the end of each compaction and cover service.

The Contractor will be required to apply cover material, from borrow pit area, to a maximum thickness of 150 mm (6 inches). The contractor will ensure the entire active face area is

covered to specification. Soil cover material and ground organic material can be mixed in at a ratio of approximately 3 parts soil to 2 parts organics as directed by the Project Manager.

Failure to cover properly will be deemed to have occurred when DCL is left exposed on the Active Face, including the failure to cover the DLC sufficiently with the approved intermediate cover methods outlined in. This will be a visual inspection done by the Regional District of Fraser Fort George.

3.1.6 Intermediate Cover

The Contractor will apply intermediate Cover Material to compacted and covered Solid Waste as directed by the Project Manager. Typically, soil is used as an intermediate Cover Material.

Prior to applying intermediate Cover Material, any irregularities in the surface will be reworked by the Contractor so that a depression free surface with a suitable grade and elevation is created. The Contractor will apply intermediate Cover Material on top of compacted Solid Waste and/or existing Cover Material to achieve a combined compacted depth of 300mm (12 inches) of Cover Material.

Once spread, levelled and graded the Contractor will pack the Cover Material with the Track typed crawler tractor. The finished surface will be free of any depressions or other surface features that will trap or pool water or prevent the flow of water over the surface of the impacted Cover Material.

3.1.7 Final Cover

The Owner will be responsible for any final cover construction.

3.2 Cover Extraction and Borrow Pit Operation

3.2.1 Borrow Area Operation

The Contractor will provide and operate heavy Equipment to complete the excavation of materials (soil/gravel) from the Borrow Areas, as indicated on Appendix D Site Map.

The Contractor will be responsible for assessing the volume of cover material required to cover each newly serviced compacted area. The Contractor must ensure the volume of cover material is within the prescribed margins of the cover material parameters. The Contractor will log the number of loads of cover material taken from the borrow pit. The number of cover material loads will be recorded and included in the single service invoicing.

The Contractor will be responsible for any grubbing required to access areas in the Borrow Area for excavation. The Contractor will haul and dispose of grubbed material at the Working Face. No separate payment will be made for grubbing.

The Contractor will maintain the Borrow Area as directed by the Owner and will comply with all legislation and regulations governing the operation of borrow area works as per the Ministry of Energy, Mines and Low Carbon Innovation.

The Contractor will ensure that their Work does not impede existing surface water drainage unless otherwise directed by the Project Manager. Work will be conducted during Landfill operating hours.

3.3 Forced Work

- 3.3.1 The Contractor may be asked to do extra work while onsite at the Mackenzie Landfill.
- 3.3.2 Forced work may include but is not limited to:
- establishing ditches, separation of materials, pushing up the yard and garden pile, pushing up metal pile(s), and smoothing out roadways and landings
- 3.3.3 The Contractor will do extra work only when directed by the Project Manager or designate.

3.4 Term and Termination

The term of this Contract shall commence as set out in Section 2. and shall continue in effect until terminated by either party as provided herein. Either party may terminate this Agreement at any time, with or without cause, by providing not less than 30 business days advance written notice to the other party. The Contractor or the Regional District may terminate this Agreement immediately in writing if either party becomes insolvent, enters bankruptcy, receivership, or other like proceeding (voluntary or involuntary) or makes an assignment for the benefit of creditors.

4. SPECIFIC TERMS AND CONDITIONS

Contractors shall recognize the following:

- a) The Contractor is to provide Compaction and Cover Services at the Mackenzie Landfill in a manner that protects the environment and is consistent with the conditions of the Operational Certificate for the Facility issued under the provisions of the Environmental Management Act (included in Appendix E), as well as all pertinent Federal, Provincial and local applicable acts, regulations, by-laws, guidelines and policies.
- b) The Regional District owns and operates a monitoring well collection and control system at the Landfill. The Contractor shall ensure that access is maintained to all well access points and collection system manholes, holding tanks and other access cleanouts, at all times. The Contractor shall take all measures necessary to ensure that the monitoring well system is not damaged during the course of the Contractor's operations.
- c) During the term of any Contract Agreement the Regional District shall retain title, as personal property, to all Equipment and or facilities at the located Facility at the commencement of the Contract Agreement.
- d) During the term of Contract Agreement, the Contractor will retain title, as personal property, to all Equipment and or facilities provided by the Contractor. Upon termination of the Contract Agreement, all Equipment and or facilities that are the property of the Contractor shall be removed from the Facility.

- e) A pre-contract site condition visual inspection will be completed jointly by the Contractor and the Regional District to establish the baseline conditions.

5. OPERATING HOURS

The Facility and the Landfill operate during the following operating hours:

Year Round

Monday to Friday 9 am – 5 pm
Saturday & Sunday 9 am – 3 pm
Holiday Operating Hours 9 am – 4 pm

The Facility is open during the following holidays: Easter Monday, Victoria Day, Labour Day and Thanksgiving ONLY.

The Facility is closed on New Year's Day, Family Day, Good Friday, Easter Monday, Victoria Day, Canada Day, BC Day, Labour Day, National Day for Truth and Reconciliation, Thanksgiving Day, Remembrance Day, Christmas Day and Boxing Day.

The Regional District retains the right to adjust operating hours. The Regional District will provide two weeks' advance written notice to the Contractor of any change in operating hours.

The Contractor will provide and maintain an emergency contact phone number for emergency call out by the Regional District outside of regular operating hours. The Contractor will provide this emergency contact number to the Regional District prior to commencement of the Contract Agreement.

Work will only take place during operating hours. No permission is given for work to be performed outside of these hours of operation unless directed by the Project Manager and prior permission is obtained.

6. CONTRACTOR'S EQUIPMENT

6.1 General

The Contractor will provide the following Equipment that will be at the Facility in working order at all times and available for work and equipped to complete the Work as required herein. All Equipment provided for the purpose of the Work will be as listed in the List of Equipment.

All mobile and Heavy Equipment employed on site (including pickup trucks) must meet or exceed WorkSafeBC standards for the job site.

6.1.1 Bulldozer

One track-type tractor bulldozer meeting the following specifications:

- 5000 hours or less
- A minimum manufacturer's specified mass of 15,876 kg;

- A flywheel horsepower of 165 or greater
- A grouser depth of not less than 4.5 cm
- An enclosed pressurized cab with working ventilation and all-season climate control systems;
- A design that allows the operator to have a clear and unobstructed view whenever operating the bulldozer in a forward or reverse direction; and

Typical Work includes but is not limited to:

- Pushing, spreading, grading and compacting Acceptable DLC waste;
- Pushing, spreading, grading and compacting cover soil;
- Pushing, spreading, grading and compacting intermediate cover soil;
- Pushing, spreading, grading and compacting soil to construct and maintain Pads, berms and roads as directed by the Regional District;
- Pushing, spreading, grading and compacting soil or Acceptable DLC Waste to construct Starter Berms; and
- Spreading, grading and compacting Acceptable DLC Waste; and spreading, grading and compacting acceptable intermediate cover.

6.1.2 Excavator

Hydraulic excavator capable of excavating soil from the Borrow Area, soil from the Clean Fill Stockpile Area piles and loading trucks at a rate that will allow uninterrupted performance of the Works.

Excavator will be no more than 10 years old and have no more than 8000 hours. Equipment with over 4000 hours requires certified maintenance records.

Track mounted hydraulic excavator with approximately 180 horsepower, a maximum reach of approximately 10 metres, and a bucket capacity greater than 1.0 cubic metres.

6.1.3 Articulated Rock Truck

Tandem axle dump truck capable of hauling soil from the Borrow Area or Clean Fill Stockpile to the Landfill, at a rate that will allow uninterrupted performance of the Works. Box size must accommodate net load of 16 m³ or 20 cubic yards. Articulated Rock Truck will be no more than 10 years old and have no more than 8000 hours. Equipment with over 4000 hours requires certified maintenance records.

6.1.4 Other Equipment

Any Equipment used by the Contractor for the extraction and stockpiling of soil, or any other Equipment used by the Contractor to complete the Work, will be of a design suitable for use in a landfill environment and in good working order. All Equipment will have:

- An enclosed pressurized cab with working ventilation and all-season climate control systems;
- A design that allows the operator to have a clear and unobstructed view whenever operating the Equipment in a forward or reverse direction; and
- A working two-way communication system.

Where the Contract Manager is not satisfied with the condition or suitability of the Equipment provided, the Contractor will follow all orders given by the Project Manager to the Contractor to repair or replace the Equipment.

6.1.5 Water Tanker

One Water Tank, tandem axle carrier with rubber tire - axle configuration. Tank must hold a minimum of 10,000 litre capacity, have a minimum of 200 feet of 1.5-inch diameter fire hose and a water pump capable of 300 GPM (gallons per minute) at 100 PSI (pounds per square inch) on board unit.

The water tank and all required firefighting Equipment will be in good working order and be able to discharge water for the purpose of firefighting.

During the period of April 1 to October 301 the contractor will test monthly the pump, hoses and systems ability to pump water and demonstrate its suitability to fight fires to the satisfaction of the Project Manager. The Contractor will, at their own expense, and in the presence of Regional District staff, test the water tank and Equipment to demonstrate its suitability to fight fires to the satisfaction of the Project Manager or designate on at least two separate occasions between April 1 and March 31 of the following year.

The Contractor must be able to tow the water tank with their on-site Equipment. The water tank will remain full for the duration of the service season from April 1 to October 301.

6.2 Maintenance and Repair of Contractor's Equipment

The Contractor will maintain and repair their Equipment to the manufacturer's original recommended specifications. Any modifications made to Equipment that do not meet the manufacturer's original recommended specifications require written approval by the Project Manager.

The Contractor will keep, maintain and operate their Equipment in a condition in accordance with the Workers' Compensation Act.

6.3 Communication Equipment

The Contractor's Equipment will have working two-way communication systems. The two-way communication system will allow the Contractor's staff to communicate with the Regional District Landfill staff during Facility operating hours. The Contractor's two-way communication system must not interfere with the current Facility two-way radio system.

6.4 Standby Equipment

The Contractor will provide, at their expense, stand-by Equipment so that, in case of breakdown, the cover and compaction operations will not be interrupted. Whenever an Equipment breakdown occurs; the Contractor must immediately notify the Project Manager in writing of the breakdown. The written notification will detail the nature of the breakdown, the repairs required, the estimated repair time required and the Contractor's action plan for providing replacement Equipment. If the Contractor's Equipment is inoperable, the Contractor will provide replacement.

- If the Bulldozer breaks down or is inoperable, the Contractor will provide a working replacement Bulldozer equivalent to or exceeding the specifications of the original Equipment, within 7 days of the breakdown.
- If the Excavator breaks down or is inoperable, the Contractor will provide a working replacement Excavator equivalent to or exceeding the specifications of the original, within 7 days of the breakdown.
- If the Articulated Rock Truck breaks down or is inoperable, the Contractor will provide a working Articulated Rock Truck equivalent to or exceeding the specifications of the original, within 7 days of the breakdown.

7. CONTRACTORS LANDFILL OPERATING PERSONNEL

The Contractor will provide the following personnel that will be at the Facility at all times and available for work and equipped to complete the Work as required herein.

7.1 Contractor's Onsite Personnel

The Contractor will keep on the Work during each requested service period sufficient onsite personnel (minimum two persons) to carry out the Work requested for that service period.

The Contractor will ensure that all personnel are experienced and well-trained to the satisfaction of the Contract Manager and will act as the Contractor's on-site supervisor while conducting work at the facility.

If there are more than one worker, one will be designated as the supervisor.

All personnel must have at least three years' experience operating bulldozers, earthwork in accordance with grades and elevations set by others, road construction and maintenance.

At least one member of the on-site personnel (in addition to the supervisor):

- has, in the previous 24 months, successfully completed a SWANA recognized Training Sanitary Landfill Operators course or equivalent, and will continue attendance at such courses as required; or
- is certified in the operation of borrow areas as required by Provincial legislation.

Training must include annual training in the use of fire extinguishers and portable fire suppression Equipment listed in Section 6.1.5 "Water Tanker".

8. SECURITY

Access to the Landfill within the Facility is restricted. The Contractor's staff must sign in and out every time they arrive at or leave the Landfill at the scalehouse.

Equipment stored at the Facility has been subject to acts of theft and vandalism. The Contractor should take all necessary precautions to minimize their exposure to acts of theft and vandalism.

The Regional District accepts no responsibility for damage, vandalism or theft to any of the Contractor's facilities and Equipment stored at the Facility.

9. EQUIPMENT REPAIR AND MAINTENANCE WORK

The Contractor will not store any fluids, lubricants, filtration devices, ozone depleting substances and any other materials at the Facility without the written approval of the Contract Manager.

- The Contractor will not complete any Equipment repair, maintenance, cleaning or washing at the Facility without the written approval of the Project Manager. The written request to the Contract Manager must include a plan on how the Contractor will manage, store and dispose of fluids, lubricants, filtration devices, ozone depleting substances and anything else that may contaminate the ambient environment.
- The Contractor will handle and store all fluids, lubricants, filtration devices, ozone depleting substances and anything else that may contaminate the ambient environment in a manner that does not allow for these materials to be introduced into the ambient environment. The Contractor must store and dispose of these materials in accordance with local, provincial and federal criteria and regulations.
- Repair work will not interfere with the Work.

10. FIRE CONTROL

The Contractor will be responsible for any fires at the Landfill, or resulting from, the Work.

- Smoking is strictly prohibited anywhere within the Landfill perimeter or property; this includes work or personal vehicles and any equipment.
- The Contractor will be responsible for the fire protection of the Work or as a result of performing the Work.
- No fires are permitted within the Facility without the written approval of the Project Manager.
- The Contractor will take all necessary and proper steps to see that all waste disposed at the Working Face is treated in such a manner as to prevent fire.
- Any soil required to extinguish fires or to restore the surface of the Landfill due to fire will be placed and compacted by the Contractor. The Contractor will keep track of the cubic meters of soil used and will be paid as forced work – hourly rates in the schedule of prices.
- The Contractor will, in the event of fire within the Facility and if on site for the purpose of a requested service, operate their Equipment as directed by the Project Manager or the responding fire personnel to control and extinguish the fire.
- The Contractor will immediately notify the Regional District on-site staff when they or their employees observe smoke or flame. A fire report is to be provided to the Project Manager within 24 hours.

11. RECORD KEEPING

At a minimum the Contractor must prepare and maintain the following plans and records and make these plans and records available to the Project Manager immediately upon request.

11.1 Health and Safety Plan

The Contractor must prepare a Health and Safety plan in accordance with the provincial Workers' Compensation Act. A copy will be submitted to the Regional District prior to commencing the Work. The Contractor's employees must acknowledge the plan by signing a form which is to be kept on file at the Contractor's facility/office. Training procedures and training records for each employee will be kept on file at the Contractor's facility/office.

11.2 Safety Meetings

The Contractor will prepare for, schedule, administer and record proceedings for monthly safety meetings with their employees working at the Mackenzie Landfill.

The Contractor will forward a copy of the minutes of the monthly safety meetings to the Regional District with monthly invoices. Meeting minutes will be kept on file at the Contractor's facility/office.

11.3 Equipment Maintenance Logs

The Contractor will maintain Equipment maintenance records for each piece of Equipment operating at the Facility. The records will detail regular maintenance, repairs and inspections.

These logs will be kept on file at the Contractor's facility/office.

12. APPENDICES

Appendix A Acknowledgement Letter

Appendix B Information Documents

B1 - Sample Contract Agreement

B2 - General Conditions

B3 - Specification

B4 - Example Irrevocable Commercial Letter of Credit

B5 – Tenderer's Checklist

Appendix C Forms

C1 - Tenderer's Form

C2 - Tenderer's Experience in Similar Work Form

C3 - List of Contractor's Personnel Form

C4 - List of Subcontractors Form

C5 - List of Equipment Form

C6 - Schedule of Prices- Tendered Price

C7 - Schedule of Prices- Forced Work
C8 - Conflict of Interest Disclosure Statement
C9 – Goods & Services Tax Information

Appendix D Site Plan
Appendix E Operational Certificate MR-01697
Appendix F Mackenzie Select Waste Landfill Design, Operations and Closure Plan
Appendix G Cover Log Sheet
Appendix H Incident Report

APPENDIX A - ACKNOWLEDGEMENT LETTER

The undersigned has received the full set of Tender Documents.

Signature

Company

Name (please print)

Address

Title

City

Phone Number

Fax Number

Date

Email Address

We presently intend to _____ provide/ _____ not provide a Tender as requested.

Please send any amendments to this Invitation to Tender via: _____ email _____ fax.

Return immediately to:

Darren Wahl, Manager of Solid Waste Operations

darren.wahl@rdffg.bc.ca

Regional District of Fraser-Fort George
155 George Street
Prince George BC V2L 1P8

Phone: 250-960-4400

APPENDIX B1 - CONTRACT AGREEMENT

BETWEEN:

REGIONAL DISTRICT OF FRASER-FORT GEORGE, a local government incorporated pursuant to the *Local Government Act* and having its business office located at:
155 George Street
Prince George, BC V2L 1P8

(hereinafter called "the Regional District")

OF THE FIRST PART

AND:

CONTRACTOR
a company duly incorporated under the laws of British Columbia and having a place of business at:
address
address, pc

(hereinafter called the "Contractor")

OF THE SECOND PART

WITNESSETH that the Contractor and the Regional District undertake and agree as follows:

1. The Contractor will:
 - (a) Provide all necessary labour, equipment, transportation, materials, supervision, and services to perform all the work, and fulfill everything as set forth in, and in strict accordance with, the Contract documents for "Invitation to Tender ES-25-13– Compaction and Cover of Demolition Material – Mackenzie Select Waste Landfill.
 - (b) Commence to actively proceed with the work of the Contract January 1, 2026.
2. The Regional District will pay the Contractor as full compensation for the performance and fulfilment of this Contract, the sum or sums of money specified herein in the manner and at the times specified in the Contract Documents.
3. The Invitation and Instructions to tenderers, Tender Form, List of Subcontractors, Tender's Experience in Similar Work, Schedule of Prices, all appendices, amendments and Addendum(s), as well as the tenderer's submission, are incorporated herein, to the intent and purpose as though recited in full herein, and the whole will form the Contract and will endure to the benefit of, and be binding upon, the parties hereto and their successors, executors, administrators, and assigns.
4. No implied contract of any kind whatsoever, by or on behalf of the Regional District, will arise or be implied from anything contained in this Contract or from any position or situation of the parties at any time, it being understood and agreed that the express contracts, covenants and agreements made herein by the parties hereto are, and will be, the only contract, covenants and agreements on which any rights against the Regional District may be founded.

5. Subject to Clause 4, this Contract will supersede all communications, negotiations, and agreements, either written or verbal, made between the parties hereto in respect of matters pertaining to this Contract prior to the execution and delivery hereof.
6. All communications in writing between the parties will be deemed to have been received by the addressee if delivered to the individual, or to a member of a firm, or to the General Manager of the Regional District for whom they are intended, or if sent by hand delivery, mail or registered mail as follows:

The contractor at _____
address

The Regional District at 155 George Street, Prince George, BC V2L 1P8.

IN WITNESS WHEREOF the parties have duly executed this Contract.

SIGNED ON BEHALF OF THE
REGIONAL DISTRICT OF FRASER-FORT GEORGE

Chair

Date

GM of Legislative and Corporate Services

Date

SIGNED ON BEHALF OF
CONTRACTOR

DO NOT SIGN SAMPLE ONLY

Signature

Date

DO NOT SIGN SAMPLE ONLY

(Name and Title) (Please print)

APPENDIX B2 - GENERAL CONDITIONS

1. INTENT OF CONTRACT DOCUMENTS

This Contract is not an agreement of employment. The Contractor is an independent contractor, and nothing herein will be construed to create a partnership, joint venture, or agency and neither party will be responsible for the debts or obligations of the other.

2. LOCAL CONDITIONS

The Contractor will, by personal inspection, examination, calculations or tests, or by any other means, satisfy themselves with respect to the local conditions to be encountered and the quantities, quality and practicability of the Work and of their methods of procedure. No verbal agreements or conversations with any officer, agent or employee of the Regional District, either before or after the execution of the Contract, will affect or modify any of the terms or obligations herein contained.

3. MANAGER'S STATUS

The Contract Manager will be the Regional District's representative during the period of operation and will observe the Work in progress on behalf of the Regional District for the purpose of ensuring that the Work has been satisfactorily carried out. The Contract Manager will have the authority to stop the Work whenever such stoppage may be necessary, in their opinion, to ensure the proper execution of the Work in accordance with the provisions of the Contract.

If at any time the Contract Manager is of the opinion that there exists a danger to life or to property, they may order the Contractor to stop Work or to take such remedial measures as is considered necessary.

The Contractor will comply with such an order immediately. Neither the giving, nor the carrying out of such orders thereby entitles the Contractor to any extra payment and the Regional District will not be held liable for any damages or any breach of laws, bylaws or regulations that may result.

4. SUPERVISOR AND LABOUR

The Contractor will comply with all federal and provincial legislation regarding wages and labour regulations including payment of any and all dues, levies, or charges made under or in relation to the Contract. The Contractor will make proof of payment available to the Contract Manager when requested.

5. CHARACTER OF WORKERS

All workers must have sufficient knowledge, skill and experience to perform properly the Work assigned to them and to be tactful and courteous in dealing with the public and the Owner's staff. Any supervisor, Equipment operator, or worker employed by the Contractor or Subcontractor who, in the opinion of the Contract Manager, does not perform their Work in a competent manner, appears to act in a disorderly or intemperate manner, is intoxicated or willfully negligent will at the written request of the Contract Manager, be removed from the site of the Work immediately and will not be employed again in any portion of the Work without the approval of the Contract Manager.

6. ASSIGNMENT OF CONTRACT

The Contractor will not sublet, sell, transfer, assign, or otherwise dispose of the Contract or any portions thereof, or their right, title or interest therein, or their obligations thereunder without written consent of the Regional District, except for assignment to a bank of the payments to be received hereunder.

7. PROVISIONS FOR TERMINATION OF CONTRACT BY THE OWNER

In the event of the breach or non-performance by the Contractor of any of the covenants, conditions and agreements contained in the Contract to be performed or stoppage under Section 3 MANAGER'S STATUS, the Regional District reserves the right to take corrective actions. The Owner may also deduct from the payments due to the Contractor or deduct from the Irrevocable Commercial Letter of Credit any payments or expenditures it is required to make to remedy any such non-performance or breach hereof.

In the event that the Ministry of Environment and Climate Change Strategy, or any other authorized regulatory agency, cancels or suspends the Waste Discharge Permit, or future Operating Certificate, for the Mackenzie Landfill, the Owner retains the right to terminate this Contract without notice.

Any salvaging by the Contractor, their employees or Subcontractors will be considered a breach of Contract and result in termination of the Contract.

For unsatisfactorily performed Work, the Contractor will, with written notice, have 24 hours to correct Deficiencies. If not completed within 24 hours, under General Conditions, Section 11 OWNER'S RIGHT TO CORRECT DEFICIENCIES, the Regional District has the right to correct them at which time the Regional District has the right to withhold costs from payment to the Contractor or deduct from the irrevocable line of credit. After three such written notices, the Contract will be terminated.

The Owner will have the right to terminate the Contractor's rights to continue with the Work if the Contractor at any time becomes bankrupt, makes an assignment of their property for the benefit of creditors, or if a receiver or liquidator should be appointed, and that such termination shall be effective upon the Owner giving notice thereof.

8. CONTRACTOR'S TERMINATION OF CONTRACT

The Contractor will have the right to terminate the Contract for any of the following reasons:

- a. In the event of an Order of any Court or other public authority, other than the Owner, causing the Work to be stopped or suspended, when the period of such stoppage or suspension exceeds 90 days, and when such stoppage or suspension occurs through no act or fault of the Contractor, their agents or servants, the Contractor will receive from the Owner payment for the Work completed. The Owner will not be liable for any loss of profits, damages, or expenses incurred by the Contractor as a result of such stoppage or suspension. Such termination will be effective upon the Contractor giving notice thereof.
- b. In the event the Owner fails to pay for the Work performed, except as provided in the Contract Documents, within 30 days from this specified date of payment and fails to

remedy such default within 10 days of the Contractor's written notice to do so, the Contractor will receive from the Owner payment for the Work completed. Such termination will be effective, upon the Contractor giving notice thereof.

9. SUSPENSION OF WORK BY THE OWNER

The Owner may, at any time, suspend the Work, or any portion thereof, provided they give the Contractor two working days' written notice of suspension.

10. SUBCONTRACTORS

All subcontractors, including affiliates of the Tenderer, should be clearly identified in the Tender as per the form attached as Appendix C4.

A Tenderer may not subcontract to a firm or individual whose current or past corporate or other interests, may, in the Regional District's opinion, give rise to an actual, perceived or potential conflict of interest in connection with the services described in the Tender. This includes, but is not limited to, involvement by the firm or individual in the preparation of the Tender or a relationship with any employee, Contractor or representative of the Regional District involved in preparation of the Tender, participating in evaluation or in the administration of the Contract. If a Tenderer is in doubt as to whether a proposed Subcontractor might be in a conflict of interest, the Tenderer should consult with the Contract Manager prior to submitting a Tender. By submitting a Tender, the Tenderer represents that it is not aware of any circumstances that would give rise to a conflict of interest that is actual, perceived or potential, in respect of the Tender.

11. OWNER'S RIGHT TO CORRECT DEFICIENCIES

Upon failure of the Contractor to perform the Work in accordance with the Contract Documents, and after written notice to the Contractor, or without notice if any emergency or danger to the Work or public exists, or where the Owner may be found to be out of compliance of the Permit or Operating Certificate requirements, the Owner may, without prejudice to any other remedy they may have, correct such deficiencies. The cost of Work performed by the Owner in correcting deficiencies will be paid by the Contractor or may be deducted from monies payable to the Contractor.

12. INDEMNITY AND RELEASE BY CONTRACTOR

The Contractor will indemnify and save harmless the Regional District from and against all losses, claims, demands, payments, suits, actions, recoveries and judgements of any kind brought or recovered against either of them by reason of any act or omission of the Contractor, its Subcontractors, agents or employees arising out of the entering of the Contract or the carrying out of the Work, whether on lands owned by the Regional District and whether arising from statutory liability or not.

13. REGIONAL DISTRICT'S RIGHT TO CORRECT DEFICIENCIES

The Regional District shall have and retain full authority to inspect the work of the Contractor to ensure that the requirements of the Contract are being fulfilled. Upon failure of the Contractor to perform the work in accordance with the Contract Documents, and after five days written notice to the Contractor, or without notice if any emergency or danger to the work or public exists, the Regional District may, without prejudice to any other remedy they may have, correct such

deficiencies. The cost of Work performed by the Regional District in correcting deficiencies shall be paid by the Contractor or may be deducted from monies payable to the Contractor.

14. DISPUTE RESOLUTION

If a claim, dispute, or controversy arises out of or relates to the interpretation, application, enforcement, or performance of services under this agreement, the Contractor and the Regional District agree first to try in good faith to settle the dispute by negotiations between the Contractor and the Regional District. If such negotiations are unsuccessful, the Contractor and the Regional District agree to attempt to settle the dispute by arbitration if both parties agree. If the dispute cannot be settled through arbitration, the Contractor and the Regional District may agree to attempt to settle the dispute through good faith mediation. If the dispute cannot be resolved through mediation and unless otherwise mutually agreed, the dispute shall be settled by litigation in an appropriate court in the Province of British Columbia.

15. NOTICE OF DEFAULT

If the Consultant is in default of the performance of any of its material obligations set out in this Agreement, then the Regional District may, by written notice to the Consultant, require such default to be corrected. If within 15 days' receipt of such notice the default has not been corrected or reasonable steps, as determined by the Regional District in its sole discretion, have not been taken to correct the default, the Regional District without limiting any other right it may have, may immediately terminate this Agreement.

15.1 The Regional District shall compensate the Consultant for all Services performed hereunder through the date of any termination and all-reasonable costs and expenses incurred by the Consultant in effecting the termination. All drawings, plans or other documents resulting from the Services, whether complete or in a draft form, produced by the Consultant prior to the termination of the Agreement, will be provided to the Regional District within ten business days of the termination date.

16. INJURY OR DAMAGE TO PERSONS OR PROPERTY

The Contractor will use due care and take all necessary precautions to ensure the protection of persons and property on the site and will comply with the Workers' Compensation Act of the Province of British Columbia. The Contractor will be liable for any and all injury or damage which may occur to person or to property on the site due to any act, omission, neglect or default of the Contractor, or their employees, Subcontractors or agents and indemnify and save harmless the Regional District in this regard.

17. OCCUPATIONAL HEALTH AND SAFETY

The Mackenzie Landfill is a multi-employer work site as defined in the provincial *Workers' Compensation Act*. The Regional District of Fraser-Fort George is recognized as the prime Contractor and is responsible for coordinating the occupational health and safety programs of all employees working at the Facility. The Contractor will ensure that they follow all occupational health and safety policies and procedures established by the Regional District. Contractors, their employees or agents not complying with the Regional District's health and safety expectations will be required to stop Work and will not be allowed to resume Work until the safety requirements are met.

The Contractor will use due care and take all necessary precautions to assure the protection of persons and property at the Facility and will comply with the *Workers' Compensation Act* of the Province of British Columbia.

18. CHANGES IN THE WORK

The Owner, without invalidating the Contract, may make changes by altering, adding to, or deducting from the Work. The Contractor will proceed with the Work as changed and the Work will be executed under the provisions of the Contract. No changes will be undertaken by the Contractor without written order of the Regional District, except in an emergency endangering life or property, and no claims for additional compensation will be valid unless the change was so ordered. The Owner will entertain no payment for extra work or changes in any Contract unless a "Change Order" form is completed and signed by the Regional District and the Contractor.

If, in the opinion of the Regional District, such changes affect the Contract amount, these will be adjusted at the time of ordering the changes. The value of the addition or deduction from the Contract amount, and the method of determining such value, will be decided by the Regional District. The Regional District will use one or more of the following methods in deciding such value:

- a. by lump sum submitted by the Contractor and accepted by the Owner;
- b. on a force account basis as specified in these General Conditions.

19. PAYMENT

The Regional District will, by the thirtieth day of the month following that for which payment is required, on receipt of an invoice and on the advice from the Contract Manager that the Work has been satisfactorily carried out, pay the Contractor for Work completed, in accordance with the Contract, in the previous month. All invoices must include a reference to Contract ES-25-13. No payment will be made for materials supplied by the Owner.

Payment will be made in accordance with the unit prices in the Schedule of Prices for actual quantities of completed Work. Payment may have financial penalties withheld as outlined in Section 21. PAYMENT WITHHELD OR DEDUCTED.

The Tendered unit prices and Equipment rates will be increased annually by two percent on Tender rates and Equipment rates on the first day of November in each successive year in which the Contract is in force.

19.1 Cover and Compaction

The Tendered **Per service Price for Compaction and Cover Services** includes all of the following as detailed in Part C, Section 3.2 Cover Extraction and Burrow Area Operation

19.2 Forced work

The Tendered **equipment hourly rates** are as described in Part C, Section 3.3.

20. GOODS AND SERVICES TAX (G.S.T.)

Federal law states that five percent tax be paid on all goods and services. If the Contractor does not qualify as a small supplier, then the Contractor is required to identify the tax (GST/PST, as applicable) on all invoices and the Regional District is liable to pay this amount to the Contractor.

21. PAYMENT WITHHELD OR DEDUCTED

The Owner may withhold, suspend or deduct the whole or part of any payment to the Contractor to the extent necessary to protect itself from loss on account of one or more of the following:

- a. Where the Contractor is not performing the Work satisfactorily in the opinion of the Contract Manager.
- b. Where any defective or faulty Work has not been remedied at all or in a manner satisfactory to the Contract Manager.
- c. Where there are affidavits of claim of lien, or liens filed against the site and premises of which the Work is done or is being done, or reasonable evidence of the probable filing of such affidavits of claim of lien or of filing or registration of liens.
- d. Where there exists unsatisfied claims for damages caused by the Contractor to anyone employed on the site or retained in connection with the Work.
- e. Where Equipment that is inoperable and where the Contractor fails to meet the Contract requirements for Supply of replacement Equipment, the Owner may deduct the equivalent amount to the Force Account rate on the Schedule of Prices on an hourly basis during each operating day that the Equipment is inoperable.
- f. Where the Owner has corrected a deficiency under Appendix B2, Section 11 OWNER'S RIGHT TO CORRECT DEFICIENCIES.
- g. Where Subcontractors of suppliers of materials are not receiving prompt payment, the Owner may make payment to such Subcontractors or suppliers directly having deducted those amounts from payments to be made that are otherwise due to the Contractor.

22. RELEASE OF IRREVOCABLE COMMERCIAL LETTER OF CREDIT

The Irrevocable Commercial Letter of Credit will be returned to the Contractor within 90 days following the termination of the Contract where:

- a. no affidavits or claims of lien have been filed against the lands and premises on which the work was done, and
- b. WorkSafeBC has, at the request of the Contractor, filed with the Regional District certification that all assessments payable by the Contractor during the Contract term have been paid, and
- c. no actions, suits, claims for damages, charges under provincial or federal status have been initiated, and
- d. the Contractor has submitted the Statutory Declaration.

23. **FUEL SURCHARGE**

A Fuel Surcharge Rate Adjustment Scale will be implemented. The following table demonstrates the applicable diesel fuel surcharge rate that can be applied to the Tendered unit price each month for all **equipment on site**. The reference index will be Natural Resources Canada's Petroleum Product Prices publication for diesel prices in Prince George which can be viewed at: http://www2.nrcan.gc.ca/eneene/sources/pripr/prices_bycity_e.cfm?productID=5&locationID=4&frequency=D&priceYear=2019&Redisplay=.

The applicable fuel surcharge will be determined monthly, and the month's applicable fuel surcharge rate will be based on the fuel index price for the **first day of the month** for Prince George. **The price of \$1.500 per litre for diesel (as of September 10, 2025) will be used as a starting point for Contract ES-25-13.**

Example on how to calculate; if the index reports a price of \$1.275 on September 1, the fuel surcharge payable for the tendered unit price for the month of September will be decreased by **1.00%**. Resulting in a rebate to the Owner, to be entered as a credit line item on the invoice. If on September 1, the price is reported at \$1.640, then the Fuel Surcharge for the tendered unit price in September will be increased by **1.50%** resulting in an additional charge by the contractor to the Owner.

Fuel Surcharge Rate Adjustment Scale Table

Fuel Price is at Least	But Less Than	Fuel Surcharge
\$1.000	\$1.050	-4.50%
\$1.050	\$1.100	-4.00%
\$1.100	\$1.150	-3.50%
\$1.150	\$1.200	-3.00%
\$1.200	\$1.250	-2.50%
\$1.250	\$1.300	-2.00%
\$1.300	\$1.350	-1.50%
\$1.350	\$1.400	-1.00%
\$1.400	\$1.450	-0.50%
\$1.450	\$1.500	0.00%
\$1.500	\$1.550	0.00%
\$1.550	\$1.600	0.00%
\$1.600	\$1.650	0.50%
\$1.650	\$1.700	1.00%
\$1.700	\$1.750	1.50%
\$1.750	\$1.800	2.00%
\$1.800	\$1.850	2.50%
\$1.850	\$1.900	3.00%
\$1.900	\$1.950	3.50%
\$1.950	\$2.000	4.00%
\$2.000	\$2.500	4.50%

24. PERMIT AND REGULATIONS

The Owner will acquire and retain landfill and composting site operating permits or operational certificates issued by the Ministry of Environment and Climate Change Strategy and will acquire relevant Open Burning authorization as required.

The Contractor will, at their own expense, procure all other permits, certificates and licences required by law for the execution of the Work and will comply with all federal, provincial and local laws and regulations affecting the execution of the Work, save in so far as the Contract Documents specifically provide otherwise.

25. REMOVAL OF LIENS

The Contractor will forthwith remove at their own expense, liens filed or registered against the Landfill Property, and the Contractor will indemnify and save harmless the Owner from liability arising out of any such claims of lien.

26. INSURANCE

The Contractor shall, without limiting its obligations or liabilities, and at its own expense, provide and maintain throughout the Contract term, the following insurance with insurers licenced in the Province of British Columbia, in forms acceptable to the Regional District. All required insurance (except automobile insurance on vehicles owned by the Contractor) shall be endorsed to show the

Regional District as additional insured and to require that the Regional District be provided with 30 days' advance written notice of cancellation or material change. The Contractor will provide the Regional District with evidence of the required insurance, in a form acceptable to the Regional District, upon notification of award and prior to the execution and delivery of the Contract:

- i. Commercial General Liability (CGL) in an amount not less than \$5,000,000 inclusive per occurrence insuring against bodily injury and property damage and including liability assumed under the Contract. Such CGL coverage shall include the following liability extensions: Contingent Employers Liability, Broad Form Products & Completed Operations, Personal Injury, Blanket Contractual, and Cross Liability. The Regional District is to be added as an additional insured.
- ii. Where the Contractor requires the use of Automobiles to undertake the work of the Contract, the Contractor will have the following:
 - a. Automobile Liability on all vehicles owned, operated, or licenced in the name of the Contractor in an amount not less than \$5,000,000 per occurrence.
 - b. Non-owned Automobile Liability insurance in an amount not less than \$5,000,000 per occurrence.
- iii. Equipment insurance on all Equipment owned or rented by the Contractor to its full insurable value.
- iv. The Contractor will buy and keep in force at their expense until completion of the Contract, firefighting expense insurance in the amount of \$100,000. Such insurance is to include forestry firefighting expenses and will be in the name of the Contractor and the Regional District.

The Contractor shall ensure that all Subcontractors forming from this Contract meet the insurance requirements outlined above.

It is the sole responsibility of the Contractor to determine if additional limits of liability insurance coverage are required to protect them from risk.

27. FORCED WORK

The Owner at its sole discretion may hire the Contractor's Equipment for work to be undertaken in addition to that specified in this Contract. The Contractor will make their Equipment available to the Owner at the hourly rates listed in the Schedule of Prices – Forced Work. Such work will not interfere with the Contractor's ability to complete the Work as required in the Contract.

