

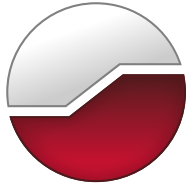


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**Environmental Impact Assessment
Registration Document
Northwest Regional Service
Commission
Waste Containment Cell Height
Increase Project
Rivière-Verte, New Brunswick**

April 29, 2022
GEMTEC Project: 100760.002



GEMTEC

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Submitted to:

Department of Environment and Local Government
Marysville Place, P.O. Box 6000
Fredericton, NB
E3A 5T8

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Registration Document
Northwest Regional Service
Commission
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GEMTEC Project: 100760.002

GEMTEC Consulting Engineers and Scientists Limited
191 Doak Road
Fredericton, NB, Canada
E3C 2E6

April 29, 2022

File: 100760.002

Department of Environment and Local Government
Marysville Place, P.O. Box 6000
Fredericton, NB
E3A 5T8

Attention: Patrick MBaya - Project Manager

**Re: Environmental Impact Assessment Registration Document
Northwest Regional Service Commission – Waste Containment Cell Height Increase**

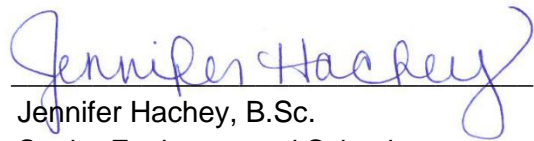
GEMTEC Consulting Engineers and Scientists Limited (GEMTEC) is pleased to submit this electronic copy of the Environmental Impact Assessment (EIA) registration document for the proposed Waste Containment Cell Height Increase project on behalf of Northwest Regional Service Commission (NWRSC). The proposed project is located at the NWRSC sanitary landfill at 248 Chem. Clément Roy, in Rivière-Verte, New Brunswick, identified by Service New Brunswick (SNB) as Property Identifier (PID) 35348432.

Please do not hesitate to contact the undersigned if you have any questions or concerns about the registration document or the information presented herein.

Sincerely,



Paul Vanderlaan, P. Eng.
Environmental Regulatory Specialist
GEMTEC



Jennifer Hachey, B.Sc.
Senior Environmental Scientist
GEMTEC

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1.0 INTRODUCTION

GEMTEC Consulting Engineers and Scientists Limited (GEMTEC) has been retained by the Northwest Regional Service Commission (NWRSC) to prepare an Environmental Impact Assessment (EIA) registration document for the proposed Waste Containment Cell Height Increase Project (herein referred to as the “Project”) at the existing sanitary landfill facility located at 248 Chem. Clément Roy, in Rivière-Verte, New Brunswick (herein referred to as the “Landfill”). The Landfill is situated on the property identified by Service New Brunswick (SNB) as Property Identifier (PID) 35348432. The general location of the proposed Project and the Landfill are presented in Figure 1.

In an effort to optimize the efficient use of the Landfill, and maximize the available airspace, NWRSC is proposing to increase the height of municipal solid waste (MSW) placed in the currently operational waste containment cells, as well as all future waste containment cells.

GEMTEC submitted a description of the Project to the New Brunswick Department of Environment and Local Government (NBDELG) on November 25, 2021 to confirm regulatory requirements for the proposal. The NBDELG issued a letter dated December 7, 2021 stating the proposed Project is considered a significant modification to an existing facility, and requires EIA Registration and review as per item (m), “all waste disposal facilities or systems” of Schedule A of the *Environmental Impact Assessment Regulation – Clean Environment Act*, before it can proceed. The Project description document and the NBDELG correspondence is presented in Appendix A.

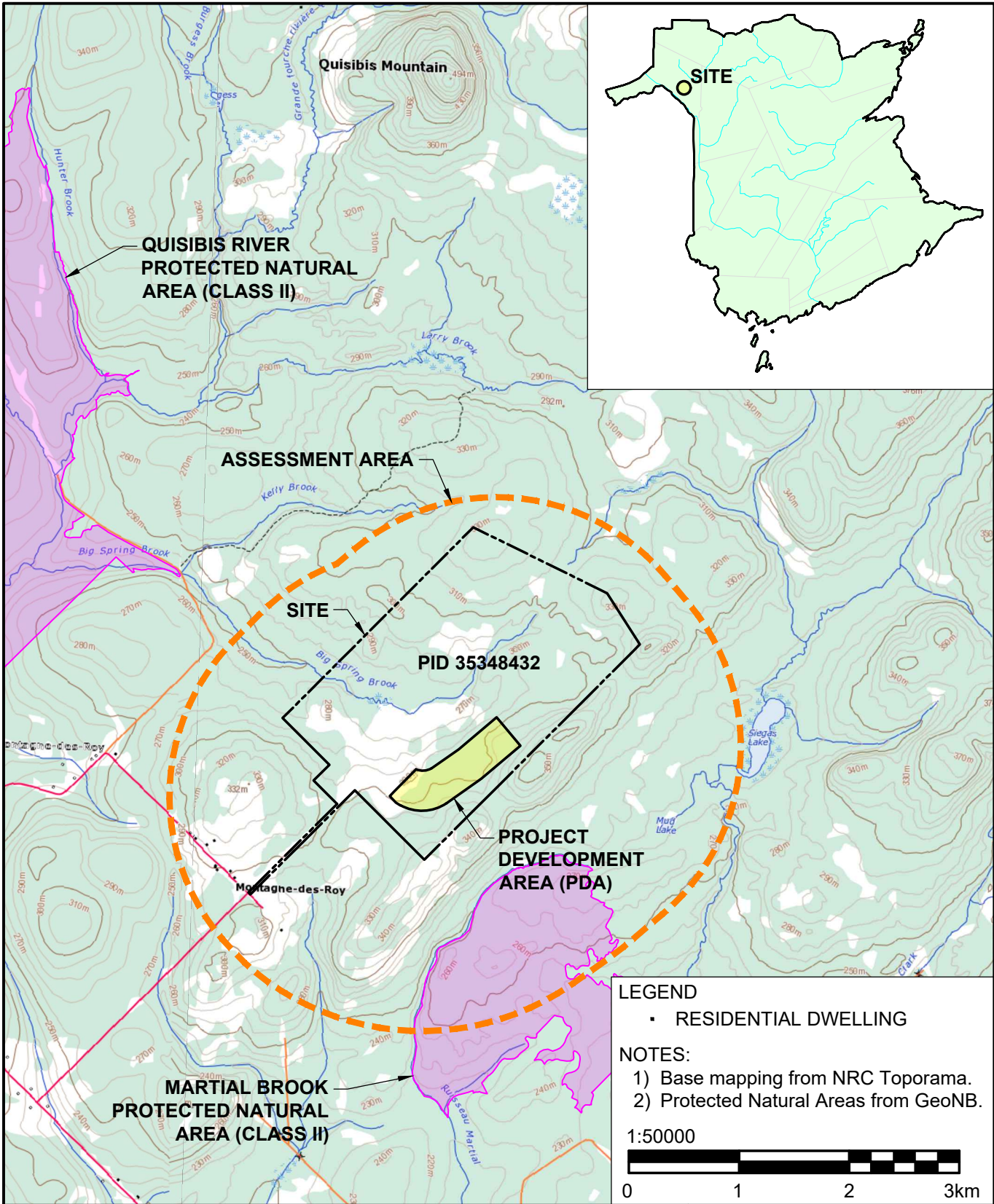
This document is the EIA Registration for the proposed Project. The document details the necessary information as outlined in the NBDELG document “A Guide to Environmental Impact Assessment in New Brunswick” dated January, 2018 as well as the Sector Guideline for Waste Disposal Facilities.

The Landfill has been operational since 1997 and receives all MSW from the Madawaska, Victoria, and western half of Restigouche counties. During the planning phase of the facility in the mid-nineties, the yearly tonnage of material to be disposed of at the Landfill was estimated to range from 22,500 to 58,500 Tonnes of MSW. At present, approximately 50,000 Tonnes of MSW is disposed of at the Landfill on an annual basis.

The remaining lifespan of the Landfill in its current configuration is estimated to be 60 years with an expected closure to occur post 2080. The current capacity of the Landfill, expressed in tonnage of waste to be disposed of, is estimated to be 3 million Tonnes. The Project would add capacity for an additional 850,000 tonnes, increasing the overall capacity of the Landfill by about 28% and extending its lifespan by up to 17 years.

The proposed Project involves increasing the maximum height of the waste containment cells from the currently approved MSW thickness of 20 metres to the maximum available volume based on cell geometry – increasing the height in some areas by up to an additional 20 metres. The

height increase is proposed for the currently active waste containment cells (Cells 9 and Cell 10), as well as all future waste containment cells. The elevation of previously filled and capped cells (i.e., Cells 1 through Cell 8) are not included in this Project and will remain unchanged. The proposed additional waste storage will utilize the existing leachate collection system and leachate treatment system. The Project does not involve an increase in the footprint of the Landfill.



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LEGEND

- RESIDENTIAL DWELLING

NOTES:

- 1) Base mapping from NRC Toporama.
- 2) Protected Natural Areas from GeoNB.

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PROJECT WASTE CONTAINMENT CELL HEIGHT INCREASE PROJECT		DRAWING GENERAL SITE LOCATION PLAN			<p>GEMTEC CONSULTING ENGINEERS AND SCIENTISTS</p>
DRAWN BY AGSD	DATE APRIL, 2022	FILE NO. 100760002-03	DRAWING NO. FIGURE 1	REVISION NO. 0	

1.1 Name of the Undertaking and Project Proponent

1.1.1 Name of the Undertaking

Waste Containment Cell Height Increase Project, Northwest Regional Service Commission, Rivière Verte, New Brunswick

1.1.2 Project Proponent

Table 1.1 Proponent Information

Name of Proponent	Northwest Regional Service Commission (NWRSC)
Address of Proponent	248 Clément-Roy Road, Montagne-de-la-Croix Rivière Verte, New Brunswick E7C 2W7
Principal Proponent Contact	Mr. Richard LeBel Director of Solid Waste Management Services Telephone: (506) 263-3470 Email: r.lebel@csrno.ca
Principal Contact Person for EIA	Paul Vanderlaan, P.Eng. GEMTEC Consulting Engineers and Scientists Limited 191 Doak Road, Fredericton, New Brunswick, E3C 2E6 Telephone: (506) 453-1025 Email: paul.vanderlaan@gemtec.ca
Property Ownership	Northwest Regional Service Commission (NWRSC)

2.0 PROJECT DESCRIPTION

2.1 Project Overview

NWRSC operates the regional sanitary landfill (the Landfill) in Rivière Verte on the property identified by SNB PID 35348432 (herein referred to as the “Site”) since 1997. The Landfill is primarily designed to serve residents of the Madawaska, Victoria and the western half of Restigouche Counties, with provisions to also accept waste from the state of Maine. The Landfill operates in accordance with an Approval to Operate (I-11189; valid to February 7, 2026) issued to the NWRSC by NBDELG (Appendix B).

Currently, the maximum allowable MSW deposition is prescribed at a thickness of 20 metres per the original EIA document for the development of the Landfill (Republic Consultants Inc., 1995). In an effort to optimize the efficient use of the Landfill, and maximize the available airspace, NWRSC proposes to increase the height to which waste is deposited in the currently active, and all future, waste containment cells (Figure 2). The actual height increase for each future cell would vary based on the cell geometry, which is not yet designed, but final elevation of the future cells is expected to range from +316 to +322 metres (geodetic datum). In Cell 9 and Cell 10, this would result in an increase in final Landfill elevation from approximately +298 meters to approximately +316 meters (Figure 3 to Figure 6).

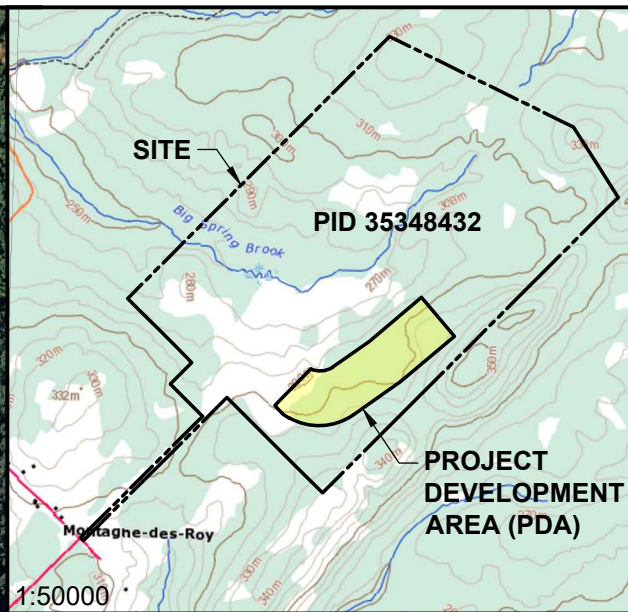
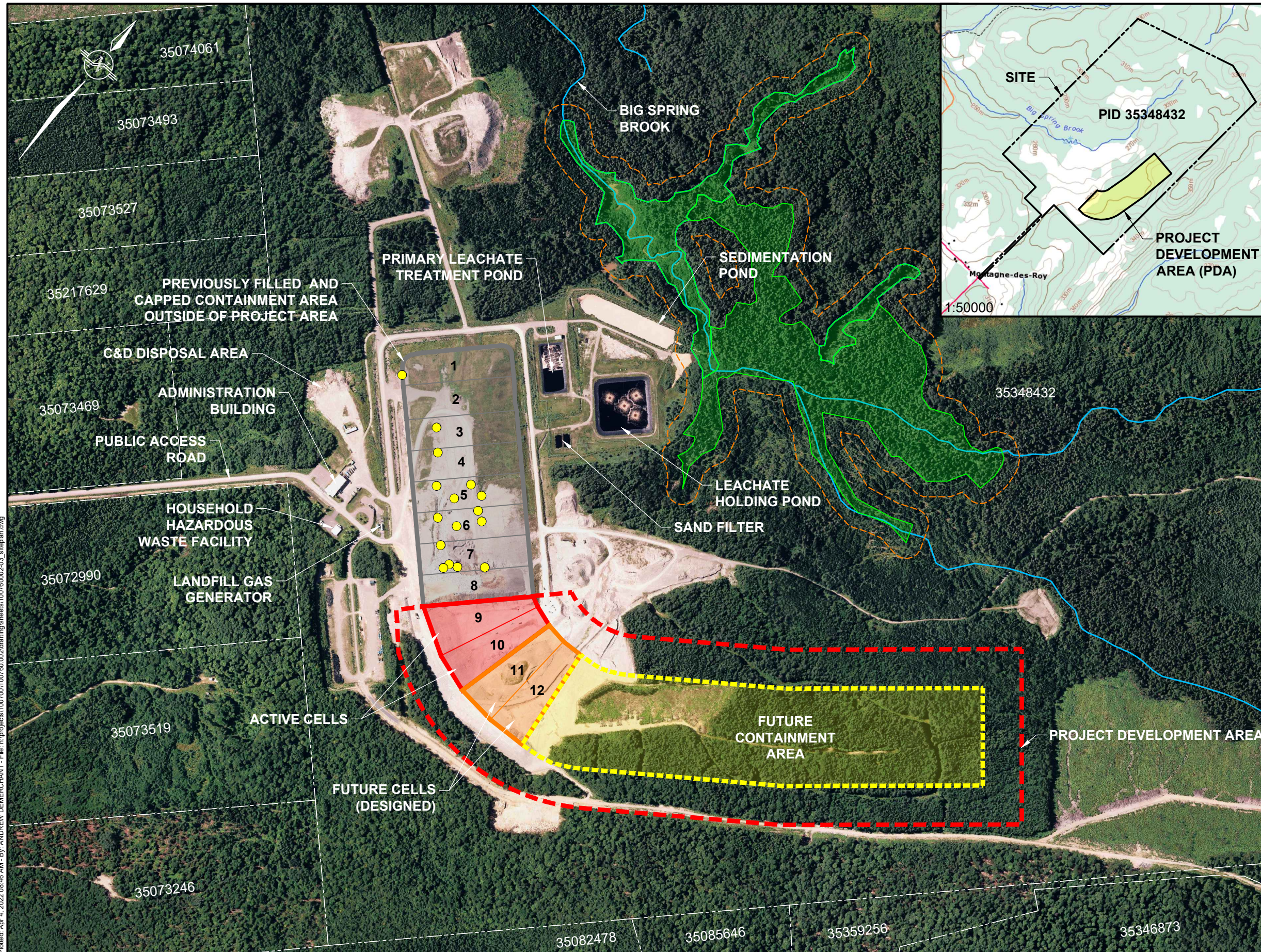
The higher MSW deposition heights would not affect the overall footprint of the Landfill cells from what has been previously approved (Figure 2). MSW would be placed as high as possible, while maintaining containment cell side slopes of 3.5 horizontal to 1 vertical (3.5H:1V) and a 20 metre wide working surface atop of each cell. A working surface at the top of each cell, with a width of 20 meters, allows for safe operation of equipment during active landfilling operations and installation of final cover, once a containment cell has been filled. Appendix C shows engineering details for current waste containment cell design (Cell 9 and Cell 10).

The Project will utilize the existing Landfill infrastructure and no new or unique materials/activities are required outside of typical landfill operational requirements. The Project does not involve any additional construction activity beyond the future planned containment area (Figure 2) and does not require any modification to the currently existing, and future planned, leachate collection system, landfill gas (LFG) collection system, or cell liner design. As such, the EIA does not consider a “construction or site development phase” and focuses only on the “operational phase” of the Landfill.

Since the Project does not involve an increase in the spatial footprint of the Landfill, it will not result in additional removal of natural habitat features beyond what was considered in the original EIA document (Republic Consultants Inc., 1995). Additionally, the Project is not located within 30 metres of any watercourse or wetland per GeoNB Mapviewer (shown on Figure 2). Operational activities/conditions are not expected to differ significantly from those currently undertaken at the Landfill (e.g., noise levels, emissions, traffic patterns, etc.).

The Project will be accessed via the existing roadway network to and within the Site (Figure 2). No new roadways or access points are required. The Project will not increase traffic type, density or volume into the Landfill. The Project activities will be completed during typical Landfill operational hours (Monday to Friday, day time hours, and Saturday mornings in non-winter seasons).

The Project, if approved, will result in a 28% increase in Landfill capacity, which corresponds to an increased lifespan of approximately 17 years. This would extend the anticipated closure date beyond 2090. The increased lifespan of the Landfill will not impact the overall site closure and reclamation plan. The closure and reclamation plan addresses requirements for environmental monitoring, engineering inspection, maintenance of final cover, leachate management, gas management and administration. In addition, the plan specifies all containment cells will be capped in accordance with NBDELG requirements.



- LEGEND**
- LANDFILL GAS WELL LOCATION
 - REGULATED WETLAND (GeoNB)
 - REGULATED WETLAND 30m BUFFER (GeoNB)
 - HYDROGRAPHIC NETWORK (GeoNB)
 - PROPERTY BOUNDARY (GeoNB)
 - PROJECT DEVELOPMENT AREA (PDA)

NOTE: 2018 aerial photo from GeoNB.