The Owner reserves the right to do extra work itself or contract to others at its sole discretion.

28. WORKSAFEBC

The Contractor will use due care and take all necessary precautions to assure the protection of persons and property while undertaking the Work and will comply with the Workers Compensation Act of the Province of British Columbia.

Prior to undertaking any of the Work in this Service Agreement, the Contractor will provide the Regional District with a Clearance Letter confirming they are in good standing with WorkSafeBC and will pay and keep current all assessments required by WorkSafeBC in relation to the Service Agreement amount.

Out of Province Contractors will be compliant with WorkSafeBC's registration requirements pertaining to out of Province firms. Where WorkSafeBC registration requirements allow for a Contractor to be registered with another Province's Worker's Compensation Board, or like organization, the Contractor will provide the Regional District with their registration number and written documentation confirming that the Contractor is in good standing with the appropriate Worker's Compensation Board, or like organization. The Contractor will pay and keep current all assessments required to maintain good standing in relation to the Service Agreement amount.

The Contractor will maintain an Occupational Health and Safety Plan (OHSP) and ensure that their employees and Sub-Service Providers are well trained and aware of the OHSP.

29. FORCE MAJEURE

If either the Contractor or the Regional District are prevented from performing their obligations under the Contract, or where the Regional District's work in respect of which the Contractor is providing Services cannot be performed, because of an act of God, an act of a legislative, administrative or judicial entity, fire, flood, labour strike or lock-out, epidemic, unusually severe weather, or other similar cause outside of the control of the Parties (collectively "Force Majeure"), then the obligations of the Contractor and the Regional District under the Contract shall be suspended for so long as the condition constituting Force Majeure continues. The Party affected by Force Majeure shall provide the other Party with notice of the anticipated duration of the Force Majeure event, any actions being taken by the Party providing notice to avoid or minimize the effect of the Force Majeure event and shall make reasonable efforts to remove or mitigate the effects of the condition constituting Force Majeure. Upon the termination of the Force Majeure event, the Regional District shall grant to the Contractor a time extension for performance of any milestone dates required as part of the Services as may be agreed with the Contractor or, if the

Regional District and the Contractor are unable to reach agreement, as determined by the dispute resolution process under Appendix B2, Section 14 of the Contract. Where as a result of Force Majeure there is a material increase in the Contractor's cost of or the time required for the performance of the Services that is not offset by a decrease in cost, then the Regional District shall increase the amount of the service fee payable to the Contractor under Appendix B2, Section 19, "PAYMENT" of this Contract, as may be agreed by the Contractor, or as determined Appendix B2, Section 14, "DISPUTE RESOLUTION" of this Contract. If the event of Force Majeure results in a material increase in the cost of the work to be performed in respect of which the Contractor is providing the Services, then the Regional District may choose not to proceed with the completion of the work and may terminate this Agreement. If the Regional District terminates this Agreement following the termination of the Force Majeure event, then it shall compensate the Contractor in accordance with Appendix B2, Section 15.1 "NOTICE OF DEFAULT".

30. DISPUTED WORK

If, in the opinion of the Contractor, they are being required to perform work beyond that which the Contract requires them to do, whether at the discretion of the Regional District or otherwise, they will, within five days, deliver to the Owner a written notice of protest in the form prescribed herein prior to proceeding with any of the disputed work. The five-day time period commences from the time of direction given by the Owner or the time at which the Contractor determines that they are required to perform such work, whichever occurs first.

The Contractor will keep accurate and detailed cost records that should indicate the cost of the work done under protest. The Contractor will not be entitled to payment if they fail to keep and produce such records.

31. RIGHTS OF WAIVER

A waiver of any breach of or provision of this Agreement will not constitute or operate as a waiver or any other breach of any other provisions, nor will any failure to enforce any provision herein operate as a waiver of such provisions or of any other provisions.

32. SEVERABILITY

All paragraphs of the Contract are severable one from the other. Should a court of competent jurisdiction find that any one or more paragraphs herein are void, the validity of the remaining paragraphs hereof will not be affected.

33. NOTICE OF PROTEST

TO: General Manager of Environmental Services
Regional District of Fraser-Fort George

FROM: (Contractor)

DATE:

SUBJECT: THE CONTRACT

Date of Direction:

You have required me to perform the following work that is beyond the scope of the Contract.
(Set out details of work).
(Include dates where applicable)

The additional costs and claim for this work is as follows:
(Set out details of cost)

All supporting documentation and invoices are attached.

I understand that I am required to keep accurate and detailed cost records which will indicate the cost of the work done under protest and failure to keep such records will be a bar to any recovery by me.

Signature of Contractor

APPENDIX B3 - SPECIFICATIONS

The Contractor will provide and operate heavy equipment. The Contractor will also provide the personnel, supervision, and labour to complete the general service as specified in the Scope of Work contained herein.

1.0 Scope of Work

- 1.1 The Contractor will, at their expense, pay for and supply all personnel, supervision, equipment and tools, labour and materials to complete the works as specified herein.
- 1.2 The Contractor will not undertake storage, maintenance or servicing of their equipment that is not needed for the scope of work at the landfill.
- 1.3 The Contractor will cover and compact all deposited demolition, land clearing, and construction waste (DLC) at the Landfill as directed by the Regional District.
- 1.4 The Contractor will not salvage materials from the Landfill or Transfer Station.
- 1.5 The Regional District accepts no responsibility for damage, vandalism or theft of any of the Contractor's equipment used or stored at the landfill.
- 1.6 The Contractor will not interfere with the day-to-day operations of the facility while completing the work required.
- 1.7 The Contractor will be responsible for costs associated with repairing or replacing any Regional District property damaged by the Contractor as a result of the Contractor's activities.
- 1.8 The Contractor will exercise good public relations while fulfilling their responsibilities under the contract and will ensure that his employees do the same.
- 1.9 The Landfill is located in the wilderness and may attract wildlife. The Contractor will take precautions and ensure that workers are properly trained so that conflicts with wildlife are avoided.
- 1.10 At minimum the Contractor will ensure that operating personnel are trained to industry standards and at least one member of the onsite personnel is trained and current in a SWANA recognized landfill operator course, or equivalent.
- 1.11 The period of work is from the January 1, 2026 – December 31, 2028. Following the initial cleanup and covering of the accumulated demolition, land clearing, and construction waste, frequency of work will be as needed based on seasonal impact of traffic volumes and materials brought into the facility.
- 1.12 The contractor will follow a site fill plan as directed by the Regional District.

2.0 Supply and/or Stockpiling of Soil Cover Material

- 2.1 The Contractor will excavate and haul cover material from the burrow area of the landfill site.
- 2.2 The contractor will be responsible for any clearing of vegetation and creating any access that may be required to extract the cover material from the burrow area.
- 2.3 The Contractor will in addition, excavate, haul and place enough soil cover material to cover the entire area to be worked with 0.15m (6 inches) of soil cover material. Once placed, the soil cover material will then be spread and compacted using a track-type bulldozer or similar tracked vehicle in good working order.

Formula for determining the amount of cover required: Length in meters X Width in meters X 0.15 divided by soil hauling capacity (in meters) equals the number of loads required.

Use of alternate cover will not be permitted without authorization from the Regional District

3.0 Cover and Compaction of Demolition Materials

- 3.1 The Contractor will follow the Regional District's direction regarding the area of the Landfill that will be used for the disposal and compaction of deposited waste materials. The Contractor will undertake the relocation of any deposited waste material, as directed by the Regional District in accordance with the site fill plan.
- 3.2 The Contractor will spread deposited waste materials in layers of 0.6 metres or less and then compact the 0.6 metre layer of waste material with at least three to five passes of the bulldozer. After the spread layer of deposited waste material has been compacted, an additional layer of 0.6 meters of deposited waste material can be spread over the previously compacted waste materials and compacted with at least three to five passes of the bulldozer. This process is to be repeated until all the deposited waste material has been compacted in the working area.
- 3.3 The Contractor will then apply daily cover or when inadequate, a soil cover over the compacted material. The depth of compacted cover is to be 0.15 meters. Care will be taken to cover all areas of exposed waste material including the active fill area and edges (toe). The slope of the working edge of the active fill area and any finished edges will not exceed 3:1 (horizontal: vertical) after compaction unless directed otherwise by the Regional District. All soil cover loads will be recorded in the attached log sheet, Appendix G.

4.0 Forced Work

- 4.1 The Contractor may be asked to do extra work while onsite at the Mackenzie Landfill.
- 4.2 Extra work may include but is not limited to:
 - establishing ditches, separation of materials, pushing up metal pile(s), and smoothing out roadways and landings
- 4.3 The Contractor will do extra work only when directed by the Regional District to do so.

APPENDIX B4 - IRREVOCABLE COMMERCIAL LETTER OF CREDIT

(to be on bank letterhead)

Letter of Credit No. _____ Amount \$ _____

Regional District of Fraser-Fort George
155 George Street
Prince George, BC V2L 1P8

Dear Sir:

Re: Irrevocable Letter of Credit No.

In accordance with the Contract to provide compaction and cover services of demolition material at the Mackenzie Select Waste Landfill, we hereby authorize you to draw on _____ (name and address of bank) Province of British Columbia, for account of _____ (name of Tenderer) up to an aggregate amount of \$100,000 available on demand for 100% value.

Pursuant to the request of our customer _____, we the _____ Bank hereby establish and give you an Irrevocable Letter of credit in your favour in the above amount which may be drawn on by you at any time and from time to time upon written demand for your payment made upon us by you, which demand we will honour without enquiring whether you have the right as between yourself and the said customer to make such demand and without recognizing any claim of our said customer, or objection by it to payment by us.

1. Draws are to be made in writing to _____ (name of bank).
2. Partial draws may be made.
3. The Bank will not inquire as to whether or not the Regional District of Fraser-Fort George has the right to make demand on this Letter of Credit.
4. This Letter of Credit is irrevocable up to 90 days after the termination of the contract.

Demands must be made not later than 90 days following the expiration of the contract.

The Demands made under this Credit are to be endorsed hereon and will state on their face that they are drawn under _____ (name and address of bank), Letter of Credit No. _____.

Yours truly,

Manager,
(On behalf of Name of Bank)

APPENDIX B5 - TENDERERS CHECKLIST

Before submitting your tender bid, check the following points:

- | | | |
|------------------------------|--|-----------|
| ☐ | Has the Tender Form been signed and witnessed? | _____ |
| ☐ | Has the Security Deposit requirement been met? | _____ |
| ☐ | Is the Schedule of Prices completed? | _____ |
| ☐ | Are the following pages included? | |
| | • Schedule of Prices – Tendered Price | _____ |
| | • Schedule of Prices – Forced Work | _____ |
| | • List of Contractor's Personnel | _____ |
| | • List of Subcontractors | _____ |
| | • List of Equipment | _____ |
| | • Tenderer's Experience in Similar Work | _____ |
| | • Goods and Services Tax Information | _____ |
| | • Conflict of Interest Disclosure Statement | _____ |
| | • Addendum(s) | _____ |
|
☐ |
Are the documents complete? |
_____ |

Note: Your Tender may be disqualified if ANY of the applicable foregoing points have not been complied with.

If submitting by hard copy:

Tenderers should ensure that the Tender is returned in a sealed envelope clearly marked on the outside with:

- | | |
|--------------------------|--|
| ☐ | Attention: General Manager of Financial Services
Regional District of Fraser-Fort George
155 George Street
Prince George, BC
V2L 1P8 |
| ☐ | INVITATION TO TENDER ES-25-13
Compaction and Cover of Demolition Materials
Mackenzie Landfill |
| ☐ | Responding Organization's name and address. |

If submitting by email:

Tenderers should ensure that the files should not collectively exceed 30MB. Tenders must be submitted to purchasing@rdffg.bc.ca. DO NOT deliver a physical copy of the tender package to the Regional District of Fraser Fort George.

Subject of the file to be:

ES-25-13 Compaction and Cover of Demolition Materials – Mackenzie Landfill – (Insert Responding Tenderer's Name)

APPENDIX C1 - TENDER FORM

Date: _____

Regional District of Fraser-Fort George
3rd Floor, 155 George Street
Prince George, BC V2L 1P8

ATTENTION: General Manager of Financial Services

Dear Sir/Madam:

Having carefully examined the Instructions to Tenderers, Form of Tender, Contract Agreement, General Conditions of Contract and Operational Specifications and subsequent written Addendum(s) (if any), and having visited the site(s) for purposes of examining site conditions and having satisfied myself/ourselves as to the sufficiency of the ITT, the undersigned agrees to furnish all labour, transportation, equipment, materials, supervision and services and to do all work necessary for and reasonably incidental, as specified in accordance with the ITT, to do the work.

I/We agree that in consideration of having my/our tender submission considered for the Total Contract Price as shown on the Schedule of Prices, this price is open for acceptance for 90 days from the date of the tender opening and will not be withdrawn during that period of time.

It is understood that payment will be made for the work on the basis of the awarded Contract only and that any approved extras or refunds will be made by mutual agreement between the Regional District and me/us.

I/We agree that the Subcontractor(s) employed will be as listed on the List of Subcontractors and further agree that no changes or additions will be made to the list without written approval of the Regional District.

If I am/we are notified in writing of the acceptance of our tender, I/we agree that within 14 days of the date of the acceptance notice I/we will enter into a contract and execute an agreement for the stated sum in the form of the specimen submitted to guarantee completion of the contract in accordance with the contract documents and within the time stated in the Tender documents.

I/We agree that the Regional District reserves the right to waive informalities in tenders, reject any or all tenders, or accept the tender deemed most favourable in the interests of the Regional District.

I/We agree that tenders which contain qualifying conditions or otherwise fail to conform to the instructions contained in this ITT may be disqualified or rejected. I/We agree that the Regional District may, however, in its sole discretion, reject or retain for its consideration tenders which are non-conforming because they do not contain the content or form required by the ITT, or for failure to comply with the process for submission set out in the ITT, whether or not such non-compliance is material.

Accompanying this Tender please find our certified cheque, bank draft or money order as the security deposit in the amount of \$5,000.

I/We agree that except for a claim for the reasonable cost of preparation of this tender, by submitting a tender, I/We irrevocably waive any claim, action, or proceeding against the Regional District including, without limitation, any judicial review or injunction application, and any claim against the Regional District and its elected officials, officers and employees for damages, expenses or costs, loss of profits, loss of opportunity or any consequential loss for any reason, including any such claim, action or proceeding arising from:

- 1) any actual or alleged unfairness on the part of the Regional District at any stage of the tender process, including without limitation any alleged unfairness in the evaluation of a tender or award of a contract;
- 2) a decision by the Regional District not to award a contract to that tenderer; or
- 3) the Regional District's award of a contract to a tenderer whose tender does not conform to the requirements of this ITT.

I/We hereby acknowledge receipt and inclusion of the following Addendum(s) to the ITT Documents:

Addendum No. _____ dated: _____ Addendum No. _____ dated: _____

Addendum No. _____ dated: _____ Addendum No. _____ dated: _____

Addendum No. _____ dated: _____ Addendum No. _____ dated: _____

Signed and Delivered by:

Signature of Authorized Signatory

Name of Tenderer

Name of Authorized Signatory (Please print)

Address

Title

City, Province, Postal Code

Signed in the presence of:

Signature

Address

Name of Witness (Please print)

City, Province, Postal Code

APPENDIX C2 - TENDERER'S EXPERIENCE IN SIMILAR WORK

The Contractor is to demonstrate that they have a minimum of five years of current customer service experience as well as staff supervision experience. List professional and recent experience.

Year	Work Performed	Reference Contact (name and phone number)	Value

APPENDIX C3 - LIST OF CONTRACTOR'S PERSONNEL

The Contractor agrees that the personnel employed by them will be as listed below and further agrees that any changes or additions made to this list will be made in writing to the Regional District.

Name of Employee	Employee's Experience / Qualifications
	Landfill Operation Experience (Specific Projects and Number of Years)
	Heavy Equipment Operation Experience (Number of Years)
	Landfill Operation Formal Training
	Heavy Equipment Formal Training

Name of Employee	Employee's Experience / Qualifications
	Landfill Operation Experience (Specific Projects and Number of Years)
	Heavy Equipment Operation Experience (Number of Years)
	Landfill Operation Formal Training
	Heavy Equipment Formal Training

Name of Employee	Employee's Experience / Qualifications
	Landfill Operation Experience (Specific Projects and Number of Years)
	Heavy Equipment Operation Experience (Number of Years)
	Landfill Operation Formal Training
	Heavy Equipment Formal Training

Name of Onsite Supervisor	Supervisor's Experience / Qualifications
	Landfill Operation Supervision Experience (Specific Projects and Number of Years)
	Landfill Operation Formal Training

APPENDIX C4 - LIST OF SUBCONTRACTORS

The Contractor agrees that the Subcontractors engaged by it will be as listed below and further agrees that any changes or additions made to this list will be made in writing to the Regional District.

Name of Subcontractor Address of Subcontractor	Reference Project and Reference Contact Information for Work to be Performed by Subcontractor	Work to Be Performed by Subcontractor

APPENDIX C5 - LIST OF EQUIPMENT

The Tenderer will provide a description of each piece of heavy-duty Equipment to be used for Compaction and Cover Services at the Mackenzie Landfill. The age and condition of the Equipment will be a significant consideration in the quotation evaluation. No changes to the Equipment used at the Facility will be allowed without the written consent of the Regional District.

State standby equipment to be used in the event of breakdown of above or assignment of equipment, and where it will be drawn from.

Bulldozer
Make: _____ Model: _____ Year: _____ Weight: _____ Horsepower: _____ Start Up Operating Hours: _____ Owned or Leased: _____ Anticipated Hours of Operation per Year: _____ Accessories or Attachments to be Provided: _____ Maintenance Performed to Date (attach records/logs as required): _____ _____ _____ _____ Proposed Maintenance Program (attach separate sheets as required): _____ _____ _____ _____ Equipment Maintenance / Replacement Guarantees: _____ _____ _____ _____

Excavator

Make: _____ Model: _____

Year: _____ Weight: _____

Horsepower: _____ Start Up Operating Hours: _____

Owned or Leased: _____

Anticipated Hours of Operation per Year: _____

Accessories or Attachments to be Provided: _____

Maintenance Performed to Date (attach records/logs as required): _____

Proposed Maintenance Program (attach separate sheets as required): _____

Equipment Maintenance / Replacement Guarantees: _____

Articulated Rock Truck

Make: _____ Model: _____

Year: _____ Weight: _____

Horsepower: _____ Start Up Operating Hours: _____

Owned or Leased: _____

Anticipated Hours of Operation per Year: _____

Accessories or Attachments to be Provided: _____

Maintenance Performed to Date (attach records/logs as required): _____

Proposed Maintenance Program (attach separate sheets as required): _____

Equipment Maintenance / Replacement Guarantees: _____

APPENDIX C6 - SCHEDULE OF PRICES – TENDERED PRICE

1)	Compaction and Cover of Demolition Materials: Includes staging DLC material for compaction, compaction of DLC materials, excavation of cover material, hauling cover material and applying and packing cover material. <i>* The average number of annual services is 4 but not limited to 6 per year, strictly dependent on volumes.</i>	PRICE PER SERVICE	
		GST	
		TOTAL	

Contractor Signature

Date

APPENDIX C7 - SCHEDULE OF PRICES – FORCED WORK

The Contractor will supply hourly rates for equipment that the Contractor may be able to make available for forced work outside of the general scope of work of this contract.

Year	Equipment make / model / description	Hourly rate (excluding GST)

APPENDIX C8 - CONFLICT OF INTEREST STATEMENT

ES-25-13
Compaction and Cover of Demolition Materials
Mackenzie Select Waste Landfill

Bidder Name: _____

The Bidder, including its officers, employees, and any person or other entity working on behalf of or in conjunction with, the Bidder on this Procurement Process:

- ☐ is free of any conflict of interest that could be perceived to improperly influence the outcome of this procurement process.
- ☐ has not, and will not, participate in any improper procurement practices that can provide the Bidder with an unfair competitive advantage including obtaining and using insider type information to prepare a solicitation offer or participating in bid rigging.
- ☐ has an actual, perceived or potential conflict of interest regarding this procurement process as a result of:

State reason(s) for Conflict of Interest:

By signing below, I certify that all statements made on this form are true and correct to the best of my knowledge.

Print Name of Person Signing Disclosure

Authorized Representative of

Signature of Person Making Disclosure

Date Signed

APPENDIX C9 - GOODS AND SERVICES TAX INFORMATION

Supplier:

Name

Address

City

Province

Postal Code

Phone Number

Are you a GST Registrant?

Yes _____

No _____

If YES, please indicate your registration number: _____

If NO, please fill in the following (check appropriate box):

☐ Supplier qualifies as a small supplier under s. 148 of the legislation

☐ Other: Specify _____

Signature of Authorized Person

Print Name

Title

Date

APPENDIX D - SITE MAP

Mackenzie Select Waste Landfill and Transfer Station



APPENDIX E - OPERATIONAL CERTIFICATE #100206

MINISTRY OF ENVIRONMENT

OPERATIONAL CERTIFICATE

100206

*Under the Provisions of the Environmental Management Act
and in accordance with the
Regional District of Fraser-Fort George
Solid Waste Management Plan*

Regional District of Fraser-Fort George

155 George Street

Prince George, British Columbia

V2L 1P8

is authorised to manage recyclable material and municipal solid waste at a sanitary landfill located 4.2 km south of Mackenzie, British Columbia, subject to the conditions listed below. Contravention of any of these conditions is a violation of the *Environmental Management Act* and may result in prosecution.

1. LOCATION OF AUTHORISED FACILITY

The location of the facility for the management of recyclable material and municipal solid wastes to which this Operational Certificate is applicable is the Mackenzie Regional Landfill, covering all unsurveyed Crown Land in the vicinity of District Lot 3458, Cariboo District, containing 16.73 hectares, more or less. The Crown Licence of Occupation for the site is #705356.

2. ENTRANCE FACILITIES

The authorised facility includes recyclable material and municipal solid waste drop-off facilities, weigh scales and related appurtenances approximately as shown on attached Site Plan A.

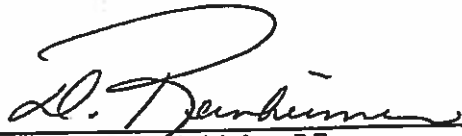
3. MANAGEMENT OF MUNICIPAL SOLID WASTE

3.1. Sanitary Landfill

3.1.1. The authorised facilities are a sanitary landfill area, recyclable material storage areas and related appurtenances approximately as shown on the attached Site Plan. The site reference number for the discharge is E211576.

Date Issued:

MAR 04 2009


Del Reinheimer, P.Eng.
for Director, Environmental Management Act

- 3.1.2. The characteristics of the discharge must be municipal solid waste as defined under the *Environmental Management Act* and other wastes as approved in writing by the Director.
- 3.1.3. Waste may be discharged to the areas specified in the Regional District's Design and Operation Plan, approximately located as shown on attached Site Plan A.

4. **GENERAL REQUIREMENTS**

4.1. **Qualified Professionals**

All facilities and information, including works, plans, assessments, investigations, surveys, programs and reports, must be certified by qualified professionals.

4.2. **Plans**

- 4.2.1. The Regional District shall prepare a Design and Operation Plan that will include considerations for site operation, development and closure, leachate and landfill gas management, composting operations, monitoring programs and environmental impact mitigation management.

The Design and Operation Plan must be submitted to the Director by May 15, 2009.

- 4.2.2. The Design and Operation Plan must address, but not be limited to, each of the subsections in the *Landfill Criteria for Municipal Solid Waste* including performance, siting, design, operational and closure and post-closure criteria.
- 4.2.3. The facilities must be developed and operated in accordance with the Design and Operation Plan.
- 4.2.4. Any updates to the plan shall be immediately submitted to the Director.

4.3. **Additional Facilities or Works**

The Director may require investigations, surveys, and the construction of additional facilities or works. The Director may also amend information requirements of this Operational Certificate including plans, programs, assessments and reports.

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5. OPERATIONAL REQUIREMENTS

5.1. Non-Compliance Reporting

The Regional District shall immediately notify the Regional Manager, Environmental Protection, or designate by facsimile (250-565-6629) of any non-compliance with the requirements of this Operational Certificate and take appropriate remedial action.

Written confirmation of all non-compliance events, including available test results, is required by facsimile within 24 hours of the original notification unless otherwise directed by the Regional Manager, Environmental Protection.

5.2. Operator Training and Development

At a minimum, the Regional District will ensure that operating personnel are trained to industry standards and current in a SWANA recognized landfill operator course or equivalent.

5.3. Electric Fencing

Areas where putrescible materials are stored or discharged shall be surrounded by an electric fence.

5.3.1. Design, Construction and Maintenance

The electric fencing shall be designed, constructed, and maintained such that bears are prevented from penetrating the fence. The Director shall be advised of any modifications to the fence.

5.3.2. Operating Period

The electric fence shall be fully operational during the period of April 15 to November 15 inclusive each year. If snow is present during this period, any electrified strands above snow line shall be isolated from the remainder of the system and energised. The Director may vary the operating period with prior written authorisation.

5.3.3. Record Keeping and Reporting

The Regional District is required to monitor wildlife (medium and large carnivores) activity at the facility and keep records of occurrences and observations of wildlife (medium and large carnivores).

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5.4. Compost

Composting facilities shall be operated and maintained in accordance with the *Organic Matter Recycling Regulation*.

5.5. Landfill Gas

Landfill gas shall be managed in accordance with the *Landfill Gas Management Regulation*.

5.6. Leachate

The characteristics of the surface water and groundwater at the property boundary must not exceed concentrations set in the *British Columbia Approved Water Quality Guidelines (Criteria)* and *A Compendium of Working Water Quality Guidelines for British Columbia*. Where natural background water quality concentrations exceed the aforementioned guidelines, characteristics of the surface water and groundwater at the property boundary must not exceed background concentrations.

6. HAZARDOUS WASTE MANAGEMENT

6.1. Hazardous Waste

"Hazardous Wastes" as defined by the *Hazardous Waste Regulation* pursuant to the *Environmental Management Act* are prohibited from disposal unless expressly authorised by the *Hazardous Waste Regulation*, approved by the Director or as specified in the Operational Certificate.

6.2. Waste Asbestos

Waste asbestos is authorized for disposal subject to compliance with the requirements of section 40 of the *Hazardous Waste Regulation* and the following conditions:

6.2.1. The asbestos waste may not be mixed with any other hazardous waste.

6.2.2. The Regional District must approve the disposal before disposal takes place.

6.2.3. All other applicable requirements of the *Hazardous Waste Regulation*, including but limited to manifesting and waste record keeping, must also be complied with.

6.3. Handling of Impacted Soil

The *Environmental Management Act*, the *Contaminated Sites Regulation* and the *Hazardous Waste Regulation* are applicable for the disposal of impacted (contaminated) soil at the facility.

6.4. Hazardous Wastes from Accidental Spills or Abandonment

Hazardous wastes resulting from accidental spills or abandonment of dangerous goods may be accepted at the facility only under the authority of Section 52(1) of the *Hazardous Waste Regulation*.

7. MONITORING

7.1. Monitoring Program

7.1.1. A monitoring program shall be developed by a qualified professional to identify potential impacts to the environment and public health from the facility.

7.1.2. The monitoring program shall be submitted as part of the Design and Operation Plan.

7.1.3. The monitoring program must address, but not be limited to, subsections 4.1, 4.2 and 7.15 of the *Landfill Criteria for Municipal Solid Waste* and the *Guidelines for Environmental Monitoring at Municipal Solid Landfills*.

7.1.4. Monitoring must be conducted in accordance with the monitoring program.

8. REPORTING

All reports and drawings shall be submitted in electronic format unless otherwise requested by the Director.

8.1. Drawings

All drawings shall be certified correct and sealed by a qualified professional. Drawings shall be submitted to the Director within 30 days of completion or as otherwise specified by the Director.

8.2. Annual Report

The Regional District shall submit an Annual Report to the Director on or before June 30 each year for the previous calendar year.

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MAR 04 2009

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Del Reinheimer, P.Eng.
for Director, Environmental Management Act

OPERATIONAL CERTIFICATE: 100206

The report shall contain, but not be limited to the following information:

- i.) an executive summary;
- ii.) the type and tonnage of waste received, recycled and landfilled for the year;
- iii.) a current topographic map detailing airspace consumption, on-site borrow pit changes and future developments;
- iv.) updated estimates for the remaining capacity, closure date for the current phase and closure date for the current landfill footprint;
- v.) any new information or proposed changes relating to the facilities and Design and Operation Plan;
- vi.) composting operation activity including amount of material received for composting, material composted, material sold and number of composting cycles;
- vii.) occurrences or observations of wildlife (medium and large carnivores) at the facility;
- viii.) a statement regarding the facility's progress in reducing the regional solid waste stream, in accordance with the hierarchy of reduce, reuse and recycle principles; and,
- ix.) the results of all monitoring programs as specified in this Operational Certificate. Data interpretation and comparison to the performance criteria in the *Landfill Criteria for Municipal Solid Waste* and the *Guidelines for Environmental Monitoring and Municipal Solid Waste Landfills*. Trend analysis, as well as an evaluation of the impacts of the discharges on the receiving environment in the previous year shall be carried out by a qualified professional.

9. CLOSURE PLAN

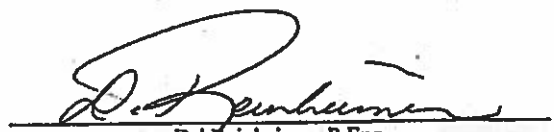
At least one year in advance of decommissioning the landfill, or as otherwise specified by the Director, a Closure Plan shall be submitted which includes at least the following information:

- i) a topographic plan showing the final elevations contours of the landfill and surface water diversion and drainage controls;
- ii) specifications for the final cap and proposed end use of the site; and,

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MAR 04 2009

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Del Reinehrmer, P.Eng.
for Director, Environmental Management Act

OPERATIONAL CERTIFICATE: 100206

- iii) provisions for a minimum 25 year post-closure care period at the facility which, at a minimum, considers the following: groundwater monitoring, surface water monitoring, landfill gas management, erosion and settlement monitoring and management.

10. CLOSURE AND POST-CLOSURE FUND

The Regional District will conform to the Public Sector Accounting and Auditing Board's requirements (PS 3270) to recognize solid waste landfill closure and post-closure liability. The Regional District will develop a plan to ensure that sufficient funds are available for closure and post-closure care work.

Date Issued:

MAR 04 2009

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for Director, Environmental Management Act

OPERATIONAL CERTIFICATE: 100206



An aerial photograph of a study area. A large, irregularly shaped area is outlined by a thin black line, labeled 'Electric Perimeter Fence'. Within this fenced area, there is a smaller, darker, irregularly shaped region labeled 'Bait Area'. To the left of the fenced area, there is a light-colored, irregularly shaped region labeled 'Gravel Pit'. Above the 'Gravel Pit' is a small, dark, rectangular structure labeled 'Bait House'. Below the 'Bait House' is a small, dark, rectangular structure labeled 'Swat Shed'. The background is a mix of dark, textured areas (likely forest or dense vegetation) and lighter, more uniform areas (likely open land or water).

This is a detailed map of the Port of Los Angeles area. The map shows the harbor, the city of Los Angeles, and the surrounding region. Key features include the San Gabriel River, San Gabriel Bay, and the Port of Los Angeles. The map is oriented with North at the top. The map includes labels for 'Port of Los Angeles', 'San Pedro', 'Long Beach', and 'Los Angeles'. It also shows the 'San Gabriel River' and 'San Gabriel Bay'. The map is oriented with North at the top.

Operational Certificate 100206

Date: MAR 04 2009



Del Reinheimer, P.Eng.
for Director, *Environmental Management Act*
Omineca and Peace Regions

APPENDIX F - MACKENZIE LANDFILL
DESIGN, OPERATIONS AND CLOSURE PLAN



MORRISON HERSHFIELD

Mackenzie Regional Landfill Design, Operations and Closure Plan

Presented to:

Darwin Paton

Environmental Services Technologist

Regional District of Fraser-Fort George

155 George St

Prince George, BC



Project No. 230259800
April 3, 2024

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1. INTRODUCTION

1.1 Background

Morrison Hershfield (MH) was retained by the Regional District of Fraser-Fort George (RDFFG) to complete a Landfill Design, Operations and Closure Plan (DOCP) for their Mackenzie Regional Landfill (the Landfill) located approximately 2 kilometers south of Mackenzie, BC, from Highway 39. MH submitted a proposal to the Regional District of Fraser-Fort George in May 2023 and the project startup meeting occurred in July 2023. A site inspection was completed by MH in August 2023.

1.2 Scope of Work

This DOCP was developed to address the requirements of the current Operational Certificate 100206 (issued March 4, 2009) and with consideration to the applicable regulations summarized in Section 1.3.

The purpose of the DOCP is to specify how the landfill site will be developed and closed, including the operational requirements and environmental controls that will be in place to support site development.

1.3 Regulatory Setting

The site is currently authorised to manage recyclable material and municipal solid waste (MSW) as a sanitary landfill under Operational Certificate 100206. A copy of the current Operational Certificate is included in APPENDIX A.

The following regulatory documents and License of Occupation documents are applicable, as they relate to facility construction, operation, closure and monitoring:

- Environmental Management Act, Chapter 53 (March 29, 2023)
- Landfill Criteria for Municipal Solid Waste, Second Edition (June 2016)
- License of Occupation No. 705356, Mackenzie Landfill (November 2, 2005)
- License of Occupation No. 706803, Mackenzie Clay Borrow Pit (January 11, 2019)
- License of Occupation No. 706803, Management Plan (March 18, 2019)

The landfill is located on Crown land under Crown License of Occupation No. 705356.

2. SITE DESCRIPTION

2.1 Location and Historic Use

The Site is located approximately 2 kilometres south of the District of Mackenzie, British Columbia on leased Crown land previously used as a gravel pit. The Mackenzie Regional Landfill site is located on unsurveyed Crown Land covering an area of approximately 16.73 hectares. The facility boundary is defined under License of Occupation No. 705356. A site location plan is provided as Figure 1.

The landfill footprint comprises an area of approximately 8.2 hectares. The Site opened in 1974 and accepts waste from the District of Mackenzie and surrounding area. The Site is operated as a natural attenuation landfill.

On December 1, 2019, the landfill site transitioned to only accept construction and demolition (C&D) waste and a newly constructed transfer station became fully operational, accepting all MSW and recyclables. The old weigh scale was replaced with a new weigh scale in 2019. The weigh scale and scale house are located at the transfer station entrance of the Site.

Figure 2 shows the current site plan of the facility, showing both the transfer station and the landfill.

2.2 Access and Layout

Access to the site is along Highway 39, approximately 2 km south of the District of Mackenzie. An access road, called Dump Road, leads to the Mackenzie Regional Transfer Station and Landfill.

Currently, the Site provides services for receiving construction and demolition (C&D) waste for disposal. MSW is received at the transfer building and hauled to the Foothills Boulevard Regional Landfill for disposal. Materials that are collected at the Transfer Station as part of recycling programs include used oil, oil filters and containers, antifreeze, lead acid batteries, and rechargeable household batteries. A swap shed, marshalling site for appliances, scrap metal, and multi-material recycling (MMR) are present at the Transfer Station.

Large quantities of source separated yard and garden (Y&G) waste are accepted at the Site at no charge. Y&G waste is chipped periodically and stockpiled on-site.

2.3 Service Population

The Mackenzie Regional Landfill facility services the northern portion of the Regional District. Only the District of Mackenzie is serviced by this landfill. The District of Mackenzie, according to the 2021 Census of Population, has a population of 3,281. The population dropped from 3,714 in 2016, which accounts for a 11.7% population decrease from 2016 to 2021.



Williston Lake

Mackenzie

39

Project Location

39

97

97

Regional District Of Fraser-Fort George

Mackenzie Regional Landfill
Site Location Plan



Project No. 230259800

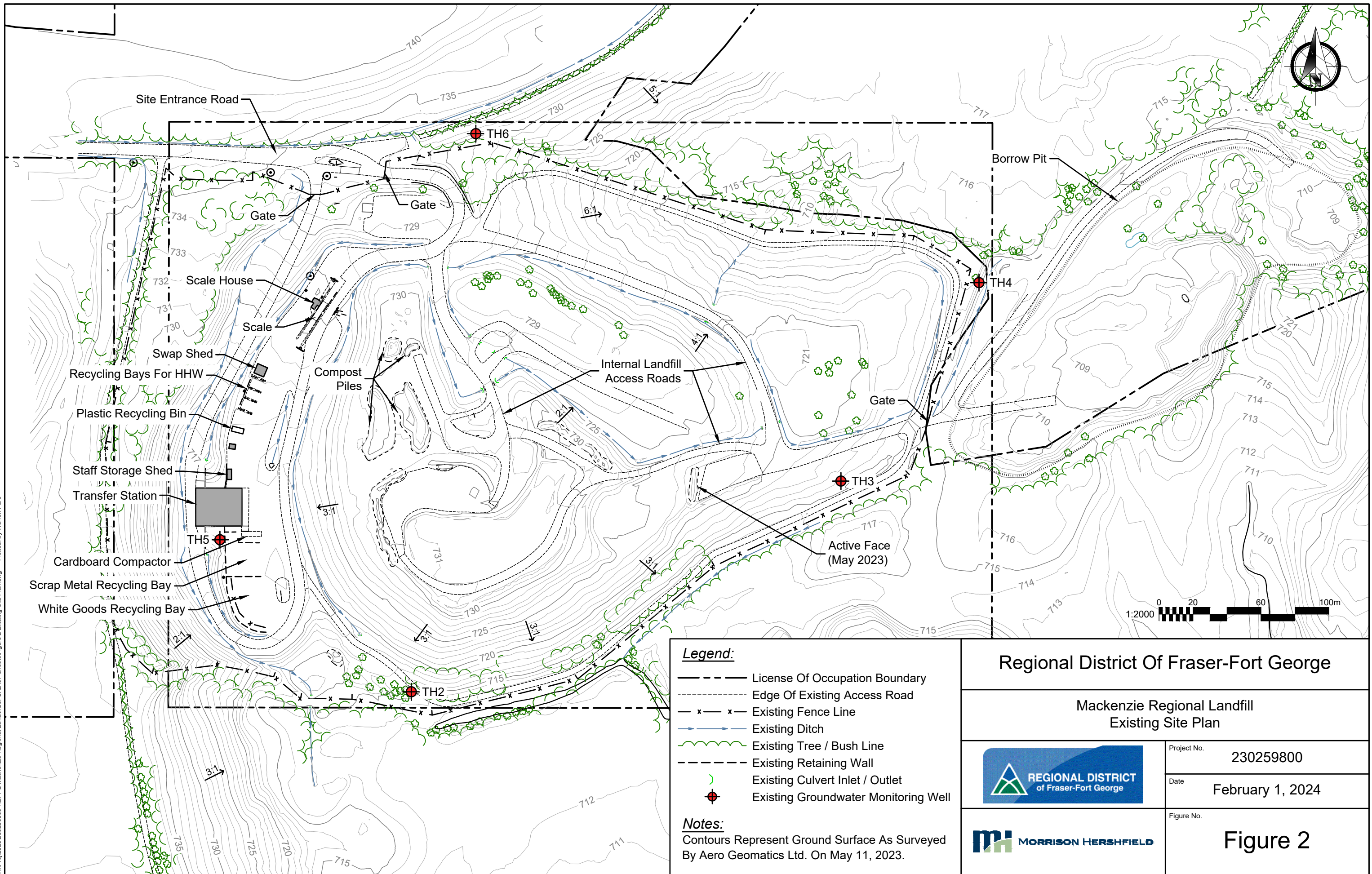
Date February 1, 2024



Figure No. Figure 1



X:\Proj\2023\230259800-RDFFG Mackenzie Regional Landfill\09_CAD\07 Streets\Figure 2 Existing Site Plan.dwg Plotted: by Warren Pare



Legend:

- License Of Occupation Boundary
- - - Edge Of Existing Access Road
- x - x - Existing Fence Line
- - - Existing Ditch
- - - Existing Tree / Bush Line
- - - Existing Retaining Wall
- - - Existing Culvert Inlet / Outlet
- - - Existing Groundwater Monitoring Well

Notes:

Contours Represent Ground Surface As Surveyed By Aero Geomatics Ltd. On May 11, 2023.