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PROJECT
WASTE CONTAINMENT CELL HEIGHT INCREASE PROJECT

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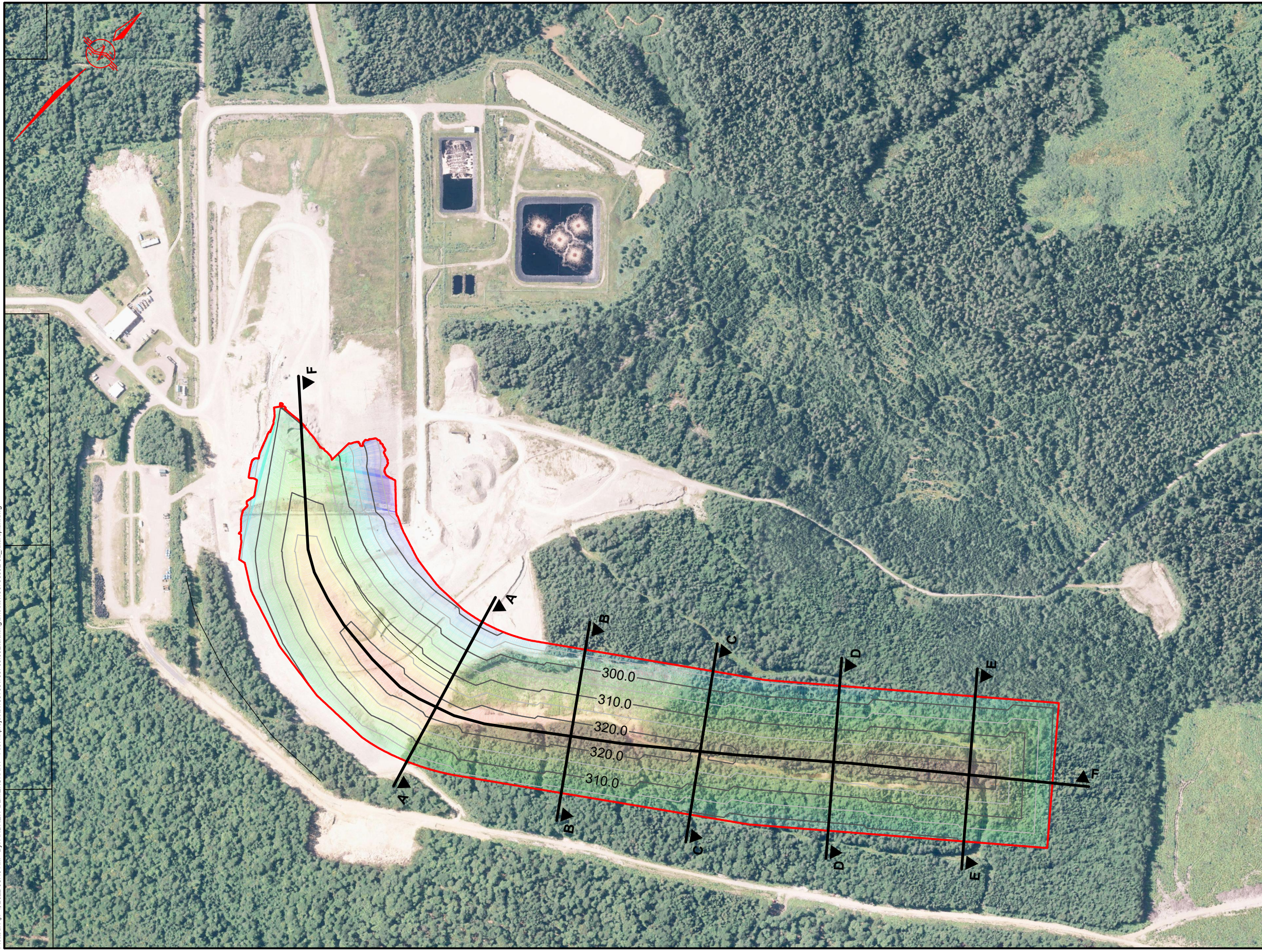
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PROJECT
WASTE CONTAINMENT CELL HEIGHT INCREASE PROJECT

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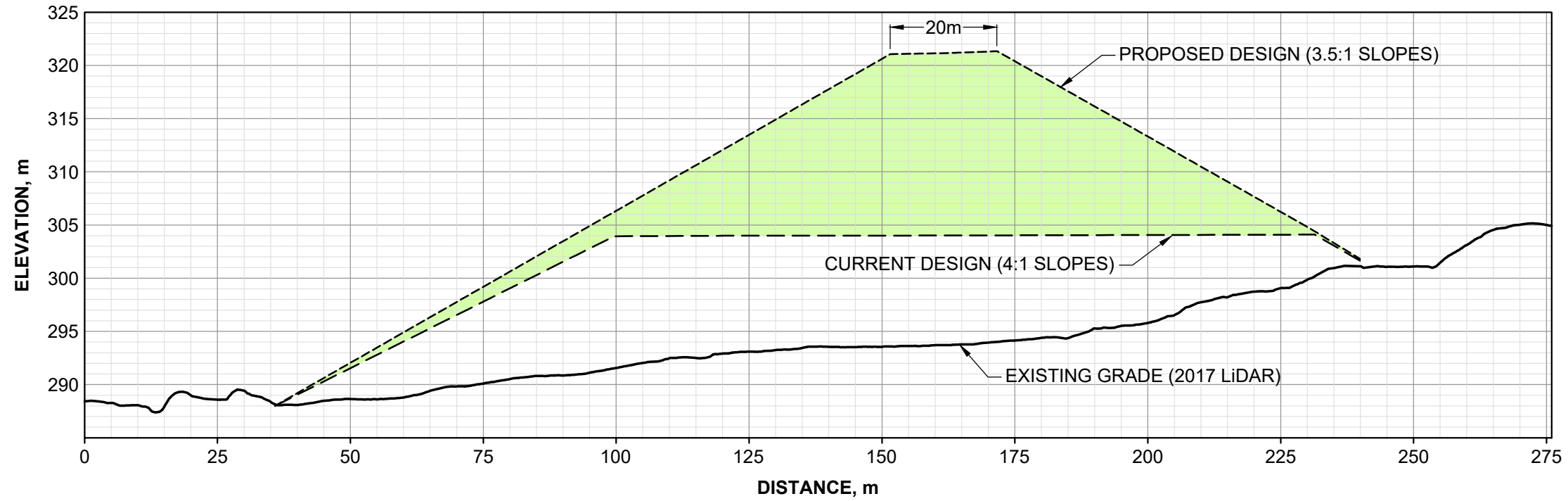
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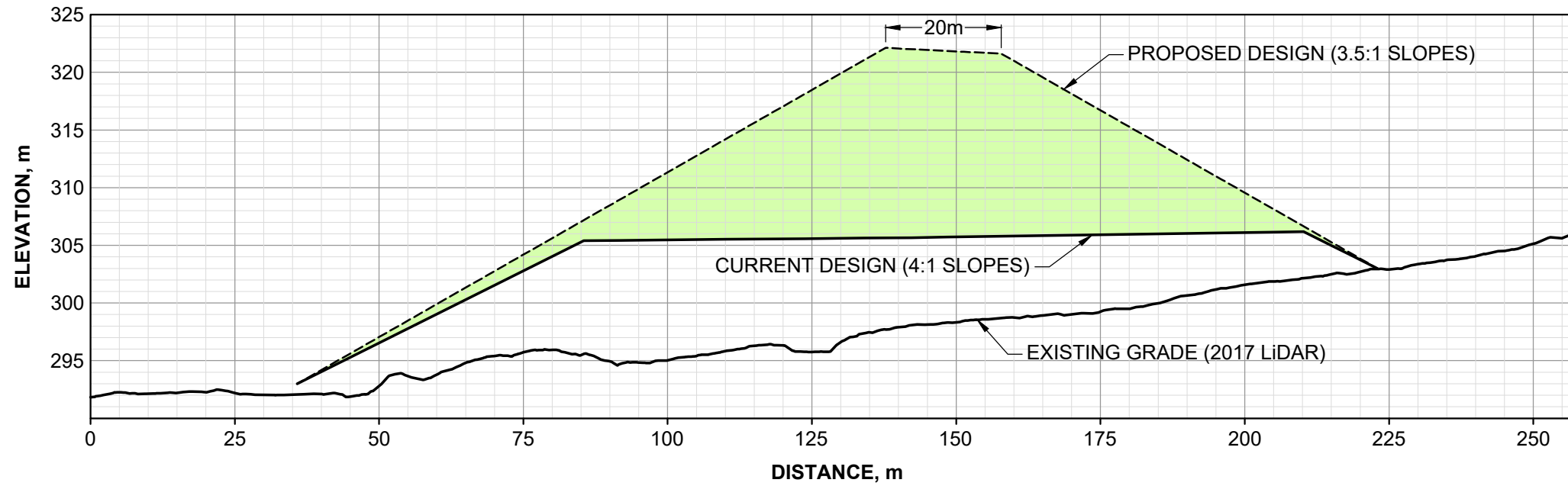


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SECTION A



SECTION B



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PROJECT
WASTE CONTAINMENT CELL HEIGHT INCREASE PROJECT

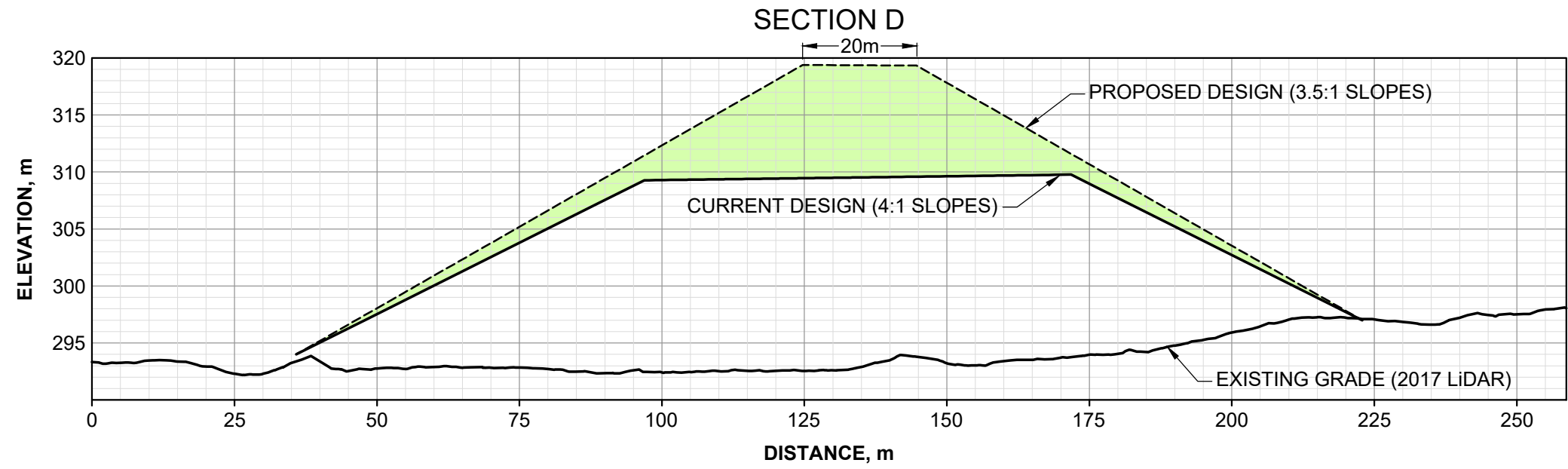
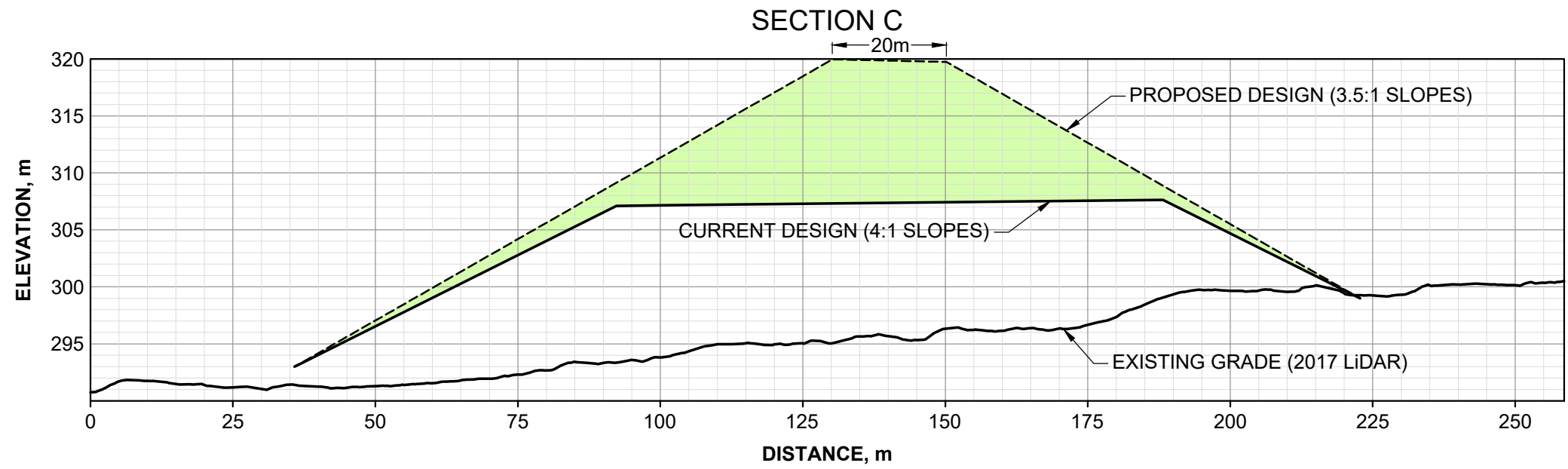
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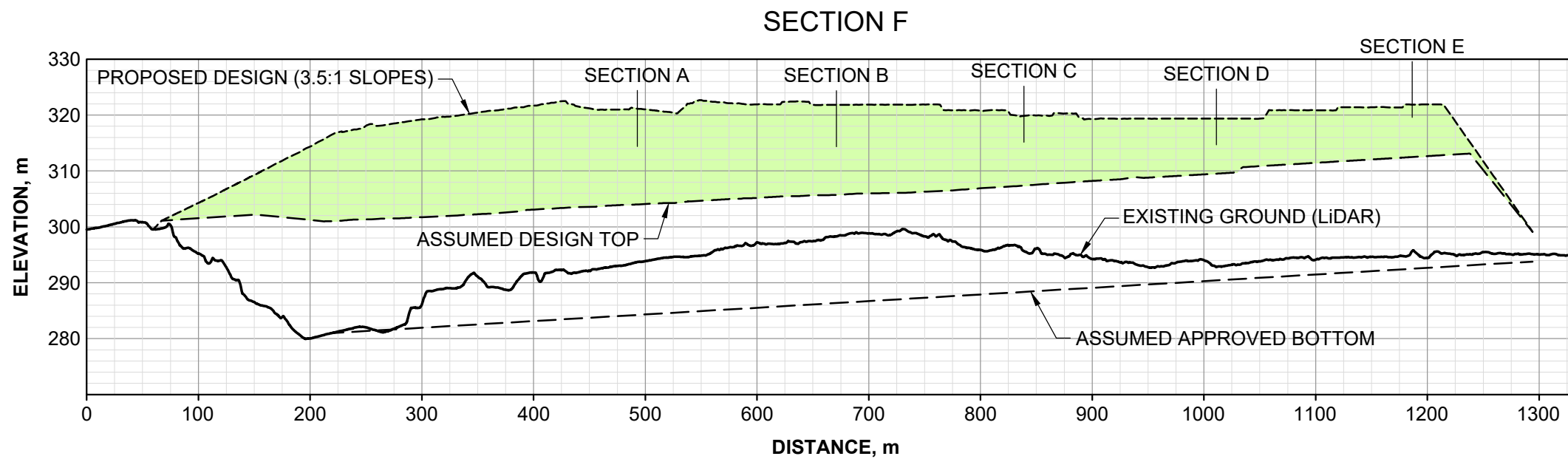
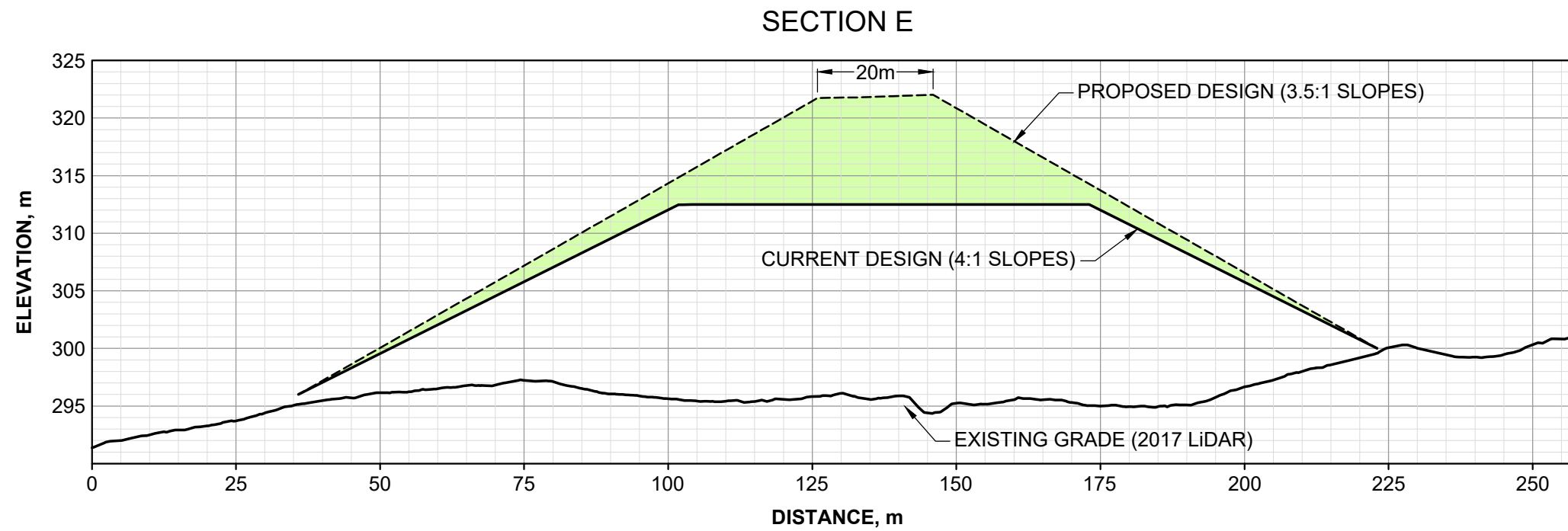
PROJECT
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PROJECT
WASTE CONTAINMENT CELL HEIGHT INCREASE PROJECT

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2.2 Purpose / Rationale / Need for the Undertaking

The Landfill was established in 1997, at which time the lifespan was estimated to be 50 years. Throughout its operational life, the management of the Landfill has aimed to optimize the use of its supporting infrastructure from both a fiscal and environmental perspective, and continually explores improvement opportunities to provide the most economical and efficient waste management service to the public. One component of this approach is to explore and implement opportunities to utilize the Landfill and its supporting infrastructure for the longest possible timeframe. Through the implementation of innovative management and waste diversion approaches, the estimated lifespan of the Landfill has already been increased by approximately 30 years to a currently expected closure date of post 2080. The proposed Project would further increase the expected lifespan by an additional 17 years, with an expected closure date to be beyond 2090.

The key rationale for the Project is to extend the life of the Landfill. This is anticipated to result in direct benefits to the municipalities and local service districts in the NWRSC jurisdiction, as to prolong the need for establishing a new landfill site for the region. The costs of siting and constructing a new landfill facility and its supporting infrastructure, would be very expensive (estimated to be at least \$20 to \$25 million in 2022 dollars); extending the life of the existing Landfill will reduce waste management costs for the public as such. Extending the life of the existing Landfill will also avoid the need for further habitat destruction/environmental impacts for the purpose of waste management in the region.

Maximizing the usable airspace in the existing Landfill is the most environmentally and economically sustainable option for waste management in the NWRSC area.

2.3 Project Location and Ownership

The Project will be carried out on the existing Landfill Site currently operated by NWRSC on PID 35348432, approximately 500 ha in size (the Site). Central coordinates of the Site are 47.3682°, - 67.9738°.

The Project Development Area (PDA) is defined as the physical footprint required for the Project (a portion of PID 35348432). It is expected the PDA will include active MSW containment cells (Cell 9 and Cell 10), all future containment cells (i.e., Cell 11, Cell 12, Cell 13, etc.), any required access/hauling routes, and temporary structures (i.e., trailer, portable toilets, equipment storage, etc.). Within the Site, the estimated footprint of the PDA is 40 hectares (ha; Figure 1 and Figure 2).

The EIA Assessment Area encompasses nearby sensitive receptors (i.e., neighbouring residential dwellings, environmentally sensitive areas, etc.) within a 2 kilometre (km) radius of the PDA (Figure 1).

The property is private land and owned by NWRSC.

2.4 Siting Considerations

The proposed Project will be implemented for currently active and future waste containment cells, allowing the storage capacity of the Landfill footprint to be maximized. It is expected this will result in a reduction of environmental impacts by extending the life of the existing Landfill within its current configuration. A cost savings to the public is also considered by utilizing the existing and future cells for a longer period of time (i.e., less construction, etc.) and the postponement of a new landfill site.

The Project will not involve an increase in the overall footprint of the Landfill, thus no additional habitat disturbance/destruction or natural vegetation removal is required. Additionally, the PDA is not located within 30 metres of any watercourses or wetlands (Figure 2; GeoNB, 2022). The PDA is not located within a wellfield or watershed protected area (GeoNB, 2022).

The Project will utilize the existing, and future development, leachate collection and treatment systems at the Landfill. Storm water drainage patterns and on-site storm water management will remain unchanged from the conditions currently observed and planned at the Landfill.

No alternate locations were considered given the Project, if approved, will be implemented within the existing Landfill footprint.

2.5 Physical Components and Dimensions of the Project

Figure 2 shows the existing site plan of the Landfill within which the Project will be implemented. The Project will not change the current or future development footprint or operation area of the Facility.

2.5.1 Landfill Cell Design

The general construction sequence for the containment cells at the Landfill is presented in Appendix C and is described below:

- The in-situ till soils are excavated down to design elevations, to maximize the cell capacity while promoting positive drainage and allowing the leachate collection system to flow to the leachate storage and treatment ponds by gravity;
- Underdrain piping systems are installed and backfilled to subgrade;
- The natural subgrade till is graded and compacted;
- Granular materials and selected till borrow material is placed to construct containment berms;
- A composite liner system is then constructed, including a low permeability re-compacted till liner overlain by two High Density Poly Ethylene (HDPE) geomembrane liners. A geonet drainage layer is installed between the two HDPE geomembranes. A Geosynthetic Clay Liner (GCL) is also incorporated in the liner system beneath leachate collection pipes;

- Leachate collection layers are constructed, consisting of a layer of geonet, overlain by geotextile, overlain with leachate collection pipes and leachate collection aggregates (clear stone in areas around the pipe, a clean sand material over the remainder of the containment cell); and
- After leachate collection systems are constructed and tied-in to existing leachate management systems, the cell is ready for service and can receive and store MSW.

Once the cell has been constructed, the disposal of waste will occur on a daily basis once capacity has been exceeded in the previously active cells. The MSW material is compacted as it is placed and covered regularly with daily cover material (aggregate) to reduce odours, mitigate against animal pests, and to reduce windblown debris.

The expected lifetime of each cell varies with the quantity of deposited waste and the size of the cell. Currently, the Landfill cells are sized and constructed to last three (3) years. Once full, the cell is capped with a layer of low permeability capping material (i.e., clay material and/or GCL). Landfill gas collection wells have also been historically installed on closed/capped Landfill cells (Figure 2). Capped cells are hydroseeded to promote growth of vegetation and protect the cap from erosion.

No modification to the typical cells design or the active Cells 9 and 10 is required to raise the maximum final height of MSW in the containment cells as side-slopes can be maintained with the proposed increase. The Project does not require an increase in lateral footprint of the active or future containment cells to support the height increase.

Operational equipment will mobilize to the PDA, as required. During the Project, the required equipment will include, but is not limited to, bulldozer(s), front-end loader(s), dump truck(s), excavator(s), and personnel truck(s). All this equipment is the same as what is currently used for the placement and containment of MSW; the project will require no additional processes or equipment as compared to what is already utilized at the Landfill. The procedures for MSW placement and containment will not change from current practice with the implementation of the Project, should it be approved.

2.5.2 Leachate Collection and Treatment

The existing leachate collection and treatment system will facilitate the requirements of the Project. No additional volume and/or storage within the Leachate Ponds (Figure 2) is deemed to be necessary as open surface areas (i.e., active waste containment cells) subjected to surface water infiltration (leachate production) will remain similar to the conditions currently observed on Site.

The additional weight resulting from the proposed waste containment cells height increase is not expected to compromise the existing, or future planned, leachate collection system. Additionally, NWRSC assesses the condition of the leachate collection lines installed at the Landfill on a regular

basis by means of video inspection (Approval to Operate, Appendix B). See section 5.5.1 for further details and a summary of analysis.

The leachate collection system drains by gravity to the low end of the waste containment cell and then to the existing treatment system through a network of solid piping and manholes. The on-Site leachate treatment system consists of:

- A primary leachate aeration lagoon for aerobic biological aeration treatment;
- A flow-controlling retention lagoon with surface aerators to maintain treating oxygen levels;
- Sand bed filters to reduce heavy metals and particulates; and;
- The final sedimentation pond, which also collects stormwater from the Site.

The treated leachate is discharged into the receiving watercourse (Big Spring Brook, Figure 2) in accordance with the COA (I-11189). Monthly sampling of the leachate is completed by Landfill personnel, tertiary sampling is completed by a third party consultant.

The treatment ponds are designed with a HDPE geomembrane liner, layers of re-compacted till soil liner and a bentonite amended soil liner. For liner design, the “half-life” (time it takes for the liner to degrade 50 %) is considered to be the design life. Published predicative design values for the half-life of unexposed (buried) HDPE liners ranges from 69 to 446 years (Geosynthetic Institute; GRI White Paper #6: Geomembrane Lifetime Prediction: Unexposed and Exposed Conditions, Koerner, Husuan, Koerner, 2005). The half-life of the HDPE liner will depend on exposure to UV radiation, moistures, pressure and temperatures; however, it is expected this existing infrastructure will withstand the proposed extended lifetime of the Landfill.

2.5.3 Landfill Gas System

In 2010, the Landfill established the Landfill Gas (LFG) system to collect and convert the odorous gases produced by the landfilling activities into electric power. The LFG system is capable of producing 633 kilowatt hours (Kwh) of energy annually, which is used to support the Landfill operations; excess energy is sold directly to Énergie NB Power.

The LFG system also serves as an odour reducing agent, as any excess gases are burnt off via a flare at a destructive rate greater than 99 %. The Project will contribute LFG to the existing system, which is designed to consider Landfill growth. Additional gas collection wells and horizontal collection piping will be installed, in sequential fashion, after waste has been placed in the current and future cells. The Project is not expected to produce additional odorous gases that exceed the capabilities of the LFG system.

Currently, LFG is extracted from the landfill at a rate of 200 standard cubic feet per minute (scfm) and the existing infrastructure has capacity to increase LFG extraction rates to 300 scfm. The LFG generator currently operates at about 90 % capacity (570 Kwh annually), which indicates

there is existing capacity for future LFG system expansion, including the additional extraction wells to be constructed as part of the currently active cells. The quantity of LFG produced at the Landfill will increase over its lifetime and is expected to exceed the capacity of the current system. The LFG utilization system will be expanded to accommodate the LFG produced at the Landfill, with the inclusion of the additional LFG generated as part of this proposed Project.

2.6 Project Related Documents

A copy of the NBDELG issued Approval to Operate (I-11189, valid to February 7, 2026) is included in Appendix B.

There is one known EIA (Environmental Impact Assessment for the Madawaska-Victoria Regional Waste Sanitary Landfill, 1995) registered with NBDELG in 1995 for the initial construction and operation of the Landfill (Republic Consultants Inc., 1995).

An Environmental Management Plan (EMP) is being developed for the Landfill, and will be submitted to NBDELG for review and approval following the submission of this EIA Registration.

2.7 COVID-19 Related

The global pandemic and manifestation of the coronavirus (COVID-19) has become an issue that affects all New Brunswickers, its business and all facets of the economy. As a result, this issue warrants consideration during the environmental review and approval processes for proposals that may be influenced by the pandemic, or alternatively, may have an impact on the pandemic.

A copy of the NWRSC's COVID-19 protocols are included in Appendix D.

3.0 ENVIRONMENTAL IMPACT ASSESSMENT METHODOLOGY

This EIA report has been written to meet the requirements of the *New Brunswick Environmental Impact Assessment Regulation 87-83* (as described in Section 1.0), and in particular:

- Documents the existing conditions of the Site and the Project description;
- Assesses potential environmental effects of the Project (positive or negative);
- Outlines mitigation and impact management measures to minimize anticipated impacts or to reduce anticipated impacts to acceptable levels.

The EIA focuses on issues directly relevant to increasing the height of the Landfill containment cells beyond the currently mandated 20 metre vertical limit. The approach of this assessment is to focus on project-specific environmental components in a method consistent with New Brunswick EIA regulatory requirements. However, the Project will not directly involve an increase in the footprint of the Landfill, habitat destruction or vegetation removal, nor is the Project located within 30 metres of any watercourse or wetland. Thereby, the assessments are generally limited to desktop investigations.

Specific to the EIA document, potential interactions or effects of the Project on the environment have been identified and are discussed herein. Where potential effects are anticipated, the proposed methods for mitigating the potential effects have been presented.

The EIA has been completed for three spatial boundaries:

- The PDA is defined as the footprint of ground disturbance required for the Project activities (a portion PID 35348432; Figure 2);
- The Site is defined as the Landfill facility located at 248 Chem. Clément Roy, in Rivière-Verte, New Brunswick, identified by SNB PID 35348432 (Figure 1); and
- The Assessment Area encompasses nearby sensitive receptors (*i.e.*, neighbouring residential dwellings, environmentally sensitive areas, *etc.*) within a 2 km radius of the Site (Figure 1).

The temporal boundaries of the EIA has been completed for the operational phase of the Project (Landfill) only. No site preparation (*i.e.*, construction phase) is required for the Project as the Landfill is an existing entity. A conceptual closure plan (*i.e.*, reclamation phase) for the Landfill is outside the scope of this Project, as detailed below.

3.1 Components Not Considered in this EIA

Archaeological resources are not discussed in this document as the Project will take place only within the current footprint of an existing Landfill and no new ground disturbing activities are required beyond what was identified in the original EIA (Republic Consultants Inc., 1995).

Any potential effects to the environment as a result of the existing and future Landfill footprint, and landfilling construction, operations, and reclamation (conceptual closure) were identified and discussed in the original EIA document (Republic Consultants Inc., 1995) and are considered outside the scope of this assessment. The scope of this EIA considers the increase of the final elevation height of the Landfill, which is a change to Landfill operations only and does not increase the overall footprint.

Extending the life of the Landfill by allowing this Project is not expected to impact the overall site closure and reclamation plan. It will extend reclamation activities into the future by extending the Landfill life expectancy. The closure plan includes annual considerations of environmental monitoring, engineering inspection, maintenance cover, leachate management, gas management and administration. The closure plan specifies all containment cells will be capped in accordance with NBDELG requirements. LFG, a primary source of Green House Gases (GHG) at the Landfill will be collected and utilized after closure, if possible. Leachate collection and treatment infrastructure will be maintained as required. The change in Landfill height will not change the overall reclamation plan design. Slopes will be constructed at a final slope of 3.5H:1V. In accordance with the Landfill Approval to Operate (I-11189), a Closure Plan will be submitted to NBDELG six months prior to closure of the facility.

4.0 DESCRIPTION OF THE EXISTING ENVIRONMENT

4.1 Atmospheric Environment

In order to assess any potential impacts of the Project on the atmospheric environment, the following components were considered:

- *Climate Conditions* are the long-term weather conditions of an area that are typically influenced by latitude, altitude and proximity to oceans. The climate conditions are measured by assessing the patterns of temperature, wind, precipitation, and other meteorological aspects;
- *Air Quality* is the concentration of naturally occurring or anthropogenic air pollutants present in the atmosphere. The concentration of the air pollutants is influenced by source location, meteorological processes (i.e., wind, rain, air temperature) and topographical conditions. The air pollutant particles can be deposited on soil, water, vegetation, and other object surfaces;
- *Sound Quality* is the type, frequency, intensity, and duration of ambient noise. Sound quality also encompasses any vibration related stress on nearby structures; and
- *Odorous emissions* are evaluated as the offensive smells recognized in the surrounding ambient air.

4.1.1 Climate Conditions

The climate conditions for the area are based upon Environment and Climate Change Canada (ECCC) climate normals recorded at the Edmundston weather station, located approximately 16 km northwest of the Landfill at an elevation of +154.2 meters. As this is the closest monitoring station with sufficient data, the climate conditions measured are assumed to be representative to those within the Assessment Area.

The Canadian Climate Normals (2005 to 2021) recorded from the Edmundston climate station indicate an annual daily average temperature of 3.6 degree Celsius (°C), with a daily maximum temperature of 24.7°C (July) and daily minimum temperature of -18.5°C (January). An extreme maximum temperature was recorded in July, 1998 (36.0°C) and an extreme minimum temperature was recorded in January, 1991 (-41.0°C). According to the climate normals, January is typically the coldest month with a daily average temperature of -12.9°C and July is the warmest month with a daily average temperature of 18.2°C (ECCC, 2022).

Average annual precipitation in Edmundston area is 1011.0 mm; the average rainfall and snowfall is 753.0 mm and 258.0 centimeters (cm), respectively. On average, July is the rainiest month and February is the snowiest (ECCC, 2022).

The prevailing winds are generally from the northwest. The hourly mean for annual wind speed is 7.1 km per hour (km/hr). March is typically the windiest month with an hourly mean wind speed of 9.7 km/hr and August is typically the least windy month with an hourly mean wind speed of 4.8 km/hr (ECCC, 2022).

4.1.2 Air Quality

Air quality is monitored by both provincial and federal agencies across New Brunswick. There are no NBDELG monitoring stations in close proximity to the Landfill; the nearest is located in Edmundston, approximately 26 km to the west of the Site. This station monitors ozone, fine particulate matter, sulphur dioxide, nitrogen dioxide, relative humidity, ambient temperature, barometric pressure, wind speed, and wind direction.

The Province of New Brunswick has Air Quality Objectives (Table 3.1) for regulated air contaminants under the *Air Quality Regulation* of the *New Brunswick Clean Air Act*.

Table 4.1 New Brunswick Air Quality Objectives

Pollutant	Averaging Period			
	1 Hour	8 Hours	24 Hours	1 Year
Carbon Monoxide (CO)	35,000 µg/m ³ (30 ppm)	15,000 µg/m ³ (13 ppm)	-	-
Hydrogen Sulphide (H ₂ S)	15 µg/m ³ (11 ppb)	-	5 µg/m ³ (3.5 ppb)	-
Nitrogen Dioxide (NO ₂)	400 µg/m ³ (210 ppb)	-	200 µg/m ³ (105 ppb)	100 µg/m ³ (52 ppb)
Sulphur Dioxide (SO ₂)	900 µg/m ³ (339 ppb)	-	300 µg/m ³ (113 ppb)	60 µg/m ³ (23 ppb)
Total Suspended Particulate (PM _{2.5})	-	-	120 µg/m ³	70 µg/m ³
Notes: µg/m ³ = micrograms per cubic metre ppm = parts per million ppb = parts per billion				

The Edmundston Air Quality Monitoring Station recorded three of the parameters outlined in Table 3.1: nitrogen dioxide, sulphur dioxide and total suspended particulate (fine particulate matter). No exceedances of the air quality objectives were logged at this monitoring station from 2019 to 2021 (NBDELG, Air Quality Data Portal, 2022).

The NWRSC Landfill operates under an NBDELG Class 4 Approval to Operate (I-11189, valid to February 7, 2026; Appendix B). According to the Approval to Operate, potential atmospheric emissions as a result of the Facility operations include:

- The generation of leachate resulting from the disposal of waste in the landfill containment cells and debris in the construction and demolition disposal site;
- Spills during landfill operations or at the household hazardous waste depot;
- Site run-off impacting off-site receptors;
- Fugitive dust emissions from truck traffic and other on-site activities; and
- Elevated odour and/or noise emissions.

The Project is not expected to result in additional or increased atmospheric emissions beyond what is outlined in the current Approval to Operate I-11189 (Appendix B).

4.1.3 Sound Quality

Landfill associated operational activities include: industrial and heavy equipment traffic, public traffic, dumping, excavating, and compaction activities. Noise emissions from the Site are approved, with conditions, in an NBDELG Approval to Operate I-11189 (Appendix B). No noise complaints have been received by the Landfill.

The Assessment Area is generally undeveloped forested land with gravel roadways throughout. Scattered rural residential dwellings and farmland are located along Chemin Clement Roy, about 1.2 km southwest of the Site (Figure 1).

4.1.4 Odorous Emissions

The LFG system is detailed in Section 2.5.3 of this EIA document.

As per the Approval to Operate I-11189 (Appendix B), the Landfill is required to cover exposed MSW at a frequency that prevents disease-vectors, odours fires, blowing litter and scavenging.

The Assessment Area is generally undeveloped forested land with gravel roadways throughout. Scattered rural residential dwellings and farmland are located along Chemin Clement Roy, about 1.2 km to the southwest of the Site (Figure 1).

4.2 Groundwater Resources

Thousands of residents in New Brunswick rely on groundwater resources for their domestic water supply. Groundwater can be impacted by concentrations of naturally occurring and anthropogenic sourced contaminants such as mineral deposits surrounding the aquifer, or from an accidental release of pollutants. Project related activities (e.g., waste disposal and petroleum product use and storage, etc.) may release contaminants into the groundwater that could potentially adversely impact human and/or ecosystem health.

In order to assess any potential impacts of the Project on the groundwater resources, three components have been identified:

- *Drainage and Topography* are the patterns that describe the physical geography of the landscape;
- *Geology and Hydrogeology* describe the subsurface soil and drainage conditions; and
- *Known Groundwater Quality and Quantity* data that provide baseline conditions for the Project area.

4.2.1 Drainage and Topography

The Landfill is located in the upper reaches of the drainage basin of Big Spring Brook. The ground elevation varies between 260 meters and 300 meters with higher elevation at the north of the Site (GC, Toporama, 2022).

In general, surface runoff from the Landfill is directed to stormwater infrastructure and an on-site sedimentation pond (Figure 2). Any surface water not captured in the stormwater collection system will flow into Big Spring Brook (GC, Toporama, 2022). The main draining basin in the area is the Grande Fourche Quisbis River. Generally, the Grande Fourche Quisbis River flows in a southerly direction into the St. John River near Sainte-Anne-de-Madawaska.

4.2.2 Geology and Hydrogeology

Bedrock geology mapping indicates that overburden soils rest on Late Devonian aged intrusive rock (NBDNR, 2008). Surficial geology mapping indicates that the Assessment Area is covered with a blanket (generally 0.5 to 3.0 metre thick) of Late Wisconsinan-aged morainal sediments consisting of lodgement till, minor ablation till, silt, sand, gravel, and rubble (Rampton, V. N., 1984).

The till deposits were investigated by excavating a total of 25 test pits (4 to 7 metres deep) and drilling 14 boreholes at 5 separate locations. As a result of these investigations, it has been determined the glacial deposits blanket an area of several square kilometers surrounding the Landfill (Republic Consultants Inc., 1995).

4.2.3 Groundwater Quality and Quantity

The NBDELG Online Well Log System (OWLS) was accessed to identify if any groundwater extraction wells are located within a 2 km radius of the PDA (i.e., Assessment Area); no results were available. The nearest groundwater well identified by OWLS is over 2.5 km away. The OWLS database is maintained by NBDELG and contains information on water wells constructed since 1994. The NBDELG takes no responsibility and makes no guarantee as to the completeness, accuracy or timeliness of the data provided in this database.

The residential properties within the Assessment Area are assumed to be serviced by private domestic wells. The residential properties are located approximately 1.5 km from the PDA and are situated up gradient (southwest) from the Project; thus, are not considered further in this EIA with respect to groundwater resources. The Landfill maintains a potable domestic well for on-Site operations.

In accordance with the current Approval to Operate (I-11189; Appendix B), regular environmental compliance monitoring is completed via a network of groundwater monitoring wells (53), underdrains and leak detection systems (16), and surface water sampling points (4). An Annual Environmental Report summarizing the results of the compliance monitoring is developed by a Professional Engineer and submitted to NBDELG; a copy of the 2020 Annual Environmental Report is included in Appendix E. Groundwater samples are submitted for laboratory analysis of general chemistry parameters and trace metals and are sampled at seasonal intervals as detailed in the Approval to Operate (Appendix B). Additionally, conductivity, dissolved oxygen, pH, temperature, and ground water elevations are collected in the field during each sampling event.

Based on the results of the most recent Annual Environmental Report (EXP, 2021; Appendix E), there is no evidence of leachate impacts to groundwater at this time. Chloride, conductivity and ammonia levels continue to be elevated at two shallow bedrock monitoring wells, however, elevated concentrations of these parameters have been observed at these locations since the inception of monitoring in October 1997. Although elevated conductivity levels were observed at a few other monitoring well locations, it is noted the concentrations of other leachate indicator parameters at these locations do not suggest the presence of any leachate impact. Trace to low levels of mercury were observed in 2020 groundwater water quality data, and it is noted similar findings were observed for previous years. Where detected, mercury levels were within the Guidelines for the Protection of Canadian Drinking Water Quality (GPCDWQ) established by Health Canada. In general, conductivity, calcium and chloride, and to a lesser extent sodium, magnesium and barium show increasing trends at some groundwater locations over time. These trends are also observed for the up-gradient “background” well stations. Elevated concentrations of multiple leachate indicator parameters potentially indicative of leachate impacts have not been observed (EXP, 2021; Appendix E).

GEMTEC has not completed a quantitative groundwater study (i.e., sampling program, data analysis, or gradient/flow interpretation, etc.) as part of this EIA as the Project is not expected to affect ground water quality or quantity beyond what is observed as a result of overall Landfill development.

4.3 Ecological Environment

The proposed PDA (Figure 2) is subject to on-going land disturbances required for the landfilling activities that have, and will, broadly alter the natural habitat, including the topography, drainage patterns, vegetation communities, and surficial geology (Photo 1 and Photo 2, Appendix F). These alterations have diminished much of the natural habitat within the historical and active containment cell areas; the future containment area is currently forested (Figure 2). Regulated environmental features (i.e., watercourses, wetlands) exist within the Site boundaries.

In order to assess any influence of the Project on the ecological environment, five components have been identified and are described below:

- *Terrestrial Habitat* describes the general environmental conditions observed within the Site. Terrestrial habitat types were determined by reviewing the readily available aerial imagery (i.e., Google Earth, GeoNB, etc.);
- *Ecologically Significant Areas* (ESAs) are areas designated as protected or managed by federal, provincial, or non-government agencies;
- *Wetlands and Watercourses* are features that offer biologically diverse ecosystems that support a wide variety of vegetation and wildlife species:
 - *Wetlands* are lands where the water table is at, near, or above the land's surface, or which is saturated, for a long enough period to promote wetland or aquatic processes as indicated by hydric soils, hydrophytic vegetation, and various kinds of biological activities adapted to the wet environment (NBDELG, 2021). In New Brunswick, wetlands are regulated under the *Clean Water Act - Watercourse and Wetland Alteration Regulation (90-80)* administered by NBDELG;
 - *Watercourses* are features in which the primary function is the conveyance or containment of water, which includes: the bed, banks and sides of any incised channel greater than 0.5 metres in width that displays a rock or soil bed; water/flow does not have to be continuous and may be absent during any time of year; or a natural or man-made basin (NBDELG, 2021). In New Brunswick, watercourses are regulated under the *Clean Water Act - Watercourse and Wetland Alteration Regulation (90-80)* administered by NBDELG;
- Flora is primarily focused on flora Species at Risk (SAR) and Species of Conservation Concern (SOCC):

- *Flora SAR* include vegetation species that have a protective status under Schedule 1 of the federal *Species at Risk Act (SARA)* or are protected under the provincial *New Brunswick Species At Risk Act (NBSAR)*; and
- *Flora SOCC* are species not protected by federal or provincial legislation but are:
 - Considered rare in New Brunswick with an Atlantic Canada Conservation Data Centre (ACCDC) rank of S1 (imperiled) to S3 (vulnerable); and/or
 - Ranked At Risk, May Be At Risk or Sensitive by the New Brunswick Department of Natural Resources and Energy Development (NBDNRED);
- *Wildlife and Birds*, which for the purpose of this assessment includes any wildlife (terrestrial and aquatic) SAR and SOCC, and migratory birds protected under the federal *Migratory Bird Convention Act (MBCA)*. Wildlife SAR are considered species that have a protective status under Schedule 1 of the federal *SARA* or are protected under the provincial *NBSAR*. Wildlife SOCC include species that are:
 - Considered rare in New Brunswick with a ACCDC S-rank of S1 (imperiled) to S3 (vulnerable); and/or
 - Ranked At Risk, May Be At Risk or Sensitive by the NBDNRED.

Field studies for flora and wildlife (including birds) are considered outside the scope of this assessment as the Project PDA is situated within an approved footprint for a landfill site (Figure 2).

4.3.1 Terrestrial Habitat

The Site is in the Madawaska Uplands located within the Central Uplands Ecoregion of New Brunswick, an environment characterized by a cooler climate with relatively abundant precipitation. The portion of the Madawaska Uplands where the Site is located contains steeply dipping Ordovician to Devonian metasedimentary rocks, some of which are calcareous (NBDNR, 2007).