Regional District Of Fraser-Fort George

**Mackenzie Regional Landfill
Existing Site Plan**



Project No. 230259800

Date February 1, 2024

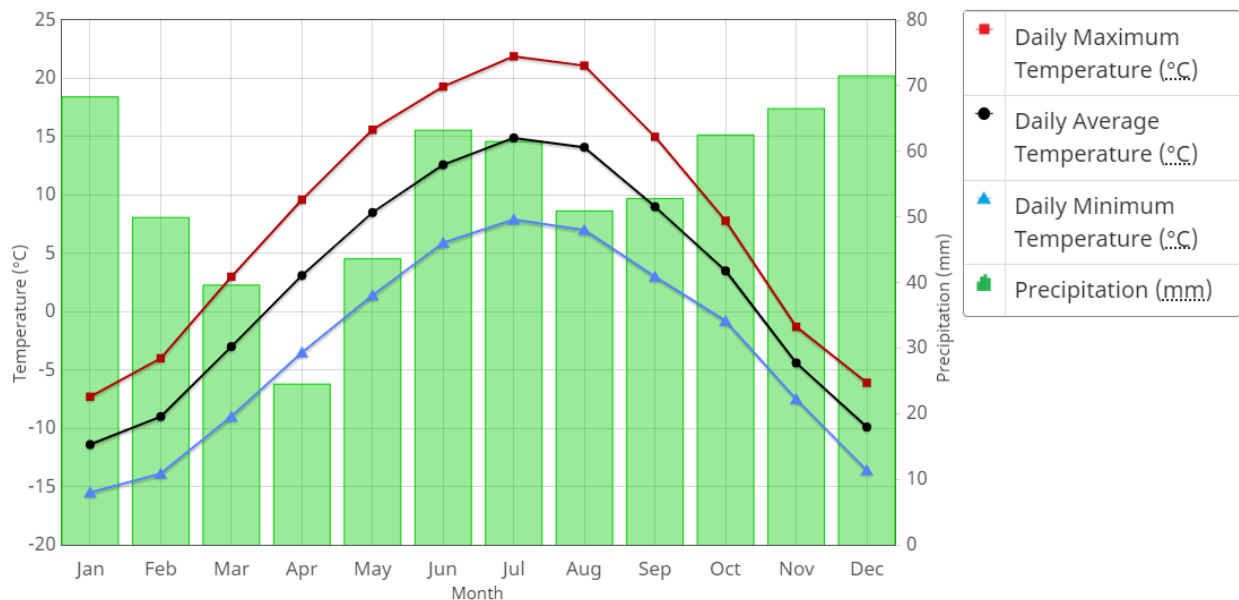


Figure No. **Figure 2**

2.4 Climate

Mackenzie experiences a subarctic climate that is tempered by influences from the Pacific Ocean, leading to milder winters, given its northern latitude when compared to other areas in Canada. The town has warm summer days, with cooler nights when mean temperatures exceed 10 °C. While winters can occasionally be extremely cold, their duration is relatively brief for a subarctic climate, with January holding the record for the coldest month, reaching an average temperature of -9.2 °C.

Canadian Climate Normals data from 1971 to 2000 published by Environment and Climate Change Canada for Station “MACKENZIE A” (ECCC, 2023) is shown in the figure below.



Average annual precipitation based on the 1971 to 2000 Climate Normals data is approximately 655 mm, with about 358 mm as rainfall and the rest as snowfall. Mackenzie averages just over 3 m of snowfall each year. The highest months of snowfall are between November to February, with the majority of rainfall between May to October.

Climate change considerations are discussed in Section 8.

2.5 Topography and Drainage

The Mackenzie Regional Landfill and Transfer Station is located within the northern section of Rocky Mountain trench at an elevation of approximately 700 m above sea level (ASL). The Parsnip Reach of Williston Lake is approximately 4 km west of the Site, at an elevation of approximately 680 m ASL. The landfill footprint is located on a gentle southwest slope and is relatively flat with surrounding areas to the north and west sloping inward to the landfill. Regional topography is generally sloped to the south or southwest and surface water drainage leaving the Site flows south toward a swampy area consisting of Tom and Eunice Lakes located approximately 220 m south of the Site. There are networks of small tributaries that connects the lakes and the swampy area into the Parsnip Reach of Williston Lake.

There are currently drainage ditches along the toe of the landfill and around the transfer station that eventually drain to the south.

2.6 Surficial and Bedrock Geology

As per information accessed online from the BC Ministry of Environment (MOE) Ground Water Resources of British Columbia, the site is situated along the northwestern perimeter of the Rocky Mountain Trench. This trench is characterized by folded volcanic formations and some sedimentary Mesozoic rock layers. The trench's floor is mainly made up of substantial deposits from glacial lakes and glacial rivers, with only a few instances of exposed bedrock.

Based on a review of BC's online bedrock geology map, MapPlace 2, the mapping shows NW-SE trending faults, of unspecified orientation, 3 km west of the Site and a second fault 3 km east of the Site. Generally the Mackenzie area lies within the northern Rocky Mountain Trench which is a product of geological faulting.

Previously, the site was utilized as a gravel pit until around 1974, and sections of its western border are still utilized for gravel extraction. Data from borehole logs from three groundwater monitoring wells in the vicinity as well as the results of a geotechnical investigation completed in December 2018 indicate that the soils beneath the area consist mainly of fluvial deposits, primarily composed of sands and gravels interspersed with occasional silt deposits. These deposits overlay glacial till, a heterogeneous amalgamation of materials ranging in size from silt, clay, and sands to gravels and boulders.

2.7 Site Investigation

2.7.1 Geotechnical Assessment (2018) for Transfer Station Development

A geotechnical assessment titled "*Geotechnical Assessment for the Proposed Mackenzie Transfer Station*" was completed for the proposed Transfer Station construction (McElhanney, 2018). The geotechnical assessment included a desktop review of publicly available data (surficial geology, bedrock, water resources), a site visit assessment, performing a field assessment by drilling 13 boreholes, and lab testing on select soil samples.

The soils observed in all test locations were generally classified as compact to dense, well graded sand and gravel. Poor recovery in the split spoons, combined with refusal at some locations suggests that there are occasional cobbles and/or boulders in the soil. Groundwater was not encountered in any of the boreholes. Based on the findings of the drilling program and historical data from geological history and surficial geology, the Site is classified as Site Class D "Stiff Soil" for seismic design purposes.

The Geotechnical memo report can be found in APPENDIX B.

3. WASTE DISPOSAL AND DIVERSION

3.1 Waste in Place

The first permit for operations at the Mackenzie landfill is dated for 1974, and MH has assumed that this was the first year the landfill began accepting waste. The landfill did not use a scale until one was installed in 1995. The annual quantity of waste disposed at the site between 1974 and 2019 was estimated to be approximately 5,000 tonnes per year based on a population of 6,000 people and a landfill disposal rate of 0.76 tonnes per capita per year. These tonnages include all material crossing the scales which includes MSW from curbside collection programs. With the installation of the Transfer Station in 2020, the waste disposal tonnages significantly decreased to around 1,000 tonnes per year due to the landfill only accepting construction and demolition waste.

Based on the above estimates of annual waste disposal from various reports, the total waste in place as of 2023 is estimated to be roughly 251,000 tonnes. A summary of the assumed disposal quantities over the landfill lifespan to date is provided as Appendix C.

3.2 Waste Transfer and Disposal

The Landfill no longer receives residential and commercial MSW since operations of a transfer site began in December of 2019. All MSW is transported to the Foothills Boulevard Regional Landfill for disposal.

Only Construction and Demolition (C&D) waste is accepted at the Landfill site. According to RDFFG records, the total amount of C&D waste landfilled at the active face was estimated at approximately 1,429 tonnes during the 2021 reporting period (January 1, 2021 to December 31, 2021).

Approximately 1,900 tonnes of commercial and residential MSW were received at the Mackenzie Transfer Station transported to the Foothills Boulevard Regional Landfill during the same reporting period.

In total, approximately 3,329 tonnes of waste was managed at the Mackenzie Regional Transfer Station and Landfill in 2021.

A summary of the MSW received and transferred and the C&D waste received and landfilled in 2021 is provided in Table 1 below (RDFFG, 2021).

Table 1: MSW transferred and C&D waste landfill in 2021

Material received in 2021	Quantity (tonnes)
MSW (received and transferred)	• 1,900 tonnes ○ 1,333 residential curbside ○ 567 self-haul
C&D (received and landfill)	• 1,429 tonnes ○ 1,189 crossing scales ○ 240 additional estimate*

**Data as reported in “2021 Annual Operations Report – Mackenzie Regional Landfill” prepared by RDFFG (RDFFG, 2021)*

The total waste tonnages received at the facility (MSW and C&D waste) during the reporting period in 2021 corresponds to an estimated waste generation rate of 2.78 kg/capita/day or 1,015 kg/capita/year in 2021, based on a population of 3,281. This includes all C&D waste material disposed in the landfill and MSW collected and transferred at the transfer station.

3.3 Waste Diversion

The following waste diversion services are offered at the Mackenzie Regional Transfer Station:

- Swap shed – waste exchange areas where reusable items can be either dropped off or picked up free of charge
- Grinding and stockpiling yard and garden waste for beneficial use on-site
- Multi-material recycling including:
 - Residential corrugated cardboard and mixed paper;
 - Plastic cartons and containers, metal food cans;
- Automotive lead acid battery collection;
- Single use battery collection;
- Sea-can for collection of used oil and antifreeze, oil filters and used oil containers through Interchange Recycling;
- Marshalling area for scrap metal;
- Marshalling area for white goods, including ODS containing appliance;
- Large appliances through the Major Appliance Recycling Roundtable (MARR) Stewardship Program; and
- An old corrugated cardboard (OCC) compactor.

In 2021, the following recyclable materials were reported to be diverted at the facility (*RDDFG Mackenzie Regional Landfill Annual Report, RDDFG 2021*):

Material	Units
Waste Oil	5,620 litres
Oil Filters (drums)	4 drums
Antifreeze	410 litres
Batteries	273 units
Scrap Metal	180 tonnes

To increase waste diversion at the facility, opportunities to divert and beneficially use C&D materials that are currently being landfilled should be explored. It is understood that concrete was being diverted and the material which is already on site is stockpiled in the northeast area of the landfill. Opportunities to divert other materials such as clean wood waste and asphalt should be explored with a focus on beneficial use options at the landfill or within the community.

4. LANDFILL DESIGN AND PHASING

4.1 Lifespan Analysis, Airspace Analysis and Cell Design

Available airspace is assessed to evaluate remaining capacity and estimate remaining landfill operational years. This assessment also considers the current waste compaction rate and soil consumption (used for daily and intermediate cover, and other projects at the landfill). The available airspace is based on the conceptual landfill design presented in this section showing the proposed landfill final contours.

Ideally the annual airspace consumption is determined by calculating the volume consumed between two topographic landfill surveys. This can be done by using AutoCAD or similar software. The apparent density can be estimated by comparing the volume consumed compared to the tonnes of waste landfilled during the same period. Airspace volume assessments (estimates of annual airspace consumption) were completed in 2021, 2022 and 2023.

The tonnage, annual airspace consumption and apparent density from the last 3 site assessment surveys (years 2021, 2022 and 2023) is outlined in Table 2 below. The reporting period was from May to May the following year.

Table 2: Volume Site Assessment for Years 2021, 2022 & 2023

Reporting Year	Tonnage (tonnes) disposed in reporting year	Airspace Consumption (m ³) in reporting year	Apparent Density (tonnes/m ³)
May 2020 - 2021	955	850	1.12
May 2021 - 2022	925	2,027	0.46
May 2022 - 2023	460	834	0.55

The density calculated in the 2020-2021 reporting year of 1.12 tonnes per cubic metre is considered an anomaly, possibly due to survey error resulting in underreported volumes in the year 2020. The apparent densities estimated in the following two reporting years were similar at approximately 0.5 tonnes/m³.

MSW was being landfilled at the site in the first 11 months of 2020 and this is included in the tonnages reported in the May 2020-2021 reporting year. MSW was no longer being landfilled in the May 2021-2022 reporting year, however the C&D disposal quantities are considered higher than a typical year due to major construction projects in the reporting period. The C&D disposal quantities observed between May 2022-2023 are considered more typical of the tonnages expected to be landfilled going forward.

Only the apparent density from the reporting years 2021-2022 and 2022-2023 were used for this DOCP as this is in line with expected apparent density values from a small C&D landfill. This is

principally due to the high consumption of soil for cover to meet covering requirements while disposing of relatively small waste quantities with high pore volumes. MH recommends reviewing the assumed apparent density after each airspace assessment is completed.

It should be noted that the apparent density does not represent the density of the compacted waste but represents the mass of waste disposed in each cubic metre of landfill airspace, which includes soils used as cover.

4.2 Population Projections

As per the *Mackenzie Community Economic Development Strategy* (District of Mackenzie, May 2021), the population of Mackenzie declined between 2001 (from 5,393) to 2011 (to approximately 3,500) largely related to local mill closures. The population increased to 3,714 in 2016 however decreased by 11.7% to 3,281 in 2021.

According to BC Statistics population projections (data updated by BC Statistics in November 2022 and accessed by MH in December 2023), the population of Mackenzie is expected to decline at an average rate of 2% per year until 2032 then see a modest increase of about 1% until 2046.

As noted in the *Mackenzie Community Economic Development Strategy* (District of Mackenzie, May 2021), the population projections do not account for impacts of COVID-19, in- and out-migration, and industry changes (e.g., mill closures, other new industries opening).

Considering the significant fluctuations and mostly declining trend in Mackenzie's population since 2001 (refer to Figure 3 below), it is assumed that Mackenzie's population will remain constant (based on 2021 population) over the projection period for the purposes of the airspace estimates. This population assumption should be reviewed at a minimum every five years.

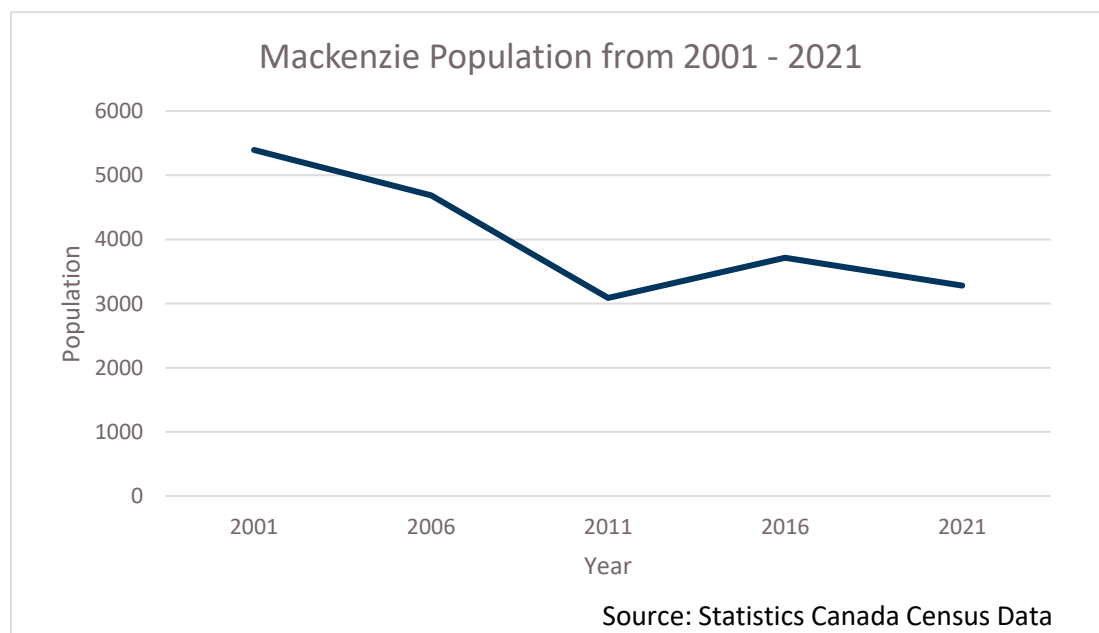


Figure 3: District of Mackenzie Population Trend From 2001 to 2021

4.3 Airspace Projection

The following are the key assumptions used in the airspace projection:

- Population growth rate – assumed to be constant (0% growth rate) at 3,281 people based on 2021 census data.
- Annual C&D quantity (tonnage) received and landfilled – conservatively assumed to be a constant 693 tonnes per year based on an average between the reported landfill quantities between May 2021 – 2022 and May 2022 – 2023¹. This corresponds to a constant C&D landfill disposal rate of 0.21 tonnes C&D waste per capita per year.
- Diversion rate - assumed to remain constant (i.e., not improve over projection period).
- Apparent density - 0.5 tonnes/m³ (average between values calculated in May 2021 – 2022 and May 2022-2023). The compaction rate achieved at larger landfills using modern landfill compaction equipment is generally over 800 kg/m³. However, 500 kg/m³ is considered realistic and on the conservative side when using the current equipment present at the Mackenzie Regional Landfill for compaction of C&D waste.

Based on the above assumptions, the annual airspace consumption is assumed to be 1,386 m³ per year over the projection period.

Soil is readily available near the site to the east of the operating landfill at a sand and gravel borrow pit. MH completed a preliminary estimate of the available soil assuming the entire area is excavated to a depth of 708.3m ASL at 3:1 side slopes. The borrow pit has approximately 35,000 m³ of soil available for use as daily, intermediate, and final cover of the landfill as well as for road construction and upgrade projects. Further discussion on materials management is provided in Section 4.7.

The consistency in acquiring survey data every year, mid of May, is sufficient to track the progression of landfilling. This will be particularly important closer to the closure of the landfill. The survey would also facilitate the assessment of the landfill operations performance through compaction, use of operational soil and use of airspace. MH recommends tracking soil used for daily cover separately to assess the efficiency of soil usage. An ideal waste to soil cover ratio is 3:1 (by volume) however this is often less for smaller landfills.

¹ As noted in Section 4.1, the C&D disposal quantities in the May 2021-2022 reporting year are considered higher than a typical year due to major construction projects in the reporting period. The C&D disposal quantities observed between May 2022-2023 are considered more typical of the tonnages expected to be landfilled going forward. A conservative approach was taken by using the average disposal quantities between the two reporting periods. MH recommends reviewing this assumption as more data on annual disposal quantities becomes available.

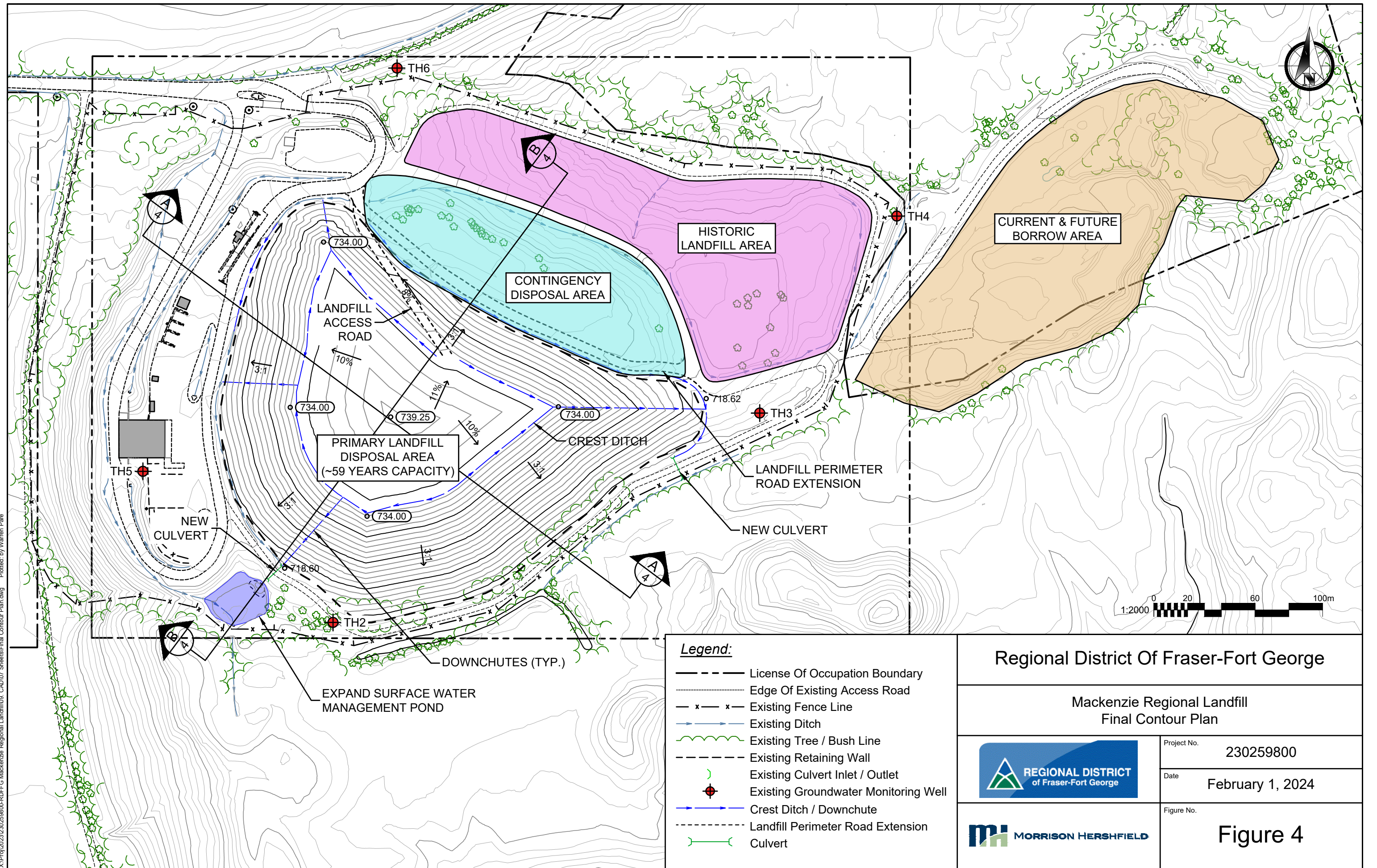
4.4 Final Landfill Design and Contour Plan

The final landfill design was developed following the general design criteria presented below and with consideration to the BC Landfill Criteria for Municipal Solid Waste, Second Edition (MOECCS, June 2016):

- The final landfill design has been developed to optimize capacity of the facility within the area designated as “primary landfill area” which is bounded by existing final slopes on the west, south, and east sides, and bounded by the existing internal service road on the north side.
- On the west side of the landfill the toe of the slope is adjacent to the transfer station road and on the south and east side the landfill toe is adjacent to the perimeter fencing and perimeter service road. Therefore, it is assumed that the landfill has reached final slopes on the west, south, and east sides and further development on these sides of the landfill will not occur. The slopes appear to be at approximately 3V:1H however final cover has not been placed.
- The landfill side slopes are designed to optimize available airspace while maintaining slope stability. The final side slopes are no steeper than 3V:1H.
- The existing access road around the landfill toe west, south, and east sides will remain in place to maintain a cleared buffer zone between the landfill and property line.
- The plateau of the final landfill is graded to promote runoff at a minimum grade of 10%.
- The landfill crest access road is to be constructed at a maximum of 10% grade to facilitate access by landfilling equipment and waste haulers.
- The proposed filling is generally vertically on existing landfilled waste.
- The landfill will remain a natural attenuation site.

The final contours of the landfill design of the Mackenzie Regional Landfill is presented in Figure 4 and cross sections showing the proposed final contours are provided in Figure 5. The design was developed based on the general design criteria listed above, the airspace analysis, and landfill capacity / remaining site life presented above. The preliminary design is intended to provide a basic design concept and guidance for filling operations. The design does not include a detailed design of the phasing, surface water works or other landfill features.

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Regional District Of Fraser-Fort George

Mackenzie Regional Landfill Final Contour Plan

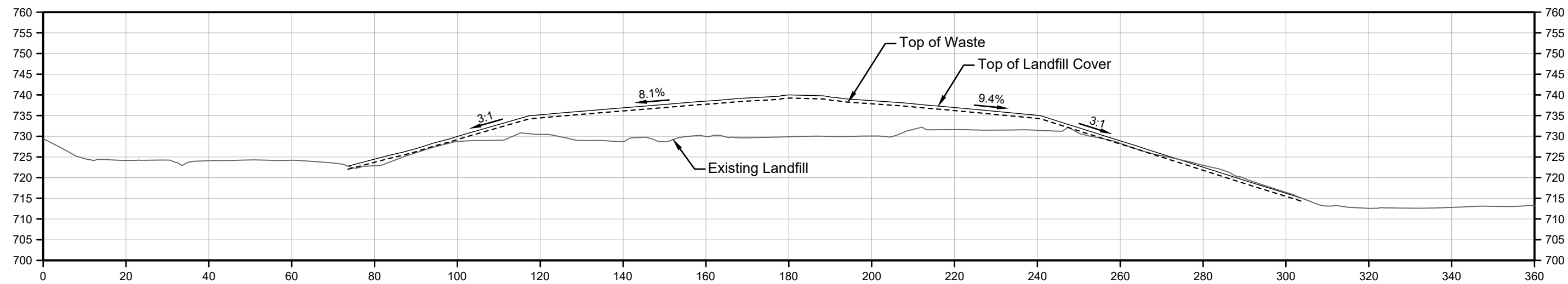


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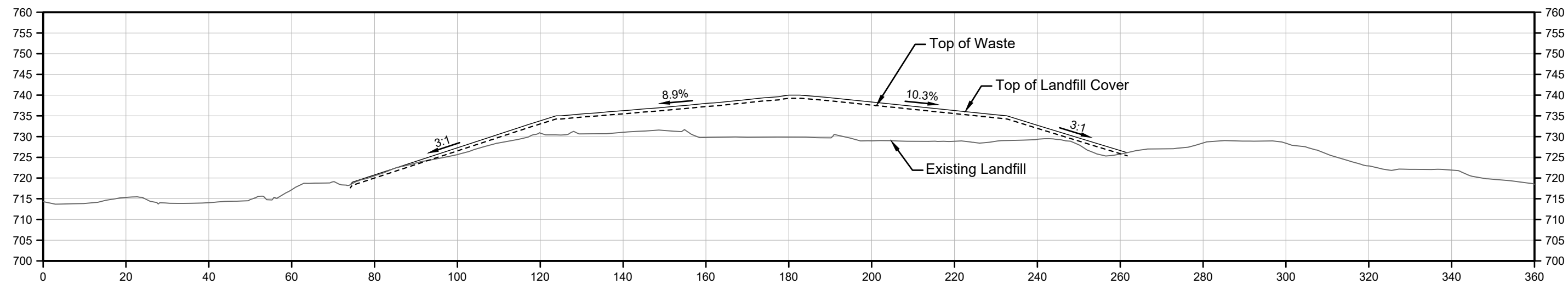
Date February 1, 2024



Figure No. **Figure 4**



Section 'A'



Section 'B'



Regional District Of Fraser-Fort George	
Mackenzie Regional Landfill Cross Sections	
	Project No. 230259800
	Date February 1, 2024
	Figure No. Figure 5

4.5 Phased Fill Plan

The landfill will be developed in five phases within the area labelled in Figure 4 as “primary landfill disposal area”. The landfill phasing plan is shown in Figure 6.

Phases 1, 2, and 3 are located along the northeast side of the landfill and have a final elevation of 730 m. At an assumed annual fill rate of 1,358 m³, each phase has approximately 5.5 years of capacity for a combined capacity of roughly 17 years. The proposed filling progression is generally from southeast to northwest. Filling will occur in Phase 1 up to an elevation of 730 m by continuing to fill and extending the active face to the northeast to meet the intersection of the two internal access roads. Access to Phase 1 will be via the existing access road to the active face and using the existing access road along the toe of the landfill in the northeast corner. Phase 1 is estimated to provide approximately 7,600 m³ of airspace.

Phase 2 is to the east of Phase 1 and piggybacks on the east interior slopes of Phase 1 and on the existing landfill slopes to the south. Access to Phase 2 would be provided by the existing access road to the northeast and a new access road constructed on the north side of the landfill. Phase 2 is estimated to provide approximately 7,500 m³ of airspace.

Phase 3 is on the north end of the landfill and will extend the elevation of 730 m from Phase 2 to the north. Access to Phase 3 will be from the existing service road along the northeast side of the landfill. Eventually as filling progresses in Phase 3 the existing access road at the north end of the landfill will need to be extended further south to provide access to the Phase 3 as it reaches the design elevation of 730 m. Phase 3 is estimated to provide approximately 7,800 m³ of airspace.

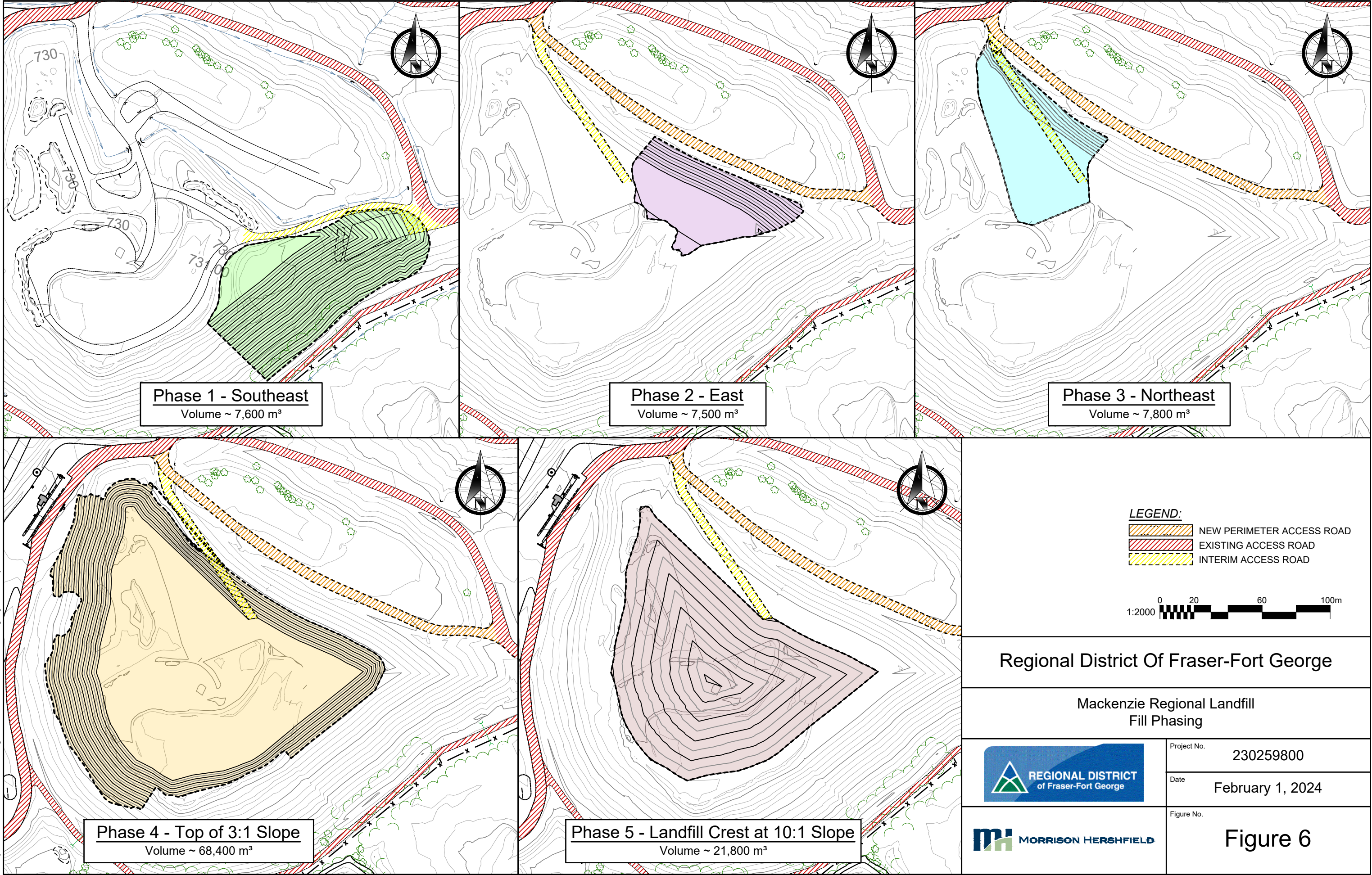
Phase 4 covers an area of approximately 22,000 sq. m and involves filling the Phases 1-3 footprint at 730 m and existing landfill high points between 730 and 731 m approximately 5 m to 735 m. Phase 4 is estimated to provide roughly 50 years of capacity (68,400 m³ of airspace) at the current fill rate therefore it is recommended that a more detailed fill plan within Phase 4 be developed closer to the anticipated development date. The existing compost piles will need to be relocated in Phase 4 however the exact timing will depend on which areas of Phase 4 are developed first.

Phase 5 is filling on top of Phase 4 to build the final landfill plateau at 10V:1H side slopes to an elevation of 740 m. Phase 5 is estimated to provide approximately 18,000 m³ of airspace.

Table 3 below summarizes the available volume in each phase and the estimated lifespan assuming an annual volumetric consumption of 1,358 m³, which accounts for an average 2% annual settlement rate by volume.

Table 3: Phase Volume and Landfill Lifespan

Phase	Fill Volume Available (m ³)	Lifespan (years)
Phase 1	7,600 m ³	5.6 years
Phase 2	7,500 m ³	5.5 years
Phase 3	7,800 m ³	5.7 years
Phase 4	68,400 m ³	50 years
Phase 5	18,000 m ³	13 years
TOTAL	109,300 m³	80 years



4.6 Detailed Fill Plan

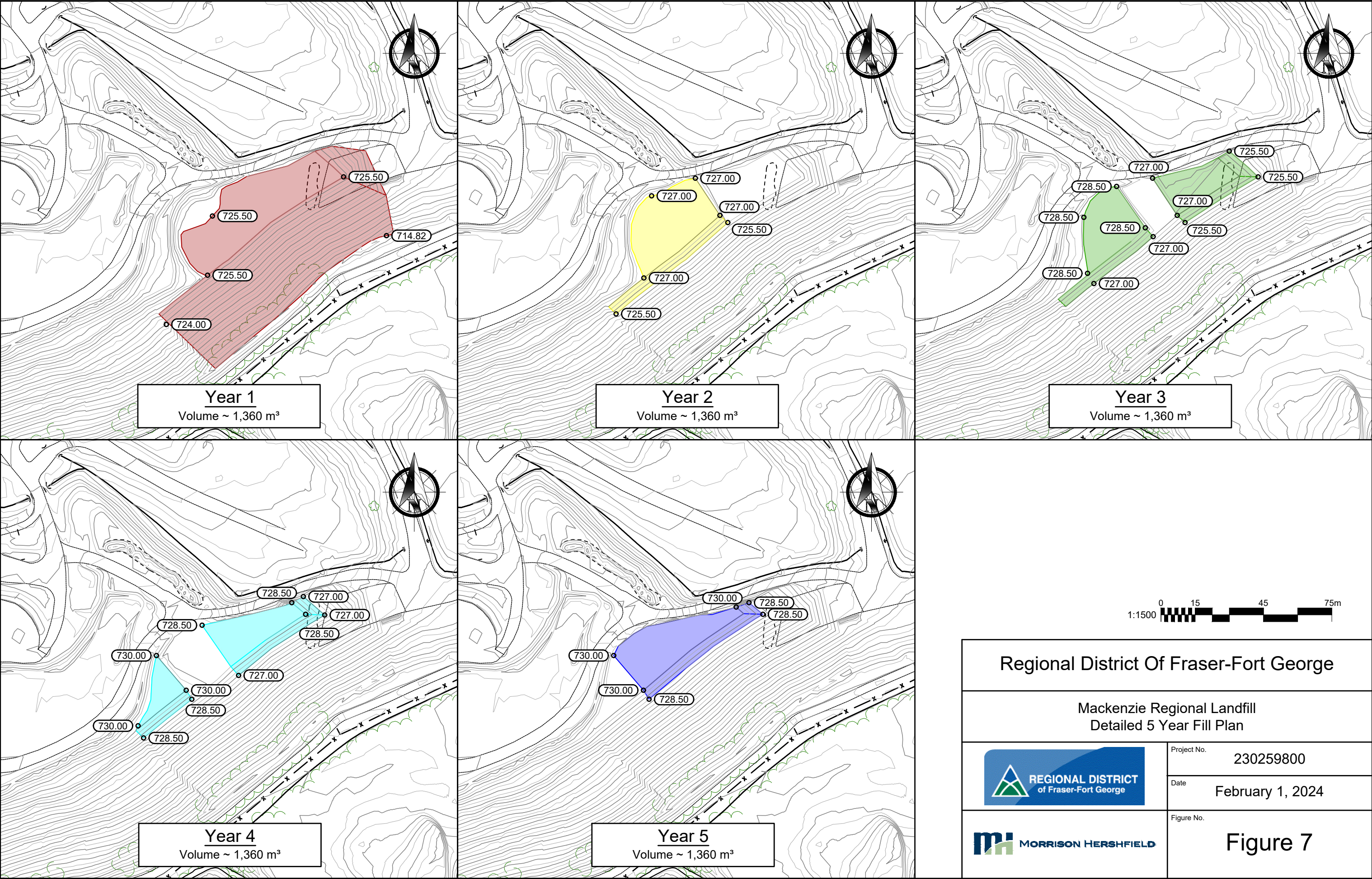
For the purposes of this DOCP, the proposed detailed fill plan for the next 5 years was developed using the annual airspace consumption of 1,358 m³ and is shown in Figure 7. Development will occur in Phase 1 in the first five years. The detailed fill plan is based on filling in 1.5 m lifts up to the design elevation of each phase.