The Site is approximately 500 ha in size and is developed as an operational landfill that encompasses: capped and active landfill cells (Photo 1 and Photo 2, Appendix F), leachate treatment ponds, a sedimentation pond, construction and demolition disposal site, a household hazardous waste depot, administrative building, landfill gas generator, and access roadways. The perimeters of the Site are vegetated and/or wetland and watercourse areas (Figure 2).

Final cover applied to the containment cells at the Facility is a composite granular layer overlain by a 150 mm growing medium and vegetative cover. Final cover is sloped a minimum of 2% to promote precipitation runoff from the waste containment cell.

4.3.2 Ecological Significant Areas (ESAs)

A data request was submitted to the ACCDC for a 5 km radius of the Site. The ACCDC report provides the location and information on significant or managed natural areas. A Managed Area

(MA) is a site with some level of protection for wildlife within the boundaries. The Ecological Significant Areas (ESA) are sites that may or may not have legal protection. The ACCDC report is presented in Appendix G.

The ACCDC report identified two MAs and two ESAs within a 5 km radius of the Site (ACCDC, Appendix F):

- The Martial Brook Protected Natural Area is a Class II MA located approximately 1 km southeast of the PDA and is approximately 300 ha in size. This MA was established in 2014 and is legally protected by the New Brunswick Department of Natural Resources and Energy Development (NBDNRED) under the *New Brunswick Fish & Wildlife Act*,
- The Quisibis River Protected Natural Area is a Class II MA that is located approximately 3 km northwest of the PDA and is approximately 707 ha in size. This MA was established in 2014 and is protected by NBDNRED under the *New Brunswick Fish & Wildlife Act*,
- The Siegas and Mud Lakes ESA, located approximately 3 km east of the PDA, is the only Ducks Unlimited site in northwestern New Brunswick. It is a shallow man-made lake with a mean depth of 3 feet and it encompasses open water and bog vegetation types; and
- The St. Louis Maillet Experimental Forest ESA, located approximately 4 km southeast of the PDA, is a forest used by the St. Louis Maillet forestry school for education and research purposes.

No National Wildlife Areas, Migratory Bird Sanctuaries, or Ramsar Sites, or New Brunswick Protected Natural Areas are located within the Assessment Area (Environment Canada Protected Areas Network, 2022; Ramsar Sites Information Service, 2022; NBDNRED Protected Natural Areas, 2022).

4.3.3 Wetlands and Watercourses

A formal wetland delineation was not completed for the Project. Based on GeoNB Mapping, there are no regulated wetlands located within 30 metres of the PDA; the nearest mapped regulated wetland is located approximately 250 metres north of the PDA. (Figure 2; GeoNB Mapping, Appendix F).

A formal watercourse assessment was not completed for the Project. Based on GeoNB Mapping, there are no regulated watercourses located within 30 metres of the PDA; the nearest watercourse, Big Spring Brook, is located approximately 300 metres north of the PDA (Figure 2; GeoNB Mapping, Appendix F). Big Spring Brook generally flows southeast to southwest through the Site, and eventually tributaries into the Big Fork Quisibis River.

4.3.4 Flora

A data request was submitted to the ACCDC for a 5 km radius of the Site. The ACCDC report provides the location of known flora SAR and SOCC, any location sensitive species and

information on protected or managed natural areas. A rare vascular flora survey was not completed as part of this assessment. It is acknowledged that new ground disturbing activities are required for the future landfill waste containment cells; however, the impacts to ecological environment for this footprint are considered in the original EIA (Republic Consultants Inc., 1995).

The ACCDC report identified two flora species (vascular plants) as occurring within 5 km of the Site. None of the species listed are considered SAR under this assessment. One species, Spotted Coralroot (*Corallorhiza maculate*) is considered to be SOCC and was observed in forested areas approximately 4.8 km northeast of the Site. Spotted Coralroot is ranked S3 and S4 (vulnerable and apparently secure) by ACCDC. Preferred habitat includes forests and woodlands (NAOCC, 2022).

4.3.5 Wildlife and Wildlife Habitat

The ACCDC report also provides the location of recorded wildlife SAR or SOCC and the presence or absence of any location sensitive species within a 5 km radius of the Site. A bird survey (e.g., point counts) was not completed as part of this assessment. It is acknowledged that new ground disturbing activities are required for the future landfill waste containment cells; however, the impacts to the ecological environment for this footprint are considered in the original EIA (Republic Consultants Inc., 1995).

The ACCDC lists nine (9) wildlife species as occurring within 5 km of the Site; six (6) of which are considered SAR under this assessment. These species include: Bank Swallow (*Riparia riparia*), Bobolink (*Dolichonyx oryzivorus*), Barn Swallow (*Hirundo rustica*), Canada Warbler (*Cardellina canadensis*), Eastern Wood-Pewee (*Contopus virens*), and Canadian Lynx (*Lynx canadensis*). Table 4.3 summarizes SAR wildlife species, their legal protection, and preferred habitat.

Three (3) wildlife species recorded by ACCDC are considered SOCC. Table 4.4 summarizes these species and their preferred habitat.

Table 4.3 Summary of Wildlife SAR Within 5 km of the Site

Common Name	Scientific Name	COSEWIC ¹	SARA ²	Provincial Legal Protection	S-Rank ³	NBDNRED General Status ⁴	Preferred Habitat
Bank Swallow	<i>Riparia riparia</i>	Threatened	Threatened	-	S2S3B,S2S3M	Sensitive	Riverbanks, road cuts, lake and ocean bluffs.
Barn Swallow	<i>Hirundo rustica</i>	Special Concern	Threatened	Threatened	S2B, S2M	Sensitive	Artificial structures, bridges, barns, and other outbuildings.
Bobolink	<i>Dolichonyx oryzivorus</i>	Threatened	Threatened	Threatened	S3B, S3M	Sensitive	Hayfields and pastures.
Canadian Lynx	<i>Lynx canadensis</i>	Not At Risk	-	Endangered	S3	At Risk	Moist, boreal forests that have cold, snowy winters and abundance of snowshoe hare.
Canada Warbler	<i>Cardellina canadensis</i>	Special Concern	Threatened	Threatened	S3B, S3M	At Risk	Moist, mixed, riparian shrub forests on slopes and in ravines.
Eastern Wood-Pewee	<i>Contopus virens</i>	Special Concern	Special Concern	Special Concern	S4B, S4M	Secure	Clearings and forest edges.
Notes: 1. Committee on the Status of Endangered Wildlife in Canada 2. <i>Species at Risk Act</i> 3. Sub-national (provincial) rank 4. NBDNRED general status of Wildlife Species							

Table 4.4 Summary of Wildlife SOCC Within 5 km of the Site

Common Name	Scientific Name	S-Rank ¹	NBDNRED General Status ²	Nesting Habitat
Aphrodite Fritillary	<i>Speyeria aphrodite</i>	S3	Secure	Base of food plant or nearby.
Blackpoll Warbler	<i>Setophaga striata</i>	S3S4B, S5M	Secure	Spruce and tamarack forests, and young stands of evergreens and alder or willow thickets.
Spotted Sandpiper	<i>Actisis macularius</i>	S3S4B, S5M	Secure	Freshwater lakes, ponds and creeks.
Notes: 1. Sub-national (provincial) rank 2. NBDNRED general status of Wildlife Species				

4.4 Cultural Features

There are no national or provincial parks located within the Assessment Area. There are no federally, provincially, or locally recognized heritage areas located within the Assessment Area. The nearest First Nations community is the Madawaska Maliseet First Nations, located approximately 26 km west of the Site. The Tobique First Nations community is located approximately 63 km southeast/east of the Site. Both the Tobique and Madawaska Maliseet communities reside on designated reserve lands and maintain the right to harvest natural resources to support their cultural, social, and economic wellbeing.

4.5 Socio-Economic Environment

In order to assess any influence of the Project on land use and economy, three environmental components have been identified and are described below:

- *Existing Land Use* describes the current residential, industrial, and commercial arrangements within proximity to the Project, as well as, the land use compatibility of the Project;
- *Visual Landscape* is the impact to the local vistas within proximity to the Project, from various viewpoints accessible to the general public; and
- *Local Economy and Local Socio-economic Structure* identifies the economic background of the regional area.

4.5.1 Existing Land Use

The Site is situated in a rural area, approximately 13 km northeast/east of the Municipalities of Edmundston and Riviere-Verte. The Landfill manages MSW, household hazardous waste, and construction and demolition debris for the Madawaska, Victoria and the western half of Restigouche Counties with provisions to also accept waste from the state of Maine. Since opening in 1997, the Landfill has operated as an engineered sanitary landfill with environmental compliance programs in accordance with a NBDELG Approval to Operate. The Project is required to support future landfill operations and to maximize the longevity of the Landfill.

Within the Assessment Area, the neighbouring residential properties are located to the southwest of the Site along Chem. Clément Roy and adjoin the southwest boundary of the Site (Figure 1). Other adjoining properties are generally forested Crown Lands. A list of all adjoining property uses is presented in Table 4.5 per SNB's Registry and Mapping Services (SNB Planet, 2022).

Table 4.5 Adjoining Property Land Use

Location Relative to the Site	PID	Land Use
Southwest	35073246	Timberland
	35073519	Timberland
	35072990	Residential Improved
	35073469	Residential Improved
	35217629	Farmland – Cultivated
	35073527	Farmland – Cultivated
	35073493	Residential Improved
Southwest / West	35074061	Farmland - Abandoned
West	35217637	Timberland
West, North and East and Southeast/South	35085646	Timberland
Northeast	35339639	Campsite Leases / Permits
	35359280	Sugar Woods
	35346907	Campsite Leases / Permits
	35359264	Sugar Woods
Northeast / East	35359256	Sugar Woods
South	35082478	Timberland

The Treasury Board of Canada Secretariat maintains an inventory of federal contaminated sites. This inventory was reviewed, in conjunction with the SNB Planet, to determine the current and historical extent of commercial and/or industrial sites adjoining the Site. Neither the Site nor any adjoining properties are identified to be federal contaminated sites. The Federal Contaminated Sites mapping, relative to the Site, is included in Appendix G.

Site and surrounding properties were searched in SNB's Registry and Mapping Services for review of the Land Gazette for each property. The Land Gazette is an information repository of land-related notices, restrictions, and other information about land parcels (i.e., PIDs). Based on a review of online Land Gazette information, there are no records of contamination or remediation for the Site or adjoining properties.

4.5.2 Visual Landscape

The Site is located in a rural area situated approximately 1.5 km from the nearest roadway (Chem. Clément Roy). Only the Landfill access road and gate is visible from this roadway (Photo 3, Appendix F). The Landfill is not readily visible from vehicle traffic on roadways or residential dwellings in the Assessment Area or beyond.

4.5.3 Local Economy and Local Socio-economic Structure

According to Statistics Canada, 47,053 persons lived in the region served by NWRSC in 2018. This population is dispersed over an area of 7,985 square kilometres (km²), of which over 37% (2,986 km²) is Crown Land reserved for forestry. The regional economy is largely based on exploiting natural resources (wood and agriculture) and on manufacturing, but the service economy is growing, mainly centered on healthcare and educational institutions (NWRSC, 2020).

Although the funding model for the NWRSC is based on each communities' tax base and population, the Landfill is funded solely through the tipping fees. This Project is funded by the Landfill's general operation budget.

5.0 SUMMARY OF POTENTIAL EFFECTS

5.1 Atmospheric Environment Potential Effects

The Project is not expected to affect climate conditions, air quality, sound quality, or ambient odour emissions beyond what is currently observed on the Site. The Project involves general landfilling practices within the existing footprint of the Landfill facility. An increase in airborne contaminants within the PDA and/or the Site is not expected and will not exceed regulatory limits as outlined in the current Approval to Operate (I-11189, Appendix B) and/or the New Brunswick Air Quality Objectives.

5.1.1 Climate Conditions Potential Effects

It is not expected the Project will affect climate conditions such as ambient temperatures, precipitation amounts and wind patterns; therefore, climate conditions are not discussed further in this EIA.

5.1.2 Air Quality Potential Effects

There will be a short-term increase of particulate matter and dust within the PDA during ground disturbing activities such as the installation of cell cover material and the placement of cell liner material. Dispersed garbage debris is also expected at any landfill facility; however, the Landfill maintains fencing to minimize the release of such debris into the surrounding environment.

It is anticipated there will be gaseous emissions within the PDA from Project machinery and equipment (i.e., excavator, crusher, dump trucks, garbage trucks, personnel trucks, etc.).

All of the aforementioned effects are currently observed within the PDA and Site as part of on-going Landfill operations and approved in the current Approval to Operate (I-11189, Appendix B). The Project activities are not anticipated to result in a significant increase to adverse impacts on air quality.

5.1.3 Sound Quality Potential Effects

Sound production within the PDA is expected from operating Project machinery and equipment (i.e., excavator, crusher, dump trucks, garbage trucks, etc.). However, it is not anticipated that there will be significant increase to sound quality impacts as a result of the Project beyond what is currently observed from the operating activities at the Landfill and approved in the current Approval to Operate (I-11189, Appendix B).

As prevailing winds are typically from the northwest the predominant receptor of noise emissions is expected to be the rural residential properties located south of the Landfill (i.e., Clément-Roy Road). The residential community is located at a lower elevation (approximately 40 to 50 metres elevation) than the proposed Project and a natural, vegetated area provides a noise barrier between the two areas.

Two factors that would affect the transmission of noise emissions generated at the Landfill are atmospheric pressure and wind velocity, both of which were considered when reviewing this Project. The difference in atmospheric pressure between elevation +298 (current finished elevation of Cell 9 and Cell 10) and +322 metres (projected finished height per Figure 3 to Figure 6) is considered to be negligible.

The average annual wind speed at elevation +322 metres is estimated to be about 1% higher than at elevation +298 metres based on the wind profile power law relationship. This increase is not anticipated to have a significant effect on the transmission of sound away from the Landfill.

Historically, the Landfill has never received any complaints from the public regarding transmission of noise from their facility.

5.1.4 Odorous Emissions Potential Effects

The LGUS currently releases the emissions of spent methane gas collected at the Landfill. The Project is not expected to produce additional odorous gases that exceed the capabilities of the LGUS or beyond what is currently observed as ambient emissions from the operating activities at the Landfill and approved in the current Approval to Operate (I-11189, valid to February 7, 2026; Appendix B).

As prevailing winds are typically from the northwest the predominant receptor of odour emissions is expected to be the rural residential properties located south of the Landfill (i.e., Clément-Roy Road). The residential community is located at a lower elevation (approximately 40 to 50 metres elevation) than the proposed Project and a natural, vegetated area provides an odour barrier between the two areas.

Two factors that would affect the transmission of odour emissions generated at the facility are atmospheric pressure and wind velocity, both of which were considered when reviewing this Project. The difference in atmospheric pressure between elevation +298 (current finished elevation of Cell 9 and Cell 10) and +322 metres (projected finished height per Figure 3 to Figure 6) is considered to be negligible.

The average annual wind speed at elevation +322 metres is estimated to be about 1% higher than at elevation +298 metres based on the wind profile power law relationship. This increase is not anticipated to have a significant effect on the transmission of odour away from the Landfill.

Historically, the Landfill has never received any complaints from the public regarding transmission of odours from their facility.

5.2 Groundwater Resources Potential Effects

Potential effects to regional groundwater resources as a result of Project activities are not expected. Some localized changes in topography within the PDA as a result of the proposed Project are expected. However, overland surface water flow and overall drainage patterns are expected to remain similar to pre-Project conditions (i.e., utilize existing underdrains, leachate holding and treatment ponds, and stormwater infrastructure).

5.2.1 Drainage and Topography Potential Effects

Some localized changes in topography within the PDA are expected but are restricted to the vertical height increase of the Landfill (i.e., from 298 metres elevation to 322 metres elevation). The side slopes of 3.5H:1V will be maintained and all new, capped waste containment cells will be integrated into the existing and future Landfill footprint.

The overall drainage patterns and volumes will remain consistent or similar to existing conditions (i.e., flow patterns continuing to be directed toward existing stormwater infrastructure). The drainage patterns are not expected to interact with groundwater resources within the Assessment Area. Drainage and topography are not discussed further in this EIA.

5.2.2 Geology and Hydrogeology Potential Effects

Potential effects to surficial geology as a result of Project activities include ground disturbance, excavation and the placement of fill atop an existing landfill site. These activities in the PDA are not expected to interact with groundwater resources, and are therefore not discussed further in this EIA.

5.2.2.1 Groundwater Quality and Quantity Potential Effects

Potential effects to groundwater quality as a result of Project activities include the potential for contaminants to be released through spills of fuels and lubricants from on-site equipment, and/or the release of leachate, with subsequent infiltration into a groundwater resource. The Project is limited to activities currently undertaken at the Landfill; no new or unique activities outside the scope of these documents will be undertaken as part of the Project.

Routine compliance monitoring of surface, groundwater and select treatment system conditions is coordinated by the NWRSC, per the Approval Operate (I-11189, Appendix B). The focus of the compliance monitoring program is to assess the potential environmental impact of the Landfill on the groundwater and surface water systems in the vicinity of the Landfill. Therefore, groundwater quality and quantity is not discussed further in this EIA.

5.3 Ecological Environment Potential Effects

The Project is not expected to affect the terrestrial habitat, wetlands and watercourses, flora, or wildlife beyond what is currently observed on the Site. The Project involves general landfilling

practices within the existing, and approved future, footprint of the Landfill and no new or unique activities will be undertaken as part of the Project.

5.3.1 Terrestrial Habitat Potential Effects

No new ground disturbance or new operational activities are proposed as part of the Project. The Project involves increasing the regulated containment cell height for in-use and future cells. No further discussion on terrestrial habitat is presented in this EIA.

5.3.2 Wetlands and Watercourses Potential Effects

The Project involves the increasing containment cell height for in-use and future cells. No regulated wetlands or watercourses are present within the PDA, per the GeoNB Mapping (Appendix G). The existing Landfill infrastructure currently mitigates against the release of contaminants into this habitat; therefore, it is unlikely there will be any adverse effects on wetlands or watercourses as a result of the Project. No further discussion on wetlands and watercourses is presented in this EIA.

Any potential effects to wetlands and watercourses with respect to the established Landfill footprint and landfilling activities were identified and discussed in the original EIA document (Republic Consultants Inc., 1995) and are considered outside the scope of this assessment.

5.3.3 Flora Potential Effects

No flora SAR or SOCC were identified within the Assessment Area. Therefore, it is not anticipated there will be any adverse effects to flora SAR and SOCC populations as a result of this Project. Flora SAR and SOCC are not discussed further in this EIA.

5.3.4 Wildlife and Bird Habitat Potential Effects

The identified potential effects to wildlife and bird habitat as a result of the Project include:

- Noise from Project activities may disrupt wildlife and birds; however, this is not considered new Project-related activity as heavy equipment is currently utilized within the PDA and Site;
- Motor vehicle traffic will occur during the Project and vehicular collisions may cause injury or death to involved wildlife and birds. This is not considered new Project-related activity as vehicle traffic is currently observed within the PDA and Site;
- There is a possibility of human interaction with wildlife as a result of personnel within the Site. In addition, there is a possibility of wildlife attraction to waste, garbage and stockpiled material stored on Site. This is not considered new Project-related activity as human presence is currently observed within the PDA and Site;

- There is low potential for migratory birds to utilize the habitat within the PDA due to the frequent ground disturbance and human presence. The Project is unlikely to alter or destroy migratory bird habitat as described in *MBCA*, with the exception of the following:
 - Attraction to cleared or stockpile areas may result in an increase in bird injuries or deaths, and/or destruction of nests. This is not considered new Project-related activities as stockpiles are currently observed within the PDA and Site;
 - Use of artificial light during nighttime operations may attract bird species. In general, Project activities will be limited to daylight hours. This is not considered new Project-related activity as artificial lights are currently observed within the PDA and Project Site; and
 - Increasing the height of the Landfill may influence the foraging bird population to fly at a higher elevation than the currently observed conditions. The change in elevation is considered negligible and is not expected to impact the accessibility of the Project Site or migratory patterns of any bird species.

The preferred habitat for wildlife SAR or SOCC was not identified within the PDA. Therefore, it is not anticipated there will be any adverse effects to wildlife SAR or SOCC populations as a result of this Project. Wildlife SAR and SOCC are not discussed further in this EIA.

5.4 Cultural Features

The Site is currently utilized as an active Landfill and no new footprints, beyond what is currently approved for future containment cells, will result as part of this Project. No First Nations or designated reserve lands are situated within the Assessment Area. A high-level project description and invitation for comments and concerns was sent to the Madawaska Maliseet First Nation and Tobique First Nation prior to the initiation of the preparation of this EIA. Any received correspondence and concerns will be presented to NBDELG under a separate cover detailing public and First Nations consultation.

5.5 Socio-Economic Environment

The Project involves the utilization of existing roadway infrastructure for the transportation of waste material and the use of the designated Landfill area for appropriate disposal. There are no anticipated significant changes to emissions, discharges or odours being generated by the Landfill as currently observed on-Site. The NWRSC will continue to operate the facility in accordance with the requirements of the Approval to Operate (I-11189; Appendix B). As such, there are no anticipated adverse impacts to surrounding properties.

5.5.1 Existing infrastructure

The Project area is within existing MSW containment cells, which consist of containment berms, subdrains, containment liners, and leachate collection layers. The liner and leachate collection systems are described in Section 2.5.2 in this report.

As a result of increasing the height of the MSW in the containment cells, additional weight or pressure will be exerted on the existing infrastructure, and therefore the potential effects are to be considered. A height increase of approximately 20 metres will exert an additional 250 kPa pressure on the underlying infrastructure.

When designing a leachate collection piping system in landfills, the pipe must be assessed to ensure excessive deflection and local buckling failure will not occur. All leachate collection pipes in Cells 9 and 10 are perforated, 200-millimetre (mm) diameter, HDPE Standard Dimensional Ratio (SDR) 17 pipes. It is assumed this pipe will also be used for all future cells.

Based on a 40-metre total thickness/height of MSW (projected assumption), the deflection ratio (deflection of pipe/diameter of pipe) of the leachate collection pipe was determined to be 3.8 percent (%), which is less than the allowable deflection ratio of 4.2 % for HDPE SDR 17 pipe (Table 9.4, Geotechnical Aspects of Landfill Design and Construction, Quian, Koerner, Gray, 2002).

Also, using a maximum MSW thickness/height of 40 metres overlying the leachate pipes, the factor of safety (FOS) against local buckling failure was calculated to exceed 5; a minimum FOS of 2 is generally required (Geotechnical Aspects of Landfill Design and Construction, Quian, Koerner, Gray, 2002).

As demonstrated by the above assessment, the existing leachate collection infrastructure can sustain the additional pressures that will result from the additional 20 metres of MWS.

According to the original EIA document (Republic Consultants Inc., 1995) the insitu soils on the site generally consist of 10 to 15 metres of dense glacial till material, underlain by bedrock. The additional 20 metres of MSW will not exceed the bearing capacity of the underlying subgrade tills.

The HDPE liner system and recompacted soil liner will not be adversely affected by the additional 20 metres of MSW placed in the containment cells. The additional overburden pressure will not reduce the permeability of the recompacted till liner. In fact, the added weight would likely help to compact / consolidate the soil liner and reduce (improve) its permeability. The HDPE liners can withstand the increased loads from the additional MSW.

5.5.2 Existing Land Use

Based on the distance between the Landfill and existing residential dwellings, and the future landscape projections presented herein (Future Projected Viewscapes, Appendix H), no new viewpoints will arise as a result of the Project. Potential effects to visual landscape are discussed further in Section 5.5.3.

The additional storage capacity of the Landfill will not increase traffic type or volume along the established hauling routes (Chem. Clément-Roy). Similar traffic volumes will be observed as per the current conditions.

Operational activities required for landfilling (i.e., heavy equipment use, construction sequencing, garbage disposal/bailing, noise and odours, etc.), are currently undertaken at the Landfill and no new activities/impacts to residential dwellings are expected as a result of the Project. As such, potential effects to residential land use is not discussed further in this EIA.

5.5.3 Visual Landscape

A Digital Surface Model (DSM) and Digital Terrain Model (DTM) from GeoNB and NRCAN, were used to create a 3D Autodesk Infracad model of the surrounding landfill area, allowing the creation of a 3D view of the proposed design from several vantage points. The vantage points were selected by first running QGIS Viewshed analyses using the proposed Landfill height as the observer location, with targets having a height of 1.75 metres above the DTM. Using the DTM allowed the exclusion of vegetation or trees effect on the initial pass. Resulting areas overlapping with existing roads or clearings were then used as observer locations, reversing the process, and providing a viewshed of the proposed Site from each location. Two QGIS Viewshed analyses were conducted per observation location as a quality check. One analysis used the DSM as the input surface, and one used the DTM. Google Earth was used, along with a 3D model of the proposed design, to help confirm or adjust the Infracad model. Treed areas along lines of sight were assessed by stand, with average heights derived from DSM and DTM cross sections.

Based on the 3D model and analysis, it was determined it is unlikely the Landfill will be visible from the ground level at any nearby residential dwelling or roadways (Figure 1 to Figure 3, Appendix H). This is based on the current level of vegetation (trees) in the Assessment Area.

A vegetated buffer will be maintained for the duration of the Project to limit the view of the PDA and Landfill in the Assessment Area.

5.5.4 Local Economy and Local Socio-economic Structure

The Project is expected to extend the lifetime of the Landfill by up to 17 years, which will provide a secure and consistent municipal waste disposal site for the Madawaska, Victoria and western half of Restigouche counties until beyond 2090. Extending the lifetime of the existing Landfill ultimately would benefit landfill users (tipping fee rate payers), including the municipalities and local service districts included in the area, when compared to the possible expenditures of finding an alternative waste disposal site or establishing a new landfill (estimated to be \$20 to \$25 million in 2022 dollars).

No impacts to local contractors are expected as a result of the Project. Construction, operation and landfilling activities will remain as per the existing conditions. NWRSC will continue to use a

public tendering process to for the supply of construction materials and the construction of components of any capital projects, such as future waste containment cells.

The Site is an active landfill site and as such the proposed Project involves an existing land use considered compatible with other land uses in the area.

6.0 SUMMARY OF PROPOSED MITIGATION

The potential effects and proposed mitigation measures to minimize the potential adverse effects to the environment during the Project are summarized in Table 6.1. An Environmental Management Plan (EMP) is currently being developed for the Landfill operations.

Table 6.1 Summary of Proposed Mitigation Measures

Project Component	Summary of Potential Interaction	Mitigation Measures
Air Quality	Potential for particulate matter and dust.	<p>Dust suppressants may be used during periods of dry weather;</p> <p>Dry materials/stockpiles may be covered or windrowed to prevent blowing dust or debris. Similarly, dusty material may be transported in covered haulage vehicles;</p> <p>Dust generating activities will be limited during periods of dry or windy conditions; and</p> <p>Wind prone areas will be stabilized in a timely manner.</p>
	Potential for gaseous emissions from equipment and truck traffic.	<p>Any non-essential internal combustion engines will be shut off when not in use, and heavy equipment will not remain idling for periods exceeding 15 continuous minutes as a best management practice; and</p> <p>Equipment will be maintained according to emission standards and in good working order.</p>
Sound Quality	Noise levels and vibration from equipment and truck traffic.	<p>Equipment will be maintained according to emission standards and in good working order;</p> <p>Equipment will be muffled, when feasible;</p> <p>A dense, mature vegetated buffer is maintained around the Site to reduce sound impacts to the surrounding receptors;</p> <p>Generally, on-site activities will be limited to day-time hours (<i>i.e.</i>, 12 hours per day); and</p>

Table 6.1 Summary of Proposed Mitigation Measures

Project Component	Summary of Potential Interaction	Mitigation Measures
		<p>The Approval to Operate (I-11189; Appendix B) mandates noise emissions released from the Landfill are controlled to prevent impacts to off-site receptors. Should a noise impact event occur, the NWRSC may be required to develop, submit and implement a Control Plan that mitigates the impacts such that they are no longer a nuisance to off-site receptors.</p>
<p>Odorous Emissions</p>	<p>Odour from waste disposal.</p>	<p>Sequential capping of the completed or inactive waste containment cells is required throughout the landfill operation per the Approval to Operate (I-11189; Appendix B).</p> <p>LFG system collects and converts the odorous gases produced by the landfilling activities into electric power, and also serves as an odor reducing agent at a destructive rate greater than 99 %. The Project is not expected to produce additional odorous gases that exceed the capabilities of the LFG system for several years. Once the current system’s capacity is exceeded, it will be expanded.</p> <p>The Approval to Operate (I-11189; Appendix B) mandates odor emissions released from the facility are controlled to prevent impacts to off-site receptors. Should an odor impact event occur, the NWRSC may be required to develop, submit and implement a Control Plan that mitigates the impacts such that they are no longer a nuisance to off-site receptors.</p>

Table 6.1 Summary of Proposed Mitigation Measures

Project Component	Summary of Potential Interaction	Mitigation Measures
Wildlife and Birds	<p>Noise from Project activities may disrupt wildlife and birds;</p> <p>Possibility of human interaction as a result of personnel within the Site, possible attraction to waste/garbage stored on Site; and</p> <p>Attraction to cleared/stockpile areas may result in an increase in bird injuries and/or deaths or destruction of nests.</p>	<p>Nearby wildlife will likely be deterred by the noise on the Site during Project activities and suitable habitat types are not limiting on adjoining properties;</p> <p>Equipment will be maintained in good working order;</p> <p>Equipment will be muffled, if feasible;</p> <p>A vegetated buffer will be maintained around the Site to reduce sound impacts to the surrounding receptors;</p> <p>If a nesting bird species is encountered, contact with and disturbance of the species and its habitat will be avoided; and</p> <p>An appropriate vegetated buffer will be established around any nests encountered to protect them from disturbance, and work in that area will be avoided until after the birds have fledged or vacated.</p>
Accidents, Malfunctions & Unplanned Events		
Vehicle Mishaps	<p>Potential for injury, death or destruction of infrastructure from vehicle accidents within the Site.</p>	<p>Vehicles will travel at appropriate speeds within the Site;</p> <p>Vehicles will kept in good working order;</p> <p>Restricted access protocols will be implemented; and</p> <p>Emergency and spill response procedures will be implemented as outlined in the EMP (in-development).</p>

Table 6.1 Summary of Proposed Mitigation Measures

Project Component	Summary of Potential Interaction	Mitigation Measures
Fire	Potential for destruction of infrastructure, habitat and wildlife death from fire.	No new chemical or petroleum storage will occur within 30 metres of an environmental sensitive area (i.e., wetland, watercourse); Equipment will be kept in good working order; and Emergency and spill response procedures will be implemented as outlined in the EMP (in-development).
Accidental Release of Contaminants	Potential for contaminants to be released into surrounding habitat through the accidental release of fuels and lubricants from equipment.	No new chemical or petroleum storage will occur within 30 metres of an environmental sensitive area (i.e., wetland, watercourse); Equipment will be kept in good working order; and Emergency and spill response procedures will be implemented as outlined in the EMP (in-development).
Failure of Erosion Control Structures	Potential for sediment loading in habitats from ground disturbance.	Appropriate Erosion and Sediment Control (ESC) structures will be properly installed around work areas prior to commencement of Project activities, as applicable. All structures will be inspected regularly to ensure that they are functioning as intended; At the first evidence runoff of sediment is starting to occur, Project work will temporarily cease. All siltation prevention devices shall be inspected and monitored; any necessary repairs will be made such that they accomplish their intended function prior to work commencing; On-site water may be treated in a sedimentation pond, as required, prior to discharge into the surrounding environment;

Table 6.1 Summary of Proposed Mitigation Measures

Project Component	Summary of Potential Interaction	Mitigation Measures
		<p>Once the Project work is complete, all exposed, erodible soil will be permanently stabilized against erosion;</p> <p>Existing vegetation will be retained whenever possible and tree/vegetation clearing will be kept to a minimum; and</p> <p>Emergency and spill response procedures will be implemented as outlined in the EMP (in-development).</p>

7.0 PUBLIC AND FIRST NATIONS INVOLVEMENT

7.1 First Nations Involvement

The Province of New Brunswick has a constitutional Duty to Consult, and accommodate where required, Aboriginal Peoples whenever a decision or activity is being contemplated that could adversely impact Aboriginal or Treaty rights. As per the Interim Proponent Guide published by the Province of New Brunswick, project proponents play a valuable role in the consultation process by engaging Aboriginal Peoples in the development of any project or proposal.

In keeping with the above guidance, a notification containing a high level description of the proposal was sent on December 17, 2021 to the Consultation Coordinator of the Neqotkuk (Tobique) and Matawaskiye (Madawaska Maliseet) First Nations, as well as the Wolastoqey Nation of New Brunswick EIA Coordinator. No comments were received at the time of issuance of this report.

7.2 Public and Stakeholder Involvement

The public involvement standards for registered projects are outlined in the Guide to Environmental Impact Assessment in New Brunswick (January, 2018).

A detailed public consultation report will be prepared and submitted by NWRSC under separate cover. It is expected that public involvement will include, at a minimum:

- A published notice of registration in the local newspapers (the Telegraph Journal and Info Week-end);
- A Project information letter to Members of the Legislative Assembly (MLAs) for the NWRSC catchment area;
- A Project information letter to local governments including the City of Edmundston and the Town of Grand Falls;
- A Project information letter to the Department of Aboriginal Affairs;
- A notice of registration will be distributed (via registered mail) to adjoining landowners of the Site;
- The registration and supporting documents will be made available at the NWRSC Landfill and online at <https://csrno.ca/en/solid-waste/>; and
- The registration and supporting documents will be made available at the Grand Falls regional NBDELG office and online at https://www2.gnb.ca/content/gnb/en/departments/elg/environment/content/environmental_impactassessment.html

8.0 APPROVAL OF THE PROJECT

Subsequent to the receipt of a Certificate of Determination, an amendment to the Approval to Operate (I-11189) will be obtained, if required.

9.0 FUNDING

The Project will be funded solely by NWRSC as a part of their typical operations budget.

10.0 REFERENCES

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11.0 STATEMENT OF LIMITATIONS

This report has been prepared for the sole benefit of the Northwest Regional Services Commission. Any other person or entity without the express written consent of GEMTEC Consulting Engineers and Scientists Limited and the Northwest Regional Services Commission may not rely upon this report.

Any use that a third party makes of this report, or any reliance or decisions made based on it, is the responsibility of such third parties. GEMTEC Consulting Engineers and Scientists Limited accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

Some of the information presented in this report was provided through existing documents and interviews. Although attempts were made, whenever possible, to obtain a minimum of two confirmatory sources of information, in certain instances, GEMTEC Consulting Engineers and Scientists Limited has been required to assume that the information provided is accurate.

The conclusions presented represent the best judgment of the trained professional and technical staff based on current environmental standards and on the Site conditions observed by staff at the time the work was performed.

Should additional information become available, GEMTEC Consulting Engineers and Scientists Limited requests that this information be brought to our attention so that we may re-assess the conclusions presented herein.



APPENDIX A

Project Description and NBDELG Correspondence

November 25, 2021

File: 100760.002

Via email: Crystale.Harty@gnb.ca

Environmental Impact Assessment Branch
Department of Environment and Local Government
Marysville Place, P.O. Box 6000
Fredericton, NB E3B 5H1

Attention: Crystale Harty, Director

Re: Northwest Regional Service Commission - Proposal to Increase Landfill Cell Height

GEMTEC Consulting Engineers and Scientists (GEMTEC) has been retained to confirm regulatory requirements for the above-mentioned proposal. Northwest Regional Service Commission (NWRSC) operates a sanitary landfill located in Rivière-Verte in northwestern New Brunswick. The Landfill is primarily designed to serve residents of the Madawaska, Victoria and the west half of Restigouche Counties with provisions to also accept waste from the Valley Solid Waste Commission.

In an effort to optimize the efficient use of the facility, and maximize the available airspace, NWRSC is proposing to increase/maximize the height of wastes placed in future containment cells based on the currently approved slope configuration of the cells (i.e. maximum slope of waste at 3.5 to 1). NWRSC would maintain a properly graded surface (approx. 20 metres wide) at the top of each cell to facilitate safe equipment movement and installation of the final cover. The anticipated change in height of wastes stored at the Landfill is estimated to be between 10 and 15 metres.

NWRSC will continue to operate the Landfill in accordance with the Approval to Operate and no additional modifications or changes to the Landfill are anticipated.

Confirmation of EIA registration requirements for the proposed initiative as outlined above is hereby requested. We look forward to your reply at your earliest convenience. Please do not hesitate to contact me should you require any additional information or clarification.

Sincerely,



Paul Vanderlaan, P.Eng.
Environmental Regulatory Specialist

cc: Susan Tao, P.Eng., DELG

December 7, 2021

Paul Vanderlaan
191 Doak Road
Fredericton, NB
E3C 2E6

RE: Northwest Regional Service Commission - Proposal to Increase Landfill Cell Height

Mr. Vanderlaan:

The Environmental Impact Assessment (EIA) Branch of the Department of Environment and Local Government (DELG) has reviewed the proposed project description submitted on behalf of the Northwest Regional Service Commission (NWRSC).

It is our understanding that the NWRSC is proposing to increase/maximize the height of wastes placed in future containment cells based on the currently approved slope configuration of the cells (i.e. maximum slope of waste at 3.5 to 1). The anticipated change in height of wastes stored at the Landfill is estimated to be between 10 and 15 metres as indicated in the attached proposal.

Based on the information provided, the proposed project is considered to be a significant modification to the landfill facility, and as such it **does** require EIA registration and review as per item (m) "*all waste disposal facilities or systems*" of *Schedule A* of the *Environmental Impact Assessment Regulation – Clean Environment Act*, before it can proceed.

Furthermore, please be aware that no project-related physical activities can be initiated until the EIA review has been completed and a *Certificate of Determination (CoD)* signed by the Minister of Environment and Climate Change has been issued. Information regarding the EIA review process can be found in our *Guide to Environmental Impact Assessment in New Brunswick*, available here



<https://www2.gnb.ca/content/dam/gnb/Departments/env/pdf/EIA-EIE/GuideEnvironmentalImpactAssessment.pdf>

If you require further information or wish to proceed with EIA registration, please do not hesitate to contact me at (506) 444-5382 or by email at crystale.harty@gnb.ca.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Crystale Harty', written in a cursive style.

Crystale Harty, B.Sc.
Acting Director, Environmental Impact Assessment Branch, ELG

CC: Patrick Mbaya, ELG



APPENDIX B

Approval to Operate



APPROVAL TO OPERATE

I-11189

Pursuant to paragraph 8(1) of the *Water Quality Regulation - Clean Environment Act*, and paragraph 5 (3) (a) of the *Air Quality Regulation - Clean Air Act*, this Approval to Operate is hereby issued to:

**Commission de services régionaux Nord-Ouest / Northwest Régional
Service Commission**
for the operation of the
Montagne-de-la-Croix Waste Management Facility

Description of Source: **A regional municipal solid waste disposal facility with leachate collection and treatment**

Source Classification: **Fees for Industrial Approvals Regulation - Clean Water Act Class 4**
Air Quality Regulation Class 4

Parcel Identifier: **35284835**

Mailing Address: **P.O. Box 522
Edmundston, NB E3V 3L2**

Conditions of Approval: **See attached Schedule (s)"A" and "B" of this Approval**

Supersedes Approval: **I-10717**

Valid From: **February 08, 2021**

Valid To: **February 07, 2026**

Recommended by: 

Issued by: 
for the Minister of Environment and Climate Change

February 09, 2021
Date

SCHEDULE "A"

A. DESCRIPTION AND LOCATION OF SOURCE

Commission de services régionaux Nord-Ouest operates a regional municipal solid waste management facility located on Chemin Clément Roy near Rivière-Verte that is commonly referred to as the Montagne-de-la-Croix Waste Management Facility. The Landfill is primarily designed to serve residents of the Madawaska, Victoria and the west half of Restigouche Counties with provisions to also accept waste from the Valley Solid Waste Commission. The Commission is also permitted to accept municipal solid waste and ground construction and demolition debris from the State of Maine. The imported construction and demolition debris is used as an intermediate cover for the containment cells. In addition, the Commission operates a construction and demolition debris disposal site, a household hazardous waste depot, and a designated area for the temporary storage of recyclable materials such as metal, tires, wood, and white goods.

As a result of the operation of the regional municipal solid waste management facility, there exist *potential* environmental impacts from: 1) the generation of leachate resulting from the disposal of waste in the landfill containment cells and debris in the construction and demolition debris disposal site; 2) spills during landfill operations or at the household hazardous waste depot; 3) site run-off impacting off-site receptors; 4) fugitive dust emissions from truck traffic and other on-site activities; and 5) elevated odour and/or noise emissions.

The operation of the regional municipal solid waste management facility by the Commission de Gestion Enviro Ressources du Nord-Ouest (COGERNO), located in the local service district of Rivière-Verte, County of Madawaska, and the Province of New Brunswick and identified by Parcel Identifier (PID) number 35284835, is hereby approved **subject to the following:**

B. DEFINITIONS

1. **"Approval Holder"** means Commission de services régionaux Nord-Ouest / Northwest Regional Service Commission.
2. **"Department"** means the New Brunswick Department of Environment and Local Government
3. **"Minister"** means the Minister of the Department and includes any person designated to act on the Minister's behalf.
4. **"Director"** means the Director of the Authorizations Branch of the Department and includes any person designated to act on the Director's behalf.