The first year will continue at the current active face area filling the current low area to 725.5 m by extending the fill area to the northeast forming the proposed toe of the landfill along the northeast side of the landfill. Years 2, 3, and 4 will continue filling in Phase 1 at 1.5 m lifts up to an elevation of 730 m at the end of Year 4. Filling in the northeast half of Phase 1 will stop at 728.5 m (end of Year 4) before transitioning filling in a counterclockwise direction to Phase 2.

Filling in Year 5 will bring Phase 2 up to an elevation of approximately 726 m and the northeast half of Phase 1 up to the final design elevation of 730.

Access to the active face within this five-year timeframe will be using the existing internal access road on the east side of the landfill. In year 5, planning should begin to decommission the existing road (filled) at the east side of the landfill site and transition to a new internal access road further north branching off the existing access road. The transition to the new access road could occur sooner however it is recommended that consideration to operations efficiency be given when determining the timing of decommissioning the existing road. New temporary access roads can be graded at 10% to 12% and then filled in with the next landfill Phase if they are no longer required.

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Regional District Of Fraser-Fort George

Mackenzie Regional Landfill
Detailed 5 Year Fill Plan



Project No. 230259800

Date February 1, 2024



Figure No. Figure 7

4.7 Materials Management Plan and Site Soil Balance

Soil is readily available near the site to the east of the operating landfill at a sand and gravel borrow pit. As noted in Section 4.3, a preliminary estimate was completed assuming an excavation depth of 708.3m ASL at 3:1 side slopes which indicates the borrow pit has approximately 35,000 m³ of soil available. Soil will be required for daily, intermediate, and final cover of the landfill as well as for road construction projects.

Based on the results of the airspace assessments completed over the past three years, MH estimates that the waste to soil cover ratio is in the 2:1 to 3:1 (by volume) range. At a 2:1 waste to cover ratio, the in-place waste density would be approximately 0.7 tonnes/m³ and at a 3:1 waste to cover ratio, the in-place waste density would be approximately 0.6 tonnes/m³ which is considered realistic for C&D waste compaction at a small landfill.

The estimated annual soil consumption based on varying waste to cover ratios and assuming total volume consumption of 1,358 m³ is presented in Table 4 below.

Table 4: Annual Soil Consumption based on Various Waste to Cover Ratios

Waste to cover ratio (by volume)	Annual soil consumption for daily cover (m ³)	Estimated Soil Required over Remaining Lifespan (80 years)
3:1	340 m ³	27,200 m ³
2:1	450 m ³	36,200 m ³
1:1	680 m ³	54,300 m ³

4.7.1 Soil Balance for Operations

A summary of the estimated sand and gravel soil required from the existing borrow pit for operations and other infrastructure projects identified in this DOCP is provided in Table 5 below (refer to Section 5 for the estimated soil required for closure). The estimated soil required for daily cover is based on a 3:1 waste to cover ratio and assuming 80 years of remaining capacity over Phases 1-5.

Table 5: Estimated Sand and Gravel Soil Required for Landfill Operations and Closure of the Primary Landfill Area

Item	Estimated Soil Required (m ³)
Daily Cover (at 3:1 waste to cover ratio)	27,200 m ³
Entrance Road Re-Alignment	700 m ³
Internal Access Road Construction (Phases 1-5)	600 m ³
TOTAL	28,500 m³

To assess the soil consumption from the borrow pit, MH compared the survey data between May 2021-2022 and May 2022-2023 to estimate the excavated volume (cut) within those survey dates. The estimated soil consumption is as follows:

- Between May 2021 to May 2022 – 2,643 m³
- Between May 2022 to May 2023 – 3,096 m³

At a conservative 2:1 waste to cover ratio, the annual soil used for cover would be approximately 450 m³. This suggests most of the soil use over the last three years has been related to other projects at the landfill such as road construction. MH recommends using the soil sparingly for covering waste as needed and only for construction projects authorized by the RDFFG. When placing cover, the operations contractor should be targeting a soil cover thickness of 150 mm and no greater than 300 mm for intermediate cover.

As shown in Table 5 above, assuming a 3:1 waste to cover ratio, a total of 28,500 m³ is estimated to be required over the remaining lifespan of the landfill for daily cover and road construction. This is less than the estimated quantity of soil available in the borrow area of 35,000 m³ therefore it is estimated that there will be sufficient soil in the borrow area if soil is used sparingly. The waste to cover ratio has the most significant impact on the amount of soil consumed over the operating period of the landfill. The final cover design will also affect the amount of soil needed for final closure and capping (refer to Section 5).

Since the landfill was converted to a C&D select waste landfill, the frequency of soil cover placement has significantly decreased. Cover is currently applied three to four times during Spring and Summer (approximately every 3 weeks) and approximately two times during the Fall and Winter (approximately every 6 to 8 weeks).

A target waste to cover ratio of 3:1 (by volume) is typical at a landfill accepting both C&D waste and MSW however since the Mackenzie Landfill is only accepting select waste and soil cover is not placed on a daily basis, a 3:1 waste to cover ratio should be considered the minimum target.

At a 3:1 waste to cover ratio, the amount of soil needed over the remaining landfill lifespan is 27,200 m³ which can be sourced from the existing borrow area. At a lower waste to cover ratio, there will likely be insufficient soil in the existing borrow pit. It is understood that additional soil can be sourced from a borrow area located further northeast of the landfill if the current borrow pit does not have enough for the operations at the Mackenzie Regional Landfill. The additional borrow area may potentially require an additional lease agreement.

A more detailed assessment of the soil required for the final landfill cover should be completed as part of the landfill Closure Plan.

5. CLOSURE PLAN

Final closure of a waste disposal facility is required under the 2016 Landfill Criteria for Municipal Solid Waste. Landfills, landfill cells or phases should be closed and capped once capacity has been reached. The final cover should be designed to minimize infiltration of water into the landfill cells and thus limit the generation of leachate. The slope and surface should be contoured to promote surface water runoff while considering long-term slope stability and airspace optimization. The cover can also be designed to help manage landfill gas.

As per Operational Certificate 100206 (dated March 4, 2009), the RDFFG is required to submit a Closure Plan to the BC Ministry of Environment and Climate Change Strategy (MoECCS) at least one year prior to the intended closure date. The closure plan is required to include the final elevation contours including surface water diversion and drainage controls, the specifications for the final cover and proposed end use, and the post-closure monitoring plan.

In addition to the minimum requirement outlined in the OC, the Closure Plan should include the following information:

- Nature and design of the final cover, including cover design details;
- A surface water management plan, including crest ditches, downchutes, toe ditches, and culverts;
- Procedures for notifying the public of facility closure;
- Post-closure environmental monitoring plan and final cover inspection plan;
- Progressive closure plan (if applicable)
- Specific post-closure land use
- Assessment of contaminating lifespan
- Estimated closure and post-closure costs, including reference to closure fund.

Though this DOCP includes the elements required for the official Closure Plan, MH recommends a separate plan be developed by a qualified professional at least two years prior to the anticipated closure date. The separate closure plan would include a detailed closure strategy and the selected cover system.

5.1 Landfill Cover Elements

A final landfill cover is constructed of layers of different materials with different properties and purposes. The typical layers of final cover are briefly described below followed by two proposed cover systems for the Mackenzie Regional Select Waste Landfill.

Vegetation and Surface Layer

The surface layer of the landfill should be constructed with a minimum 0.15 m vegetated topsoil however the thickness of the topsoil layer should be selected with consideration to the type of vegetation and availability of local soils. The main purpose of this layer is to prevent erosion and

protect the underlying layers. The topsoil layer also acts as a moisture buffer by storing moisture and releasing it through transpiration and evaporation. Established vegetation improves the aesthetics of the site, creates habitat for animals and insects, and reduces surface erosion.

There is limited availability of topsoil in the District of Mackenzie area, especially in the quantities needed for final closure of the landfill. A fabricated soil may be more suitable considering the local conditions and availability of organic materials. It is important that a fabricated soil contain sufficient nutrients to promote vegetation growth and that the soil has a relatively good water holding capacity. Alternatives to topsoil include a soil mix with compost, peat or biosolids. Hence, it is recommended that segregation of yard and garden waste and wood waste is continued and that the composting operations are reviewed with consideration to the quantity and quality of topsoil needed for final closure.

Using the May 2023 survey data, the volume of the four Y&G waste piles (both unchipped and chipped) on the landfill is estimated at 1,400 m³. The chipped yard waste can be used as an erosion control media during landfill closure or blended with mineral soil to create a topsoil material suitable for the final cover.

Any existing vegetation and topsoil stripped and grubbed from existing slopes in preparation for final cover placement should be stockpiled and used in the topsoil layer of the final cover system.

Cushion / Subsoil Layer

Sometimes a layer of soil is applied just below the topsoil (sometimes with a filter layer, in the form of a geotextile, in between). The purpose of this layer is to protect the underlying cover layers, create depth for root growth and provide additional water holding capacity.

The cushion / subsoil layer can be constructed using many different types of soils and is often selected based on soil type available on site or locally. The selection of soil and the thickness is more site-specific with consideration to the intended post-closure end use. The seed mix chosen for final closure should be selected with special consideration to root depth particularly if the final cover is constructed without a cushion / subsoil layer.

Drainage Layer

A drainage layer is commonly constructed above the barrier layer. The purpose of this layer is to facilitate the channelling of infiltrated water, especially on the side slopes, to a surface water ditch or other collection system, thereby reducing head buildup in the barrier layer. Excessive head buildup in any cover layer can lead to failure of the cover system. Without a drainage layer there is also a risk that the topsoil and cushion/subsoil layer becomes saturated which can lead to slumping and erosion. These layers are also called capillary break layers.

Drainage layers/capillary breaks can be constructed using geosynthetics (geonet or non-woven heavy geotextile) or with cohesion-less soils such as gravel and sand. It is important to prevent clogging of the drainage layer which can be done by selecting vegetation with shallow roots, install cushion/subsoil layer with sufficient thickness and/or by the use of a geotextile or sand as a filter between the drainage layer and the overlying layers.

Barrier Layer

The barrier layer can be constructed using a 1. low permeability soil (compacted clay barrier), 2. a polymer geomembrane, or 3. a geosynthetic clay liner (GCL). The purpose of the barrier layer is to prevent surface water from percolating through the waste in the landfill thereby minimizing leachate generation. It also prevents air infiltration in the waste and landfill gas system (if a part of the landfill cover) and aims to minimize the release of landfill gas emissions.

The BC Landfill Criteria (June 2016) specifies the minimum expected requirements for the final cover system. The final cover must at a minimum consist of a 0.6m thick clay liner with a hydraulic conductivity of 1×10^{-7} cm/s or less for non-arid regions, such as the District of Mackenzie, or a geomembrane cover.

- 1) A clay layer is installed in small uniform vertical lifts using clay free from debris and large clods and prepared to proper moisture content to create a low permeability layer. Clay covers allow some water to infiltrate into the waste which increases the rate of waste stabilization as well as landfill gas generation. This is particularly important at landfills where an active landfill gas collections system is installed. Clay is susceptible to freeze-thaw and wet-dry cycles which results in the development of fractures. If this occurs, it would need to be scarified and re-compacted to maintain the cover performance.
- 2) Geomembranes are factory made polymeric membranes used for final landfill cover systems but also have other applications. There are several different geomembranes on the market with different properties (e.g. thickness, smooth vs textured and density) chosen specific to its application. The most common geomembrane categories include high density polyethylene (HDPE), linear low-density polyethylene (LLDPE) and polyvinyl chloride (PVC). LLDPE is a common material in British Columbia for landfill covers however the selection of geomembrane should always be made specific to application and site-specific conditions and the overall closure and post-closure objectives and plans.

The performance of the final cover system to tolerate differential settlement is also a key consideration. Certain HDPE membranes, for example, can only tolerate 5% strain before failure which doesn't allow for much differential settlement.

Another consideration is the risk of puncture and damage to the barrier layer during installation. Geomembranes are generally more susceptible to puncture and damage during installation. Underlying soils must be selected and placed to minimize the risk of damage to the cover. A thick geotextile is often placed immediately below the geomembrane to create a cushion and to protect the cover system. Geomembranes are typically preferred when natural low permeability soils are limited or very expensive to ship and place, or timelines are very tight, and geomembranes are quicker to install.

Geomembranes consume less airspace compared to a soil cover which is especially important where airspace is limited. During the installation of geomembranes, a certain number of liner defects and pinholes should be expected and considered as part of the installation quality control program.

- 3) GCLs combine geosynthetics with a layer of sodium bentonite clay. The benefit of a GCL compared to a clay cover is the airspace savings and, in many situations, also cost saving.

The barrier layer is the most important part of the final landfill cover and most of the other layers in the cover system aim to protect or enhance the performance of the barrier layer.

Landfill Gas Collection / Venting Layer

The layer directly below the barrier layer is constructed to create a pathway for landfill gas (and leachate if there would be a breakout) to an active or passive landfill gas system, to reduce the risk for gas pressure build up. The layer is generally constructed using a high permeability soil or an engineered geosynthetic. A network of perforated gas collection pipes is placed within this layer to collect and direct the landfill gas to vents or wells.

Foundation Layer / Intermediate Cover

An intermediate cover is placed on top of the waste once final grade has been reached. The intermediate cover is a temporary landfill cover and is placed to prevent litter, rodent and vectors related issues. The intermediate cover also forms a protective layer between the waste and the final cover system. The final contours for the landfill side slopes and crest are created through placement of the foundation layer / intermediate cover.

5.2 Final Cover Options

5.2.1 Soil Cover System

Borehole logs from the geotechnical investigations completed for the transfer station indicate the surficial geology is primarily sand and gravel, with small pockets of clay. These logs suggest the availability of low-permeability soil on-site may be limited, especially at the quantities required for final closure. However, under Licence of Occupation No. 706803, the RDFFG has access to a clay quarry for the purposes of obtaining material for final landfill cover. The clay quarry is located approximately 1 km from the landfill site. MH recommends that the quantity and characteristics (hydraulic conductivity) of the clay available from the clay quarry be confirmed. This information can then be compared to the estimated quantity required for final closure.

The soil cover system proposed is designed as per the BC Landfill Criteria. According to the requirements, the barrier is to be comprised of a minimum 0.6m thick layer of low permeability clay with a hydraulic conductivity of 1×10^{-7} cm/s or less when compacted to 95% of Standard Proctor.

Clay is expected to meet the requirement of hydraulic conductivity of 1×10^{-7} cm/s or less, and modeling of the soil performance could be performed to determine the ultimate thickness required to reach similar performance as that of a soil cover described under the BC Landfill Criteria.

The soil requirements for final closure of the primary, contingency, and historic landfill areas using a soil cover are presented in Table 6 below.

Table 6 Quantity of soil required for final closure of Mackenzie Regional landfill using a low permeability soil cover.

	Primary Disposal Area (m ³)	Contingency Disposal Area (m ³)	Historic Disposal Area (m ³)	TOTAL (m ³)
Topsoil	6,400	1,800	3,000	11,200
Low permeability soil	25,700	7,000	9,200	41,900
Intermediate cover	12,800	3,500	4,600	20,900

5.2.2 Geomembrane Cover System

A geomembrane cover system also meets the BC Landfill Criteria and is proposed as Option 2 for final closure of the Mackenzie Regional landfill. The barrier layer is comprised of an engineered geomembrane, which consumes considerably less airspace compared to a clay cover. The geomembrane is protected by an underlying geotextile placed on top of the intermediate cover. A geocomposite, comprised of a drainage net sandwiched between two layers of geotextile, will be placed on top of the geomembrane before a 0.45 m common fill layer is placed. The final layer will consist of topsoil with 0.15 m thickness that is seeded. This type of cover system does not allow for passive landfill gas venting, therefore a network of perforated landfill gas collection pipes will likely be required below the barrier layer to prevent uplift of the geomembrane. Passive landfill gas vents will be required at the high points in the landfill, which will penetrate through the geomembrane cover system.

5.3 Site-Specific Landfill Cover Design and Closure Considerations

The Mackenzie Select Waste Landfill has a large disturbed footprint relative to the amount of waste currently being received at the site. As identified in Figure 3, the following three areas have been defined that will require a separate but related closure strategy.

5.3.1 Primary Landfill Disposal Area

The closure area of the primary landfill disposal footprint covers an area of approximately 42,800 m² and is estimated to have approximately 80 years of remaining capacity based on the current fill rate. It is currently the active fill area.

5.3.2 Contingency Disposal Area

The closure area of the contingency disposal footprint is approximately 11,700 m² and has been designated by the RDIFFG as a contingency disposal option if the region's primary disposal site at the Foothills Boulevard Regional Landfill becomes unavailable or if disposal capacity is needed in an emergency situation such as a flood, fire, or other natural disaster. Intermediate cover has been placed on the contingency disposal area and it is partially vegetated. The conceptual design of the contingency disposal closure area involves piggybacking on the primary landfill area by placing

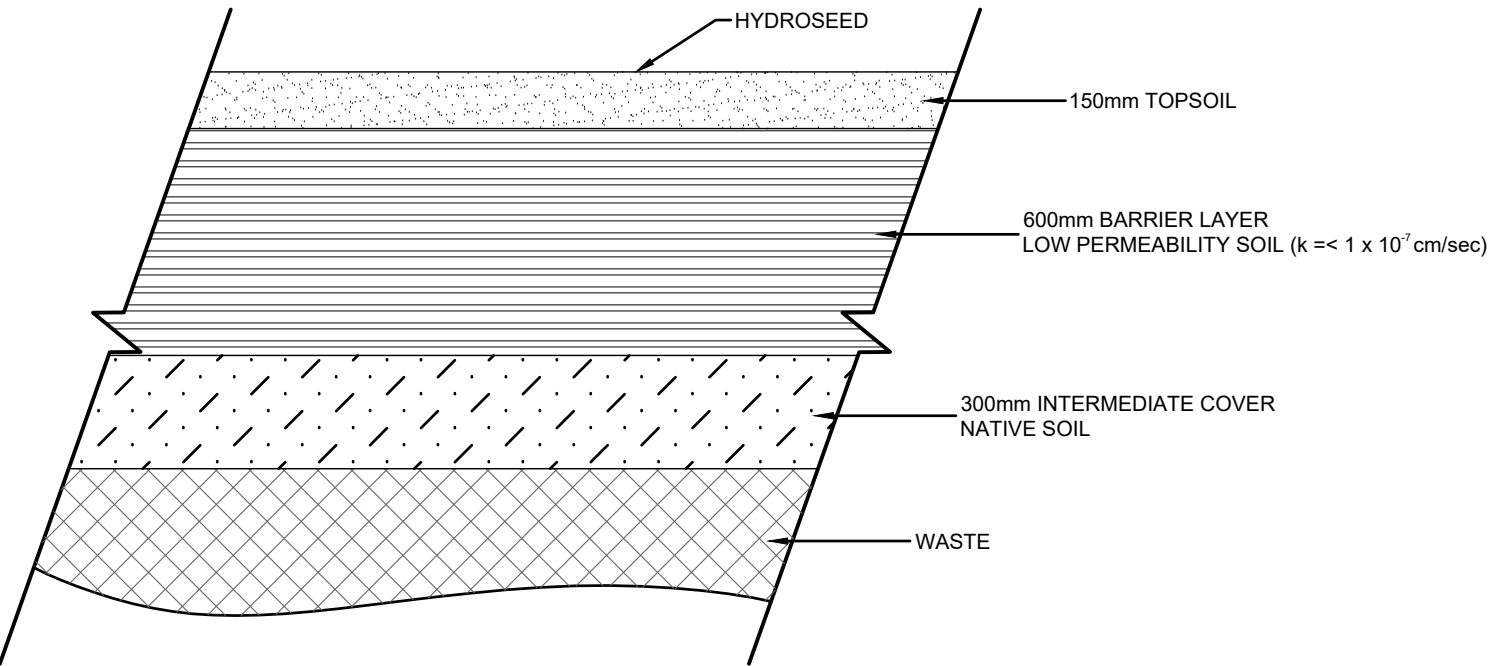
waste on the north slopes of the primary landfill disposal area. The contingency disposal area is estimated to provide an additional 90,000 m³ of airspace, or approximately 66 years of capacity at the current fill rate. Final closure of the contingency disposal area is not expected until the primary landfill disposal area reaches capacity and is closed. Historic records suggest that most of the waste in place at the landfill is located within the primary and contingency landfill areas.

5.3.3 Historic Landfill Area

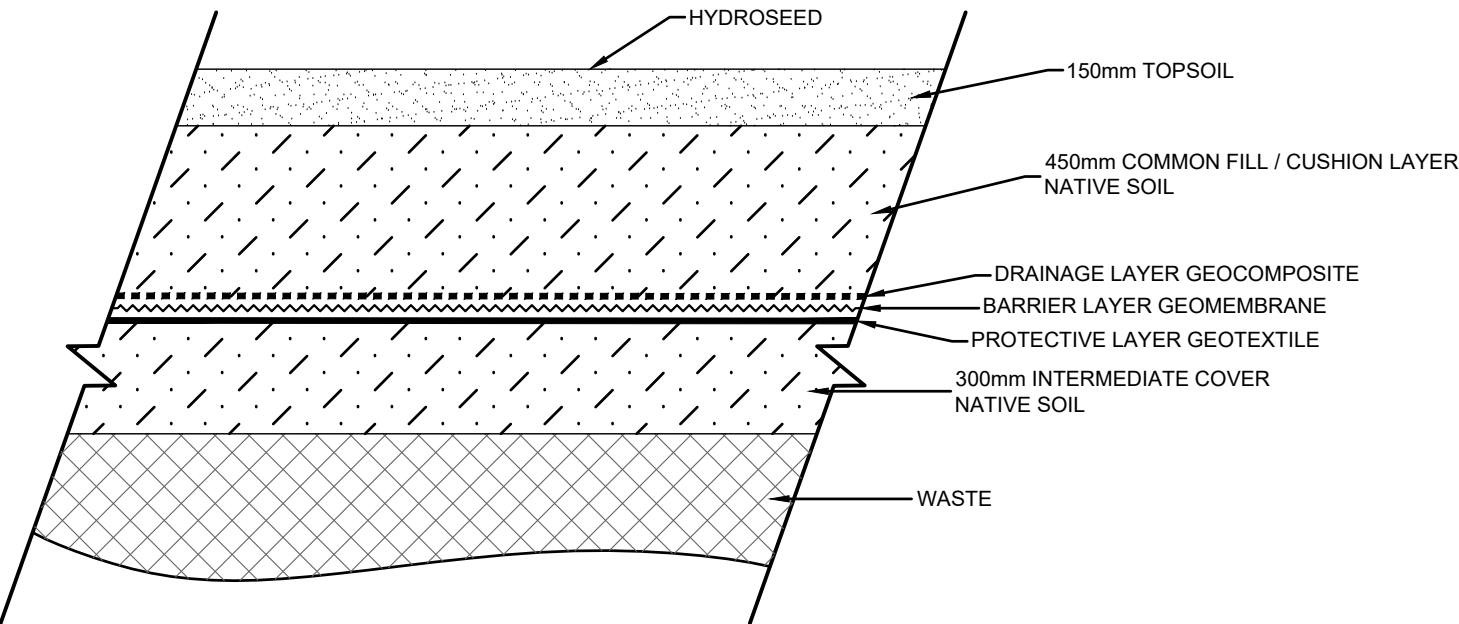
The historic landfill closure area covers an area of approximately 15,300 m². Through discussions with RDFFG staff and based on a review of historic records, landfilling may have only occurred in certain portions of this area over a limited number of years (at least five years). The extent of the waste fill area identified on a September 2005 drawing prepared by Aero Geometrics Ltd. indicates the extent of waste placement is mostly contained within and to the south of the existing internal access road within the contingency disposal area. The September 2005 drawings by Aero Geometrics identifies an elevation of 718.6 in the historic landfill area (outside of the area identified as the active waste fill area). MH compared the elevation in this location to the latest survey data for the site (May 11, 2023) and the elevations are close which suggests substantial filling did not occur in this area. RDFFG staff have confirmed that filling occurred within the northeast corner of the historic landfill area for at least five years.

Two final cover options are presented in this DOCP. The two cover systems are described and briefly discussed below. The two systems are illustrated in Figure 8 (next page).

X:\Proj\2023\230259800-RDFFG Mackenzie Regional Landfill\09_CAD\07 Sheets\Figure 7 Landfill Cover Design Options.dwg Plotted: by Warren Pare



OPTION 1 - SOIL COVER



OPTION 2 - GEOMEMBRANE COVER



Regional District Of Fraser-Fort George	
Mackenzie Regional Landfill Landfill Cover Design Options	
	Project No. 230259800
	Date February 1, 2024
	Figure No. Figure 8

5.4

5.4 Historic Landfill Area

5.4.1 Closure Options

As part of the development of this DOCP, a preliminary cost estimate was prepared to assess the potential costs of excavating waste from the historic landfill area and moving it to the contingency disposal area. The costs to excavate the waste were then compared to the cost of closing and capping the area using one of the two cover options listed above (i.e., leaving waste in place). The estimated cost to close the historic landfill area is summarized in Table 7 below.

Table 7: Estimated Closure Cost of Historic Landfill Area Assuming Waste Left in Place and Capped

Option A – Place Final Cover (Leave Waste in Place)		
Closure Area (m ²)	Closure Cost – Soil Cover	Closure Cost – Geomembrane Cover
15,300 m ²	\$845,000	\$1,659,000

The second option (Option B) that was considered was to excavate and relocate the waste from the historic landfill area to the contingency disposal area. The main benefit of excavating and relocating waste in the historic landfill area is to reduce the footprint of the landfill requiring closure thereby reducing closure costs and long-term liability.

As noted in Section 5.2.1, there is considerable uncertainty in the amount of waste in place in the historic landfill area. As noted in the *1995 Interim Operations Plan* (AGRA, 1995), the average depth of the landfill was estimated to be approximately 3 m based on the extent of the site area utilized for landfiling from 1974 to 1995. The area includes the areas now defined as the primary landfill area, contingency disposal area and historic landfill area. Based on discussions with the RDFFG, it is understood that the waste was placed in the northeast corner of the historic landfill area after 1995 for at least 5 years. Based on an assumed annual fill rate of 5,000 tonnes per year over 5 years at an apparent density of 0.5 tonnes per m³, the estimated volume of the waste in place in the historic landfill area is 50,000 m³. MH also estimated the potential amount of waste in place (requiring excavation) based on the total historic waste disposal area of 15,300 m² and assuming an average 3 m waste depth over the entire area plus an additional 0.5 m over-excavation to remove impacted soils which would result in an estimated 54,000 m³ requiring removal.

For the purposes estimating the potential cost of excavating and relocating waste, it was assumed that 54,000 m³ of material (waste and impacted soils) would need to be excavated. The estimated costs are presented in Table 8 below.

Table 8: Estimated Cost to Excavate and Relocate Waste in Historic Landfill Area

Option B – Excavate and Relocate Waste	
Estimated volume waste in place (m³)	54,000 m ³
Unit Rate for excavation and placement (\$/m³)	\$15/m ³
Excavation and placement cost	\$810,000
Testing, confirmatory sampling, oversight, reporting by QP	\$80,000
Total	\$890,000

The main factor affecting the cost of Option B is the amount of waste in place requiring excavation and removal. Option B would also have additional safety considerations due to the potential to encounter hazardous waste during excavation activities.

The contingency disposal area has an estimated 159,000 m³ of available airspace and based on the high level volume estimates above, relocating the historic waste would consume approximately a third of this volume or about 29 years of capacity based on the current landfill fill rate.

5.4.2 Preferred Closure Option

The preferred closure strategy for the historic landfill area is to leave the waste in place and install final cover (Option A). Since filling is not planned in this area, MH recommends that closure planning be initiated with the objective to close the area within the next five years. Benefits to closing this area include a reduction in the landfill liability and a reduction in leachate generation.

5.5 Closure Cost Estimate

The estimated cost to close the primary disposal area, contingency disposal area, and historic landfill areas is presented in Table 9 below. Capital costs are presented based on the type of cover system selected (soil cover or geomembrane). Detailed cost estimate tables for closure of the primary landfill disposal area are provided as Appendix D.

Table 9: Summary of Estimated Closure Costs

Closure Area	Estimated Cost (Option 1 - Soil Cover)	Estimated Cost (Option 2 - Geomembrane Cover)
Primary Landfill Disposal Area	\$ 2,139,000	\$ 4,416,000
Historic Landfill Area	\$ 845,000	\$ 1,659,000
Contingency Disposal Area	\$ 585,000	\$ 1,207,000
Total	\$ 3,569,000	\$ 7,282,000

To close all areas, it is estimated that a soil cover system would cost approximately \$3.6M and a geomembrane system would cost approximately \$7.3M. General assumptions and notes for the estimated costs are as follows:

- Estimates are considered Class D capital cost estimates based on the conceptual closure design presented in this DOCP.
- Costs are in 2023 dollars. An escalation factor, inflation and discounting has not been applied to account for closure in a future date. It is assumed that this analysis will be completed as part of liability reporting separate from this DOCP.
- The following have been applied to the subtotal:
 - Contingency – 40%
 - Engineering and Construction Oversight – 20%
- It is assumed that soil required for new access roads, intermediate cover, and the common fill layer will be sourced from the existing borrow pit and from a borrow area north of the landfill once the existing borrow pit has been depleted.
- It is assumed that clay soil required for the barrier layer under Option 1 will be sourced from the clay borrow pit located approximately 1 km from the Site (identified under License of Occupation No. 706803). It is assumed that there will be sufficient volume of clay from this source and that the clay meets the minimum hydraulic conductivity properties identified above. Importing clay from out of the region (greater than 1 km from the site) has not been considered in the cost estimate.
- Unit rate for topsoil is based on a fabricated topsoil blend consisting of Owner-supplied on-site mineral soil and Owner-supplied organics from decomposed and chipped yard waste and/or grubbed material. Another option considered is Owner-supplied compost (Norgrow) from the Foothills Boulevard Regional Landfill compost facility. Unit rate would increase if the Contractor was required to supply topsoil.

- Option 2 (geomembrane) will require a passive LFG venting system and Option 1 (soil cover) will not require a passive LFG venting system. The need for a passive LFG venting system with either option should be reviewed as part of the detailed Closure Plan.
- Vegetation on existing side slopes will be grubbed and stockpiled prior to placement of final cover and will be reused as part of final topsoil layer.
- The existing perimeter access roads along the west, south, and east toe of the landfill will be maintained. An allowance has been included for construction of a new perimeter access road along the toe of the landfill along the north end (north of Phases 1, 2, 3).
- The existing ditches along the west, south, and east toe of the landfill will be maintained. Costs have been included for new crest ditches and down chutes, upgrades to existing toe ditches and culverts, and an allowance has been included for a new surface water pond (if determined to be required through detailed engineering).
- Closure costs for the historic landfill area is based on the preferred closure strategy (waste being left in place) with the area being re-shaped/re-graded at around 15-20% slopes before final cover placement. Approximately 4000 cu. m of material will need to be excavated to re-shape the area.
- An allowance has been included for new signage.

Due to the availability of clay soil and mineral soil near the site, the soil cover option (Option 1) is considerably less costly than the geomembrane cover option. For both options, it was assumed that the existing borrow pit and the potential borrow pit further north of the landfill would be used to meet the soil requirements for intermediate cover, cushion layer, and access road upgrades. Access to the borrow pit further north of the landfill may require an additional lease agreement.

A benefit of a geomembrane system is that it requires less airspace in comparison to a soil cover system.

The soil cover system (Option 1) is considered the most cost-effective closure option for this site if sufficient quantities of soil with the required performance characteristics can be sourced. The RDIFFG should continue to collect and chip yard and garden waste material to reduce the need for imported topsoil.

5.6 Progressive Closure

The purpose of progressive closure is to minimize leachate generation, facilitate clean runoff diversion and spread the capital costs of closure over the life of the landfill. This can be achieved by fully or partially closing and capping each phase as capacity and final grade is reached.

Progressive closure is more suitable when applying a soil clay cover as closure can be performed as suitable materials become available.

5.6.1 Primary Landfill Area

The side slopes on the west, south, and east sides of the primary landfill area have reached final design grades (3V:1H) and progressive closure could begin with grubbing and placing final cover on

the existing slopes. However, since the side slopes are partially vegetated and stable, progressive closure could be initiated once Phase 3 is complete and final cover could be placed on all sides slopes in the primary landfill disposal area up to an elevation of approximately 730 m. Based on the current fill rate, this first progressive closure event would be in about 12 years.

A second progressive closure event of the primary landfill area could be halfway through filling Phase 4 on final slopes, approximately 18 years after the first closure event. The final closure event of the primary landfill area would be once the landfill reaches final contours and the landfill crest is reached.

The total closure area of the primary landfill area is 42,800 m².

5.6.2 Historic Landfill Area

As outlined in this DOCP, no waste is expected to be placed in the historic landfill area in the future and it can be closed as part of a progressive closure strategy for the Site. Based on a preliminary earthworks analysis balancing the cut and fill (no additional fill required), approximately 4,000 m³ of soil and waste will need to be excavated to re-shape the area to achieve slopes of approximately 15-20% which is acceptable to promote drainage. Once the re-shaping is complete, final cover can be placed in this area. This area is currently partially vegetated and it is recommended that the vegetation and any organic layers be removed and stockpiled before regrading so that it can be reused as part of the topsoil layer of the final cover system.

The total closure area of the historic landfill area is 15,300 m².

MH recommends that closure planning be initiated with the objective to close the historic landfill area within the next five years.

5.6.3 Contingency Disposal Area

Closure of the contingency disposal area is considered beyond the timeframe of the current DOCP (greater than 100 years based on the current fill rate). Closure of the contingency disposal area depends on several factors including the closure timeline for the historic landfill area and the estimated quantities of waste in contingency events. It is recommended that the closure strategy for the contingency disposal area be re-assessed once the closure timeline for the historic landfill area is determined.

If the contingency disposal area is used, the proposed design would piggyback on the north side of the primary landfill disposal area and the additional area requiring closure would be 11,700 m².

5.7 Erosion Prevention Controls

Once the final cover has been applied on the landfill side slopes and crest, these areas will need to be seeded. The seed mix should be chosen with consideration to the local climate and soil characteristics. It is also important to consider root depth of the established vegetation to prevent the roots from entering the cover system and damaging the landfill barrier layer. The established vegetation binds the soil and prevents erosion. The vegetation also contributes to transpiration

which reduces the moisture buildup in the soil, and reduces the chance of slope failure. Hence, it is important that the landfill is seeded as soon as possible or as soon as the growth season begins, once final closure has been completed.

It is recommended that the vegetation is inspected and maintained at least once a year. Areas with sparse vegetation should be reseeded and invasive species removed. Mowing is sometimes required, depending on the post-closure end-use.

As discussed in Section 4.4, the side slopes and crest are to be graded to promote surface water runoff in a controlled and effective way. The final contours of the Mackenzie Regional Select Waste Landfill are designed with 3H:1V side slopes and a 10% crest grading. Surface water will be directed off the crest through crest perimeter ditches and four down chutes (see Section 4.4).

5.8 Closure and Post-Closure Fund

The OC requires that the RDFFG recognize the landfill closure and post-closure liability associated with the Mackenzie Regional Landfill. Public Sector Accounting Board (PSAB) Section PS3280 (asset retirement obligations) was approved in 2018 and replaced the previous accounting standard PS3270 (solid waste landfill closure & post-closure liability) referenced in the OC and landfill criteria.

The estimated closure and post-closure costs and associated liability under PS3280 is reported under separate cover. In accordance with the OC and Landfill Criteria, the RDFFG is required to ensure sufficient funds are available (through a closure and post-closure reserve) for closure and post-closure activities.

6. OPERATIONS PLAN

This section covers the operations plan for the landfill which is operating as a C&D waste landfill and the transfer station which was constructed and became operational at the end of 2019.

6.1 Hours of Operation

The landfill and transfer station facilities are open Sunday to Thursday, 9:00 AM to 5:00 PM. Regional District staff are on site during operational hours.

The facility is closed for the following Statutory Holidays: New Years' Day, Family Day, Good Friday, Easter Monday, Victoria Day, Canada Day, BC Day, Labour Day, National Day for Truth and Reconciliation, Thanksgiving Day, Remembrance Day, Christmas Day & Boxing Day.

6.2 Staffing and Equipment

The Regional District site staff generally includes:

- One environmental services lead hand, and
- One environmental services employee.

With the compaction and cover operations contracted out, the contractor is responsible to perform compaction and applying cover at the landfill. The compaction and cover services are requested by the Regional District approximately three to four times during Spring and Summer (approximately every 3 weeks) and approximately two times during the Fall and Winter (approximately every 6 to 8 weeks). Equipment used at the Site for landfilling related activities, include the following:

- Crawler tractor
- Hydraulic excavator

6.3 Current Tipping Fees

The Mackenzie Regional Transfer Station is currently not charging tipping fees for disposal of small loads of household waste. Curbside collection of municipal solid waste is provided for residents of District of Mackenzie which is dropped off at the transfer station for final disposal at the Foothills Boulevard Regional Landfill.

Currently, tipping fees are applied for disposal of MSW and is based on weight and type of material in accordance with Municipal Solid Waste Tipping Fee and Site Regulation Bylaw No. 3166:

- Residents can drop off small loads of household waste and small amounts of construction waste under the 100 kg at no charge.
- There is no charge to drop off recycling, yard and garden trimmings, or materials for the Swap Shed.
- A tipping fee is applied for disposal of refuse and demolition, land clearing and construction waste in loads over 100 kg with a minimum charge per load.

- All controlled waste has a disposal fee, and some types of controlled waste cannot be disposed of at the Mackenzie Regional Landfill or Transfer Station.

Tipping fees are paid by cheques, credit cards, or debit cards. Commercial customers can apply for credit accounts with the Regional District.

Controlled waste requires special handling and disposal techniques to avoid creating health hazards, nuisances, or environmental pollution. Accepting controlled wastes at the Mackenzie Regional Landfill may require pre-approval or require pre-approval and a permit.

Controlled wastes that require no pre-approval or permit are the following:

- Appliances with ozone depleting substances (fridges, freezers, water coolers, air conditioners) at no charge.
- Food processing waste (tipping fee applied with a minimum charge).
 - This waste is transported/transferred to Foothills Regional Landfill.
- Gypsum board or wallboard (tipping fee applied with a minimum charge).

Some types of controlled waste that require pre-approval for disposal requires further notice to the Regional District. Arrival at the Mackenzie Regional Landfill without pre-approval can result in being turned away without permission to dispose the waste. Controlled wastes that require pre-approval are the following:

- Bulky waste
- Camp waste
- Concrete
- Condemned food
- Creosote treated wood
- Dead animals
- Pumping from commercial laundry lint traps, parking lot drainage sumps or sumps collecting vehicle washing facility run-off
- Vehicle hulks
- Wood ash from industrial operations

In addition to pre-approval, some types of controlled waste require a disposal permit. The users are required to complete an online controlled waste disposal permit application. Controlled wastes that require both pre-approval and a permit are the following:

- Asbestos
- Biosolids
- Contaminated soil
- International waste

6.4 Transfer Station Facilities and Waste Acceptance Procedures

Since 2020, the site has been operating as a select waste C&D landfill facility with the construction and completion of the transfer station building and new scale.

All users enter the facility through the main access road to the north, where they drive towards the transfer station to check in at the site office and weigh scale area. Once vehicles are on the scale, they are directed by the staff to the appropriate location. Users are either directed to the transfer station area for recycling and MSW drop-off, or to the landfill area for C&D waste disposal and Y&G waste composting. All accepted wastes are monitored by the staff at the scale house to prevent disposal of hazardous or other prohibited waste, as outlined in the 2016 BC Landfill Criteria and Operational Certificate.

The transfer station facilities include the following (identified on Figure 2):

- A 27m by 22.3 m pre-engineered metal transfer station building with three entrance doors with a concrete tipping floor and cantilevered loadout bay;
- Scale house and one 40 foot (12 m) bi-directional scale;
- Cardboard compactor recycling located beside the transfer building;
- A swap shed and staff storage shed;
- Interchange Recycling (formerly BC Used Oil Management Association) Sea-can container for collection of used oil, oil filters, and antifreeze;
- Bin for plastic and mixed container recycling;
- Concrete block bunkers for white goods and scrap metal recycling; and
- Concrete block bunkers for receiving household hazardous waste (HHW)

The transfer station building is where users can drop-off MSW on the tipping floor which is transferred and disposed at the Foothills Boulevard Regional Landfill. Multi-material recycling bins are present to the north of the transfer station building where users can drop-off plastic recyclables. Used oil, oil filters and containers, antifreeze, lead acid batteries, and rechargeable household batteries are received at separate bays further north of the transfer station building. The swap shed is next to the bays at the north.

Vehicles directed to the landfill are instructed to back into the active face to dispose of their C&D waste, then drive back to the scale to weigh the difference and pay the C&D waste tipping fee. The Y&G waste drop-off area is currently located on top of the landfill, currently northwest of the landfill active face. Vehicles are directed to drop-off yard waste at this location, but they do not need to drive back across the scale after disposal as there is currently no tipping fee applied to yard waste.

6.5 Landfill Active Face Operating Procedures

The Regional District shall make reasonable effort to minimize the amount (surface area) of the exposed waste at the tipping face. This is to minimize the amount of cover soil required, as well as reduce volumes of leachate and mitigate access by vectors. Safety and operational considerations are the biggest constraints on reducing the tipping face size. The tipping face should be kept as

small as possible, and the ideal width of the tipping face is approximately 10 m for the size of the Mackenzie Regional Landfill. However, the width of the tipping face must also be sufficiently sized to accommodate the average number of vehicles unloading simultaneously during peak use.

The operator should maintain the active face at the end of each operating day to ensure that users can safely back as close to the tipping area as possible. This keeps the active tipping area tidy and reduces the amount of soil lost while pushing and compacting (soil is shaved/gouged from the tipping area into the waste). The best practice for efficient compaction is to compact 300 mm thick layers of waste, and the typical rule for sufficient compaction is four to six passes over the active face.

The active face should be sloped to provide storm water drainage away from the cell. However, it is best practice to maintain the active face at a slope no greater than 3H:1V to ensure effective compaction. MH recommends the active face is kept close to 3H:1V.

The waste should be placed in lifts about 1.5 m high, spread and compacted in layers no more than 300 mm thick, and a cover should be applied only on an as needed basis, at a minimum with each lift placement.

6.6 Cover Placement and Alternative Daily Cover Options

Daily and intermediate cover layers are barriers that help to contain the waste and help reduce impacts on the surrounding environment. Daily cover can be used to enclose cells daily, or an alternative daily cover can be used, and cells can be enclosed with soil at the end of a specified operation period.

Since the Mackenzie Regional Landfill transitioned to only accepting inert C&D waste in 2019, daily cover is not required as significantly lower quantities of waste is landfilled and the waste is considered relatively inert and does not attract rodents, vectors, and animals to the same extent as MSW with organics. Cover is still required to control vectors, wildlife, dust, litter, odour, stormwater infiltration and manage the risk of fire. Cover is currently applied three to four times during Spring and Summer (approximately every 3 weeks) and approximately two times during the Fall and Winter (approximately every 6 to 8 weeks). Based on an assumed annual C&D waste tonnage of 693 tonnes and waste density of 0.6 tonnes/m³, the annual volume consumed by waste is estimated to be approximately 1,155 m³ per year or an average of 3.2 m³ per day. Based on filling in 10 m by 10 m sections in 1.5 m lifts, this provides about 1.5 months of capacity before cover should be placed. The frequency of cover placement should be adjusted based on the quantity and characteristics of waste received.

The active face should be graded to achieve the smoothest surface possible before applying the cover to reduce material requirements. The maximum thickness of the cover should be no greater than 300 mm and a target thickness of 150 mm is recommended to conserve soil and maximize the waste to cover ratio.

The use of alternative daily covers (ADCs) may help reduce soil use and conserve airspace. The cost of using soil as cover is relatively low due to the proximity of the borrow pit adjacent to the landfill, however an economic analysis could be completed comparing the cost of using an ADC

compared to the current practice of using soil as cover, considering the estimated airspace savings, and considering the estimated soil in the current borrow pit and the amount of soil available in the borrow area further north of the landfill. The following alternative daily cover options may be applicable to Mackenzie Regional Select Waste Landfill.

6.6.1 Geosynthetic Covers

Geosynthetic covers are re-usable materials such as tarps or rubber belts. Suppliers can manufacture the covers with perimeter attachments used to anchor the cover over the active face surface. This is a common method that has been successfully implemented in several facilities across Canada. Photo 1 shows a geosynthetic daily cover used at the RDEFG's Foothill Boulevard Regional Landfill.



Photo 1 Alternative Daily Cover at the Foothills Blvd Landfill (Prince George)

Geosynthetic covers are deployed and removed each operating day, so there is no airspace consumption and no restriction to landfill gas and leachate flow. A benefit of geosynthetic covers is that they are reusable and can be deployed and removed relatively quickly. Disadvantages include difficulty deploying covers in adverse weather conditions (windy), employee exposure to waste and potential tearing of the material. Eventually they need to be replaced. Specialized deployment equipment can be purchased to improve safety and speed, however there are high capital and maintenance costs associated with this equipment.

Another form of ADC is steel plates which function using the same principle as geosynthetic covers. However, because the Mackenzie Landfill is only accepting relatively small quantities of C&D waste, the use of steel plates as ADC is considered cost prohibitive and would introduce additional complexity to the operations.

Ultimately, the choice of using alternative daily cover for active landfill faces should be based on the specific needs, regulations, and conditions of the landfill site.

6.7 Electric Fence and Wildlife Control

The perimeter of the landfill and transfer station is currently enclosed with an electric fence that has three access points. The three access gates are located as follows:

- First north gate used for transfer trucks to enter the transfer station building from the ground loadout bay level.
- Second north gate for users to enter and exit the facility.
- Third gate on the east side of the site that provides access to the borrow pit.

This electric fence was installed concurrently with the completion of construction of the transfer station at end of 2019, replacing an electric fence that was installed earlier in 1994.

In accordance with the OC, the electric fence must be operational during the period of April 15 to November 15 inclusive each year. If snow is present during this period, the OC requires that any electrified strands above snow line be isolated from the remainder of the system and energised. The electric fence was upgraded in 2022 to enable the fence to be fully energized regardless of the snowpack depth.

Further detail on routine maintenance tasks relating to the electric fence can be found in Section 6.8.

6.8 Routine Inspection Tasks

MH recommends the landfill operator conduct daily inspections that include the following tasks:

- In accordance with the OC, examine and maintain electric fencing during periods of activation to ensure it is sufficiently charged to deter wildlife, and there is no debris contacting the fence that may act as a ground.
- Maintain electric fencing with the aid of a grass trimmer to remove any tall grass from touching the electric fence during growing season.
- Verify correct segregation of waste and transfer improperly segregated wastes, as required.
- Ensure there are no leaks from special waste storage containers, or white goods with Ozone Depleting Substances (ODS).
- Examine and maintain signages around site and clean when dirty. Report any damage to RDFFG and repairs to be arranged as soon as possible.
- Ensure that spill kit containers are readily available and stocked. They are to be stored in an easily accessible location within the facility (i.e., the scale house).
- Inspect groundwater monitoring wells. Report any damage to RDFFG and repairs to be arranged as soon as possible.

MH recommends that surface water run-off is inspected during spring melt and as required by an environmental protection officer or qualified staff. At a minimum, these inspections should include observations of flow rate and direction, and facility impacts caused by run-off. This will assist in

preventing any potential water ponding spots around the landfill, thus reducing leachate production within the landfill area.

MH recommends the landfill operator conduct daily inspections that include the following tasks:

- In accordance with the OC, perform daily checks during the start of operational days on electric fencing voltage with a voltage meter and document the date and time of the checks. The voltage and amperage are to be recorded in the document and filed safely.
- Describe any wildlife observations on site, including the date and time spotted, in the same document mentioned above.
- General housekeeping to maintain the cleanliness of the site, such as, but not limited to, collecting plastic debris around the site, consolidating batteries & stack on pallets, maintaining Swap Shed cleanliness, and clear site office/recycling depot access.
- Consolidate hazardous waste area, and label & list quantities of hazardous waste.
- Inspect access road conditions at the beginning of each operational day. Report any damage to RDFFG and repairs to be arranged as soon as possible.

Maintenance may be required based on the deficiencies noted during weekly and daily inspections. Any deficiencies that have been addressed should be noted in the following inspection report. All maintenance, weekly and daily inspections should be recorded and kept on file.

6.9 Safety and Training Recommendations

MH recommends site operators and any personnel conducting work on site complete the following training:

- Basic first aid (Level 1)
- Workplace Hazardous Materials Information Systems (WHMIS)

Additionally, it is recommended that all operators and managers complete the following training as required under the OC:

- Solid Waste Association of North America's (SWANA's) Manager of Landfill Operations (MOLO) course, Landfill Operations Basics (LOB) course or similar

Operations staff should also receive training from the RDFFG on the following:

- Traffic management procedures;
- Waste handling procedures in the transfer station;
- Management of controlled wastes; and
- Electric fence operation.

6.10 Reporting and Record Keeping

The OC requires that all reports and drawings be submitted to the MOECCS in electronic format.

The daily and weekly routine inspection tasks recommended above should be recorded and kept on file (on-site and electronically).

Additional reporting required under the OC and Landfill Criteria includes the following:

- **Non-compliance reporting.** The RDFFG is required to notify the Regional Manager, Environmental Protection (BCMOECCS) immediately of any non-compliance with the requirements of the OC and take appropriate remedial action. Written follow-up of the non-compliance event is required to be provided to the MOECCS within 24 hours of the event.
- **Annual Operations Report.** The RDFFG is required to submit an Annual Report to the MOECCS on or before June 30 each year for the previous calendar year. As specified in the OC, the annual report should contain at a minimum the following for the reporting year:
 - Executive summary;
 - Types and tonnage of waste received, recycled, and landfilled;
 - Current topographic map/survey summarizing airspace consumption and on-site borrow pit development, including estimate of airspace utilization factor (effective compaction density);
 - Updated estimate of remaining capacity, closure date for current phase, and closure date for the current landfill footprint;
 - Any new information or proposed changes related to the DOCP or facilities;
 - Information related to Y&G waste collection and composting operations;
 - Occurrences or observations of wildlife at the facility;
 - Public complaints;
 - Statement regarding the facility's progress in reducing the regional solid waste stream, in accordance with the latest Solid Waste Management Plan (SWMP);
 - Results of all environmental monitoring specified in the OC and DOCP, including data interpretation and trend analysis by a QP.
- **Annual Environmental Monitoring Report.** The annual Environmental Monitoring Report should include the following:
 - Results of the environmental monitoring program in the reporting year;
 - Data tabulation, comparison to applicable performance criteria and water quality standards, interpretation, trend analysis, graphs;
 - Identification of any current or potential non-compliance with applicable standards; and
 - Conclusions, recommendations and proposed changes to the environmental monitoring program.

The reports summarized above should include relevant drawings, signed and sealed by the QP responsible for the report and/or drawings.

7. FIRE SAFETY, EMERGENCY RESPONSE PLAN AND CONTINGENCY PLAN

7.1 Fire Safety Plan & Emergency Response Plan

The most common causes of landfill fires include malfunctioning equipment, or disposal of burning or smoldering material. The spread of landfill fires is largely impacted by landfill operations, such as active face compaction, application of cover material and the types of landfilled material. Measures that should be taken to prevent landfill fires include:

- Placement of soil cover.
- Implementing progressive closure.
- Conducting regular inspections, including load inspections of incoming waste at the scales and general inspections of site.
- Separating recyclable material such as tires, white goods, wood and hazardous waste from the landfill active face.

Proper compaction and cover material application restrict oxygen supply to the cell and act as a fire break, reducing the risk of fire.

A fire safety and emergency response plan for the facility should be developed and maintained.

MH has prepared a fire safety and emergency response plan copy for staff in Appendix E. This plan must be reviewed and updated at least once annually. The plan includes landfill fire response procedures and relevant emergency contact information. Copies must be provided to the staff at visible, easy to reach and known storage places, ideally in the following locations:

- In the scale house building
- In the transfer station building
- In the staff vehicle

The Fire Safety and Emergency Response Plan must be submitted to the appropriate fire authorities and the responding fire departments initially and upon the completion of significant changes.

7.2 Contingency Plan

As defined in the Landfill Criteria, a Contingency Plan is required as part of the DOCP document. A Contingency Plan covers:

- Possible failure and non-compliance scenarios of the leachate and surface water infrastructure.
- Practical and implementable contingency measures to address any failure or non-compliance with the performance criteria.

If the RDFFG suddenly has to close the Mackenzie Regional Landfill either due to a non-compliance or in the event of a failure with the Site's performance criteria, the RDFFG will be sending the waste intended for disposal at the Mackenzie Regional Landfill to the Foothills Boulevard Regional Landfill. The Foothills Boulevard Regional Landfill is located south of Mackenzie and is accessible by Highway 97. The total haul time from the Mackenzie Regional Select Waste Landfill to the Foothills Boulevard Regional Landfill is estimated to be 5 to 6 hours roundtrip, including bin pick up and drop off.

The Mackenzie Regional Landfill has also been identified as a facility that can provide contingency disposal capacity in the event the Foothills Boulevard Regional Landfill cannot accept waste or in the event of an emergency and/or natural disaster requiring the disposal of a large amount of waste in a short period.

Non-compliance scenarios that could be identified during the recommended daily and weekly inspections include issues with the electric fence and failures of slopes and surface water management infrastructure. In the event of non-compliance scenarios, RDFFG staff will work with the landfill operator to address the non-compliance in a timely manner, with immediate priorities on safety and environmental protection. Non-compliance scenarios related to the environmental monitoring program would be identified in the annual environmental monitoring report and corrective actions and recommendations would be provided by the QP.

Reporting of non-compliance events should follow the required reporting procedures outlined in Section 6.10.

8. LANDFILL GAS GENERATION ASSESSMENT

Under the Landfill Gas Management Regulation, the owner or operator of a regulated landfill site must ensure that a landfill gas management facilities design plan is prepared for the landfill site if the landfill is estimated to generate 1,000 tonnes or more of methane in the calendar year immediately preceding the calendar year of the assessment.

Under the Landfill Gas Management Regulation, landfills with greater than 100,000 tonnes of waste in place must complete a landfill gas generation assessment. An initial landfill gas assessment was completed as part of the 1995 landfill Operations and Closure Plan (AGRA, 1995) which concluded a landfill gas recovery and management system was not required.

An updated landfill gas generation assessment was completed as part of the development of this DOCP. The BC MOECCS LFG Generation Estimate Tool was used. The calculation tool estimates the annual methane production in tonnes per year based on user inputs including the amount of waste in place, broken down to relatively inert, moderately decomposable, and decomposable waste. Methane generation rates and precipitation data are other input parameters used in the model, which is based on a first-order decay model.

The annual methane production was estimated since inception at year 1974 to 2023. Additionally, the tool also estimates methane production over the next 5 years.

Key assumptions included in the model are as follows:

- Start of landfilling in 1974 with a constant annual amount of 5,000 tonnes per year.
- Total waste in place in year preceding 2023 – 245,467 tonnes. Refer to Section 3.1.
- Breakdown of decomposability of waste (total 5000 tonnes per year) from 1974 to 2019:
 - 1,500 tonnes relatively inert (30%)
 - 1,500 tonnes moderately inert (30%)
 - 2,000 tonnes decomposable (40%)
- Waste composition from 2020 onwards assumed to be only inert waste at 1,000 tonnes per year.
- Gas production potential, L_0 :
 - Relatively inert = 20 m³ CH₄/tonne
 - Moderately decomposable = 120 m³ CH₄/tonne
 - Decomposable = 160 m³ CH₄/tonne
- Methane Generation Rate, k
 - Relatively inert = 0.02 year⁻¹
 - Moderately decomposable = 0.06 year⁻¹
 - Decomposable = 0.09 year⁻¹

The estimated methane production is shown in Figure 9 below. The methane generation is below the 1,000 tonnes BC regulatory threshold and the peak of methane production is estimated at 323

tonnes in the year of 2020, which is well below 1,000 tonnes of methane produced in each calendar year.

Environment and Climate Change Canada (ECCC) is developing regulations under the Canadian Environmental Protection Act to reduce methane emissions from MSW landfills. The proposed regulatory objectives identify a methane generation threshold of 664 tonnes that would trigger the requirement for an active landfill gas collection and control system (or field testing to demonstrate methane generation below this threshold). This ECCC threshold is shown on Figure 9 below as a reference.

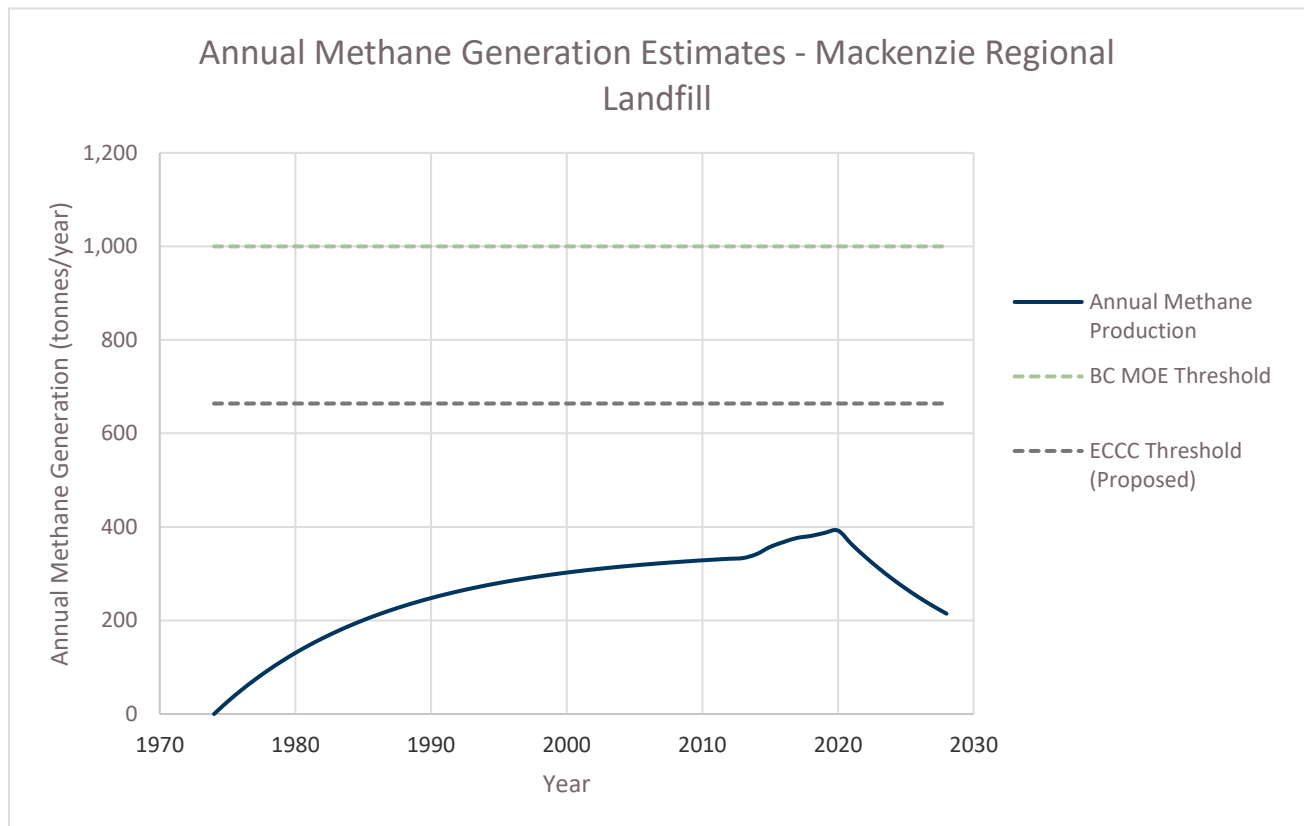


Figure 9: Annual Methane Generation Estimates – Mackenzie Regional Landfill

As shown in the graph above, the methane production peaked in 2020 at 392 tonnes. It is estimated to decrease significantly once the landfill transitioned to only accepting C&D waste (inert waste). Methane generation is expected to steadily decrease from year 2020 onwards due to only C&D waste being landfilled. LFG generation over the next five years is forecasted to drop significantly from 336 to 231 tonnes of methane annually from years 2022 to 2027, assuming a constant 1,000 tonnes of C&D waste landfilled per year.

The estimated methane gas generation is well below the BC MOECCS and proposed ECCC thresholds that would trigger the requirement to actively collect LFG at the Mackenzie Regional Landfill.

Assuming the landfill continues to only accept inert C&D at small quantities, the decreasing amount of methane generated at the Mackenzie Regional Landfill will reduce the environmental impacts and safety risks related to methane and fugitive emissions at the Site. Strategies to minimize methane generation through operational practices and the potential to reduce fugitive emissions through closure design are discussed in other sections of this report.

9. CLIMATE CHANGE CONSIDERATIONS

The effects of climate change on landfill closure activities have been considered at a high-level in this assessment.

9.1 Anticipated Future Climate

Climate change projections present a picture of the future weather patterns. The following are the changes to Mackenzie's weather anticipated over the next 50 years:

- Mean temperatures are predicted to increase for all seasons.
- Wetter throughout the year. Precipitation is predicted to increase for all seasons.
- The number of very hot days (Days where the maximum temperature exceeds 30°C) are predicted to increase.
- Fewer cold days.
- The number of very cold days (Days where the minimum temperature is below -30°C) are predicted to decrease.
- Length of Frost-Free season is predicted to increase.
- Much Longer Growing Season

The table below shows the anticipated changes to key climate patterns. Two time periods are presented; the 2050's are representative for landfills to be closed in the near future and the 2080's is applicable for landfills anticipated to be closed in 50 years time (applicable to the Mackenzie Regional Landfill).

Table 10: Anticipated Changes to Key Climate Patterns

Variable	Time Period (1976-2005)	Time Period (2021-2050)	Time Period (2051-2080)
Precipitation (mm) Annual	653	697	746
Mean Temperature (°C) Annual	0.7	2.7	4.7
Very Hot Days (+30 °C) (Days)	1	2	7

Very Cold Days (-30°C) (Days)	10	5	2
Frost Free Season (Days)	93	122	147

Climate forecasts for the Pine Pass region was used as the representative location for data selection. Data is derived using Representative Concentration Pathway (RCP) 8.5 High Emissions Scenario from The Climate Atlas of Canada.

There is very little risk for the Mackenzie Regional Select Waste Landfill to be affected by climate change in the next 50 years. However, to plan for climate change in the future, the RDFFG will have to implement strategies to mitigate any damages that may be due to the climate change. The strategies and considerations are further explained in the next section.

9.2 Consideration of Climate Change on Landfill Closure

The overall resilience of the project to climate change is relatively high. While there are some potential impacts to consider, such as increased precipitation affecting surface water management during closure and post closure, the proposed landfill closures appear relatively resilient when facing climate change.

A wetter and warmer climate will result in slightly increased methane and leachate production. However, this will not materially impact closure and post closure costs. The following considerations have been included in the closure and post closure cost estimates:

- Climate change could potentially modestly impact ditch sizing and cover system design for the sites. Specifically, this may necessitate the upsizing of ditches around the Mackenzie Regional Transfer Station and Select Waste Landfill, although it is not expected to significantly affect closure costs. This should be considered in the detailed design of the site closure.
- Surface water management will be more prevalent in the future with wetter climates and more precipitation annually. Better surface water management will reduce leachate infiltration at the landfill site, thus affecting the environment less. There is not expected to be a substantial increase in cost to maintain more resilient surface water management infrastructure such as larger ditches.
- Wildfire risk may increase as forest fires have been growing more intense in the past decade due to climate change. The landfill is now only accepting C&D waste, however landfill fires will continue to be a risk that needs to be managed. Proper landfilling operations will be more important, especially when it comes to placing daily cover and load inspections.
- Post closure maintenance costs may also be influenced by climate change. With a wetter climate, there may be an increased risk of erosion, which could lead to higher annual maintenance costs to repair the erosion issues. Post closure maintenance costs have been increased moderately to account for this.

The Mackenzie Regional Select Waste Landfill site faces specific climate change risks, including increased precipitation and intense wildfires. As part of the preparation of a detailed Closure Plan, MH recommends conducting a climate change risk assessment on closure activities. This assessment should include the associated costs, such as incorporating a budget allowance of approximately \$5,000 to \$10,000 specifically for addressing climate change impacts during the closure phase. By considering these potential impacts and allocating appropriate resources, the site closure can be more climate change resilient.

Overall, climate change is neither likely to significantly change closure planning nor affect closure costs severely. Minor adjustment to closure costs has been included to account for climate change effects on closure. Because this landfill is relatively small, remote and generally passive, the landfill appears to be relatively resilient to climate change.

9.3 Contingency Disposal due to Climate Change

The Mackenzie Regional Landfill is considered a contingency disposal facility in the event the region's primary disposal facility (the Foothills Boulevard Regional Landfill) becomes unavailable to accept waste or if additional disposal capacity is needed. This could be due to an extreme weather event caused by climate change.

This potential scenario was considered in this DOCP primarily through ensuring the final landfill contour design provides sufficient capacity based the current waste tonnages being received at the landfill but also by ensuring the landfill has additional capacity available to accept waste quantities greater than the forecasted amounts (refer to Section 3).

9.4 Opportunities for Emission Reductions Associated with Landfill Closure

Landfill closure presents significant opportunities for emissions reductions by reducing harmful greenhouse gasses released from decomposing waste. Final closures can reduce the rate of greenhouse gas production. With careful planning and timely landfill closure, it is possible to reduce the carbon footprint of the waste sites.

Greenhouse gas emissions associated with the closure of the site is primarily the landfill gas release from the sites after closure. There will also be emissions created by heavy equipment, transportation of soil and earthworks during closure. Finally, there will be minor emissions associated with post-closure monitoring and inspection travel.

The key means of emissions reduction during closure is the mitigation of methane gas. Maximizing the diversion of water from the landfill and exploring biocover opportunities can help oxidize methane to carbon dioxide and reduce methane release into the atmosphere. A biocover can greatly reduce the global warming potential of the landfill gas because carbon dioxide is a much less potent greenhouse gas than methane. Since this landfill site is considered too small for active gas flaring, alternative approaches such as biocovers should be considered. The cost and effectiveness of implementing biocovers should be reviewed as part of the development of a detailed Closure Plan. Furthermore, incorporating tree planting initiatives as part of site closure and

reclamation can also be another tool to remove carbon and contribute to emissions reduction efforts.

During closure activities themselves, there are generally limited opportunities for reducing the carbon emissions of the closure. However, there still are potential strategies to minimize emissions during this phase.

During closure, one approach is to focus on reducing emissions associated with heavy machinery and earthworks. This can be achieved through efficient design practices, such as conservative sizing, and incorporating specifications in tender documents that promote reduced fuel usage and minimize idling. Another consideration is the utilization of low carbon vehicles and equipment to further reduce emissions. Lastly, the use of locally sourced soils and/or organic materials can be a low carbon solution for closure activities.

The Mackenzie Regional Select Waste Landfill has been accepting concrete to be landfilled. However, the concrete is currently being stockpiled, away from the active face to the northeast of the landfill for temporary storage to be crushed and used for road use. MH supports the crushing of the concrete blocks to smaller pieces to be used as part of road construction.

10. ENVIRONMENTAL MONITORING PLAN

A preliminary Environmental Monitoring Plan (EMP) is provided in this section with consideration to the monitoring requirements in the Operational Certificate, the requirements specified in the landfill criteria, and the results from the groundwater monitoring program to date.

The EMP, including the applicable water quality criteria, should be reviewed and updated following the installation of additional groundwater monitoring wells along the property boundary and after a hydrogeological assessment has been completed.

10.1 Current Groundwater Monitoring Program

Three groundwater monitoring wells (TH-1, TH-2 and TH-3) were first installed at the site in 1994 as part of the development of the original interim operations plan (Agra, 1995). TH-1 was destroyed by equipment around 2001. Two additional groundwater monitoring wells (TH-4 and TH-5) were added in 2012. Until Spring 2019, the long-term monitoring program consisted of four groundwater monitoring wells located along the southern, eastern, and southwestern perimeters of the landfill. In July 2019, an additional background monitoring well (TH-6) was installed on the northern portion of the landfill to replace the previously destroyed TH-1. Groundwater monitoring is currently completed twice per year, in accordance with the Operational Certificate.

There is currently two upgradient monitoring wells (TH-3 and TH-4), two down gradient monitoring wells (TH-2 and TH-5), and one cross gradient well (TH-6). The groundwater well locations are shown on Figure 2. Based on the Spring and Fall 2022 groundwater elevations, it is inferred that there is a strong west/southwest gradient in the groundwater flow direction. This is found to be consistent with previous interpretations of groundwater flow direction in the preceding years.

10.1.1 Water Use and Potential Receptors

The Landfill Criteria recommends identifying current and planned future uses of groundwater and surface water within 1 km of the landfill footprint. As identified in the 2022 Annual Groundwater Monitoring Report (SNC-Lavalin, 2023), the closest water wells are located approximately 1.3 km northwest of the landfill.

According to SNC-Lavalin, based on review of the MOECC Strategy Protocol 21, Water Use Determination, the site-specific factor “groundwater used for drinking water” is considered applicable in the 2023 reporting year. Additionally, the landfill is located approximately 300 m northwest of two lakes, Tom and Eunice Lakes.

However, the drinking water wells are farther than 1 km northwest of the site and it is considered unlikely that the landfill will affect those well’s water quality considering both the distance and the fact that they are cross-gradient from the landfill. The two nearby lakes (Tom and Eunice) appear to be upgradient of the landfill and thus also are unlikely to be affected. The most likely receptor is the wetland complex approximately 900 m west of the site, across the highway.

MH recommends reassessing the potential receptors and current and planned future uses of groundwater and surface water as part of a Hydrogeological Assessment for the site. The Hydrogeological Assessment should include hydraulic conductivity testing to assess the applicability of the CSR Drinking Water standards.

10.1.2 Applicable Water Quality Standards

Because Tom and Eunice Lakes are located approximately 300 m south of the landfill, the 2022 Annual Groundwater Monitoring Report (SNC-Lavalin, 2022) concludes the applicable groundwater standards for the landfill are the CSR Drinking Water (DW) and Aquatic Life (AW) standards for groundwater discharging to surface water used by freshwater aquatic life at the landfill.

MH recommends continuing to apply the CSR Drinking Water (DW) and Aquatic Life (AW) standards until a Hydrogeological Assessment is completed. As noted above, the two lakes (Tom and Eunice) appear to be upgradient of the landfill and therefore unlikely to be affected. The Hydrogeological Assessment should include an assessment of hydraulic gradient and flow direction with consideration to nearby receptors. The applicable water quality standards should be reassessed as part of the Hydrogeological Assessment.

10.1.3 Recommended Groundwater Monitoring Plan

The groundwater monitoring plan recommended in this section is considered preliminary and should be reviewed as part of the Hydrogeological Assessment.

Groundwater quality monitoring should be continued at the Site twice per year. The samples should be collected once in the spring and once in the late summer to assess seasonal variability in water levels and water quality.

Water levels should be recorded and samples should be analyzed for the parameters shown in Table 11.

Table 11: Recommended List of Landfill Monitoring Parameters

Analysis	Rationale	Minimum List of Parameters	
Dissolved Metals²	Major cations in groundwater and indicators of potential landfill operation related impacts. <i>NOTE: field filtration with 0.45 um filter to remove sediment required. Samples must be preserved after filtration.</i>	■ Arsenic ■ Cadmium ■ Cobalt ■ Copper ■ Calcium ■ Iron	■ Lead ■ Magnesium ■ Manganese ■ Potassium ■ Selenium ■ Sodium
General Chemistry	Primary indicators of potential landfill related impacts. Includes major anions. <i>NOTE: all groundwater should be field filtered unless noted otherwise</i>	■ Ammonia ■ Alkalinity ■ Hardness ■ Chloride ■ Laboratory pH	■ Laboratory conductivity ■ Sulphate ■ Nitrate ■ Nitrite
Field Measurements	Important observations of physical conditions. Also, some parameters change with time and must be measured immediately. <i>NOTE: all field equipment must be adequately decontaminated between sampling location to prevent cross-contamination</i>	■ Water level/depth to water ■ pH	■ Temperature ■ Conductivity
Other Parameters	Miscellaneous other parameters related to human impacts.	■ Dissolved Organic Carbon (DOC) (unfiltered)	■ LEPH/HEPH (including PAH)

MH recommends monitoring hydrocarbons (LEPH/HEPH + VOCs) twice a year for 2 years. If there are no significant detections of hydrocarbons, the monitoring frequency can be reduced to once every 3 to 5 years.

10.2 Current Surface Water Monitoring

Surface water is currently not being monitored at the landfill site. However the Operational Certificate indicates that the surface water at the property must not exceed concentrations set in the BC Approved Water Quality Guidelines and Working Quality Guidelines.

Considering the landfill is only accepting inert C&D waste, the contributions from surface water from the landfill site to existing bodies of water within a 1 km radius of the landfill is considered low.

² Most analytical laboratories provide packages for these parameters. Ensure that the minimum parameters list is included in the selected analytical package.

A long-term surface water monitoring plan has historically not been considered warranted (AGRA, 1995). However, the need for a long-term surface water monitoring plan should be considered in developing the work plan for the Hydrogeological Assessment. This could include a one-time surface water sampling event from nearby surface water bodies or at the ditch discharge locations off-site on the south side of the property to assess potential impacts to surface water. The results would determine the need to incorporate surface water quality monitoring in the EMP.

10.3 Groundwater Quality

This section provides a summary of groundwater quality results based on a cursory review of available annual groundwater monitoring reports (SNC 2023, 2021, 2020, 2019, AMEC 2010).

There are two background sampling locations, namely TH-4 and TH-3, upgradient of the landfill, with the groundwater flow direction being west/southwestward beneath the landfill. Background samples provide a reference point that indicates the natural groundwater quality outside the potential zone of influence from the landfill.

Background samples from TH-4 and TH-3 showed consistent results of low levels of chloride (<0.5 to 4 mg/L), which is typically used as a leachate indicator for any MSW landfill site. TH-2 and TH-5, on the other hand, showed higher elevations of chloride concentrations (between 7 and 40 mg/L) and extremely high ammonia (greater than 10000 ug/L) as both are located downgradient of the landfill. TH-6, however, is a new well that was installed in 2019 to the north of the landfill and indicates low levels of chloride concentrations, indicating that the groundwater at TH-6 location is not affected by the landfill.