5. **"Facility"** means the property, buildings, and equipment as identified in the Description and Location of Source above, and all contiguous property in the title of the Approval Holder at that location.
6. **"Inspector"** means an inspector designated under the *Clean Air Act*, the *Clean Environment Act*, or the *Clean Water Act*.
7. **"containment cell"** means the area at the Facility approved in writing by the Department for the disposal of solid waste.
8. **"watercourse"** means the full width and length, including the beds, banks, sides and shoreline, or any part of a river, creek, stream, spring, brook, lake, pond, reservoir, canal, ditch or other natural or artificial channel open to the atmosphere, the primary function of which is the conveyance or containment of water whether the flow be continuous or not.
9. **"friable asbestos"** means waste material containing asbestos fibre or asbestos dust in a concentration greater than 1% by weight that is **not** tightly bound within a solid matrix such that it is easily crumbled by the hands.
10. **"petroleum product"** means a mixture of hydrocarbons, or their by-products, of any kind and in any form, including airplane fuel, asphalt, bunker "C" oil, crude oil, diesel fuel, engine oil, fuel oil, gasoline, kerosene, lubricants, mineral spirits, naphtha, petroleum based solvents regardless of specific gravity, transformer oil and waste petroleum products and excluding propane and paint.
11. **"biomedical waste"** means,
 - a) human anatomical and blood waste,
 - b) animal anatomical and blood waste, any part of the carcass of an animal infected with a communicable disease or suspected by a licensed veterinary practitioner to be infected with a communicable disease
 - c) animal blood waste,
 - d) microbiology laboratory waste,
 - e) sharps waste,
 - f) cytotoxic waste,
 - g) waste that has come into contact with human blood waste that is infected or suspected of being infected with any infectious substance (human), or
 - h) a waste containing or derived from one or more wastes described in clauses (a) through (g),

and/or items listed in HAZ1 of the federal *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*. This definition excludes teeth, hair, bristles, feathers horns, hooves, nails, urine, feces and wastes that are controlled under the *Health Animals Act*

12. **"hazardous waste"** means any waste material intended for disposal or recycling, that is identified as a hazardous waste or hazardous recyclable material by the federal *Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations*, and/or is included in Class 1 and/or Class 7 of the federal *Transportation of Dangerous Goods Regulations*. This definition excludes any waste(s) for which the Director of the Approvals Branch has issued a written exemption.
13. **"sludge"** means a solid, semi-solid or liquid residue having less than 15% solids generated during the treatment of municipal and/or industrial wastewater, or generated as a result of other processes.
14. **"liquid waste"** means bulk liquids in a volume greater than 20 litres.
15. **"liquid oily waste"** means any waste containing free flowing petroleum products.
16. **"petroleum contaminated soil"** means soil that contains petroleum products at quantities determined, to the satisfaction of the Department, to be above the level indicated in the most recent version of the RBCA Tier I Risk-Based Screening Level (RBSL) Guidelines for Soil: Commercial, Non-potable, Coarse-grained for Gas (Modified TPH).
17. **"C&D debris"** means
 - a) concrete, brick and untreated wood,
 - b) siding, ceiling tile, gyproc, insulation,
 - c) asbestos that is not friable asbestos,
 - d) solid roofing materials such as asphalt shingles,
 - e) glass from doors and windows,
 - f) metal, wood and durable plastic structural materials from the demolition of a building,
 - g) wiring and incandescent light fixtures that do not contain fluorescent tubing/lighting,
 - h) toilets, bathtubs, wash basins, and plumbing fixtures,
 - i) floor coverings attached to a building during demolition,
 - j) broken and aged asphalt, or
 - k) any mixture of (a) thru (j)

that has been obtained during the construction, renovation or demolition of a building or structure. Debris or other materials obtained from commercial, industrial and manufacturing sources is not acceptable. Debris: i) from a building that has or may have manufactured, contained, transferred or distributed contaminated or hazardous (such as a pesticide storage warehouse) products; or ii) that contains PCB's (polychlorinated biphenyls), or iii) that contains lead paint of a known concentration greater than 1000ppm (parts per million) or that has been deemed leachable toxic (exceeds 5 mg/L) or contains lead paint that is flaking/chipping/peeling is not considered C&D debris for the purpose of this Approval.

18. "**C&D Site**" means the portion of the Facility approved by the Department for the disposal of C&D debris as indicated on ADI drawing 4107-0021 FIGURE 3 as the C&D Site.
19. "**disposal cell**" means the area at the C&D Site approved by the Department for the disposal of C&D debris.
20. "**sorting area**" means a location at the C&D Site, if approved in writing by the Director, where loads of C&D debris may be dumped and sorted. Unapproved materials may temporarily be stored here.
21. "**household hazardous waste**" means, for the purposes of this approval, hazardous waste that is generated in New Brunswick households.
22. "**hazardous waste collection and transportation network**" means a company that is approved by or acceptable to the Department to collect and transport hazardous waste.

C. EMERGENCY REPORTING

23. The Approval Holder, operator or any person in charge of the Facility **shall immediately** notify the Department where:
 - a) there has been, or is likely to be, a release of a contaminant or contaminants, such as leachate, wastewater, petroleum products, hazardous materials, or gaseous material, from the Facility which is of such magnitude or duration that there is a concern for the health or safety of the public, or there could be an impact to the environment.

Notification Procedure

Verbal notification should immediately be made to the **Region 6 (Grand Falls) Office by calling (506) 473-7744**. If contact cannot be made for any reason the problem should immediately be reported to the **Environment and Climate Change Canada's NEEC at 1-800-565-1633**. At this time the problem that occurred, its resulting impact and what was done to minimize the impact should be clearly expressed.

Within 24-hours of the time of initial notification, a copy of a **Preliminary Emergency Report** shall be filed by a designate representing the Approval Holder to the Regional Office within the Department and the Department's Central Office using the email provided below. The Preliminary Emergency Report shall clearly communicate as much information that is available at the time about the environmental emergency.

Within five (5) days of the time of initial notification, a copy of a **Detailed Emergency Report** shall be filed by a designate representing the responsible party to the Regional Office and the Department's Central Office using the emails provided below. The Detailed Emergency Report shall include, as minimum, the following: i) a description of the problem that occurred; ii) a description of the impact that occurred; iii) a description of what was done to minimize the impact; and iv) a description of what was done to prevent recurrence of the problem.

**Grand Falls Regional Office at elg.egl-region6@gnb.ca,
and the
Central Office in Fredericton at elg.egl-info@gnb.ca**

D. GENERAL INFORMATION

24. The issuance of this Approval does not relieve the Approval Holder from the responsibility of complying with other applicable federal, provincial or municipal legislation and/or bylaws.
25. The Approval Holder shall ensure that a copy of this Approval, including all attached Schedules, is kept in a prominent location in the office or working area of the Facility.
26. The Approval Holder shall immediately notify the Department in writing of any change in the legal name or address of the Facility.
27. Any operating problems or other matters that could cause the Facility to be in non-compliance with this Approval should be reported to the Department immediately.
28. An Inspector, at any reasonable time, has the authority to inspect the Facility and carry out such duties as defined in the *Clean Air Act*, the *Clean Environment Act* and/or the *Clean Water Act*.

E. TERMS AND CONDITIONS

GENERAL CONDITIONS

29. **Prior to July 10, 2024**, the Approval Holder shall submit a written application to the Department for a renewal of this Approval on a form provided by the Minister. The application shall include documentation supporting any proposed changes to the terms and conditions of this Approval.

30. In the event of Facility closure, the Approval Holder shall, in addition to any requirements under the *Environmental Impact Assessment Regulation 87-83* filed under the *Clean Environment Act*, prepare plans for complete site rehabilitation and ongoing monitoring and leachate treatment if appropriate. The plans shall be submitted to the Director for review and approval **at least six (6) months** before the planned closure date. The documentation shall include, but not necessarily be limited to, updated site plans and an engineering proposal for the site rehabilitation, ground and surface water monitoring and closure. The plans must be prepared or approved by a person who is a member of the Association of Professional Engineers and Geoscientists of the Province of New Brunswick.
31. In the event of closure of the C&D Site at the Facility, the Approval Holder shall ensure that a Closure Plan is prepared and submitted to the Director for review and approval **at least three (3) months** before the planned closure date. The plans must be prepared or approved by a person who is a member of the Association of Professional Engineers and Geoscientists of the Province of New Brunswick and include, but not necessarily be limited to, updated site plans and an engineering proposal for site rehabilitation, ground and surface water monitoring and closure.
32. The Approval Holder shall ensure that any item received at the Facility containing ozone-depleting substances, including but not limited to those utilized for refrigeration and/or air conditioning, are decommissioned according to the *Ozone Depleting Substances Regulation 97-132* filed under the *Clean Air Act*.
33. The Approval Holder shall ensure that waste, including C&D debris and friable asbestos, that originates from outside of New Brunswick, with the exception of the previously approved waste from the State of Maine, is not accepted at the Facility unless specifically approved by the Minister following an evaluation under the *Environmental Impact Assessment Regulation*.
34. The Approval Holder shall ensure that an Environmental Management Plan (EMP) is in place at the Facility. The EMP should include detailed emergency and contingency response procedures resulting from the spillage, release or mishandling of a petroleum product, hazardous or other dangerous materials at the Facility. The EMP should also include details on how the Facility will respond to emergency situations that may arise such as forest fires, restricted access to the Facility (traffic accidents or other blockade for example), failure of the retention ponds or leachate collection systems or other events that would interrupt normal operation of the Facility.

OPERATING CONDITIONS

35. The Approval Holder shall ensure that the Facility is not used for the disposal of the materials listed below unless otherwise approved in writing by the Director.
 - petroleum contaminated soil,
 - liquid wastes (with the exception of septage from the Facility sewage system),

- sludge (with the exception of sludge from the Facility leachate treatment system),
 - liquid oily wastes,
 - hazardous wastes,
 - biomedical waste or
 - any mixture of the above
36. The Approval Holder shall ensure that the minimum 25-year breakthrough requirement for the containment cells at the Facility is maintained.
37. The Approval Holder shall provide supervision when any material is being disposed of at the Facility, including the C&D Site. No disposal at the Facility, including the C&D Site, is permitted otherwise.
38. The Approval Holder shall ensure that the incoming waste at the Facility is routinely scrutinized to ensure that unacceptable waste is not received at the Facility.
39. The Approval Holder shall ensure that imported C&D debris from the State of Maine is not used as an intermediate cover on the side slopes of the landfill cells at the Facility.
40. The Approval Holder shall ensure that all exposed waste disposed of in the landfill portion of the Facility is covered with a minimum of 150 mm of clean soil (or an alternate cover approved in writing by the Director), at a frequency that prevents disease-vectors, odours fires, blowing litter and scavenging.

WASTE DISPOSAL

41. The Approval Holder shall ensure that hot loads arriving at the Facility containing ashes or other materials that could potentially cause a fire in the containment cells are temporarily stored in a separate secure location until the risk of fire has been eliminated. The material shall then be disposed of in the containment cells (or a designated area that has been approved in writing by the Director) at the Facility.
42. The Approval Holder shall ensure that any friable asbestos accepted at the Facility for disposal has been wetted, placed in securely tied, double bagged 6 mil polyethylene bags or securely tied single 6 mil polyethylene bag that has been placed in a drum or cardboard box with all seams securely taped and each bag, cardboard box and/or drum is clearly labelled "WASTE ASBESTOS UN2590" or "DECHETS D'AMIANTE UN2590" and there are no punctures in the containers (if they are punctured, the contents must be wetted and repackaged prior to land filling) and they are placed at a dedicated location within the engineered portion of the sanitary landfill and are immediately covered with a minimum of 300 mm of clean cover material, or 1000 mm of municipal solid waste. Asbestos should be accepted at the Facility by appointment only, and not disposed during windy conditions.
43. The Approval Holder shall ensure that there is a sufficient quantity of wetting agent on-site when asbestos is being handled and disposed at the Facility.

44. The Approval Holder shall ensure that appropriate facility staff supervises the unloading and covering of asbestos waste at the Facility. Unloading of friable asbestos at the Facility should be done by the driver (or assistant) and any personnel at the Facility who handle the asbestos should be wearing the proper respirators and clothing during the unloading and disposal of the asbestos waste.
45. The Approval Holder shall ensure that an "Asbestos Disposal Record" is maintained. The Record shall include, but not necessarily be limited to, the disposal date, volume of asbestos waste, origin of the shipment, contractor delivering the asbestos waste and a detailed plan of the disposal location at the Facility.

IMPORTATION

46. The Approval Holder shall ensure that all construction and demolition debris imported to the Facility is from a facility in the State of Maine approved by the Maine Department of Environmental Protection (DEP) to handle C&D debris.
47. The Approval Holder shall ensure that all imported construction and demolition debris accepted at the Facility is directed to a lined disposal cell of the landfill. Material that is appropriate for recycling or that can be reused should be salvaged whenever practical.
48. The Approval Holder shall ensure that all imported construction and demolition debris has been ground prior to its use as an intermediate cover material at the Facility.
49. The Approval Holder shall maintain an 'Imported Construction and Demolition Debris Database' that includes, but is not necessarily limited to, the origin and hauler of each imported load of construction and demolition debris and the tonnage of each load of imported construction and demolition debris.
50. The Approval Holder shall ensure that the imported construction and demolition debris brought to the Facility is regularly scrutinized to ensure that it does not contain something other than construction and demolition materials (such as hazardous or oily wastes).

LEACHATE AND SURFACE WATER

51. The Approval Holder shall ensure that no untreated leachate is released from the Facility to the environment or to the Facility's surface water drainage system including the sedimentation ponds.
52. The Approval Holder shall ensure that all leachate at the Facility is directed to the Facility's leachate collection and treatment system.

53. The Approval Holder shall ensure that surface water at the Facility that has not been in contact with leachate or solid waste is directed to the sedimentation pond(s). Clean surface water that has a total suspended solids (TSS) value of 25mg/l or less may be diverted from the sedimentation pond(s) if approved in writing by the Department. Water from empty containment cells that has not been in contact with leachate or solid waste should bypass the leachate storage and treatment system and be directed to the surface water drainage system at the Facility.
54. The Approval Holder shall ensure that there is a continuous, permeable layer of gravel surrounding the waste at the Facility from the top of the upper side slopes through the top of the berm area to the leachate collection system. Particular care must be exercised at the top of berm area so that the final cover will properly intersect the top of berm.
55. The Approval Holder shall ensure that the leachate collection piping at the Facility is properly maintained to ensure they remain free flowing.
56. **Prior to October 26, 2021** the Approval Holder shall ensure that the leachate collection piping at the Facility is inspected by video, or other method pre-approved in writing by the Department, to ensure the leachate collection system at the Facility is in proper working condition.

CONSTRUCTION

57. The Approval Holder shall ensure that the necessary engineering documentation is submitted to the Director, and approved in writing by the Department, prior to the construction, modification or expansion of 1) additional solid waste disposal cells, 2) landfill gas management systems; 3) sludge handling facilities, 4) leachate collection and treatment systems, 5) facilities for processing recyclables or managing organics, 6) storage of waste including household hazardous waste, 7) special waste disposal cells/locations or any other pertinent construction activity at the Facility.
58. The Approval Holder shall ensure that final cover applied to the containment cells at the Facility shall be a minimum of 300 mm granular layer, 600 mm low permeability clayey till @ 1×10^{-7} cm/sec hydraulic conductivity, 150 mm granular protection layer, 150 mm growing medium and vegetative cover and shall be sloped a minimum of 2% to promote precipitation runoff from the disposal cell. All holes, cave-ins and faults shall be filled in or repaired, as required, until the final cover has been properly stabilized. All side slopes shall be designed to ensure proper slope stability and full containment of leachate.

If approved in writing by the Director, an alternative final cover plan may be used.

59. The Approval Holder shall ensure that a Quality Assurance and Quality Control (QA/QC) report is submitted to the Department upon completion of the installation of final cover on a containment cell or cells at the Facility. The report must be prepared or approved by a person who is a member of the Association of Professional Engineers and Geoscientists of the Province of New Brunswick or is licensed to practise as a professional engineer pursuant to the *Engineering Profession Act* and include as a minimum:
- commentary that confirms that all construction activities and testing associated with the installation of final cover were supervised by a qualified independent third party and that the final cover meets the Department's requirements as detailed in the previous condition;
 - all test parameters, the number of tests and locations;
 - copies of any inspection and testing reports;
 - a summary of any problems or deficiencies encountered and how they were corrected;
- and
- other information as requested by the Department.

The QA/QC report should be forwarded to the Department no later than 3 months upon completion of the final cover.

60. The Approval Holder shall ensure that all containment cells at the Facility continue to be designed so that the installed leachate piping can be inspected by video to verify that the leachate piping is in proper working condition.
61. The Approval Holder shall ensure that, prior to decommissioning any monitoring wells at the Facility, a decommissioning plan and schedule is submitted to the Director and approved in writing by the Department.

CONSTRUCTION AND DEMOLITION DEBRIS

62. The Approval Holder shall ensure that the following set back distances are maintained between the C&D Site and the environment:

Water Supply Wells	300 m
Residence or Institutional Land Use	300 m
Industrial/Commercial Land Use	150 m
Watercourse or Wetland	150 m
Right-of-ways of Public Roads	150 m
Property Lines	50 m

Note: These are recommended set back distances. If deemed appropriate by an inspector, the Director may modify these set back distances in writing.

63. The Approval Holder shall ensure that only C&D debris is disposed of at the C&D Site. Any material at the C&D Site that is not located in a designated sorting area is considered disposed.

64. The Approval Holder shall ensure that C&D debris disposed of at the C&D Site is done so in the disposal cell.
65. The Approval Holder may use, if previously approved in writing by the Director, a designated sorting area to scrutinize loads of C&D debris brought to the C&D Site.
66. The Approval Holder shall ensure that all unapproved materials brought to the C&D Site, as well as those being temporarily stored in a designated sorting area immediately removed from the C&D Site and disposed of in the landfill disposal area at the Facility or are placed in a dumpster (or other temporary storage container approved by the Department) at the Facility as soon as possible and no longer than one day.
67. The Approval Holder shall ensure that the area between the property line of the Facility and the C&D Site disposal cell is maintained with a treed or bermed buffer zone.
68. The Approval Holder shall ensure that all exposed C&D debris at the C&D Site is covered at least once per week with a clean/uncontaminated granular cover material at least 150 mm deep.
69. The Approval Holder shall ensure that the side slopes of the disposal area of the C&D Site are properly stabilized (using riprap or a vegetative layer as part of the cover system for example) and maintained to limit erosion.
70. The Approval Holder shall ensure that a cover of at least 300mm thick of low permeability soil and vegetation is applied to portions of the C&D Site that have reached final grades or are no longer in use and is sloped in such a manner to ensure positive drainage and prevent standing or pooling of water on the surface.
71. The Approval Holder shall ensure that a minimum of 1.5 metres of overburden is maintained between the C&D debris and the bedrock and seasonal high groundwater.
72. The Approval Holder shall ensure that the C&D Site is designed and operated such that surface water is prevented from entering the disposal cell. No C&D debris shall be disposed of in free standing water.

SITE MANAGEMENT

73. The Approval Holder shall ensure that unauthorized access to and scavenging at the Facility is controlled.
74. The Approval Holder shall ensure that areas of the containment cells at the Facility that will be inactive for at least three months are covered with a 300 mm intermediate cover layer, graded to promote drainage and minimize erosion and infiltration. Any leachate or any water that has, or could, come in contact with waste in the containment cells must be directed to the leachate collection system.

75. The Approval Holder shall ensure that white goods, scrap metals, electronics, propane tanks/canisters, wood, tires and any other materials being salvaged at the Facility are stored in a secured area separate from the main waste disposal area.
76. The Approval Holder shall ensure that excessive accumulation of recyclable or salvageable materials such as wood, tires, and white goods at the Facility is prevented by regularly having the materials removed from the Facility and taken to an appropriate location for recycling or disposal.
77. The Approval Holder shall ensure that the drainage ditches at the Facility are maintained to ensure they remain free flowing at all times.
78. The Approval Holder shall ensure that enough cover material is available at the Facility to meet the cover requirements for the landfill containment cells and the C&D Site.
79. The Approval Holder shall ensure that debris and litter at the Facility is controlled. Adequate barriers and/or fencing shall be utilized to confine debris and litter to the immediate disposal area. Any debris or litter found along the access roads or otherwise not contained in the containment cells shall be routinely collected and disposed in an appropriate location.
80. The Approval Holder shall ensure that a Pest Management Program is in place at the Facility that is in compliance with "Pest Control at NB Landfill Sites and Transfer Stations", attached as Schedule "B".

HOUSEHOLD HAZARDOUS WASTE

81. The Approval Holder shall ensure that the household hazardous waste depot at the Facility is operated in accordance with the most recent edition of the household hazardous waste Operations Manual that has been approved in writing by the Department.
82. The Approval Holder shall ensure that only household hazardous waste that is generated in New Brunswick is received and stored in the household hazardous waste depot at the Facility. All household hazardous waste received by the Facility is to be stored in the household hazardous waste depot.
83. The Approval Holder shall ensure that all household hazardous waste being stored in the household hazardous waste depot at the Facility is collected by a hazardous waste collection and transportation network. No household hazardous waste is to be stored at the Facility for more than one year.
84. The Approval Holder shall ensure that household hazardous waste at the Facility shall only be received, sorted, stored, and transferred from the Facility.

85. The Approval Holder shall ensure that all household hazardous waste stored in the household hazardous waste depot is:
- a) secured in sealed and chemically resistant containers;
 - b) away from high traffic areas and protected from vehicle impacts;
 - c) away from electrical panels;
 - d) in a containment area that has secondary containment adequate to contain 110 % of the nominal volume of the largest container in the containment area;
 - e) in a containment area that is designed to prevent contact between incompatible chemicals; and
 - f) in a containment area designed to prevent the release or discharge of chemicals to the environment as a result of a spill or other upset condition.
86. **Within 15 days of the end of each month**, the Approval Holder shall submit a monthly report to the Director of the Approvals Branch that includes a summary of all spills that have occurred in association with the operation of the household hazardous waste program. This summary shall identify the material spilled, the approximate volume spilled, the date of the spill, the containment method employed, and the steps taken to prevent a future recurrence of the spill. If no spill has occurred during any given month then the report shall state this. This does not relieve the Approval Holder of compliance with the Environmental Emergency Reporting section of this Approval.
87. The Approval Holder shall keep records of all household hazardous waste that has been transported from the Facility for disposal. These records shall include the company transporting the waste, the date of transport, the amount of waste transported, and the final destination of the waste. These records shall be kept on site for a minimum of two years and shall be made available upon request.

EMISSIONS AND DISCHARGES

88. The Approval Holder shall ensure that effluent discharged from the sand filter to the sedimentation pond at the Facility does not exceed the following limits:

BOD ₅	40 mg/l	pH	6.0-9.5	Copper	0.5 mg/l
Iron	5 mg/l	Chromium	0.5 mg/l		
Nickel	0.5/mg/l	Zinc	0.5 mg/l		

Dilution of the sand filter effluent is not acceptable. Samples of the sand filter effluent must be taken and analyzed at the beginning of a discharge event and weekly during the discharge event.

89. The Approval Holder shall ensure that any discharge from the Facility, including the sedimentation pond, to a watercourse has a total suspended solids (TSS) value of 25 mg/l or less.