The groundwater quality data showed that there are elevated levels of dissolved lithium at certain wells, namely TH-2, TH-3, TH-4, and TH-5. Dissolved lithium concentrations were found to be elevated since 2016 and is found in both the upgradient and downgradient wells. Because it is found in the background wells, the elevated lithium concentrations are not likely related to landfill operations.

Concentrations of dissolved Arsenic, Barium, Cobalt, and Copper exceed the Contaminated Site Regulation Drinking Water Standard in the downgradient wells. Thus, these metal concentrations are likely waste management related.

Ammonia is the key contaminant of concern at MSW landfills. The upgradient wells (TH 3 & 4) have ammonia ranging from less than 5 µg/L in TH 4 to up to 180 µg/L at highest (in 2021 and 2022) in TH 3. Concentrations of ammonia at downgradient wells (TH-2 and TH-5) are consistently high, ranging from 8,620 µg/L (between pH 8.0 to 8.5) to 21,800 µg/L (for less than pH 7.0) and exceed the Aquatic Life standards. The nearest receptor is the wetland complex 900 m west of the site.

Based on slightly elevated ammonia and chloride concentrations at TH-3, there may be some historical effects from cross-gradient flow/run off at TH-3, however the effects are significantly lower than the downgradient impacted wells (TH-2 and TH-5).

To assess the potential offsite impacts, it is recommended that a set of three monitoring wells be installed along the downgradient property boundary to assess groundwater quality leaving the site. Information from these wells should be used to prepare a Hydrogeological Assessment for the site, including consideration of potential environmental receptors of concern. These wells should be

added to the routine monitoring program to assess site impacts on groundwater at the property boundary with consideration to the applicable standards.

10.4 Post-Closure Environmental Monitoring and Maintenance

As per the BC Landfill Criteria, post-closure monitoring is required for a minimum period of 30 years after final landfill closure, which is considered the minimum contaminating lifespan of the landfill. As part of the detailed Closure Plan, the contaminating lifespan of the landfill should be determined using the latest updated environmental monitoring information.

Post-closure operation and maintenance activities should also be included in the detailed Closure Plan.

As summarized in the BC Landfill Criteria, the post-closure operation and maintenance program includes, but is not limited to:

- Maintenance of the final cover including vegetation and repair of damage due to erosion, leachate breakouts, slope failures, settlement, and burrowing animals.
- Operation and maintenance of surface water management works, including repairs due to settlement.
- General site maintenance including maintenance of access roads and fencing.
- Operation and maintenance of landfill gas management facilities (passive venting pipes), including repairs to infrastructure damage by settlement.
- An environmental monitoring program to be carried out during the contaminating lifespan (a minimum of 30 years after final closure).
- Practical and implementable contingency measures to address any failure of the works or non-compliance with the performance criteria.

Groundwater monitoring should continue into the post-closure as outlined in Section 10.1. It is likely that the bi-annual environmental monitoring will be required for at least 10 years, after which monitoring frequency can be reduced. Environmental monitoring program reductions may be determined by the MOECCS.

MH recommends completing general maintenance inspections on a bi-annual basis for the first three years of the post-closure period. After three years the inspection frequency should be reassessed based on the inspection results and revegetation of the site, unless otherwise required under future permits or requirements set out by the MOECCS.

Annual reports documenting the general maintenance inspections and environmental monitoring results are to be prepared and submitted to the MOECCS.

10.5 Landfill Gas Monitoring

It is understood that landfill gas (LFG) has not been monitored at the Mackenzie Regional Landfill. Based on the current annual landfilled tonnages and the characteristics of the landfilled waste (inert C&D waste), LFG generation is relatively low and expected to decrease in the future.

The Mackenzie Regional Landfill is located on highly permeable granular soils and there is currently no known continuous low permeable layer that would encourage lateral landfill gas movement. Once final cover is placed on the landfill, the risk of lateral gas migration increases as the low permeability cover encourages landfill gas to move laterally, unless passive landfill gas wells are installed.

Enclosed spaces are potentially at risk of landfill gas migration. With the recent construction of the transfer building, scale house, and share shed these buildings are potentially at risk of landfill gas migration. However, it is understood all buildings are constructed at grade with concrete slabs with no basements therefore the risk is considered low. To assess potential lateral LFG migration, it is recommended that a one-time landfill gas migration monitoring event is conducted along the toe of the slope at the west face of the landfill, adjacent to the transfer building. Soil vapour probes should be installed and monitored for any indications of lateral LFG movement.

The on-site scale house, transfer building and other enclosed buildings should be equipped with methane gas sensors that notify occupants when methane concentrations reaches 20 percent of the lower explosive limit of methane (1% by volume).

Landfill gas monitoring should be conducted for three years following landfill closure. If soil vapour sampling indicates LFG is within acceptable concentrations for the duration of the monitoring period, landfill gas monitoring will not be required after three years. However, a new landfill gas monitoring plan will be required if gas emission exceedances are encountered in the three year monitoring period following landfill closure.

11. CONTAMINATING LIFESPAN

Contaminating lifespan means the period of time during which the landfilled waste has the potential to produce effluent or air contaminants, as defined in the Environmental Management Act, including at least 30 years after installation of final cover over the entire landfill footprint. At a minimum, the contaminating lifespan is assumed to be at least 30 years when determining the requirements for post-closure operation and maintenance and the amount of financial security required for the landfill site.

As outlined in Section 3.1, the estimated waste in place as of 2023 is roughly 251,000 tonnes. Assuming filling continues in the primary landfill disposal area as outlined in this DOCP, an additional 55,000 tonnes of waste will be placed over the next 59 years for a total of 306,000 tonnes of waste in place when filled to the design capacity. This does not include additional waste placed in the contingency disposal area.

According to the Landfill Criteria, under Section 8.3 Post-Closure Period, because the landfill has more than 100,000 tonnes of MSW in place but less than 1,000,000 tonnes of MSW in place, a contaminating lifespan of 100 years is recommended in the absence of an assessment of the contaminating lifespan by a QP.

MH recommends that a technical analysis of the expected contaminating lifespan be completed by a QP as part of the Hydrogeological Assessment. Factors that should be considered as part of the assessment include trends in groundwater quality and the projected waste quantities expected to be landfilled in the future. The amount of waste landfilled over the next 59 years is expected to be significantly less than historical waste tonnages. Furthermore, the characteristics of the waste (relatively inert C&D waste) is expected to be different than the characteristics of historical waste (MSW). These factors should be considered in the assessment and determination of the contaminating lifespan.

12. RECOMMENDATIONS

Based on the findings from MH's site visit in August 2023, review of current operations and as a part of the development of this DOCP, recommended projects to support site development and closure, and recommendations to address current operational challenges are provided below:

- The existing operational certificate 100206 (issued March 4, 2009) has not been updated since the Mackenzie Regional Landfill transitioned to only accepting C&D waste in 2019 and does not reflect the current facility operations or the new transfer station facilities. MH recommends that the RDFFG consider applying for an amendment to the OC to reflect the changes to facility operations, including an update to the types of waste materials accepted for transfer and disposal at the site. The updated OC should reference the latest DOCP, including any contingency disposal plans specified in the DOCP.
- The final contour landfill is designed within the primary disposal area to minimize the footprint in which future waste is placed. To minimize future closure costs and landfill liability, landfilling should not extend beyond the primary landfill disposal area.
- To conserve soil from the borrow area, the current practice of applying cover three to four times during Spring and Summer (approximately every 3 weeks) and approximately two times during the Fall and Winter (approximately every 6 to 8 weeks) should continue. Because the landfill is only accepting C&D waste, cover can be applied less frequently however it is recommended that the size of the active face be a maximum of 10 m by 10 m to minimize leachate generation and potential operational issues such as wind blown litter and vectors.
- A comparison of soil consumption from the borrow pit suggests some of the soil use over the last three years has been related to projects at the landfill such as road construction not related to landfill cover. MH recommends using the soil sparingly for covering waste as needed and only for construction projects authorized by the RDFFG. A minimum waste to soil cover ratio (by volume) of 3:1 is recommended. To assess the landfill contractor's soil usage, we recommend developing a methodology to track the amount of soil used for cover during the reporting year. Annual surveys of the borrow area provides information on the total soil used at the site however more detailed tracking is required as the contractor uses soil for other projects including road construction.
- When placing cover, the operations contractor should be targeting a soil cover thickness of 150 mm and no greater than 300 mm for intermediate cover.
- To reduce closure costs, MH recommends that yard and garden waste continue to be collected, stockpiled and chipped. Before filling in Phase 4 starts, options to use the material should be assessed including potentially blending the material to be used for progressive closure of final landfill slopes.
- To reduce leachate generation and to spread the closure cost over the life of the landfill, MH recommends placing final cover on finished side slopes along the west and south sides of the landfill and as each Phase is completed. Progressive closure could be considered at the start of Phase 4 in approximately 12 years when side slopes have reached design grades on all sides of the landfill and utilizing and/or relocating the yard waste/compost piles will need to be considered.

- Though this DOCP includes the required elements of a closure plan, MH recommends a separate detailed Closure Plan be developed closer to anticipated closure date. Progressive closure of the primary landfill disposal area may be initiated at the end of Phase 3 in approximately 15 years based on the current fill rate.
- It is recommended that all operators and managers responsible for overseeing or working at the Site complete the Solid Waste Association of North America's (SWANA's) Manager of Landfill Operations (MOLO) course and/or Landfill Operations Basics (LOB) course or similar. Training should be renewed at least once every five years.
- It is understood that landfill gas (LFG) has not been monitored at the Mackenzie Regional Landfill. Enclosed spaces are potentially at risk of landfill gas migration. Therefore, it is recommended that landfill gas migration monitoring is conducted along the toe of the slope along the west side of the landfill, adjacent to the transfer station and scale house. Soil vapour probes should be installed and monitored for any indications of lateral LFG movement.
- Groundwater quality at the west license of occupation boundary needs to be determined. To assess the potential offsite impacts, it is recommended that a set of three monitoring wells be installed along the downgradient (west) property boundary to assess groundwater quality leaving the site. Once property-line groundwater monitoring wells are established, a Hydrogeological Assessment should be completed to evaluate potential for off-site water quality effects.
- Since filling is not planned in the historic landfill area, MH recommends that closure planning be initiated with the objective to close the historic landfill area within the next five years. Benefits to closing this area include a reduction in the landfill liability and a reduction in leachate generation.
- To inform closure planning and refine closure cost estimates, the quantity and quality of the soil available in the clay borrow area should be assessed. The hydraulic conductivity should be compared to the minimum requirements as outlined in this DOCP. The quantity of available clay should also be compared to the amount required for closure (estimated in this DOCP).
- While the amount of waste landfilled at the site has significantly decreased since 2019, the transition to a C&D waste landfill may introduce additional fire risks. C&D landfills are generally considered to be at a higher risk of landfill fires, due to the nature of the material (low moisture content and highly combustible). A preliminary Fire Safety Plan & Emergency Response Plan is included in this DOCP however the plan should be reviewed with RDEFG staff and the landfill operations contractor to ensure the fire risks and prevention measures are understood, and input from all parties is incorporated into the Plans.
- To increase waste diversion at the facility, opportunities to divert and beneficially use C&D materials that are currently being landfilled should be explored. It is understood that concrete is currently being diverted and used in landfill operations. Opportunities to divert other materials such as clean wood waste and asphalt should be explored with a focus on beneficial use options at the landfill or within the community.

- This DOCP should be reviewed and updated as needed at least once every five years with a focus on key assumptions such as fill rates and waste density calculations, airspace consumption, soil usage and lifespan projections.

13. REFERENCES

- Agra Earth & Environmental, 1995. The Mackenzie Landfill Operations and Closure Plan.
- AMEC Earth & Environmental, May 18, 2011. 2010 Annual Groundwater Monitoring Report Mackenzie Regional Landfill.
- BC Ministry of Environment and Climate Change, June 2016. Landfill Criteria for Municipal Solid Waste.
- Dillon Consulting, August 8, 2022. 2022 Volume Assessment – Mackenzie Regional Landfill.
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- McElhanney, December 10, 2018. Geotechnical Assessment for the Proposed Mackenzie Transfer Station
- MWA Environmental Consultants Ltd & XCG Consultants Ltd., 2015. 2015 Regional Solid Waste Management Plan.
- Prairie Climate Centre (2019). Climate Atlas of Canada, version 2 (July 10, 2019).
<https://climateatlas.ca>
- Regional District of Fraser-Fort George, 2022. Mackenzie Regional Landfill 2021 Annual Report.
- Regional District of Fraser-Fort George, 2021. Mackenzie Regional Landfill 2020 Annual Report.
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- SNC-Lavalin, March 17, 2023. 2021 Annual Groundwater Monitoring Report.
- SNC-Lavalin, April 13, 2021. 2020 Annual Groundwater Monitoring Report.
- SNC-Lavalin, March 30, 2020. 2019 Annual Groundwater Monitoring Report.
- SNC-Lavalin, May 9, 2019. 2018 Annual Groundwater Monitoring Report.
- Tetra Tech, June 15, 2021. Regional District of Fraser-Fort George 2021 Landfill Airspace Volume Assessment – Mackenzie Regional Landfill Technical Memo.
- Tri Environmental Consulting Inc., July 31, 2018. 2018 Waste Characterization Study, Regional District of Fraser-Fort George.

14. CLOSURE

The Regional District of Fraser-Fort George retained Morrison Hershfield to conduct the work described in this report, and this report has been prepared solely for this purpose.

This document, the information it contains, the information and basis on which it relies, and factors associated with implementation of suggestions contained in this report are subject to changes that are beyond the control of the author. The information provided by others is believed to be accurate and may not have been verified.

Morrison Hershfield does not accept responsibility for the use of this report for any purpose other than that stated above and does not accept responsibility to any third party for the use, in whole or in part, of the contents of this document. This report should be understood in its entirety, since sections taken out of context could lead to misinterpretation.

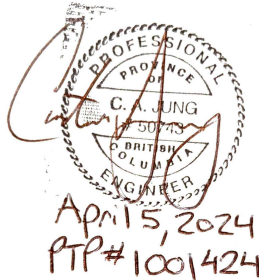
We trust the information presented in this report meets Client's requirements. If you have any questions or need addition details, please do not hesitate to contact one of the undersigned.

Morrison Hershfield Limited

Prepared by:



Curtis Jung, P.Eng.
Solid Waste Engineer
cjung@morrisonhershfield.com



Forest Pearson, P.Eng.
Geological Engineer
FPearson@morrisonhershfield.com

Reviewed By:



Derek Stevens, P.Eng.
Senior Waste Engineer
DStevens@morrisonhershfield.com

APPENDIX A: Operational Certificate #100206, issued March 4, 2009



MINISTRY OF ENVIRONMENT

OPERATIONAL CERTIFICATE

100206

*Under the Provisions of the Environmental Management Act
and in accordance with the
Regional District of Fraser-Fort George
Solid Waste Management Plan*

Regional District of Fraser-Fort George

155 George Street

Prince George, British Columbia

V2L 1P8

is authorised to manage recyclable material and municipal solid waste at a sanitary landfill located 4.2 km south of Mackenzie, British Columbia, subject to the conditions listed below. Contravention of any of these conditions is a violation of the *Environmental Management Act* and may result in prosecution.

1. LOCATION OF AUTHORISED FACILITY

The location of the facility for the management of recyclable material and municipal solid wastes to which this Operational Certificate is applicable is the Mackenzie Regional Landfill, covering all unsurveyed Crown Land in the vicinity of District Lot 3458, Cariboo District, containing 16.73 hectares, more or less. The Crown Licence of Occupation for the site is #705356.

2. ENTRANCE FACILITIES

The authorised facility includes recyclable material and municipal solid waste drop-off facilities, weigh scales and related appurtenances approximately as shown on attached Site Plan A.

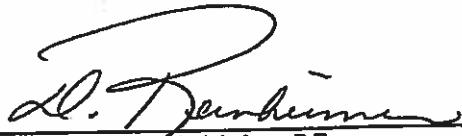
3. MANAGEMENT OF MUNICIPAL SOLID WASTE

3.1. Sanitary Landfill

3.1.1. The authorised facilities are a sanitary landfill area, recyclable material storage areas and related appurtenances approximately as shown on the attached Site Plan. The site reference number for the discharge is E211576.

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for Director, Environmental Management Act

- 3.1.2. The characteristics of the discharge must be municipal solid waste as defined under the *Environmental Management Act* and other wastes as approved in writing by the Director.
- 3.1.3. Waste may be discharged to the areas specified in the Regional District's Design and Operation Plan, approximately located as shown on attached Site Plan A.

4. **GENERAL REQUIREMENTS**

4.1. **Qualified Professionals**

All facilities and information, including works, plans, assessments, investigations, surveys, programs and reports, must be certified by qualified professionals.

4.2. **Plans**

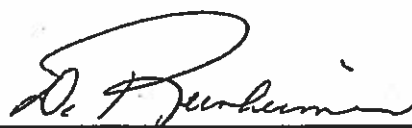
- 4.2.1. The Regional District shall prepare a Design and Operation Plan that will include considerations for site operation, development and closure, leachate and landfill gas management, composting operations, monitoring programs and environmental impact mitigation management.

The Design and Operation Plan must be submitted to the Director by May 15, 2009.

- 4.2.2. The Design and Operation Plan must address, but not be limited to, each of the subsections in the *Landfill Criteria for Municipal Solid Waste* including performance, siting, design, operational and closure and post-closure criteria.
- 4.2.3. The facilities must be developed and operated in accordance with the Design and Operation Plan.
- 4.2.4. Any updates to the plan shall be immediately submitted to the Director.

4.3. **Additional Facilities or Works**

The Director may require investigations, surveys, and the construction of additional facilities or works. The Director may also amend information requirements of this Operational Certificate including plans, programs, assessments and reports.



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5. OPERATIONAL REQUIREMENTS

5.1. Non-Compliance Reporting

The Regional District shall immediately notify the Regional Manager, Environmental Protection, or designate by facsimile (250-565-6629) of any non-compliance with the requirements of this Operational Certificate and take appropriate remedial action.

Written confirmation of all non-compliance events, including available test results, is required by facsimile within 24 hours of the original notification unless otherwise directed by the Regional Manager, Environmental Protection.

5.2. Operator Training and Development

At a minimum, the Regional District will ensure that operating personnel are trained to industry standards and current in a SWANA recognized landfill operator course or equivalent.

5.3. Electric Fencing

Areas where putrescible materials are stored or discharged shall be surrounded by an electric fence.

5.3.1. Design, Construction and Maintenance

The electric fencing shall be designed, constructed, and maintained such that bears are prevented from penetrating the fence. The Director shall be advised of any modifications to the fence.

5.3.2. Operating Period

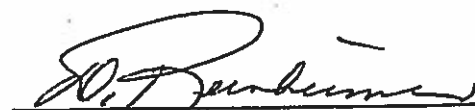
The electric fence shall be fully operational during the period of April 15 to November 15 inclusive each year. If snow is present during this period, any electrified strands above snow line shall be isolated from the remainder of the system and energised. The Director may vary the operating period with prior written authorisation.

5.3.3. Record Keeping and Reporting

The Regional District is required to monitor wildlife (medium and large carnivores) activity at the facility and keep records of occurrences and observations of wildlife (medium and large carnivores).

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5.4. Compost

Composting facilities shall be operated and maintained in accordance with the *Organic Matter Recycling Regulation*.

5.5. Landfill Gas

Landfill gas shall be managed in accordance with the *Landfill Gas Management Regulation*.

5.6. Leachate

The characteristics of the surface water and groundwater at the property boundary must not exceed concentrations set in the *British Columbia Approved Water Quality Guidelines (Criteria)* and *A Compendium of Working Water Quality Guidelines for British Columbia*. Where natural background water quality concentrations exceed the aforementioned guidelines, characteristics of the surface water and groundwater at the property boundary must not exceed background concentrations.

6. HAZARDOUS WASTE MANAGEMENT

6.1. Hazardous Waste

"Hazardous Wastes" as defined by the *Hazardous Waste Regulation* pursuant to the *Environmental Management Act* are prohibited from disposal unless expressly authorised by the *Hazardous Waste Regulation*, approved by the Director or as specified in the Operational Certificate.

6.2. Waste Asbestos

Waste asbestos is authorized for disposal subject to compliance with the requirements of section 40 of the *Hazardous Waste Regulation* and the following conditions:

- 6.2.1. The asbestos waste may not be mixed with any other hazardous waste.
- 6.2.2. The Regional District must approve the disposal before disposal takes place.
- 6.2.3. All other applicable requirements of the *Hazardous Waste Regulation*, including but limited to manifesting and waste record keeping, must also be complied with.

6.3. Handling of Impacted Soil

The *Environmental Management Act*, the *Contaminated Sites Regulation* and the *Hazardous Waste Regulation* are applicable for the disposal of impacted (contaminated) soil at the facility.

6.4. Hazardous Wastes from Accidental Spills or Abandonment

Hazardous wastes resulting from accidental spills or abandonment of dangerous goods may be accepted at the facility only under the authority of Section 52(1) of the *Hazardous Waste Regulation*.

7. MONITORING

7.1. Monitoring Program

7.1.1. A monitoring program shall be developed by a qualified professional to identify potential impacts to the environment and public health from the facility.

7.1.2. The monitoring program shall be submitted as part of the Design and Operation Plan.

7.1.3. The monitoring program must address, but not be limited to, subsections 4.1, 4.2 and 7.15 of the *Landfill Criteria for Municipal Solid Waste* and the *Guidelines for Environmental Monitoring at Municipal Solid Landfills*.

7.1.4. Monitoring must be conducted in accordance with the monitoring program.

8. REPORTING

All reports and drawings shall be submitted in electronic format unless otherwise requested by the Director.

8.1. Drawings

All drawings shall be certified correct and sealed by a qualified professional. Drawings shall be submitted to the Director within 30 days of completion or as otherwise specified by the Director.

8.2. Annual Report

The Regional District shall submit an Annual Report to the Director on or before June 30 each year for the previous calendar year.

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The report shall contain, but not be limited to the following information:

- i.) an executive summary;
- ii.) the type and tonnage of waste received, recycled and landfilled for the year;
- iii.) a current topographic map detailing airspace consumption, on-site borrow pit changes and future developments;
- iv.) updated estimates for the remaining capacity, closure date for the current phase and closure date for the current landfill footprint;
- v.) any new information or proposed changes relating to the facilities and Design and Operation Plan;
- vi.) composting operation activity including amount of material received for composting, material composted, material sold and number of composting cycles;
- vii.) occurrences or observations of wildlife (medium and large carnivores) at the facility;
- viii.) a statement regarding the facility's progress in reducing the regional solid waste stream, in accordance with the hierarchy of reduce, reuse and recycle principles; and,
- ix.) the results of all monitoring programs as specified in this Operational Certificate. Data interpretation and comparison to the performance criteria in the *Landfill Criteria for Municipal Solid Waste* and the *Guidelines for Environmental Monitoring and Municipal Solid Waste Landfills*. Trend analysis, as well as an evaluation of the impacts of the discharges on the receiving environment in the previous year shall be carried out by a qualified professional.

9. CLOSURE PLAN

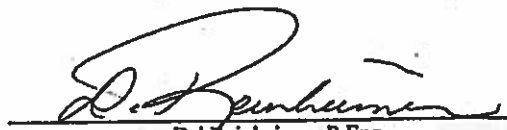
At least one year in advance of decommissioning the landfill, or as otherwise specified by the Director, a Closure Plan shall be submitted which includes at least the following information:

- i) a topographic plan showing the final elevations contours of the landfill and surface water diversion and drainage controls;
- ii) specifications for the final cap and proposed end use of the site; and,

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- iii) provisions for a minimum 25 year post-closure care period at the facility which, at a minimum, considers the following: groundwater monitoring, surface water monitoring, landfill gas management, erosion and settlement monitoring and management.

10. CLOSURE AND POST-CLOSURE FUND

The Regional District will conform to the Public Sector Accounting and Auditing Board's requirements (PS 3270) to recognize solid waste landfill closure and post-closure liability. The Regional District will develop a plan to ensure that sufficient funds are available for closure and post-closure care work.

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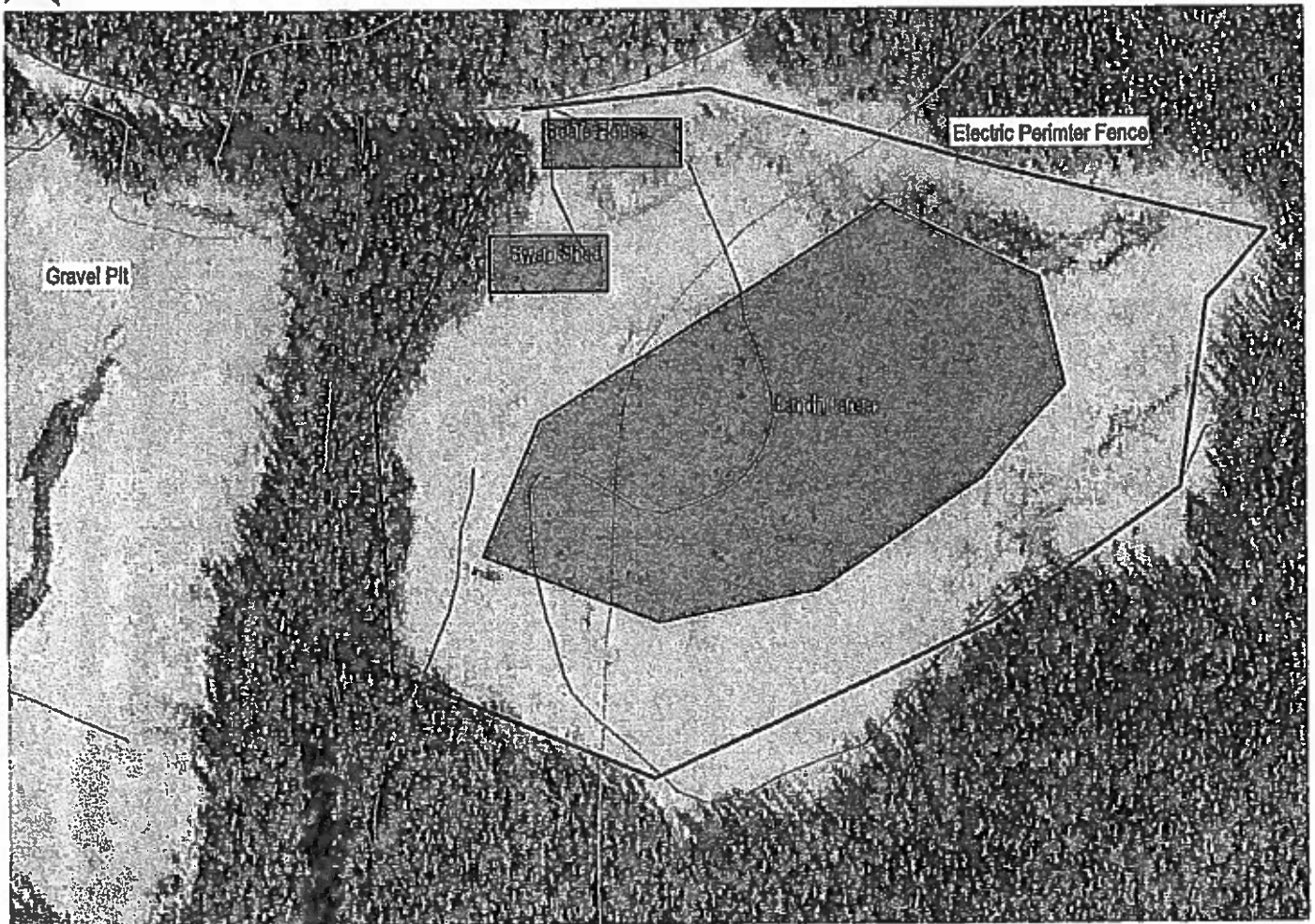
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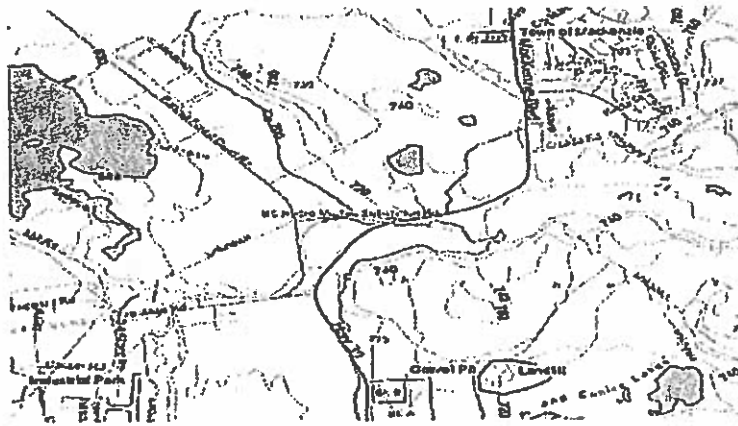
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SITE PLAN A



Location Map



Not to Scale

Operational Certificate 100206

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Omineca and Peace Regions

APPENDIX B: Geotechnical Assessment for the Proposed Mackenzie Transfer Station





To

Mr. Mircea Cvaci

Sperling Hansen Associates

From

Melissa Chappel Ph.D., P.Eng.

On Behalf of

McElhanney Consulting Services Ltd.

MCSL Branch

Prince George

Re

Geotechnical Assessment for the Proposed Mackenzie Transfer Station

Date

December 10, 2018

File Number

2341-02565-00

1. INTRODUCTION

McElhanney Consulting Services Ltd. (McElhanney) is pleased to submit this technical memorandum report to Sperling Hansen Associates (the Client) summarizing the geotechnical assessment and recommendations for the proposed Mackenzie Transfer Station located near Mackenzie, BC.

Authorization to proceed was provided by the final client, Ms. Petra Wildauer of the Regional District of Fraser-Fort George via Mr. Cvaci, via email on September 4, 2018. This letter report is subject to the appended Statement of Limitations – Geotechnical Services.

In conducting the geotechnical assessment and submitting this report, McElhanney has:

- Completed a desktop review of publicly available data including surficial geology, bedrock, water resources, seismic hazard, GIS, etc.;
- Conducted a site visit assessment to observe the general site conditions including equipment access;
- Performed a field assessment including thirteen (13) boreholes;
- Completed a laboratory testing on select soil samples; and,
- Prepared this report summarizing the results of the geotechnical assessment and preliminary geotechnical recommendations for the design and construction of the proposed development.

2. SITE DESCRIPTION

The proposed transfer station “the Site” will be located adjacent to the west side of the existing Mackenzie landfill. The landfill which is operated by the Regional District of Fraser-Fort George (RDFFG) is located approximately 3 km south of Mackenzie on Dump Road on RDFFG land previously used as a gravel pit. The landfill receives used oil, oil filters and containers, antifreeze, lead acid batteries, and household batteries. In addition to large quantities of yard and garden waste as well as scrap metal, demolition, land clearing and construction (DLC) waste. The Site is confined by steep sand and gravel slopes to the south and west, the landfill to the east, and Dump Road to the north (Figure 1).



Figure 1- Site Overview (Google Earth image, 2018)

3. SOIL AND GROUNDWATER CONDITIONS

Historically the geology on the east side of the south end of Williston Lake is glacial drift overlying bedrock, consisting of gravel, sand and silt.

The geotechnical field assessment was carried out on September 17, 2018, and comprised thirteen (13) boreholes, with locations depicted in the site plan found in Attachment A. The boreholes were drilled by Geotech Drilling Services Ltd. of Prince George BC, to depths ranging between 0 and 6.4 m below ground surface.

The subsurface conditions encountered in each borehole were observed and recorded by a McElhanney representative. Detailed borehole logs have been included in Attachment B. The soils observed in the field were classified in accordance with the Modified Unified Classification System for Soils (MUSCS). The borehole locations were recorded using a hand-held GPS.

Upon completion of the field program, select soil samples were transported to McElhanney's laboratory for index testing including moisture content and sieve analysis. The laboratory testing results are summarized in the following section and the laboratory test reports in Attachment C.

The soils observed in all test locations can be generally classified as compact to dense, well graded sand and gravel. Poor recovery in the split spoons, combined with refusal at some locations suggests that there are occasional cobbles and/or boulders in the soil. Groundwater was not encountered in any of the boreholes. Moisture content of the native material ranged from approximately 3-6%. Based on the interpretation of the subsurface conditions encountered during

this field assessment, the preliminary soil properties provided in Table 1 are recommended for preliminary static design of the proposed structures.

Table 1 Interpreted Soil Parameters

Application	Soil Description	Unit Weight (kN/m ³)	Friction Angle (°)	Cohesion	Subgrade Modulus (kN/m ³)
Subgrade Soil	Compact to Dense Sand and Gravel	20	34	0	1.5 x 10 ⁶
Retained or Reinforced soil	Engineered Fill (Section 4.6)	21	35	0	N/A

4. Recommendations

4.1 Site Preparation

The following recommendations are provided for subgrade preparation activities required for grade-supported load-bearing structures:

Remove any existing organic soil, soft, and other deleterious materials underlying load-bearing structures to expose the underlying sand subgrade soils. The suitability of the material for use as subgrade should be evaluated during subgrade preparation by a qualified geotechnical engineer to assess the type and quantity of deleterious materials that might be present within this soil unit. Note that the subsurface conditions may change in locations not explicitly investigated and/or may vary due to activities carried out at the Site following the field assessment. The thickness of unsuitable materials in areas not assessed by McElhanney due to limited access should be confirmed during site preparation activities.

All prepared subgrades should be inspected in the field by a Geotechnical Engineer or their representative to confirm that the subgrade conditions are consistent with the design conditions assumed in this report. The exposed subgrade should be proof-rolled using either a fully-loaded tandem truck or a single-drum compaction roller under the direction of McElhanney or their representative to identify any loose areas before placement of any Engineered Fill or grade-supported building foundations.

Subject to field review at the time of construction, approved subgrade of any sub-excavations within the proposed development limits should be backfilled to design subgrade elevation with approved granular materials in accordance with material selection, placement and compaction specifications for Engineered Fill, as defined in Section 4.6 below.

General non-structural site grading fills that may be required to raise local site grades beyond the building site limits should consist of approved common fill comprising clean inorganic granular materials from approved local or imported sources. Subject to surface grading, drainage and settlement tolerances required for site grading design, common fill materials may be placed in uniform layers not exceeding 300 mm thickness and compacted to a minimum of 95% Standard Proctor Maximum Dry Density (SPMDD) unless otherwise specified in this report. Topsoil and deleterious materials are considered to be unsuitable on which to place load-bearing structures and should be removed from the foundation areas of any proposed buildings or gravel yard or road structures.

4.2 Site Drainage

It is necessary to control surface water run-off and to minimize infiltration in areas with silty subgrade. The subgrade surface for the Site should be shaped to prevent ponding of water and prepared as recommended above.

The finished grades should provide surface drainage away from all structures. Within 2 m of structures, the exterior should be graded to slope away from the structure at a sufficient gradient; a gradient of 2% should be used wherever possible. Positive surface drainage across the yard should be established to prevent ponding. Recommended minimum grades of 2% should be used on gravel surfaced areas, where possible. The subgrade may require capping to prevent infiltration into the existing foundation.

4.3 Groundwater

Groundwater seepage could be encountered during construction due to seasonal variation and/or during a wetter construction season, therefore there is the potential for perched groundwater conditions due to varying subsurface soil materials. Construction plans should include means and methods to control and remove groundwater infiltration from all excavations if encountered.

4.4 Temporary Excavations

To protect any adjacent infrastructure during construction, and to allow for safe worker access, temporary excavation slopes shall be constructed as per the most current applicable British Columbia Occupational Health & Safety Code. For planning purposes, it is recommended that temporary excavation slopes be sloped no steeper than 1.5 Horizontal to 1.0 Vertical (1.5H:1.0V) within areas of fine-grained sands. Flatter slopes or other temporary support measures may be required if significant seepage or groundwater inflow conditions are encountered. Steeper temporary slopes of up to 1.0H:1.0V may be considered in shallow excavations based on conditions encountered during construction. If steeper slopes or slopes greater than 6 m are to be considered, or poor/saturated soil conditions are encountered, a Geotechnical Engineer should be consulted to review.

4.5 Seismic Site Classification

Seismic site classification according to the 2015 National Building Code of Canada (NBCC) requires soil characterization of the upper 30 m of the soil profile. It is noted that the maximum depth of investigation at the Site was 6.4 m below ground surface. Based on the findings of the drilling program and our understanding of the geological history and surficial geology in the area, the Site is classified as Site Class D "Stiff Soil" for seismic design purposes.

4.6 Engineered Fill

Any fill soil placed to support structural elements of the development shall be considered Engineered Fill. Recommendations for material quality and placement of Engineered Fill are summarized as follows:

Engineered Fill should consist of well-graded sand and gravel with less than 5% fines (material passing the 0.075 mm sieve) and a maximum aggregate size not exceeding 75 mm. Any granular materials proposed for use as Engineered Fill should be tested and approved by the Geotechnical Engineer before placement. The gradation for Select Granular Sub Base (SGSB) in Table 2 (Section 4.7) is an approved gradation for Engineered Fill.

Engineered Fill should be placed on prepared subgrade surfaces (Section 4.1) consisting of inorganic soils and approved by the Geotechnical Engineer before fill placement.

Engineered Fill used to support load-bearing structures, utilities, or any other component that may be settlement-sensitive should be compacted to a minimum of 100% SPMDD. For the gravel yard structure, Engineered Fill should be

compacted to a minimum of 98% SPMDD with the upper 300 mm compacted to 100% SPMDD. In landscaped areas or other areas where the risk of differential and/or total settlement greater than 25 mm may be acceptable, Engineered Fill may be compacted to a minimum of 95% SPMDD.

Engineered Fill should be placed in horizontal lifts to a maximum loose thickness not exceeding 300 mm or less, dependent on the compaction equipment utilized. Engineered Fill should be placed at moisture conditions within 3% of the optimum moisture content as determined by a Standard Proctor Moisture-Density Test (ASTM D698).

Engineered Fill areas should extend from the proposed foundation at a minimum of a two horizontal to one vertical (2H:1V) slope starting at least 3 m (horizontally) from the foundation to allow for the distribution of stresses and to provide frost protection.

Continuous Quality Control and Quality Assurance (QC/QA) compaction testing and construction reviews should be performed by the Geotechnical Engineer's representative or a qualified testing agency during placement of all Engineered Fill to verify compliance with the above recommendations.

4.7 Gravel Yard and Access Road Surfacing Recommendations

Gravel yard recommendations are based on the sand and gravel encountered in the boreholes. There are two possible approaches to the construction of the gravel access road and yard:

- apply a minimum 150 mm of crushed base course (CBC referred to in Table 2) over the native soil. The finished surface should be compacted to 100% SPMDD; or
- use the native sand and gravel and grade as necessary. For areas that are sandy, this option would require significant maintenance and is not recommended.

The finished surface for either option should have a 2% slope from the center of the road to the shoulder.

Table 2 Recommended Gradation of CBC and SGSB

Sieve Size (mm)	Percent Passing (%)	
	CBC	GSGB
100	-	100
75	-	-
25	100	-
19	80-100	15-100
9.5	50-85	0-100
4.75	35-70	-
2.36	25-50	-
1.18	15-35	-
0.60	-	0-100
0.30	5-20	0-15
0.075	0-5	0-5

4.8 Spread Footings

Strip and square footings are considered feasible for the proposed development, provided that the footings are placed on the native soil or on Engineered Fill placed on the native soils. Subgrade preparation and Engineered Fill placement must be as outlined in this report. The subgrade bearing surfaces for all foundation construction must be inspected and approved by the Geotechnical Engineer or their representative before placing formwork.

Based on proposed shallow foundations and expected subsurface conditions, bearing pressures for the design depth of 1.2 m are provided in Table 3 below.

Table 3 Summary of Factored Bearing Capacity for depth of 1.2 m

Subgrade Soil	Minimum Width of Foundation (m)	Net Bearing Capacity (kPa) ¹	
		Factored ULS ⁽²⁾	SLS ⁽³⁾
Compact to Dense Sand and Gravel	1	400	400
	3	500	250

1. Canadian Foundation Engineering Manual, 4th Edition, Canadian Geotechnical Society, Bitech Publishing Ltd., Richmond, BC.
2. ULS - Ultimate Limit State, based on semi-empirical data and calculated using a geotechnical resistance factor of 0.5.
3. SLS – Serviceability Limit State, based on SPT data gathered in the field investigation, valid for settlements less than 25 mm

To ensure a uniform stress distribution, the entire foundation must be constructed on a uniform bearing surface. A 150 mm leveling course of 25 mm crushed base course meeting compacted to 100% SPMDD should be placed below foundation elements if required to provide a level uniform surface on prepared subgrade. Crushed Base Course should conform to the gradation specification provided for well graded base in Table 2 (Section 4.7).

Groundwater seepage and/or surface water runoff must not be allowed to enter or collect in foundation excavations. Any water or snow that accumulates in the footing excavations must be removed and subgrade allowed to dry before construction of the footings.

A perimeter sub-drain pipe consisting of minimum 100 mm PVC SDR 28 or 35 perforated pipe, sloped at minimum 1%, should be installed along the outside perimeter of the building foundations at or below the foundation grade to collect any groundwater seepage and help maintain unsaturated soil conditions at the foundation level. The sub-drain should consist of perforated pipe, with perforations located at 4 and 8 o'clock, surrounded by free draining drain rock and wrapped by a non-woven filter fabric to minimize soil contamination and clogging of the drain rock material. The perimeter drain pipe should be allowed to collect, transport, and discharge groundwater seepage to an appropriately designed frost-free outfall.

4.9 Slab-on-Grade

The following recommendations are provided for grade support floor slabs construction:

- Subgrades should be prepared as recommended in Section 4.1 with any unsuitable subgrade material being removed and replaced with Engineered Fill due to the risk of differential settlement of any loose, deleterious or compressible materials.
- A minimum of 150 mm thick CBC layer should be placed below the underside of the floor slab before concrete placement; the gradation should conform to the specifications provided above in Table 2. The base course should be compacted to a minimum 100% SPMDD.
- A heavy-duty vapour barrier should be provided on the underside of the floor slab.



4.10 Frost Protection

Concrete foundations must not be placed on frozen soils, and soils beneath the foundation should not be allowed to freeze during or after construction; therefore, the foundation subgrade must be protected from freezing during and after construction. Concrete foundations should be protected from freezing, and proper curing conditions should be provided as per Canadian Standard Association (CSA) concrete specifications. Footings founded above the frost depth must be protected using insulation. Frost depth and Insulation requirements are discussed below.

The potential presence of silt in the native soils encountered at the Site cause the soil to be considered to be potentially frost-susceptible. If frost is permitted to penetrate, there is a risk of heaving and frost action on the concrete slab or footings. Frost must not be allowed to penetrate beneath footings prior to, during, or after construction. If the building is constructed during freezing conditions, the subgrade soil at the design footing elevation must be protected from freezing. Foundation concrete should be cured in appropriate conditions as per Canadian Standards Association specifications (CSA A23.1-14).

To reduce the potential for frost heave, foundations in soil should be provided with a minimum cover of 2.5 m. Alternatively, for the design depth of 1.2 m, for an unheated structure, it is recommended to have 100mm of insulation placed at a minimum depth of 0.3 m below the ground surface. Based on the design freezing index for the closest station to Mackenzie (Chetwynd Airport) and the Site conditions, the insulation should be extended to a minimum horizontal distance of at least 2.44 m for unheated structures, per Figure 13.11 of the Canadian Foundation Engineering Manual 4th Edition. The adjacent finished grade should be designed with a gradient of at least 2% over a horizontal distance of 2 m to direct surface water away from the building.

4.11 Concrete Block Retaining Wall

Concrete block retaining walls are considered suitable at the Site. In order to accommodate and reduce the potential for differential movement and achieve an appropriate drainage surface, a 200 mm thick layer of CBC compacted to 100% SPMDD is to be constructed under the footprint of the wall.

Infill material shall be SGSB or free draining imported granular soils as approved by the Engineer. Unsuitable soils for backfill (poor quality fills, soil with organics or greater than 5% fines) shall not be used in the reinforced soil mass.

Drainage should be provided behind the wall to prevent hydrostatic pressure. Retaining wall design should be reviewed by a Geotechnical Engineer, specifically the global stability should be modeled.

5. DESIGN AND CONSTRUCTION REVIEW

Once a final detailed foundation design has been prepared, it is recommended that the design be reviewed by McElhanney to verify that the geotechnical recommendations have been included in the final design.

To issue applicable Building Code Schedules and/or construction QA/QC letters, all foundation, backfill and Engineered Fill subgrade must be reviewed by the geotechnical engineer as specified in this report. McElhanney can provide these construction reviews as well as material testing services during construction if requested.



6. CLOSURE

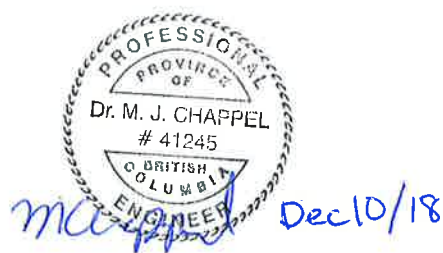
We trust this report submission meets your requirements for the project. Should you have any queries, please do not hesitate to contact the undersigned.

Sincerely,

McElhanney Consulting Services Ltd.

Prepared By:

Reviewed By:



Melissa Chappel, P.Eng.
Geotechnical Engineer
mchappel@mcelhanney.com

Shiloh Carlson, P.Eng.
Geotechnical Division Manager
scarlson@mcelhanney.com

Statement of Limitations – Geotechnical Services

Attachment A: Site Plan

Attachment B: Borehole Logs

Attachment C: Laboratory Reports



Statement of Limitations – Geotechnical Services

Use of this Report. This report was prepared by McElhanney Consulting Services Ltd. ("McElhanney") for the particular site, design objective, development and purpose (the "**Project**") described in this report and for the exclusive use of the client identified in this report (the "**Client**"). The data, interpretations, and recommendations pertain to the Project and are not applicable to any other project or site location, and this report may not be reproduced, used or relied upon, in whole or in part, by a party other than the Client, without the prior written consent of McElhanney. The Client may provide copies of this report to its affiliates, contractors, subcontractors and regulatory authorities for use in relation to and in connection with the Project provided that any reliance, unauthorized use, and/or decisions made based on the information contained within this report are at the sole risk of such parties. McElhanney will not be responsible for the use of this report on projects other than the Project, where this report or the contents hereof have been modified without McElhanney's consent, to the extent that the content is in the nature of an opinion, and if the report is preliminary or draft. This is a technical report and is not a legal representation or interpretation of laws, rules, regulations, or policies of governmental agencies. The professional services retained for this Project include only the geotechnical aspects of the subsurface conditions at the site, unless otherwise specifically stated and identified in this report. In particular, environmental conditions such as surface and subsurface contamination are outside the scope of this report.

Standard of Care and Disclaimer of Warranties. This study and report have been prepared in accordance with generally accepted engineering and scientific judgments, principles and practices. McElhanney expressly disclaims any and all warranties in connection with this report including, without limitation, any warranty that this report and the associated site review work has uncovered all potential geotechnical liabilities associated with the subject property.

Effect of Changes. All evaluations and conclusions stated in this report are based on facts, observations, site-specific details, legislation and regulations as they existed at the time of the site assessment. Some conditions are subject to change over time, and the Client recognizes that the passage of time, natural occurrences, and direct or indirect human intervention at or near the site may substantially alter such evaluations and conclusions. Construction activities can significantly alter soil, rock and other geologic conditions on the site. McElhanney should be requested to re-evaluate the conclusions of this report and to provide amendments as required prior to any reliance upon the information presented herein upon any of the following events: a) any changes (or possible changes) as to the site, purpose, or development plans upon which this report was based, b) any changes to applicable laws subsequent to the issuance of the report, c) new information is discovered in the future during site excavations, construction, building demolition or other activities, or d) additional subsurface assessments or testing conducted by others.

Subsurface Risks. Soil, rock and groundwater data were collected in general accordance with the standards and methods described in the document. The classification and identification of soils, rocks, and geologic formations was based on commonly accepted methods employed in the practice of geotechnical engineering and related disciplines. Interpretations of groundwater levels and flow direction are based on water level observations at selected test hole locations and are expected to fluctuate. Observations at test holes indicate the approximate subsurface conditions at those locations only. Subsurface conditions between test holes were based, by necessity, on judgement and assumptions of what exists between the actual locations sampled and may vary significantly from actual site conditions and all persons making use of this report should be aware of, and accept this risk. Even a comprehensive sampling and testing program, implemented in accordance with appropriate



equipment by experienced personnel, may fail to detect all or certain conditions.

Information from Client and Third Parties. McElhanney has relied in good faith on information provided by the Client and third parties noted in this report and has assumed such information to be accurate, complete, reliable, non-fringing, and fit for the intended purpose without independent verification. McElhanney accepts no responsibility for any deficiency, misstatements or inaccuracy contained in this report as a result of omissions or errors in information provided by third parties or for omissions, misstatements or fraudulent acts of persons interviewed.

Underground Utilities and Damages. In the performance of the services, McElhanney has taken reasonable precautions to avoid damage or injury to subterranean structures or utilities. Subsurface sampling may result in unavoidable contamination of certain subsurface areas not known to be previously contaminated such as, but not limited to, a geologic formation, the groundwater or other hydrous body. McElhanney will adhere to an appropriate standard of care during the conduct of any subsurface sampling.

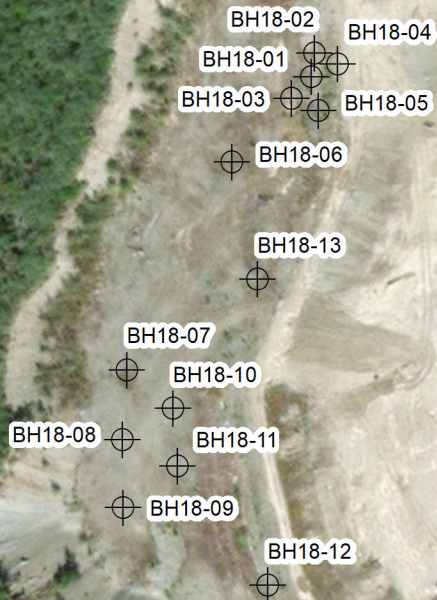
Independent Judgments. McElhanney will not be responsible for the independent conclusions, interpretations, interpolations and/or decisions of the Client, or others, who may come into possession of this report, or any part thereof. This restriction of liability includes decisions made to purchase, finance or sell land or with respect to public offerings for the sale of securities.

Construction. The subsurface information contained in this report were obtained for the owner's information and design. The extent and detail of assessments necessary to determine all relevant conditions that may affect construction costs would normally be greater than the assessments carried out for this report. Accordingly, a contingency fund to allow for the possibility of variations of subsurface conditions should be included in the construction budget to cover costs associated with modifications of the design and construction procedures resulting from conditions that vary from the assumptions in this report. If during construction, subsurface conditions are found to be other than those described in this report, McElhanney is to be notified and may alter or modify the geotechnical report recommendations. If McElhanney is not retained to provide services during construction, then McElhanney is not responsible for confirming or recording that subsurface conditions do not materially differ from those interpreted conditions contained in this report or for confirming or recording that construction activities have not adversely affected subsurface conditions or the recommendations contained in this report.



ATTACHMENT A: SITE PLAN

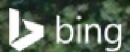




LEGEND



Drilling Locations (September, 2018)



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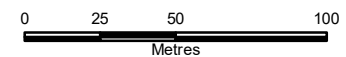
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McElhanney Consulting Services Ltd.

12-556 North Nechako Road
Prince George, BC Canada V2K 1A1
Tel. 250 561 2229

SPEHLING HANSEN ASSOCIATES
MACKENZIE, BC

**GEOTECHNICAL ASSESSMENT FOR THE
MACKENZIE TRANSFER STATION
SITE PLAN**



ORIGINAL SIZE: LETTER (8.5" X 11")

1:2,500

Drawing No.

01

Project No.

2341-02565-00

Rev.

01



ATTACHMENT B: BOREHOLE LOGS



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Prince George, BC V2K 1A1
Telephone: 250-561-2229

BH18-01

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CLIENT Regional District Fraser Fort George

PROJECT NAME Mackenzie Transfer Station

PROJECT NUMBER 2341-02565-00

PROJECT LOCATION Mackenzie Regional Landfill

DATE STARTED 9/17/18 COMPLETED 9/17/18

GROUND ELEVATION 733 m MASL HOLE SIZE _____

DRILLING CONTRACTOR Geotech Drilling Ltd.

GROUND WATER LEVELS:

DRILLING METHOD Odex - Truck-mounted

AT TIME OF DRILLING ---

LOGGED BY T.Garden CHECKED BY _____

AT END OF DRILLING ---

NOTES Weather: Cool and overcast

AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION
	GB S01	100		MC=5%		SAND, some gravel, some silt, well graded, trace cobbles (150mm), subrounded to subangular, inferred compact, massive, brown, moist
2	SPT S02	38	5-13-13-13 (26)	MC=4%		- at 1.5m, compact -Wash sieve (S01b): 17% gravel, 72% sand, 11% fines
4						
	SPT S03	55	16-20-19- 17 (39)	MC=5%		4.30 728.70 GRAVEL and SAND, trace silt, well graded, coarse to fine gravel, subrounded,dense, massive, grey, moist
6	SPT S04	60	10-15-16- 17 (31)	MC=6%		6.40 726.60

Groundwater not encountered.
Backfilled with drill cuttings and bentonite from 0.0m-1.0m and 5.4m-6.4m.
Bottom of borehole at 6.40 meters.



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CLIENT Regional District Fraser Fort George

PROJECT NAME Mackenzie Transfer Station

PROJECT NUMBER 2341-02565-00

PROJECT LOCATION Mackenzie Regional Landfill

DATE STARTED 9/17/18 **COMPLETED** 9/17/18

GROUND ELEVATION 731 m MASL **HOLE SIZE** _____

DRILLING CONTRACTOR Geotech Drilling Ltd.

GROUND WATER LEVELS:

DRILLING METHOD Odex - Truck-mounted

AT TIME OF DRILLING ---

LOGGED BY T.Garden **CHECKED BY** _____

AT END OF DRILLING ---

NOTES Weather: Cool and overcast

AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION
	GB S01	100		MC= 3%		SAND and GRAVEL, trace silt, well graded, trace cobbles (150 mm), subrounded, inferred compact, massive, brown, moist
2	SPT S02	60	9-10-10-10 (20)	MC= 3%		- at 1.5m, compact
	SPT S03	60	8-12-12-12 (24)	MC= 0%		
3.66						727.34

Groundwater not encountered.
Backfilled with drill cuttings and bentonite from 0.0m-1.0m and 2.66m-3.66m.
Bottom of borehole at 3.66 meters.



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CLIENT Regional District Fraser Fort George

PROJECT NAME Mackenzie Transfer Station

PROJECT NUMBER 2341-02565-00

PROJECT LOCATION Mackenzie Regional Landfill

DATE STARTED 9/17/18 **COMPLETED** 9/17/18

GROUND ELEVATION 732 m MASL **HOLE SIZE** _____

DRILLING CONTRACTOR Geotech Drilling Ltd.

GROUND WATER LEVELS:

DRILLING METHOD Odex - Truck-mounted

AT TIME OF DRILLING ---

LOGGED BY T.Garden **CHECKED BY** _____

AT END OF DRILLING ---

NOTES Weather: Cool and overcast

AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION
	GB S01	100		MC= 3%		SAND and GRAVEL, trace silt, well graded, trace cobbles (200mm), subrounded, massive, brown, moist
2	SPT S02	51	18-26-17- 29 (43)	MC= 3%		- at 1.52m, dense
	SPT S03	21	23-28-32- 24 (60)	MC= 1%		GRAVEL, some sand, trace silt, well graded, coarse to fine gravel, subrounded, very dense, massive, moist, brown

Groundwater not encountered.
Backfilled with drill cuttings and bentonite from 0.0m-1.0m and 2.66m-3.66m.
Bottom of borehole at 3.66 meters.



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CLIENT Regional District Fraser Fort George

PROJECT NAME Mackenzie Transfer Station

PROJECT NUMBER 2341-02565-00

PROJECT LOCATION Mackenzie Regional Landfill

DATE STARTED 9/17/18 COMPLETED 9/17/18

GROUND ELEVATION 729 m MASL HOLE SIZE

DRILLING CONTRACTOR Geotech Drilling Ltd.

GROUND WATER LEVELS:

DRILLING METHOD Odex - Truck-mounted

AT TIME OF DRILLING ---

LOGGED BY T.Garden CHECKED BY

AT END OF DRILLING ---

NOTES Weather: Cool and overcast

AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION
	GB S01	100		MC= 4%		GRAVEL and SAND, some silt, well graded, trace cobbles (150mm), subrounded, inferred compact, massive, brown, moist - Wash sieve (S01): 48% gravel, 37% sand, 15% fines.
2	SPT S02	33	12-21-24- 22 (45)	MC= 3%		- at 1.52m dense
	SPT S03	33	11-15-14- 13 (29)	MC= 3%		- at 3.05m compact

3.66

725.34

Groundwater not encountered.
Backfilled with drill cuttings and bentonite from 0.0m-1.0m and 2.66m-3.66m.
Bottom of borehole at 3.66 meters.



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CLIENT Regional District Fraser Fort George

PROJECT NAME Mackenzie Transfer Station

PROJECT NUMBER 2341-02565-00

PROJECT LOCATION Mackenzie Regional Landfill

DATE STARTED 9/17/18 **COMPLETED** 9/17/18

GROUND ELEVATION 730 m MASL **HOLE SIZE** _____

DRILLING CONTRACTOR Geotech Drilling Ltd.

GROUND WATER LEVELS:

DRILLING METHOD Odex - Truck-mounted

AT TIME OF DRILLING ---

LOGGED BY T.Garden **CHECKED BY** _____

AT END OF DRILLING ---

NOTES Weather: Cool and overcast

AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION
	GB S01	100		MC= 4%		SAND and GRAVEL, trace silt, well graded, coarse to fine gravel, trace cobbles (200m), subrounded, massive, brown, moist
2	SPT S02	22	15-16-23- 28 (39)	MC= 2%		- at 1.52m gravelly, dense
	SPT S03	7	15-33-41 (74)	MC= 1%		- at 3.05m, SPT refusal inferred cobble or boulder
3.51						

726.49

Groundwater not encountered.
Backfilled with drill cuttings and bentonite from 0.0m-1.0m and 2.51m-3.51m
Bottom of borehole at 3.51 meters.



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PAGE 1 OF 1

CLIENT Regional District Fraser Fort George

PROJECT NAME Mackenzie Transfer Station

PROJECT NUMBER 2341-02565-00

PROJECT LOCATION Mackenzie Regional Landfill

DATE STARTED 9/17/18 **COMPLETED** 9/17/18

GROUND ELEVATION 735 m MASL **HOLE SIZE** _____

DRILLING CONTRACTOR Geotech Drilling Ltd.

GROUND WATER LEVELS:

DRILLING METHOD Odex - Truck-mounted

AT TIME OF DRILLING ---

LOGGED BY T.Garden **CHECKED BY** _____

AT END OF DRILLING ---

NOTES Weather: Cool and overcast

AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION
	GB S01	100		MC= 4%		SAND, some gravel, trace silt, well graded, trace cobbles (150mm), subrounded, inferred compact, massive, brown, few fine rootlets, moist - Wash sieve (S01): 17% gravel, 75% sand, 8% fines
2	SPT S02	30	16-19-16- 11 (35)	MC= 3%		- at 1.52m, dense
	SPT S03	55	11-14-15- 23 (29)	MC= 5%		- at 3.05m, compact

3.66

731.34

Groundwater not encountered.
Backfilled with drill cuttings and bentonite from 0.0m-1.0m and 2.66m-3.66m.
Bottom of borehole at 3.66 meters.



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BH18-07

PAGE 1 OF 1

CLIENT Regional District Fraser Fort George

PROJECT NAME Mackenzie Transfer Station

PROJECT NUMBER 2341-02565-00

PROJECT LOCATION Mackenzie Regional Landfill

DATE STARTED 9/17/18 **COMPLETED** 9/17/18

GROUND ELEVATION 735 m MASL **HOLE SIZE** _____

DRILLING CONTRACTOR Geotech Drilling Ltd.

GROUND WATER LEVELS:

DRILLING METHOD Odex - Truck-mounted

AT TIME OF DRILLING ---

LOGGED BY T.Garden **CHECKED BY** _____

AT END OF DRILLING ---

NOTES Weather: Cool and overcast

AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION
	GB S01	100		MC= 3%		SAND and GRAVEL, trace silt, well graded, coarse to fine gravel, trace cobbles (200mm), subrounded, inferred compact, massive, brown, moist
2	SPT S02	33	42-32-22- 23 (54)	MC= 2%		- at 1.59m, subangular, very dense, grey
	SPT S03	27	39-55	MC= 2%		- at 2.59m, SPT refusal inferred cobble or boulder
4	SPT S04	50	18-24-28- 27 (52)	MC= 2%		- at 4.11m, subangular, very dense, grey
6	SPT S05	55	14-18-20- 24 (38)	MC= 3%		- at 5.64m, dense - at 5.7m, wash sieve (SPT05): 36% gravel, 57% sand, 7% fines.
6.25						

728.75

Groundwater not encountered.
Backfilled with drill cuttings and bentonite from 0.0m-1.0m and 5.25m-6.25m.
Bottom of borehole at 6.25 meters.



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PAGE 1 OF 1

CLIENT Regional District Fraser Fort George

PROJECT NAME Mackenzie Transfer Station

PROJECT NUMBER 2341-02565-00

PROJECT LOCATION Mackenzie Regional Landfill

DATE STARTED 9/18/18 **COMPLETED** 9/18/18

GROUND ELEVATION 736 m MASL **HOLE SIZE** _____

DRILLING CONTRACTOR Geotech Drilling Ltd.

GROUND WATER LEVELS:

DRILLING METHOD Odex - Truck-mounted

AT TIME OF DRILLING ---

LOGGED BY T.Garden **CHECKED BY** _____

AT END OF DRILLING ---

NOTES Weather: Cool and sunny

AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION
	GB S01	100		MC=4%		SAND, some gravel, trace silt, well graded, coarse to fine gravel, trace cobbles (200mm), subrounded, inferred compact, massive, brown, moist
2	SPT S02	38	2-5-10-9 (15)	MC=3%		- and GRAVEL, some cobbles (150mm), subangular, compact
	SPT S03	68	9-11-11-11 (22)	MC=5%		- trace cobbles, cobbles (150mm), subangular, compact, occasional cobble
4						
	SPT S04	63	13-21-18- 16 (39)	MC=6%		- at 4.27m, dense
6	SPT S05	77	9-13-14-15 (27)	MC=4%		- gravelly, compact - Wash sieve (SPT05): 31% gravel, 62% sand, 7% fines.

6.40

729.60

Groundwater not encountered.
Backfilled with drill cuttings and bentonite from 0.0m-1.0m and 5.4m-6.4m.
Bottom of borehole at 6.40 meters.

GENERAL BH / TP / WELL 2565-0 BOREHOLE LOGS - COPY.GPJ GINT STD CANADA LAB.GDT 12/6/18



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BH18-09

PAGE 1 OF 1

CLIENT Regional District Fraser Fort George

PROJECT NAME Mackenzie Transfer Station

PROJECT NUMBER 2341-02565-00

PROJECT LOCATION Mackenzie Regional Landfill

DATE STARTED 9/18/18 **COMPLETED** 9/18/18

GROUND ELEVATION 737 m MASL **HOLE SIZE** _____

DRILLING CONTRACTOR Geotech Drilling Ltd.

GROUND WATER LEVELS:

DRILLING METHOD Odex - Truck-mounted

AT TIME OF DRILLING ---

LOGGED BY T.Garden **CHECKED BY** _____

AT END OF DRILLING ---

NOTES Weather: Cool and sunny

AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION
	GB S01	100		MC= 5%		SAND and GRAVEL, trace silt, well graded, coarse to fine gravel, trace cobbles (200mm), subrounded, inferred compact, massive, brown, moist
2	SPT S02	17	12-18-21- 26 (39)	MC= 3%		- at 1.22m, dense
						2.40 734.60
	SPT S03	21	16-19-27- 18 (46)	MC= 4%		SAND, trace gravel, trace silt, well graded, coarse to fine gravel, subrounded, dense, massive, brown
4						
	SPT S04	76	9-9-10-11 (19)	MC= 5%		-at 4.27m, compact
6	SPT S05	68	7-12-16-14 (28)	MC= 4%		- gravelly - at 5.57m, wash sieve (SPT05): 25% gravel, 65% sand, 10% fines.
						6.40 730.60

Groundwater not encountered.
Backfilled with drill cuttings and bentonite from 0.0m-1.0m and 5.4m-6.4m.
Bottom of borehole at 6.40 meters.



McElhanney Consulting Services Ltd.
12-556 North Nechako Road
Prince George, BC V2K 1A1
Telephone: 250-561-2229

BH18-10

PAGE 1 OF 1

CLIENT Regional District Fraser Fort George

PROJECT NAME Mackenzie Transfer Station

PROJECT NUMBER 2341-02565-00

PROJECT LOCATION Mackenzie Regional Landfill

DATE STARTED 9/18/18 **COMPLETED** 9/18/18

GROUND ELEVATION 735 m MASL **HOLE SIZE** _____

DRILLING CONTRACTOR Geotech Drilling Ltd.

GROUND WATER LEVELS:

DRILLING METHOD Odex - Truck-mounted

AT TIME OF DRILLING ---

LOGGED BY T.Garden **CHECKED BY** _____

AT END OF DRILLING ---

NOTES Weather: Cool and sunny

AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION
2	GB S01	100		MC= 3%		SAND, some gravel, trace silt, well graded, coarse to fine gravel, trace cobbles (200mm), subrounded, inferred compact, massive, moist
	SPT S02	38	10-18-17- 17 (35)	MC= 3%		- at 1.22m, angular, dense
4	SPT S03	21	25	MC= 1%		GRAVEL and SAND, well graded, coarse to fine gravel, subrounded to angular, very dense, massive, brown, moist
	SPT S04	30	25-29-23- 19 (52)	MC= 3%		- at 2.74m, SPT refusal inferred cobble or boulder
6	SPT S05	0	16-14-23- 29 (37)	MC= 1%		- no recovery at 5.79m, inferred cobble or boulder

Groundwater not encountered.
Backfilled with drill cuttings and bentonite from 0.0m-1.0m and 5.4m-6.4m.
Bottom of borehole at 6.40 meters.



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BH18-11

PAGE 1 OF 1

CLIENT Regional District Fraser Fort George

PROJECT NAME Mackenzie Transfer Station

PROJECT NUMBER 2341-02565-00

PROJECT LOCATION Mackenzie Regional Landfill

DATE STARTED 9/18/18 COMPLETED 9/18/18

GROUND ELEVATION 736 m MASL HOLE SIZE

DRILLING CONTRACTOR Geotech Drilling Ltd.

GROUND WATER LEVELS:

DRILLING METHOD Odex - Truck-mounted

AT TIME OF DRILLING ---

LOGGED BY T.Garden CHECKED BY

AT END OF DRILLING ---

NOTES Weather: Cool and sunny

AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION
	GB S01	100		MC= 4%		SAND, some gravel, trace silt, well graded, coarse to fine gravel, trace cobbles (200mm), subrounded, inferred compact, massive, brown, moist
2	SPT S02	21	8-12-14-19 (26)	MC= 3%		- at 1.22m, rounded, compact
	SPT S03	51	7-10-10-11 (20)	MC= 4%		
4						
	SPT S04	55	11-12-12-11 (24)	MC= 6%		- trace gravel - at 5.8m, wash sieve (SPT05): 6% gravel, 86% sand, 8% fines.
6	SPT S05	72	10-9-11-14 (20)	MC= 4%		

6.40

729.60

Groundwater not encountered.
Backfilled with drill cuttings and bentonite from 0.0m-1.0m and 5.4m-6.4m.
Bottom of borehole at 6.40 meters.



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Prince George, BC V2K 1A1
Telephone: 250-561-2229

BH18-12

PAGE 1 OF 1

CLIENT Regional District Fraser Fort George

PROJECT NAME Mackenzie Transfer Station

PROJECT NUMBER 2341-02565-00

PROJECT LOCATION Mackenzie Regional Landfill

DATE STARTED 9/18/18 **COMPLETED** 9/18/18

GROUND ELEVATION 734 m MASL **HOLE SIZE** _____

DRILLING CONTRACTOR Geotech Drilling Ltd.

GROUND WATER LEVELS:

DRILLING METHOD Odex - Truck-mounted

AT TIME OF DRILLING ---

LOGGED BY T.Garden **CHECKED BY** _____

AT END OF DRILLING ---

NOTES Weather: Cool and sunny

AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	RECOVERY %	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION
	GB S01	100	MC= 4%		SAND, some gravel, trace silt, well graded, coarse to fine gravel, trace cobbles (200mm), subrounded, inferred compact, massive, brown, moist
2	GB S02	100	MC= 4%		
				3.05	730.95

Groundwater not encountered.
Backfilled with drill cuttings and bentonite from 0m-1m and 2.05m-3.05m.
Bottom of borehole at 3.05 meters.



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12-556 North Nechako Road
Prince George, BC V2K 1A1
Telephone: 250-561-2229

BH18-13

PAGE 1 OF 1

CLIENT Regional District Fraser Fort George

PROJECT NAME Mackenzie Transfer Station

PROJECT NUMBER 2341-02565-00

PROJECT LOCATION Mackenzie Regional Landfill

DATE STARTED 9/18/18 **COMPLETED** 9/18/18

GROUND ELEVATION 732 m MASL **HOLE SIZE** _____

DRILLING CONTRACTOR Geotech Drilling Ltd.

GROUND WATER LEVELS:

DRILLING METHOD Odex - Truck-mounted

AT TIME OF DRILLING ---

LOGGED BY T.Garden **CHECKED BY** _____

AT END OF DRILLING ---

NOTES Weather: Cool and sunny

AFTER DRILLING ---

DEPTH (m)	SAMPLE TYPE NUMBER	RECOVERY %	TESTS	GRAPHIC LOG	MATERIAL DESCRIPTION
	GB S01	100	MC= 3%		SAND, gravelly, trace silt, well graded, trace cobbles (150mm), subrounded, inferred compact, massive, brown, moist - at 0.5m, wash sieve (S01): 29% gravel, 63% sand, 8% fines.
2	GB S02	100	MC= 3%		
				3.05	728.95

Groundwater not encountered.
Backfilled with drill cuttings and bentonite from 0.0m-1.0m and 2.05m-3.05m.
Bottom of borehole at 3.05 meters.



ATTACHMENT C: LABORATORY REPORTS

McElhanney Consulting Services Ltd.

Suite 12-556 North Nechako Rd

Prince George, BC

SIEVE ANALYSIS REPORT**8 16 30 50 SERIES**

TO
 Sperling Hansen Associates
 #8-1225 East Keith Road
 North Vancouver, BC,
 V7J 1J3

PROJECT NO. 2341-02565-00

CLIENT Sperling Hansen Associates
C.C.

ATTN: Mr. Mircea Cvaci

PROJECT Proposed Mackenzie Transfer Station
Geotechnical Assessment

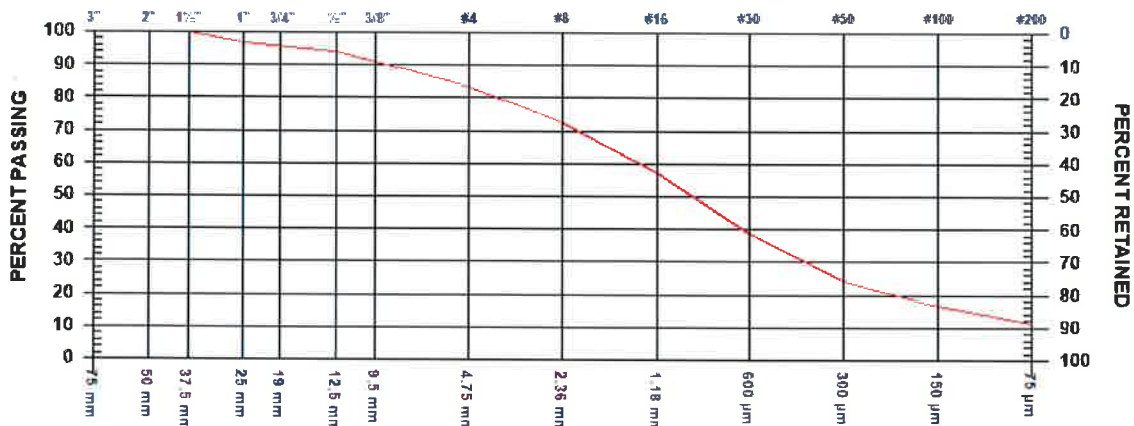
Mackenzie, BC

CONTRACTOR

SIEVE TEST NO. 1 DATE RECEIVED 19.Sep.2018 DATE TESTED 21.Sep.2018 DATE SAMPLED 17.Sep.2018

SUPPLIER
 SOURCE BH18-01, S01(b) @1.5-3.0 m
 SPECIFICATION
 MATERIAL TYPE SAND, some gravel, some fines

SAMPLED BY T.Garden
 TESTED BY S.Wall
 TEST METHOD WASHED



GRAVEL SIZES			PERCENT PASSING	GRADATION LIMITS
3"	75 mm			
2"	50 mm			
1 1/2"	37.5 mm	100.0		
1"	25 mm	97.0		
3/4"	19 mm			
1/2"	12.5 mm	94.0		
3/8"	9.5 mm	91.1		

SAND SIZES AND FINES		PERCENT PASSING	GRADATION LIMITS
No. 4	4.75 mm	83.3	
No. 8	2.36 mm	72.6	
No. 16	1.18 mm	57.3	
No. 30	600 µm	38.7	
No. 50	300 µm	24.2	
No. 100	150 µm	16.7	
No. 200	75 µm	11.2	

MOISTURE CONTENT 3.9%

COMMENTS

Tested as per ASTM C136.

Gravel=16.7%, Sand=72.1%, Silt/Clay=11.2%

McElhanney Consulting Services Ltd.

Suite 12-556 North Nechako Rd

Prince George, BC

SIEVE ANALYSIS REPORT**8 16 30 50 SERIES**

TO
 Sperling Hansen Associates
 #8-1225 East Keith Road
 North Vancouver, BC,
 V7J 1J3

PROJECT NO. 2341-2565

CLIENT Sperling Hansen Associates
C.C.

ATTN: Mr. Mircea Cvaci

PROJECT Proposed Mackenzie Transfer Station
Geotechnical Assessment

Mackenzie, BC

CONTRACTOR

SIEVE TEST NO. 2 DATE RECEIVED 19.Sep.2018 DATE TESTED 10.Oct.2018 DATE SAMPLED 17.Sep.2018

SUPPLIER
 SOURCE BH18-04, S01 @ 0-1.5 m
 SPECIFICATION
 MATERIAL TYPE GRAVEL and SAND, some fines

SAMPLED BY T.Garden
 TESTED BY S.Wall/T.Rail
 TEST METHOD WASHED



GRAVEL SIZES			PERCENT PASSING	GRADATION LIMITS
3"	75	mm	100.0	
2"	50	mm		
1 1/2"	37.5	mm		
1"	25	mm		
3/4"	19	mm		
1/2"	12.5	mm		
3/8"	9.5	mm	57.0	

SAND SIZES AND FINES		PERCENT PASSING	GRADATION LIMITS
No. 4	4.75 mm	51.9	
No. 8	2.36 mm	44.5	
No. 16	1.18 mm	36.4	
No. 30	600 µm	29.6	
No. 50	300 µm	22.0	
No. 100	150 µm	17.5	
No. 200	75 µm	14.5	

MOISTURE CONTENT 3.6%

COMMENTS

Tested as per ASTM C136.