90. The Approval Holder shall ensure that any discharge from the sedimentation pond at the Facility to a watercourse is Non-Acutely Lethal to rainbow trout as determined by Environment Canada's most recent *Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout*, Report EPS 1/RM/13.
91. The Approval Holder shall ensure that both odour and noise emissions released from the Facility are controlled to prevent impacts to off-site receptors. In the event that odour or noise emission impacts do occur, the Department may require the Approval Holder to develop, submit and implement a Control Plan that mitigates the impacts such that they no longer cause a nuisance to off-site receptors. The Control Plan shall be submitted to the Director for review and approval prior to implementation.
92. The Approval Holder shall ensure that no burning is conducted at the Facility, including the C&D Site, at any time.
93. The Approval Holder shall ensure that fugitive dust emissions generated from truck traffic or other activities at the Facility are controlled by the use of water. Written permission from the Department must first be obtained if calcium chloride or other chemical compounds are to be used for dust control. The use of a petroleum product for dust control is **prohibited**.

TESTING AND MONITORING

94. The Approval Holder shall ensure that all samples required to be obtained for the Facility are analyzed by a laboratory that is accredited to ISO/IEC 17025, by an accreditation body meeting the requirements of ISO/IEC 17011, and deemed proficient for the requested parameters for which proficiency training is available. The Standards Council of Canada (SCC) and the Canadian Association Laboratory Accreditation Inc. (CALA) are recognised as acceptable laboratory accreditation bodies.

For the purpose of this Approval, “GENERAL CHEMISTRY” shall include:

Ammonia	Alkalinity (as CaCO ₃)	Calcium
Chloride	Copper	Hardness (as CaCO ₃)
Iron	Nitrate-Nitrite (as N)	Magnesium
Manganese	o-Phosphate (as P)	Potassium
r-Silica (as SiO ₂)	Sodium	Sulfate
Total Suspended Solids	Total Organic Carbon	Turbidity
Zinc		

with the associated calculated parameters: Bicarbonate, Carbonate, Hydroxide, Cation Sum, Anion Sum, % difference, Theoretical conductance, Saturation pH (5°C) and Langelier Index (5°C).

and “TRACE METALS” shall include:

Aluminum	Antimony	Arsenic	Barium
Beryllium	Bismuth	Boron	Cadmium
Calcium	Chromium	Cobalt	Copper
Iron	Lead	Magnesium	Manganese
Mercury (CVAAS)	Molybdenum	Nickel	Potassium
Rubidium	Selenium	Silver	Sodium
Strontium	Tellurium	Thallium	Tin
Uranium	Vanadium	Zinc	

and "INDICATOR PARAMETERS" shall include:

Ammonia	Chloride	Conductivity
Copper	Iron	Manganese
pH (Field and Lab)	Nitrite-Nitrate	Total Organic Carbon
Total Dissolved Solids	Sodium	Sulfate

and "BTEX/TPH" shall be analysed in accordance with the Atlantic RBCA Tier 1 Guidelines for Laboratories and shall include the following parameters:

Benzene	C6-C10 Hydrocarbons
Toluene	>C10-C21 Hydrocarbons
Ethylbenzene	>C21-<C32 Hydrocarbons
Xylene	Modified TPH (Tier 1)
% Rec. iso-butylbenzene-Volatile	
% Rec. iso-butylbenzene-Extractable	
% Rec. n-dotriacontane-Extractable	

95. The Approval Holder shall ensure that all sampling required at the Facility is undertaken by a technician qualified to perform such sampling. The existing network of groundwater monitoring wells at the Facility is as follows:

<u>Well</u>	<u>Shallow Till</u>	<u>Deep Till</u>	<u>Shallow Bedrock</u>	<u>Deep Bedrock</u>
MW1	MW1-ST	MW1-DT	MW1-SBR	MW1-DBR
MW2	MW2-ST	MW2-DT		
MW3	MW3-ST	MW3-DT		
MW4	MW4-ST	MW4-DT		
MW5	MW5-ST	MW5-DT		
MW6	MW6-ST	MW6-DT	MW6-SBR	MW6-DBR
MW7	MW7-ST	MW7-DT	MW7-SBR	MW7-DBR
	MW8-ST		MW8-SBR	
ADI97-1	ADI97-1ST			
ADI97-3	ADI97-3ST	ADI97-3DT		
ADI97-4	ADI97-4ST	ADI97-4DT		

C&D-MW1	C&D-MW1-ST	C&D-MW1-SBR	
C&D-MW2	C&D-MW2-ST	C&D-MW2-SBR	
C&D-MW3		C&D-MW3-SBR	C&D-MW3-DBR
C&D-MW4	C&D-MW4-ST	C&D-MW4-SBR	
ROY93-1	ROY93-1ST	ROY93-1DT	ROY93-1SBR

- 96. The Approval Holder shall ensure that any new groundwater monitoring wells, underdrains, leak detection systems or other sampling points at the Facility are sampled and analyzed as directed by the Department in writing.
- 97. The Approval Holder shall ensure that all field testing equipment is calibrated before and after each sampling event conducted at the Facility.
- 98. The Approval Holder shall ensure that prior to obtaining a ground water sample from a monitoring well at the Facility, a minimum of one well volume and a maximum of three well volumes be purged from that monitoring well.
- 99. The Approval Holder shall ensure that the following field parameters are obtained during each sampling event at the Facility:

Conductivity	Dissolved Oxygen	pH
Temperature	ground water elevations (referenced to geodetic datum)	

- 100. The Approval Holder shall ensure that all groundwater samples obtained at the Facility that are to be submitted for TRACE METAL analysis are field filtered using 0.45 µm in-line waterra filter or equivalent. All other samples should be unfiltered.
- 101. The Approval Holder shall ensure that the groundwater monitoring well nests MW1, MW2, MW3, MW4, MW5, MW6, MW7, and MW8 are sampled three times each calendar year and analyzed for:

GENERAL CHEMISTRY and TRACE METALS

The groundwater monitoring wells must be sampled at seasonal intervals (Spring, Summer and Fall) that will provide an accurate representation of groundwater quality at the Facility.

- 102. The Approval Holder shall ensure that the groundwater monitoring well nests C&D-MW1, C&D-MW2, C&D-MW3 and C&D-MW4 are sampled at least two times each calendar year and analyzed for:

GENERAL CHEMISTRY and TRACE METALS

The groundwater monitoring wells must be sampled at seasonal intervals (Spring, Summer or Fall) that will provide an accurate representation of groundwater quality at the Facility.

103. The Approval Holder shall ensure that the underdrains and leak detection systems C1-U, C3-LD, C3-U, C4-LD, C4-U, C5-LD, C5-U, C6-LD, C6-U, LT-D1, LT-LD1, LT-LD2, LT-U, LHP-LD, LHP-U, LHP U2 and any others installed during the construction of additional containment cells at the Facility are sampled monthly from March through December each year by a qualified employee of the Facility and quarterly by a qualified independent technician and analyzed for the following parameters:

INDICATOR PARAMETERS	Flow (quantify if possible)
Abnormal color (visual)	Abnormal odour

104. The Approval Holder shall ensure that for each leachate discharge event at the Facility, a sample is obtained at the “end of pipe” point of discharge of the sedimentation pond and sent to a Standards Council of Canada (SCC) accredited or equivalent laboratory to test for toxicity using Environment Canada’s most recent *Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout*, Report EPS 1/RM/13. The sample location and timing shall assess and be representative of the most critical leachate concentrations in the discharged water.

105. The Approval Holder shall ensure that the water quality of the surface water sampling points BS1, BS3, GF1 and GF2 is analysed in the month prior to a leachate discharge event with two additional analyses taken in the middle of a leachate discharge event. One sampling round shall be conducted at a time that assesses the most critical affect of the leachate discharge on the stream. Sampling and analysis shall verify that the receiving stream does not exceed the CCME guidelines for Fresh Water Aquatic Life (FWAL) for the following:

Aluminum	Alkalinity	Ammonia (as NH ₃ -N)	Arsenic
BTEX/TPH	Cadmium	Chlorine (reactive)	Chromium
Coliform (Faecal)	Copper	Cyanide (as free CN)	Dissolved Oxygen
Hardness	Iron	Lead	Mercury (CVASS)
Molybdenum	Nickel	Nitrate	Nitrite
pH	Phenols (total)	Selenium	Silver
TSS	Zinc		

For the purpose of this Approval the surface water sampling points are as follows:

BS1 - Upstream of leachate discharge;

BS2 - Downstream of leachate discharge (Gauging Station);

BS3 - Downstream of leachate discharge at point of complete mixing (Point of Compliance);

GF1 - Upstream of confluence of Big Spring Brook with Grand Fourche Rivière Quisibis; and

GF2 - Downstream of confluence of Big Spring Brook with Grand Fourche Rivière Quisibis.

106. The Approval Holder shall ensure that benthic invertebrate sampling is conducted between July 15 and September 30 of each year on the Big Spring Brook at GF1, GF2, BS1 and BS3. Diversity index values must be calculated and compared against the background information.
107. The Approval Holder shall ensure that electro-fishing is conducted between July 15 and September 30 of each year to obtain qualitative information on species composition at the surface water sampling points GF1 and GF2 and comparisons made against the background information.
108. The Approval Holder shall ensure that the raw leachate influent at MH-L1 (Leachate Treatment Pond - LTP) at the Facility is sampled quarterly for:
- BOD₅ GENERAL CHEMISTRY
TKN TSS
TRACE METALS (Spring and Summer only)
BTEX/TPH
109. The Approval Holder shall ensure that the effluent from LTP cell #2 (at outlet) at the Facility is sampled monthly by a qualified technician and analyzed for:
- Ammonia, BOD₅, MLSS, MLVSS, pH, Temperature, TSS and Dissolved Oxygen (D.O.) profile (as required).
110. The Approval Holder shall ensure that the effluent from LTP cell #2 (at outlet) at the Facility is sampled quarterly and analyzed for GENERAL CHEMISTRY and sampled semi-annually (spring, summer or fall) and analyzed for TRACE METALS.
111. The Approval Holder shall ensure that a sample from the Leachate Holding Pond (LHP) at the Facility is obtained monthly and analyzed for Ammonia, BOD₅, o-phosphate, pH, Temperature, TKN and TSS. A quarterly sample shall be obtained from the LHP and analyzed for GENERAL CHEMISTRY and a semi-annual sample (Spring, Summer or Fall) shall be obtained from the LHP and analyzed for TRACE METALS.
112. The Approval Holder shall ensure that a sample from the Sand Filter effluent at the Facility is obtained monthly, when the effluent is being discharged to the sedimentation pond, and analyzed for:
- Ammonia, BOD₅, Chromium, Conductivity, Copper, Dissolved Oxygen, Iron, Nickel, o-phosphate, pH, Temperature, TKN, and Zinc.
113. The Approval Holder shall ensure that the vibrating wire piezometers in the containment cells at the Facility are monitored monthly and the readings are recorded.

114. The Approval Holder shall ensure that when effluent is being discharged from the sedimentation pond that a daily sample is obtained and analyzed for Total Suspended Solids (TSS).
115. The Approval Holder shall ensure that the results of all sampling and analysis conducted at the Facility are kept on file in both a hardcopy and electronic version.

GREENHOUSE GAS MANAGEMENT

116. Prior to **March 31st, 2022**, the Approval Holder shall prepare and submit a Greenhouse Gas Management Plan to the Department in accordance with the *Guidelines for Greenhouse Gas Management for Industrial Emitters in New Brunswick*, July 2015, or as may be updated from time to time. The Greenhouse Gas Management Plan shall be renewed every 5 years, as a minimum.
117. **Beginning in 2023**, the Approval Holder shall prepare and submit an Annual Greenhouse Gas Progress Report to the Department by July 1st of each year, for the previous calendar year, in accordance with the *Guidelines for Greenhouse Gas Management for Industrial Emitters in New Brunswick*.

REPORTING

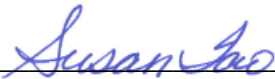
118. **Beginning in 2021**, the Approval Holder shall submit a greenhouse gas emissions report by **June 1st of each year**, for the previous calendar year, to the Department by means of the SWIM system. Reporting shall be consistent with Environment and Climate Change Canada's Greenhouse Gas Emissions Reporting Program (GHGRP). Reporting requirements are published annually in the Canada Gazette, Part 1 under the authority of subsection 46(1) of the *Canadian Environmental Protection Act, 1999* (CEPA 1999).
119. **By March 31 of each year**, the Approval Holder shall ensure that an Annual Environmental Report for the previous calendar year is submitted to the Director. The report must include as a minimum:
 - a copy of the Asbestos Disposal Record;
 - recommendations for any future monitoring, groundwater well installation or other work at the Facility;
 - confirmation that all field testing equipment has been calibrated before and after each sampling event conducted at the Facility;
 - confirmation that each groundwater monitoring well has been appropriately purged prior to obtaining a sample;
 - dates of all sampling conducted at the Facility;
 - a copy of the analytical results of the sampling and monitoring data obtained from the Facility for the previous calendar year and a review of those analytical results that is completed by a professional engineer or geoscientist licensed with the Association of Professional Engineers and Geoscientists of New Brunswick that include as a minimum:
 - comparisons with historical results from the Facility;
 - identification of possible analytical anomalies;

- an evaluation and discussion of the results for the surface water sampling points, groundwater monitoring wells, any cell or leachate pond underdrains/subdrain collection manholes and commentary on whether or not there is evidence of an immediate or potential impact to the environment, ground or surface waters and if so, recommendations for additional investigation, monitoring and remediation to mitigate the impacts;
- confirmation that the containment cells and leachate pond(s) have been operated such that the minimum breakthrough requirements have been maintained; and
- trending graphs for each monitoring well at the Facility and the leachate pond leak detection and cell underdrain manholes for the following parameters showing results vs. time:

Alkalinity, Ammonia, Barium, Boron, Calcium, Chloride, Conductivity, Iron, Magnesium, pH, Sodium, Sulphate, and Dissolved Organic Carbon.

Note: Trending graphs should be completed on an annual basis but an alternate schedule may be accepted if approved in writing by the Director.

120. **By June 30, October 31 & March 1 of each year**, the Approval Holder shall ensure that an environmental monitoring report is submitted to the Director. It is understood that the June report will include monitoring from January to April, the October report will include monitoring from May to August and the March report will include monitoring from September to December. The reports must be prepared or approved by a person who is a ~~member~~ member of the Association of Professional Engineers and Geoscientists of the Province of New Brunswick or is licensed to practise as a professional engineer pursuant to the *Engineering Profession Act* and include, as a minimum, a copy of the analysis, a comparison of the analysis with previous analytical results from the Facility, and commentary indicating whether there is an indication of any immediate, or potential threat or impact to the environment, ground or any surface waters. If an impact has occurred or is suspected the report must include a proposal for further investigation and/or remediation.
121. **Within 15 days of the end of each month**, the Approval Holder shall submit a monthly inventory report of all household hazardous waste stored in the Household Hazardous Waste Building for the previous month to the Approvals Branch of the Department on an appropriate form that has been provided by the Department.
122. In the event the Approval Holder violates any Term or Condition of this Approval the Approval Holder is to immediately report this violation to the Department by calling (506) 453-7945. In the event the violation may cause the health or safety of the general public to be at risk and/or harm to the environment could or has resulted, the Approval Holder shall follow the Emergency Reporting procedures contained in this Approval.
123. In the event the Approval Holder receives a complaint from the public regarding unfavourable environmental impacts associated with the Facility, the Approval Holder is to report this complaint to the Department within one business day of receiving the complaint.

Prepared by: 
Susan Tao, P.Eng. / ing.
Approvals Engineer

SCHEDULE "B"

PEST CONTROL AT NB LANDFILL SITES AND TRANSFER STATIONS

1. Use Limitations

“Treated baits must be placed in locations not accessible to children, pets, domestic animals, wildlife or in tamper proof bait stations. Do not place bait in areas where there is a possibility of contaminating food or that come in direct contact with food.”

If a facility is contracting a professional pest control company to conduct a rodent control program, tamper resistant bait stations may be one component of the control program. The following recommendations are proposed for a rodent control program at these sites.

- 1 The company must hold a valid Provincial Operator’s License and Pesticide Use Permit.
- 2 All personal directly involved in the mixing, loading and application of the pesticides for the control of rodents at facilities must hold a valid Class F Pesticide Applicator’s Certificate, which must be in their immediate possession.
- 3 The treatment area must be posted with an approved sign prior to the treatment.
- 4 The signs are to be conspicuously posted at all ordinary points of access.
- 5 The applicator shall ensure that the signs are removed after either the completion of treatment or the expiration of their permit.
- 6 The sign shall be rectangular in shape with a minimum size of 14 cm x 21 cm, rain resistant with type or letters of sufficient size and clarity to be easily read together with a symbol of a cautionary raised hand inside a symbol of a stop sign. The information on the sign must be bilingual and must contain the words “Attention”, Pesticide Application”, the name of the pesticide, the Pest Control Product registration number, date of application, name of applicator, operator name or logo and telephone number.
- 7 Industry approved tamper resistant bait stations must be attempted before using other methods of baiting.
- 8 The Director of Pesticides Control or any member of the Pesticides Management Unit must approve areas that require alternative baiting methods.

January 23, 2002

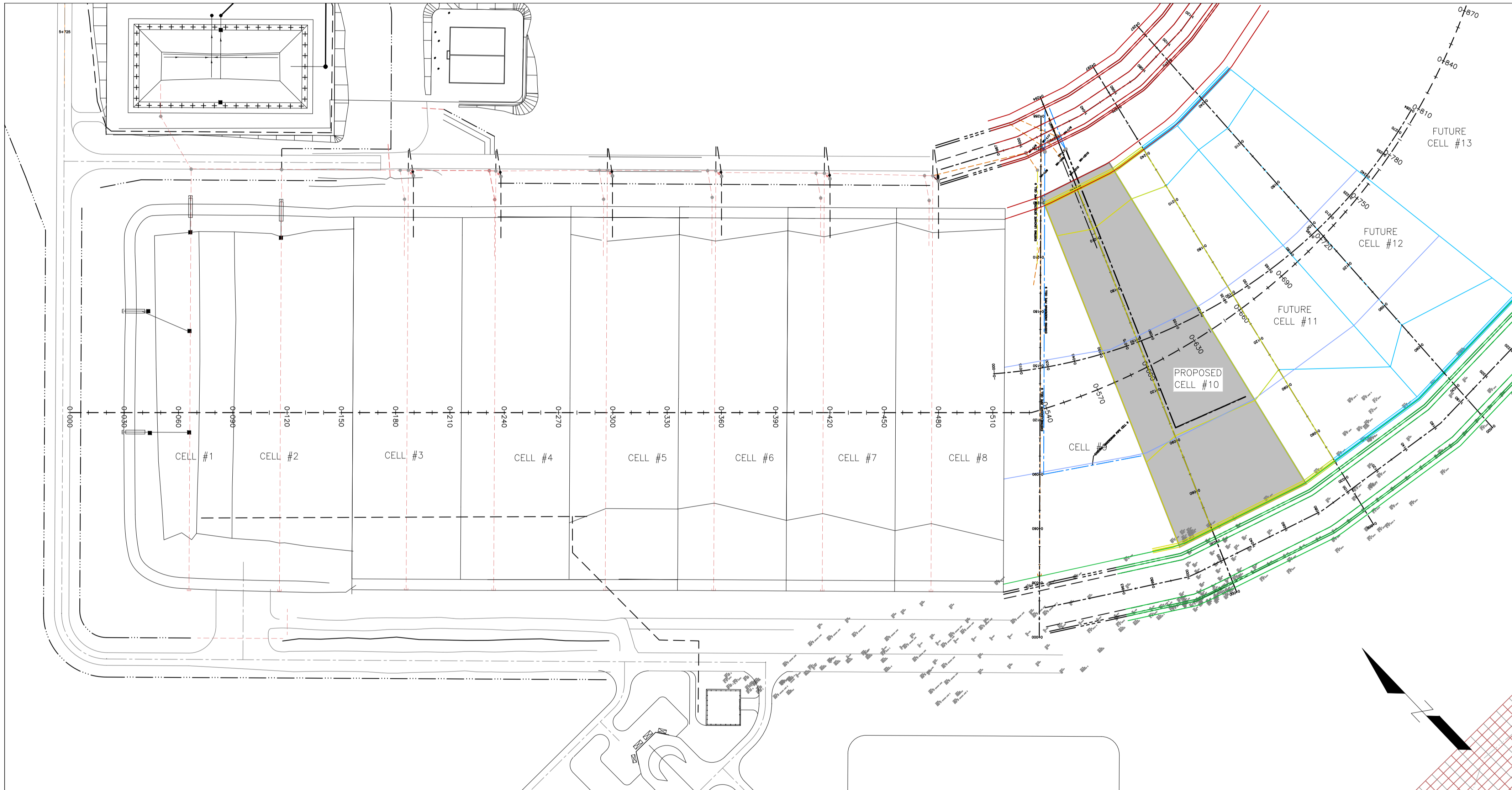


APPENDIX C

Waste Containment Cell Design

C.R.S.N.O. / N.W.R.S.C.