Gravel=48.1%, Sand=37.4%, Silt/Clay=14.5%

McElhanney Consulting Services Ltd.Suite 12-556 North Nechako Rd
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8 16 30 50 SERIES**TO
Sperling Hansen Associates
#8-1225 East Keith Road
North Vancouver, BC,
V7J 1J3

PROJECT NO. 2341-02565-00

CLIENT Sperling Hansen Associates
C.C.

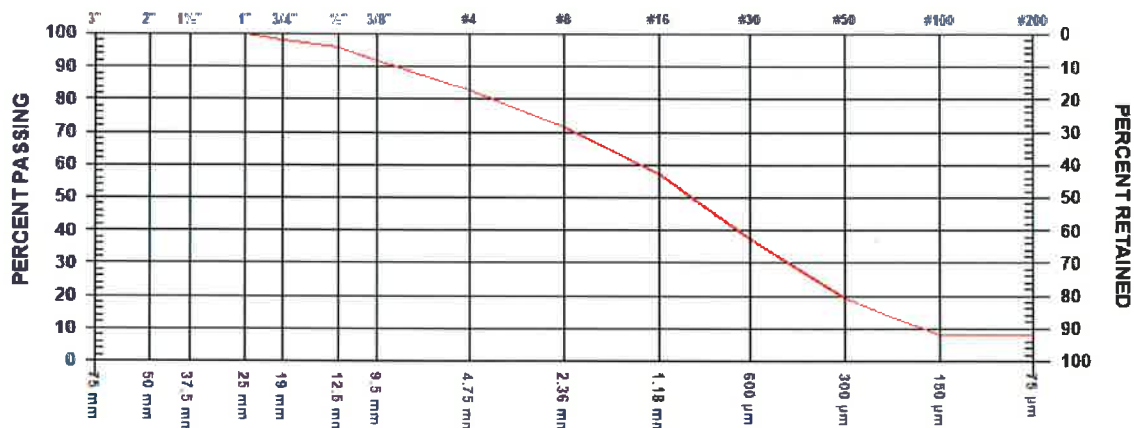
ATTN: Mr. Mircea Cvaci

PROJECT Proposed Mackenzie Transfer Station
Geotechnical Assessment

Mackenzie, BC

CONTRACTOR

SIEVE TEST NO. 3 DATE RECEIVED 19.Sep.2018 DATE TESTED 21.Sep.2018 DATE SAMPLED 17.Sep.2018

SUPPLIER
SOURCE BH18-06, S01 @ 0-1.5 m
SPECIFICATION
MATERIAL TYPE SAND, some gravel, trace finesSAMPLED BY T.Garden
TESTED BY S.Wall/T.Rail
TEST METHOD WASHED

GRAVEL SIZES			PERCENT PASSING	GRADATION LIMITS
3"	75	mm		
2"	50	mm		
1 1/2"	37.5	mm		
1"	25	mm	100.0	
3/4"	19	mm	98.2	
1/2"	12.5	mm	96.1	
3/8"	9.5	mm	91.8	

SAND SIZES AND FINES		PERCENT PASSING	GRADATION LIMITS
No. 4	4.75 mm	82.8	
No. 8	2.36 mm	71.6	
No. 16	1.18 mm	57.4	
No. 30	600 µm	37.5	
No. 50	300 µm	19.4	
No. 100	150 µm	7.9	
No. 200	75 µm	7.9	

MOISTURE CONTENT 3.5%

COMMENTS

Tested as Per ASTM C136

Gravel=17.2%, Sand=74.9%, Silt/Clay=7.9%

Margaret

McElhanney Consulting Services Ltd.Suite 12-556 North Nechako Rd
Prince George, BC**SIEVE ANALYSIS REPORT
8 16 30 50 SERIES**TO
Sperling Hansen Associates
#8-1225 East Keith Road
North Vancouver, BC,
V7J 1J3

PROJECT NO. 2341-02565-00

CLIENT Sperling Hansen Associates
C.C.

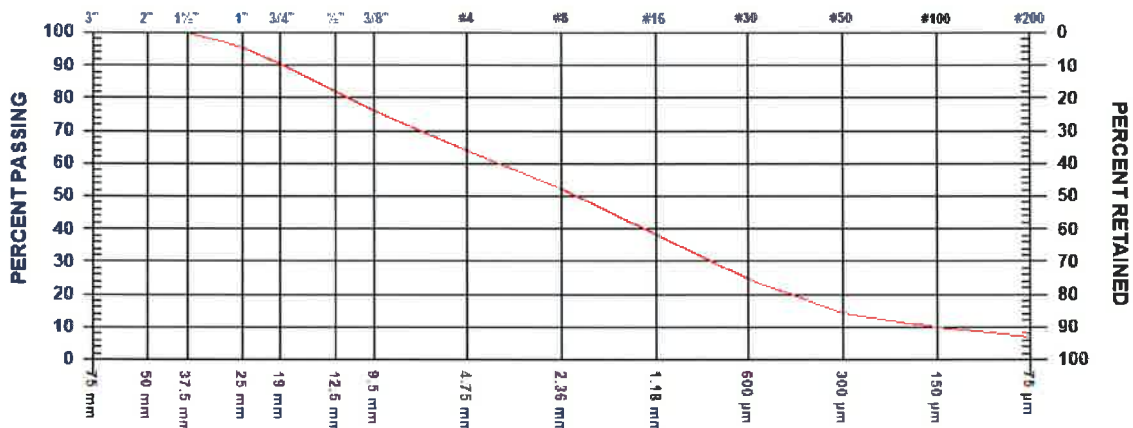
ATTN: Mr. Mircea Cvaci

PROJECT Proposed Mackenzie Transfer Station
Geotechnical Assessment

Mackenzie, BC

CONTRACTOR

SIEVE TEST NO. 4 DATE RECEIVED 19.Sep.2018 DATE TESTED 21.Sep.2018 DATE SAMPLED 17.Sep.2018

SUPPLIER
SOURCE BH18-07, S05 @ 5.6-6.2 m
SPECIFICATION
MATERIAL TYPE SAND and GRAVEL, trace finesSAMPLED BY T.Garden
TESTED BY S.Wall/T.Rail
TEST METHOD WASHED

GRAVEL SIZES			PERCENT PASSING	GRADATION LIMITS
3"	75 mm			
2"	50 mm			
1 1/2"	37.5 mm	100.0		
1"	25 mm	95.7		
3/4"	19 mm	90.5		
1/2"	12.5 mm	81.8		
3/8"	9.5 mm	76.1		

SAND SIZES AND FINES			PERCENT PASSING	GRADATION LIMITS
No. 4	4.75 mm	64.0		
No. 8	2.36 mm	52.2		
No. 16	1.18 mm	38.4		
No. 30	600 µm	25.0		
No. 50	300 µm	14.3		
No. 100	150 µm	9.8		
No. 200	75 µm	6.7		

COMMENTS

Tested as per ASTM C136.

Gravel=36.0%, Sand=57.3%, Silt/Clay=6.7%

M. C. Wall

McElhanney Consulting Services Ltd.Suite 12-556 North Nechako Rd
Prince George, BC**SIEVE ANALYSIS REPORT
8 16 30 50 SERIES**TO
Sperling Hansen Associates
#8-1225 East Keith Road
North Vancouver, BC,
V7J 1J3PROJECT NO. 2341-02565-00
CLIENT Sperling Hansen Associates
C.C.

ATTN: Mr. Mircea Cvaci

PROJECT Proposed Mackenzie Transfer Station Mackenzie, BC
Geotechnical Assessment

CONTRACTOR

SIEVE TEST NO. 5 DATE RECEIVED 19.Sep.2018 DATE TESTED 21.Sep.2018 DATE SAMPLED 18.Sep.2018

SUPPLIER
SOURCE BH18-08, S05 @ 5.8-6.1 m
SPECIFICATION
MATERIAL TYPE SAND, gravelly, trace finesSAMPLED BY T.Garden
TESTED BY S.Wall/T.Rail
TEST METHOD WASHED

GRAVEL SIZES			PERCENT PASSING	GRADATION LIMITS
3"	75 mm			
2"	50 mm			
1 1/2"	37.5 mm		100.0	
1"	25 mm		89.2	
3/4"	19 mm		80.3	
1/2"	12.5 mm		73.7	
3/8"	9.5 mm		72.2	

SAND SIZES AND FINES			PERCENT PASSING	GRADATION LIMITS
No. 4	4.75 mm		68.8	
No. 8	2.36 mm		65.9	
No. 16	1.18 mm		59.3	
No. 30	600 µm		41.9	
No. 50	300 µm		21.3	
No. 100	150 µm		11.7	
No. 200	75 µm		6.7	

MOISTURE CONTENT 3.6%

COMMENTS

Test as per ASTM C136.

Gravel=31.2%, Sand=62.1%, Silt/Clay=6.7%

McElhanney Consulting Services Ltd.Suite 12-556 North Nechako Rd
Prince George, BC**SIEVE ANALYSIS REPORT
8 16 30 50 SERIES**TO
Sperling Hansen Associates
#8-1225 East Keith Road
North Vancouver, BC,
V7J 1J3

PROJECT NO. 2341-02565-00

CLIENT Sperling Hansen Associates
C.C.

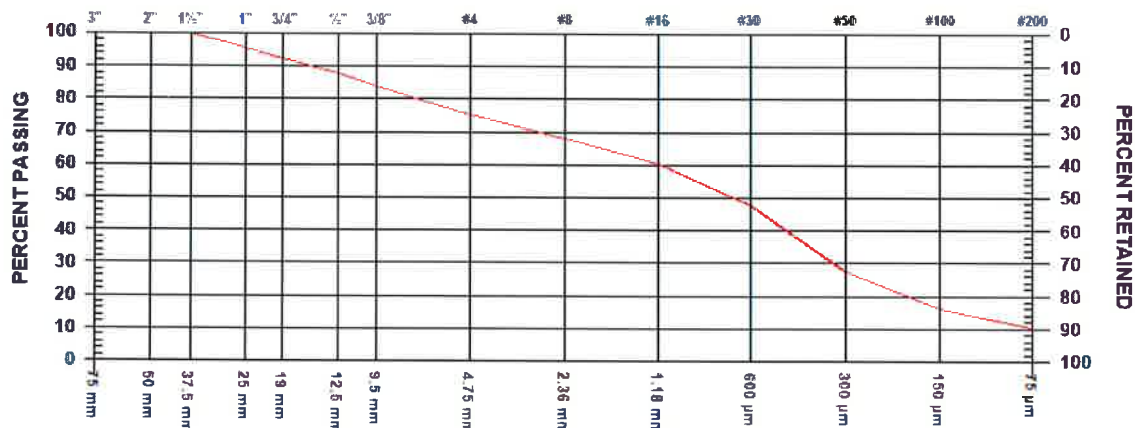
ATTN: Mr. Mircea Cvaci

PROJECT Proposed Mackenzie Transfer Station
Geotechnical Assessment

Mackenzie, BC

CONTRACTOR

SIEVE TEST NO. 6 DATE RECEIVED 19.Sep.2018 DATE TESTED 21.Sep.2018 DATE SAMPLED 18.Sep.2018

SUPPLIER
SOURCE BH18-09, S05 @ 5.8-6.4 m
SPECIFICATION
MATERIAL TYPE SAND, gravelly, trace finesSAMPLED BY T.Garden
TESTED BY S.Wall/T.Rail
TEST METHOD WASHED

GRAVEL SIZES			PERCENT PASSING	GRADATION LIMITS
3"	75	mm		
2"	50	mm		
1 1/2"	37.5	mm	100.0	
1"	25	mm	95.3	
3/4"	19	mm	92.4	
1/2"	12.5	mm	87.8	
3/8"	9.5	mm	83.9	

SAND SIZES AND FINES			PERCENT PASSING	GRADATION LIMITS
No. 4	4.75	mm	75.4	
No. 8	2.36	mm	67.9	
No. 16	1.18	mm	60.2	
No. 30	600	µm	47.7	
No. 50	300	µm	27.4	
No. 100	150	µm	16.0	
No. 200	75	µm	10.2	

MOISTURE CONTENT 3.7%

COMMENTS

Tested as per ASTM C136.

Gravel=24.6, Sand=65.2%, Silt/Clay=10.2%

mircea

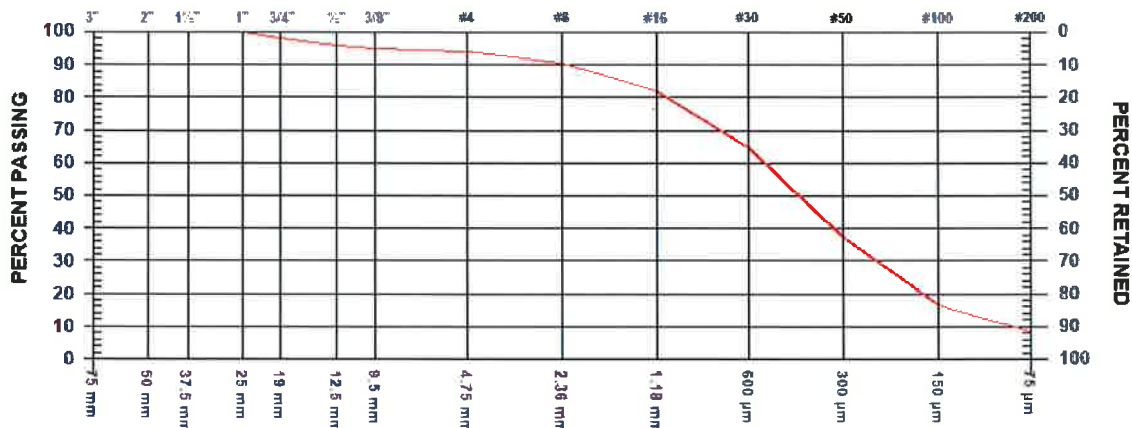
McElhanney Consulting Services Ltd.Suite 12-556 North Nechako Rd
Prince George, BC**SIEVE ANALYSIS REPORT
8 16 30 50 SERIES**TO
Sperling Hansen Associates
#8-1225 East Keith Road
North Vancouver, BC,
V7J 1J3PROJECT NO. 2341-02565-00
CLIENT Sperling Hansen Associates
C.C.

ATTN: Mr. Mircea Cvaci

PROJECT Proposed Mackenzie Transfer Station Mackenzie, BC
Geotechnical Assessment

CONTRACTOR

SIEVE TEST NO. 7 DATE RECEIVED 19.Sep.2018 DATE TESTED 21.Sep.2018 DATE SAMPLED 18.Sep.2018

SUPPLIER
SOURCE BH18-11, S05 @5.8-6.4m
SPECIFICATION
MATERIAL TYPE SAND, trace gravel, trace finesSAMPLED BY T.Garden
TESTED BY T.Rail
TEST METHOD WASHED

GRAVEL SIZES			PERCENT PASSING	GRADATION LIMITS
3"	75 mm			
2"	50 mm			
1 1/2"	37.5 mm			
1"	25 mm	100.0		
3/4"	19 mm	98.1		
1/2"	12.5 mm	95.9		
3/8"	9.5 mm	95.2		

SAND SIZES AND FINES		PERCENT PASSING	GRADATION LIMITS
No. 4	4.75 mm	94.2	
No. 8	2.36 mm	90.6	
No. 16	1.18 mm	81.9	
No. 30	600 µm	64.8	
No. 50	300 µm	37.2	
No. 100	150 µm	16.8	
No. 200	75 µm	8.5	

MOISTURE CONTENT 4.3%

COMMENTSTested as per ASTM C136.
Gravel=5.8%, Sand=85.7%, Silt/Clay=8.5%

**McElhanney****McElhanney Consulting Services Ltd.**

12-556 North Nechako Rd Tel 250 561 2299

Prince George BC Fax 250 563 1941

Canada V2K 1A1 www.mcelhanney.com

MOISTURE CONTENT WORKSHEET**Oven Dry Method****ASTM D2216****PROJECT NAME:** Mackenzie Transfer Station**PROJECT NO.** 2341-02565-00**CLIENT:** Sperling Hansen Associates**DATE SAMPLED:** 2018-09-17**SAMPLED BY:** T.Garden**DATE TESTED:** 2018-09-21**TESTED BY:** S.Wall

TH/TP NO.	Sample No.	Depth	Moisture	Comments
BH18-01	S01	0-1.5 m	5.2	
BH18-01	S01(b)	1.5-3.0 m	4.9	
BH18-01	S02	1.5-2.1 m	4.7	
BH18-01	S03	4.3-4.9 m	3.9	
BH18-01	S04	5.8-6.4 m	5.7	
BH18-02	S01	1-1.5 m	3.4	
BH18-02	S02	1.5-2.7 m	3.1	
BH18-02	S03	3.0-3.7 m	-	Sample not found
BH18-03	S01	0-1.5 m	3.3	
BH18-03	S02	1.5-2.7 m	2.9	
BH18-03	S03	3.0-3.7 m	1.1	
BH18-04	S01	0-1.5 m	3.6	
BH18-04	S02	1.5-2.1 m	2.5	
BH18-04	S03	3.0-3.7 m	3.0	
BH18-05	S01	0-1.5 m	4.0	
BH18-05	S02	1.5-2.1 m	2.4	
BH18-05	S03	3.0-3.5 m	0.5	
BH18-06	S01	0-1.5 m	3.6	
BH18-06	S02	1.5-2.1 m	2.9	
BH18-06	S03	3.0-3.7 m	4.9	
BH18-07	S01	0-1.5 m	3.1	
BH18-07	S02	1.5-2.1 m	2.2	
BH18-07	S03	2.6-3.2 m	1.6	
BH18-07	S04	4.1-4.7 m	1.8	
BH18-07	S05	5.5-6.2 m	2.9	
BH18-08	S01	0-1.5 m	4.0	
BH18-08	S02	1.5-2.1 m	3.4	
BH18-08	S03	3.0-3.7 m	4.6	
BH18-08	S04	4.1-4.7 m	5.5	
BH18-08	S05	5.5-6.2 m	3.6	
BH18-09	S01	0-1.5 m	4.7	
BH18-09	S02	1.5-2.1 m	2.8	
BH18-09	S03	3.0-3.7 m	3.5	
BH18-09	S04	4.1-4.7 m	4.9	
BH18-09	S05	5.5-6.2 m	3.7	

COMMENTS:

McElhanney Consulting Services Ltd.

12-556 North Nechako Rd Tel 250 561 2299

Prince George BC Fax 250 563 1941

Canada V2K 1A1

www.mcelhanney.com

MOISTURE CONTENT WORKSHEET

Oven Dry Method

ASTM D2216

PROJECT NAME: Mackenzie Transfer Station

PROJECT NO. 2341-02565-00

CLIENT: Sperling Hansen Associates

DATE SAMPLED: 2018-09-17

SAMPLED BY: T.Garden

DATE TESTED: 2018-09-21

TESTED BY: S.Wall

[illegible]

COMMENTS:

APPENDIX C: Assumed Historical Annual Disposal Quantities

Annual Tonnage Mackenzie Regional Landfill

Year	Tonnage (*est)										
1995	4,700		Source: Mackenzie Landfill, Interim Operations Plan, AGRA, December 12, 1995								
1996	5,000										
1997	5,000										
1998	5,000										
1999	5,000										
2000	5,000										
2001	5,000										
2002	5,000		Source: Mackenzie Landfill, Interim Operations Plan, AGRA, December 12, 1995								
2003	5,000										
2004	5,000										
2005	5,000										
2006	5,000		Extrapolated estimate								
2007	7,107		Source: Scale Reords								
2008	7,033										
2009	7,033										
2010	7,033										
2011	7,033										
2012	7,033		Source: RDFFG Annual Report/scale avg								
2013	6,325		Source: RDFFG Annual Report								
2014	7,778		Source: RDFFG Annual Report								
2015	7,063		Source: RDFFG Annual Report								
2016	6,892		Source: RDFFG Annual Report								
2017	6,117		Source: RDFFG Annual Report								
2018	6,645		Source: RDFFG Annual Report								
2019	6,439		Source: RDFFG Annual Report								
2020	779		Changed to a Transfer station. All MSW transported to FBRLF. DLC buried on site								
2021	1,429		Source: RDFFG Annual Report								

Red estimated

Black actual

Note: Estimate for residential tonnage drop off based on population and 1 tonne per capita as follows; 2007 thru 2016 3,855 tonnes.

From 1996 to 2012 based on population and 0.76 tonnes per capita 4,700 tonnes, excluding 2007

In 2020 the site began operations as a trasnsfer station with a select only DLC area.

APPENDIX D: Detailed Closure Cost Estimates



Table D.1 - Closure Cost Estimate - RDFFG Mackenzie Regional Landfill DOCP
Soil Cover Option 1 - Primary Landfill Disposal Area

	Description	Quantity	Units	Estimated Unit Rate	Estimated Cost
1	Site Preparation				
1.01	Mobilization	1	LS	\$15,000.00	\$15,000
1.02	General site cleanup	1	LS	\$5,000.00	\$5,000
1.03	Hauling, filling and grading	1	LS	\$5,000.00	\$5,000
1.04	Smoothing, proof rolling, minor grubbing and topsoil stripping	42,800	m ²	\$3.00	\$128,400
	Subtotal				\$153,400
2	Landfill Cover System				
2.01	Intermediate cover - haul, place and compact	12,840	m ³	\$15.00	\$192,600
2.02	Clay Barrier layer (600 mm thick) - haul, place and compact	25,680	m ³	\$20.00	\$513,600
2.03	Supply, Import, Place 150mm topsoil	6,420	m ³	\$35.00	\$224,700
2.04	Hydroseed topsoil	42,800	m ²	\$2.00	\$85,600
	Subtotal				\$1,016,500
3	Access Roads and Perimeter Fencing Improvements				
3.01	Internal Access road construction	750	m ³	\$15.00	\$11,250
3.02	Perimeter fencing upgrades	1	LS	\$30,000.00	\$30,000
3.03	Perimeter access road upgrades	1	LS	\$50,000.00	\$50,000
	Subtotal				\$91,250
4	Surface Water Management				
4.01	New crest ditching and downchutes	717	m	\$50.00	\$35,850
4.02	Upgrades to existing toe ditches and culverts	300	m	\$50.00	\$15,000
4.03	Expansion of surface water pond	1	LS	\$20,000.00	\$20,000
	Subtotal				\$70,850
5	Signage and Access				
5.01	Signage and Access	1	LS	\$5,000.00	\$5,000
	Subtotal				\$5,000
	Subtotal				\$1,337,000
				Contingency (40%)	\$534,800
				Engineering (20%)	\$267,400
				Total Cost	\$2,139,000
				Cost per m²	\$49.98

Table D.2 - Closure Cost Estimate - RDFFG Mackenzie Regional Landfill DOCP
Geomembrane Cover Option 2 - Primary Landfill Disposal Area

	Description	Quantity	Units	Estimated Unit Rate	Estimated Cost
1	Site Preparation				
1.01	Mobilization	1	LS	\$15,000.00	\$15,000
1.02	General site cleanup	1	LS	\$5,000.00	\$5,000
1.03	Hauling, filling and grading	1	LS	\$5,000.00	\$5,000
1.04	Smoothing, proof rolling, minor grubbing and topsoil stripping	42,800	m ²	\$3.00	\$128,400
	Subtotal				\$153,400
2	Landfill Cover System				
2.01	Intermediate cover - haul, place and compact	12,840	m ²	\$15.00	\$192,600
2.02	Geotextile (heavy weight) - Supply and install	42,800	m ²	\$4.75	\$203,300
2.03	LLDPE Geomembrane - Supply and install	42,800	m ²	\$13.75	\$588,500
2.04	Geocomposite drainage layer - Supply and install	42,800	m ²	\$15.00	\$642,000
2.05	Common fill layer (450 mm thick) - supply and install	19,260	m ³	\$15.00	\$288,900
2.06	Supply, Import, Place 150mm topsoil	6,420	m ³	\$35.00	\$224,700
2.07	Hydroseed topsoil	42,800	m ²	\$2.00	\$85,600
2.08	Passive LFG venting system	42,800	m ²	\$5.00	\$214,000
	Subtotal				\$2,439,600
3	Access Roads and Perimeter Fencing Improvements				
3.01	Internal Access road construction	750	m ³	\$15.00	\$11,250
3.02	Perimeter fencing upgrades	1	LS	\$30,000.00	\$30,000
3.03	Perimeter access road upgrades	1	LS	\$50,000.00	\$50,000
	Subtotal				\$91,250
4	Surface Water Management				
4.01	New crest ditching and downchutes	717	m	\$50.00	\$35,850
4.02	Upgrades to existing toe ditches and culverts	300	m	\$50.00	\$15,000
4.03	Expansion of surface water pond	1	LS	\$20,000.00	\$20,000
	Subtotal				\$70,850
5	Signage and Access				
5.01	Signage and Access	1	LS	\$5,000.00	\$5,000
	Subtotal				\$5,000
	Subtotal				\$2,760,100
	Contingency (40%)				\$1,104,040
	Engineering and Construction Oversight (20%)				\$552,020
	Total Cost				\$4,416,000
	Cost per m²				\$103.18

APPENDIX E: Fire Safety & Emergency Plan





MORRISON HERSHFIELD

Fire Safety & Emergency Response Plan (STAFF)

Mackenzie Regional Landfill



Date: December 12, 2023

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APPENDICES

APPENDIX A: Emergency Checklist Sheet

APPENDIX B: Emergency Preparedness Checklist



1. INTRODUCTION

This document is prepared for the Mackenzie Regional Landfill (the Site) staff for use in a case of a fire or emergency. This response plan sets out procedures to address foreseeable emergencies. This plan should be reviewed with staff and all relevant parties on a recurring basis. Updates to this plan should be considered should operations at the landfill change. The key points to note of this plan are:

- What is the nature and severity of the emergency?
- What needs to be done?
- Who does it?

This handbook is meant for **STAFF** use to be kept at an easily accessible and known place on site. Ideally, copies of this handbook are to be kept in a transfer station building, scale house building and in all staff vehicles.

This document will cover the following:

- Important notes and terms related to an emergency response
- Procedure form to follow
- Relevant contacts
- Emergency Response form to fill (Appendix A)
- An emergency preparedness checklist (Appendix B)

This plan should be reviewed with the local fire department and make any further changes necessary to fit the site's needs.

2. DEFINITIONS AND TERMS

An emergency is when a serious, unexpected, and often dangerous situation occurs that requires immediate action. An emergency response is when the encountered staff responds to an emergency to defuse or lessen the negative impact of the incident. The goal of an emergency response plan is NOT to endanger self or others in the process of defusing or lessening the negative impact of the incident, it is to behave and act rationally in a safe manner without emotion to solve the emergency response.

Emergency responses include the following:

- Fires
- Accidents and medical emergencies (i.e., vehicular crashes, fall from heights)
- Environmental and operation contingencies (i.e., exposed electrical lines)

The following two levels of reporting is required by any individual who locates a fire or emergency:

- **Report to a Supervisor:** Refers to a direct supervisor in charge of the individual who encountered or witnessed an emergency incident.

and

- **Report to the Owner (the Regional District of Fraser-Fort George):** The owner shall immediately be given details of the emergency incident. It is the owner's responsibility to ensure protection of human health and safety, provide directions to defuse or lessen the negative impact of the emergency, and report the incident to affected agencies prior to investigating the incident themselves.

3. FIRE MANAGEMENT

3.1 Fire Response Procedures

All fires should be treated seriously and reported as an emergency. Should an emergency occur, employees shall report to the primary muster point. Should the primary muster point be inaccessible, employees shall report to the secondary muster point.

The muster points for the Mackenzie Landfill are shown on Figure 1.

In the event of a fire, the following general procedures should be followed:

- **Do not panic.** The greatest danger lies not in fighting the fire, but in the panic that arises from a fire.
- Do not fight fire alone.
- Do not place yourself or others in danger while fighting the fire.
- Contact other nearby employees and bystanders, direct them to first muster point when safe.
- Summon the appropriate landfill equipment.
- Notify the Fire Department. Tell them the location and type of fire and whether it looks like it will spread out of the immediate area.
- Notify the Solid Waste Services Manager immediately. Follow their instructions.
- Notify surrounding property owners, particularly if it appears that the fire could spread beyond the landfill.
- When the Fire Department arrives, follow their instructions.

All fires will be reported as an emergency situation. Should an emergency occur, employees shall report and direct all bystanders to the primary muster point. Should the primary muster point be inaccessible, employees shall report to the secondary muster point.

Figure 1: Site Plan



3.2 General Fire Fighting Guidelines

- For a landfill fire, the fire is better controlled with the use of a dozer and dirt. If it is safe to do so, dig out and isolate the burning waste. Then either let it burn out or cover with dirt. Lots of water will not necessarily extinguish the fire and can cause more problems than it solves.
- Do not overuse water. Remember that most landfill fires can be controlled with a relatively small amount of water. In most cases, soil is more effective than water.
- If two or more water trucks are being used, try to use shifts so that at least one water truck is at the fire at all times.
- Do not waste time trying to fight a large fire with a fire extinguisher.
- Do not approach any fire with a tractor unless a water truck is close by for backup.
- Never risk personal injury or death attempting to save a machine or building.
- Remember, **SAFETY FIRST**.

3.3 Fire Prevention on Landfill

Preventative fires are the best way to not require a fire response and lessens the risk of staff and bystanders from exposing to any dangers. The Mackenzie landfill will be operated in a manner that will minimize the potential for landfill fires.

The risk of a landfill fire occurring due to spontaneous combustion or surface ignition can be minimized by maintaining the active excavation size as small as practical.

Fire prevention techniques will include:

- Thoroughly compacting waste.
- Applying daily cover to completely cover each cell's daily waste with inert mineral soil.
- Maintaining adequate soil resources near the excavation face to fight a fire.
- Maintaining sufficient water resources available to fight a fire.
- A smoking ban, especially in refueling areas and landfill excavation areas.
- Good site security to prevent arson.
- Maintaining a comprehensive load checking program to prevent the dumping of hot/burning materials.
- Maintaining a program of separating the dumping of ash barrels from general waste tipping face.
- Maintenance around pits to keep weeds and grass down to maintain a fire break reaching in or out of the landfill.
- Ongoing employee training on early fire hazard recognition.

3.4 Wind-Blown Litter & Debris

Managing wind-blown litter and debris control is required at landfills, which is as important as fire prevention. Wind-blown litter and debris can be found from all sorts of waste, such as lightweight papers, cardboard, plastic bags, to even plastic Tupperware. Controlling and collecting wind-blown litter and debris will be a routine for landfill staff to take part in.

The following are preventative methods to control wind-blown litter and debris:

- Encourage covers on inbound loads.
- Maintain small working face as practical.
- Maintain portable litter catchment fences around active areas.
- Maintain perimeter fencing.
- Regular inspection of loads to make sure all objects and wastes are secured.
- Litter retrieval program for staff.
- Employee training and awareness.

It is recommended the staff performs the following routines, but not limited to:

- Review working face and litter catchment fence placement before starting work and before end of day.
- Off-site litter pick-up daily.
- On-site litter pick-up weekly.

4. FIRE PROCEDURE CHECKLIST

THE FIRST PERSON ON THE SCENE MUST:

1 PROTECT human health and safety.
Eliminate possible dangerous sources.
Warn/remove bystanders.

2 EVACUATE the building when safe to do so.

3 DIRECT self and bystanders to a muster point when it is safe to do so.

4 CALL 911 and wait for emergency response personnel to arrive. Direct personnel to Civic Address:

CHECK FOR CIVIC ADDRESS

5 CONTACT the Supervisor and Owner to update the situation.

6 REPORT in writing on the emergency response as needed when help arrives.

5. EMERGENCY RESPONSE

Unexpected accidents can happen in any situation and staff at the landfill are no exception. The staff at the landfill will require training and understanding of the state of emergency and be considered as part of their daily job routine to be aware of the situation around them.

Staff at the Landfill will require to have the following:

- Employee Safety Training and Awareness
- First Aid Training
- Access to Safety Plan and Procedures

There are a number of different emergencies and accidents that the staff may encounter. Below are a couple of examples of emergencies that staff may encounter and should know how to handle when such situations occur.

5.1 Medical Emergencies:

All injuries should be considered important and will be reported as a safety incident to the Landfill Manager.

First Aid should be applied that is appropriate to the nature of the injury, and in the even the injury requires medical assistance, the individual should either be taken to a medical emergency center, or an ambulance service contacted.

A medical doctor should be consulted for all injuries that may result in infections as a result of working with waste materials. This includes injuries such as cuts and scrapes, skin punctures with sharp items, and fire or chemical burns.

If the person injured is a site customer or visitor, Landfill employees are to provide any assistance necessary and will apply appropriate First Aid.

For any serious medical injuries that involve life or death, contact 911 immediately.

5.2 Vehicular or Equipment Accidents:

All vehicle accidents should be reported and an investigation as to the cause should be carried out. Following the investigation, appropriate mitigative measure should be determined and implemented to avoid future accidents.

6. EMERGENCY PROCEDURE CHECKLIST

THE FIRST PERSON ON THE SCENE MUST:

- 1 **PROTECT** human health and safety.
Eliminate possible dangerous sources.
Warn/remove bystanders.
- 2 **ATTEND** to the injured person and apply
First Aid.
- 3 **CALL 911** and wait for emergency
response personnel to arrive. Direct
personnel to Civic Address:
CHECK FOR CIVIC ADDRESS
- 4 **STAY** with injured person until medical
assistance arrives.
- 5 **CONTACT** the Supervisor and Owner to
update the situation.
- 6 **REPORT** in writing on the emergency
response as needed when help arrives.

7. EMERGENCY RELATED RESOURCES AND CONTACT NUMBERS

Supervisor	XXXXXXXXXXXXXXXXXXXX
Alternate	XXXXXXXXXXXX
Firehall	911
Alternate	XXXXXXXXXXXX
Chief Administrative Officer	XXXXXXXXXXXXXXXXXXXX
Alternate	XXXXXXXXXXXX
Environment Canada	XXXXXXXXXXXX

APPENDIX A: Emergency Checklist Sheet

EMERGENCY RECORD SHEET

Date of Emergency: _____ Time: _____ am / pm

Location: _____

(Facility and exact location at facility)

Type of Emergency:

☐ Fire

☐ Vehicle or equipment accidents

☐ Medical (minor or major)

☐ Others: _____

What caused the emergency?

Actions Taken: _____

Who was the Emergency Reported to: _____

Emergency Impacts (Injuries, accidents, damage to property)

Report Completed by: _____ Date: _____

Signature: _____



Mackenzie Regional Landfill – Incident Report

Reported by: _____

Reported to: _____

Department: _____

Date of Report: _____

INCIDENT INFORMATION

Date of Incident: _____ Time of Incident: _____ (am/pm)

Location (please be specific): _____

Nature of Incident:

☐ Injury/Illness

☐ Fire

☐ Vehicle Collision

☐ Property Damage

☐ Spill

☐ Other: _____

Incident Description (use additional form if necessary): _____

Nature of Injury (if applicable):

☐ First Aid

☐ Medical Aid

☐ Modified Work

☐ Lost Time

☐ Fatal

Property Damage and Estimated Loss/Damage (if applicable): _____

Name	Contact Information	Staff	Contractor	Witness
		☐	☐	☐
		☐	☐	☐
		☐	☐	☐
		☐	☐	☐



Was a Police Report Filed? ☐ YES ☐ NO File No.: _____

Reporting Officer: _____ Phone: _____

Contributing Factors (if any): _____

Corrective Actions: _____

Disciplinary Actions: ☐ Verbal Warning ☐ Written Warning ☐ N/A

Follow-Up Actions (use additional form if necessary): _____

Reporting Employee Name/Position: _____

Employee Signature: _____ Date: _____

Supervisor Name: _____

Supervisor Signature: _____ Date: _____

Manager Name: _____

Manager Signature: _____ Date: _____

Comments/Recommendations: _____



WITNESS STATEMENT #1

Please give as many details about the incident as possible (who, what where, when how & why)

[illegible]

Witness Name: _____

Witness Signature: _____

Date: _____

WITNESS STATEMENT #2

Please give as many details about the incident as possible (who, what where, when how & why)

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Witness Name: _____

Witness Signature: _____

Date: _____



APPENDIX B: Emergency Preparedness Checklist

Emergency Preparedness Checklist			
Checked by:		Date:	
Item List			Check Box
Soil/Cover Pile nearby active face (2-3 loads)			
Fire Extinguisher:			
• Inside excavator			
• Inside transfer station building			
• Inside staff vehicle			
Muster Points			
Are they clear?			
• Muster Point A			
• Muster Point B			
Are signages visible?			
• Muster Point A			
• Muster Point B			
First Aid Kit:			
• Inside transfer station building Expiry Date: _____			
• Inside staff vehicle Expiry Date: _____			

APPENDIX G - COVER LOG SHEET

Regional District of Fraser-Fort George
MACKENZIE SELECT WASTE LANDFILL

Soil Cover LOG

[illegible]

APPENDIX H - INCIDENT REPORT



REGIONAL DISTRICT
of Fraser-Fort George

INCIDENT REPORT ILLE 1.1

This report must be completed immediately and filed within 24 hours of the incident. Please print in ink. Originals will be forwarded to Main Office.

MACKENZIE SELECT WASTE LANDFILL

DATE: _____

TIME: _____AM/PM

A. Person Reporting Incident:

NAME: _____

POSITION: _____

B. Details of Incident:

(Include descriptions of person or persons involved, description of all vehicles involved, license plate numbers, what was observed and any additional relevant information - use back of page if more space required)

SIGNATURE: _____

DATE: _____

C. Witnesses:

1. NAME: _____

2. NAME: _____

ADDRESS: _____

ADDRESS: _____

PHONE #: _____

PHONE #: _____

SIGNATURE: _____

SIGNATURE: _____

D. Action Taken:

RCMP CONTACTED: YES _____ NO _____ OFFICER'S NAME: _____ FILE #: _____

INVESTIGATED: YES _____ NO _____

E. Reported to Regional District:

DATE: _____

TIME: _____AM/PM

EMPLOYEE: _____

SUPERVISOR: _____

SIGNATURE: _____

SIGNATURE: _____

DATE: _____

DATE: _____

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