CONSTRUCTION OF CELL NO.10



DRAWING No.	DRAWING TITLE	REV.
597-18-3-TP	TITLE PAGE	0
597-18-3-C1	PLAN & PROFILE PIPING AND MANHOLE	0
597-18-3-C2	PLAN & PROFILE GRADING & SLOPE	0
597-18-3-D1	TYPICAL DETAILS	0
597-18-3-D2	TYPICAL DETAILS	0

PROJECT No. 597-18-3
ISSUED FOR TENDER



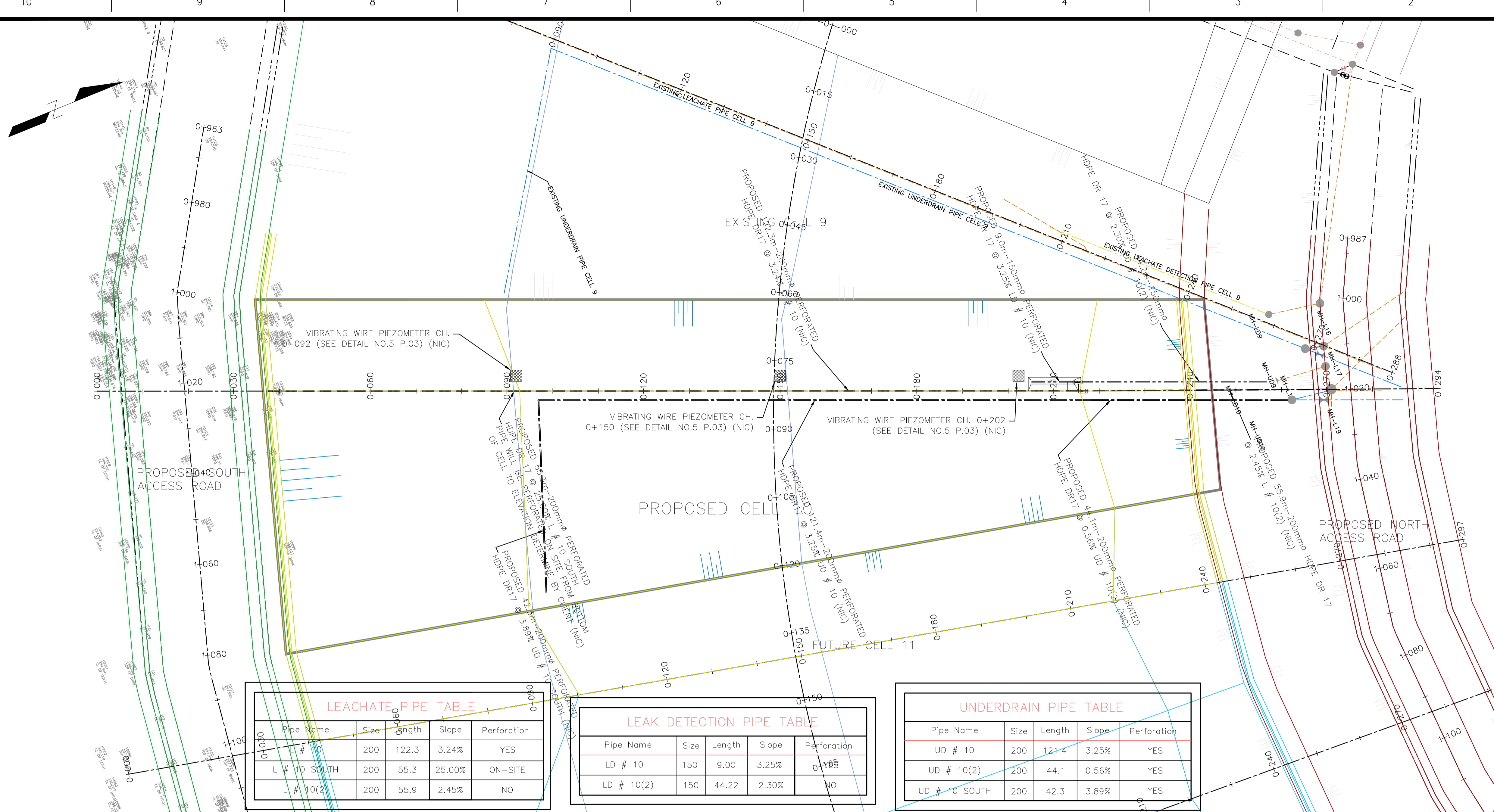
**ROY
CONSULTANTS**
ENGINEERING SERVICES D'INGÉNIERIE

13, rue Costigan
Edmundston (NB) E3V 1W7
T. 506.737.9730
www.royconsultants.ca

Estimated Quantities

- 600 mm of Clayey Till:	13,620 m ³
- Geosynthetic Clay Liner (GCL) 2 Meter wide:	250 m ²
- Geosynthetic Clay Liner (GCL) 6 Meter wide:	750 m ²
- 60 mil HDPE Secondary Membrane:	12,800 m ²
- HDPE Secondary Geonet:	12,800 m ²
- 80 mil HDPE Primary Membrane:	7,600 m ²
- 80 mil HDPE Textured Primary Membrane:	5,300 m ²
- HDPE Primary Geonet:	7,600 m ²
- Additional HDPE Geonet:	500 m ²
- Type N2 Geotextile for liner:	13,620 m ²
- 350mm of Gravel Type A	2,553 m ³
- 600mm of Gravel Type A	2,828 m ³
- Gravel Type B	556 m ³

The above mentioned numbers are approximate quantities only. It will be the contractor's responsibility to make its own quantity calculations for pricing purposes.



LEACHATE PIPE TABLE

Pipe Name	Size	Length	Slope	Perforation
L # 10	200	122.3	3.24%	YES
L # 10 SOUTH	200	55.3	25.00%	ON-SITE
L # 10(2)	200	55.9	2.45%	NO

LEAK DETECTION PIPE TABLE

Pipe Name	Size	Length	Slope	Perforation
LD # 10	150	9.00	3.25%	YES
LD # 10(2)	150	44.22	2.30%	NO

UNDERDRAIN PIPE TABLE

Pipe Name	Size	Length	Slope	Perforation
UD # 10	200	121.4	3.25%	YES
UD # 10(2)	200	44.1	0.56%	YES
UD # 10 SOUTH	200	42.3	3.89%	YES

- NOTES**
- EXISTING LEAKAGE DETECTION PIPING (LD)
 - - - PROPOSED LEAKAGE DETECTION PIPING (LD)
 - - - EXISTING LEACHATE COLLECTION PIPING (L)
 - - - PROPOSED LEACHATE COLLECTION PIPING (L)
 - EXISTING UNDERDRAIN PIPING (UD)
 - - - PROPOSED UNDERDRAIN PIPING (UD)
 - LIMIT OF CELL #10
 - - - PROPOSED EDGE OF ROAD
 - - - PROPOSED DITCH
 - ▣ PROPOSED VIBRATING WIRE PIEZOMETER
 - EXISTING MANHOLES
 - ◀ EXISTING VALVE ON UNDERDRAIN PIPING

NO.	DATE	ISSUED FOR TENDER	Y.G.
0	2021-03-24	ISSUED FOR TENDER	Y.G.

NO.	DATE	REVISIONS	BY:
			PAR:

Client
 C.R.S.N.O. / N.W.R.S.C.

Project
 Projet

CONSTRUCTION OF CELL #10



Drawing Title
 Titre du Plan

PLAN & PROFILE PIPING AND MANHOLE

Design by: Design par:
 L.R.

Drawn by: Dessine par:
 J. BELLEFLEUR

Checked by: Verifie par:
 JP FOURNIER

Date:
 19-02-06

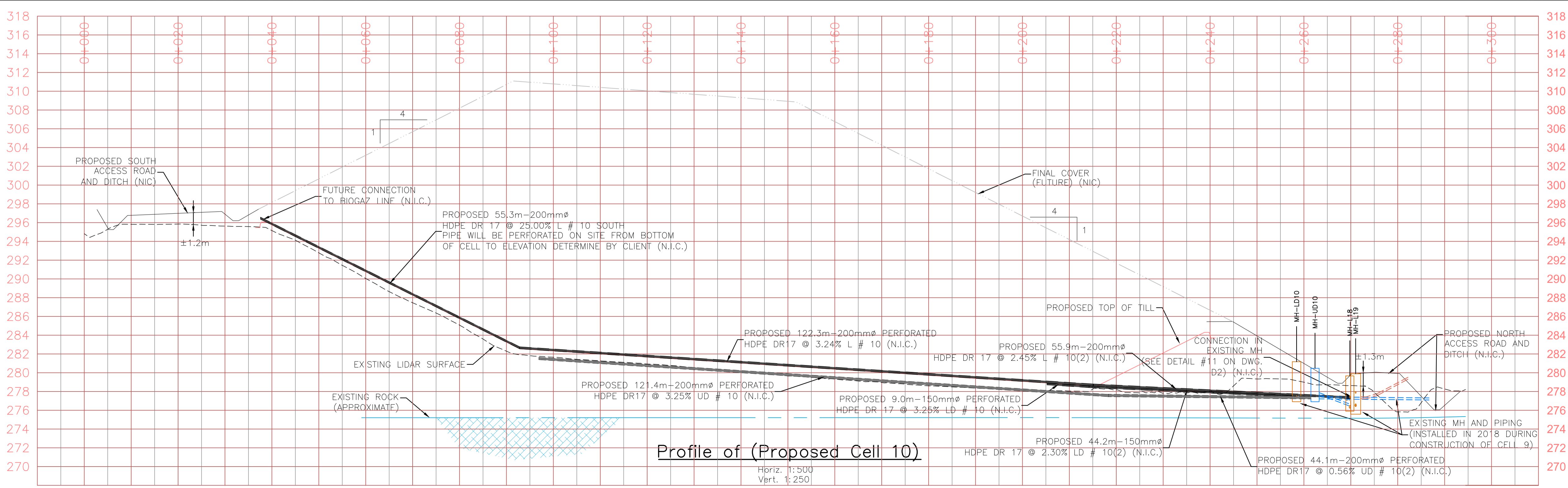
Scale: Echelle:
 1:500

Sheet: Feuille:
 01 of/de 04

Drawing Number: Numero du Plan:
 597-18-3-C1

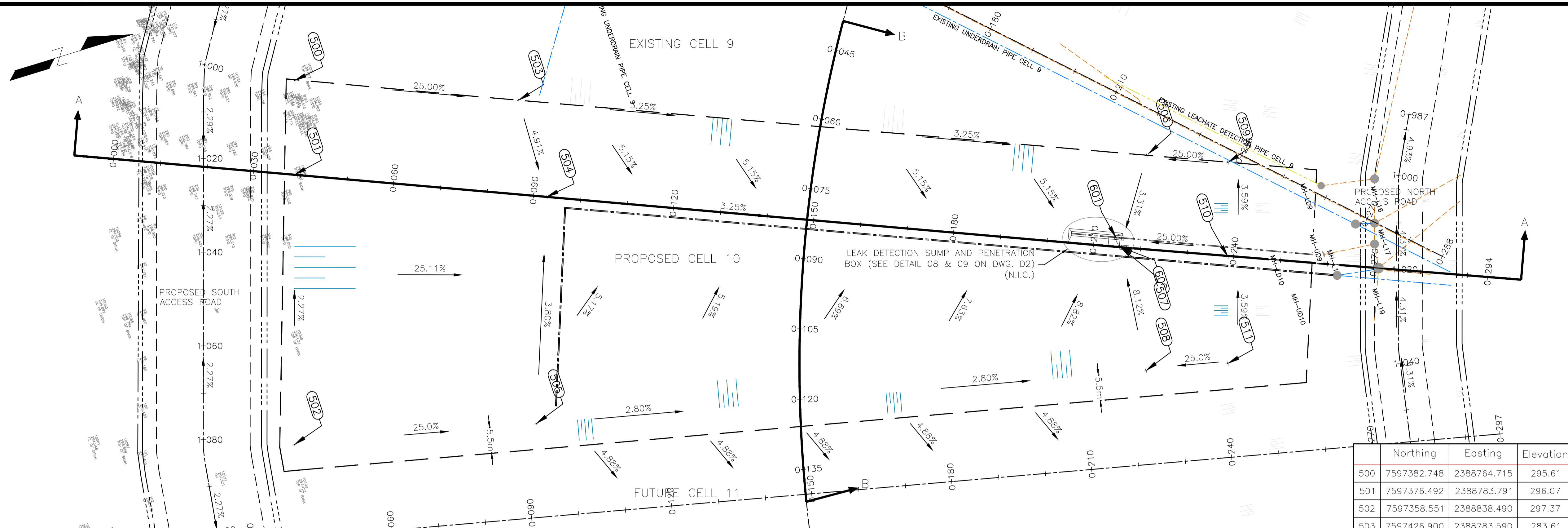
Rev. 0

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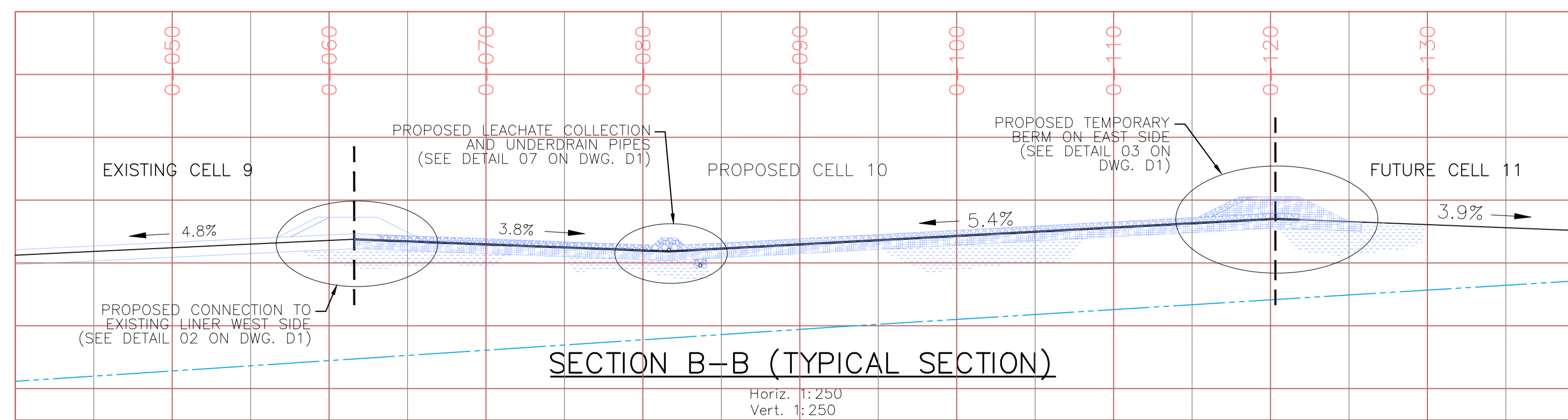
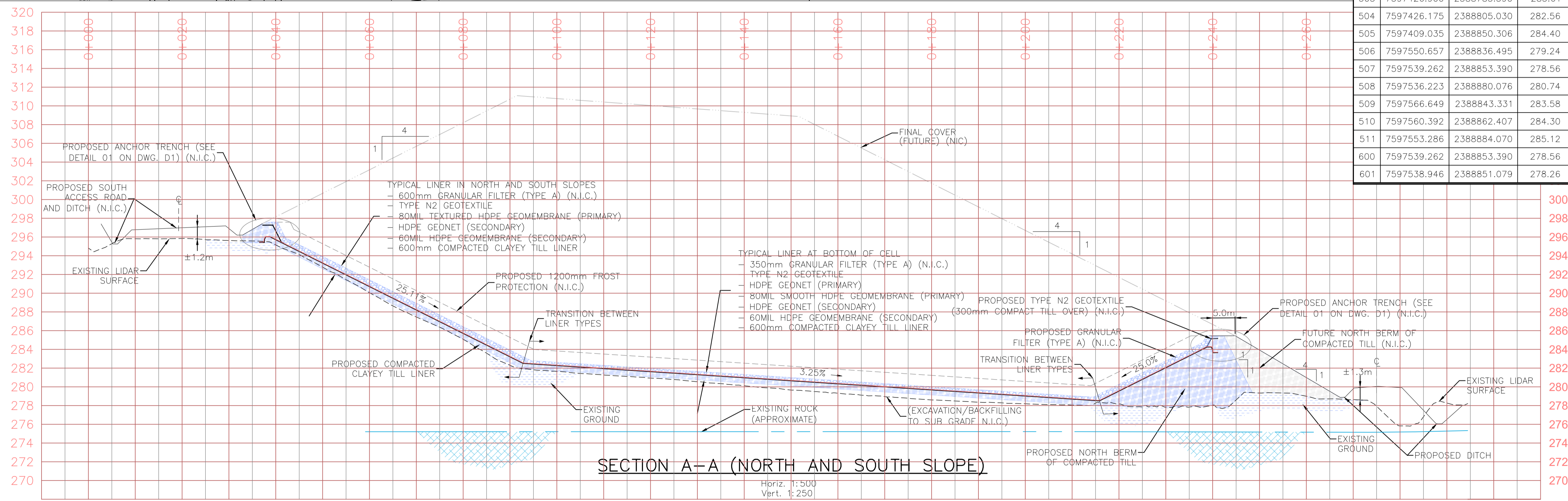


Profile of (Proposed Cell 10)

Horiz. 1:500
 Vert. 1:250



	Northing	Easting	Elevation
500	7597382.748	2388764.715	295.61
501	7597376.492	2388783.791	296.07
502	7597358.551	2388838.490	297.37
503	7597426.900	2388783.590	283.61
504	7597426.175	2388805.030	282.56
505	7597409.035	2388850.306	284.40
506	7597550.657	2388836.495	279.24
507	7597539.262	2388853.390	278.56
508	7597536.223	2388880.076	280.74
509	7597566.649	2388843.331	283.58
510	7597560.392	2388862.407	284.30
511	7597553.286	2388884.070	285.12
600	7597539.262	2388853.390	278.56
601	7597538.946	2388851.079	278.26



NOTES

- LIMIT OF CLAYEY TILL LINER FOR CELL #10
- PROPOSED EDGE OF ROAD
- PROPOSED DITCH

NO.	DATE	REVISIONS	BY: PAR:
0	2021-03-24	ISSUED FOR TENDER	Y.G.

- A A DETAIL No
- B No DU DETAIL
- C LOCATION DRAWING No
- D SUR DESSIN No
- E DRAWING No
- F DESSIN No

Client Client

C.R.S.N.O. / N.W.R.S.C.

Project Projet

CONSTRUCTION OF CELL #10



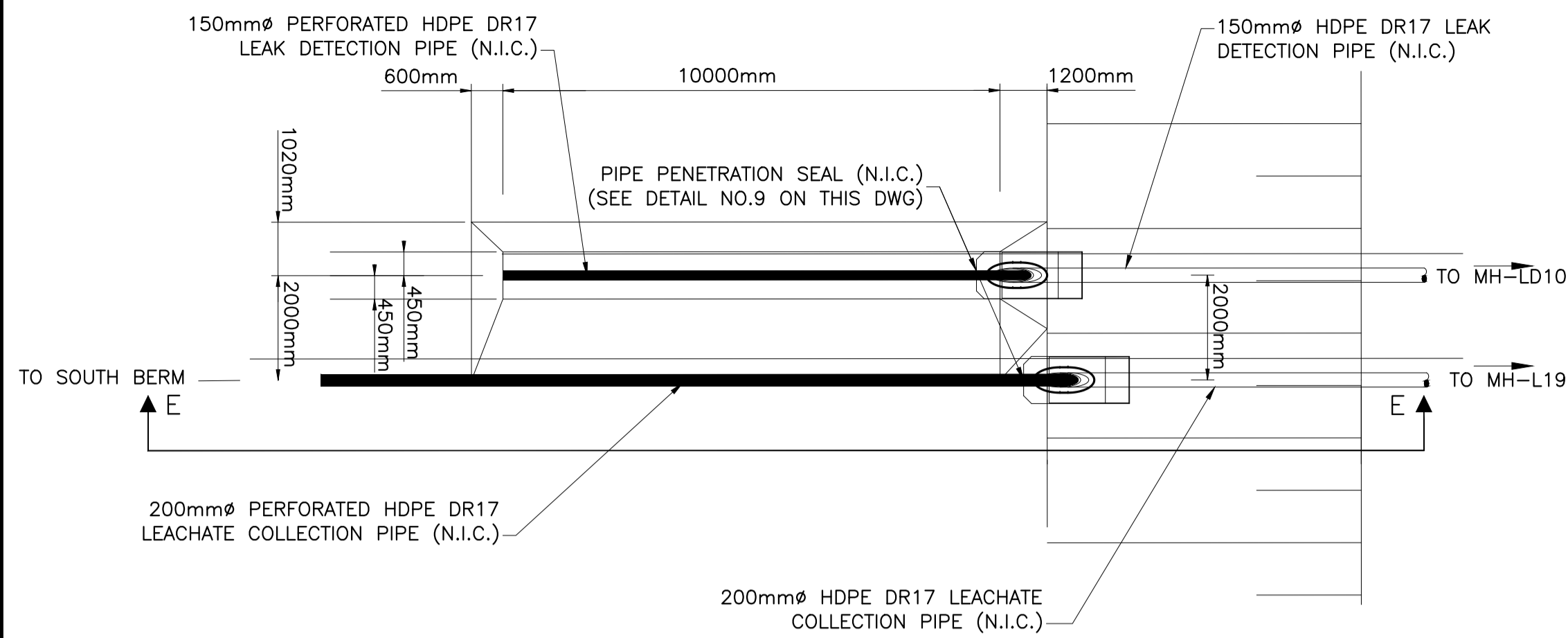
Drawing Title Titre du Plan

PLAN & PROFILE GRADING & SLOPE

Design by: L.R.	Design par:	Drawn by: J. BELLEFLEUR	Dessiné par:
Checked by: JP FOURNIER	Vérifié par:	Date: 19-02-06	
Scale: 1:500	Echelle:	Sheet: 02	Feuille: of/de 04

Drawing Number: 597-18-3-C2. Numero du Plan: 597-18-3-C2. Rev. 0

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TRENCH WALLS TO BE SLOPED OR SHORED IN ACCORDANCE WITH THE N.B. OCCUPATIONAL SAFETY ACT.

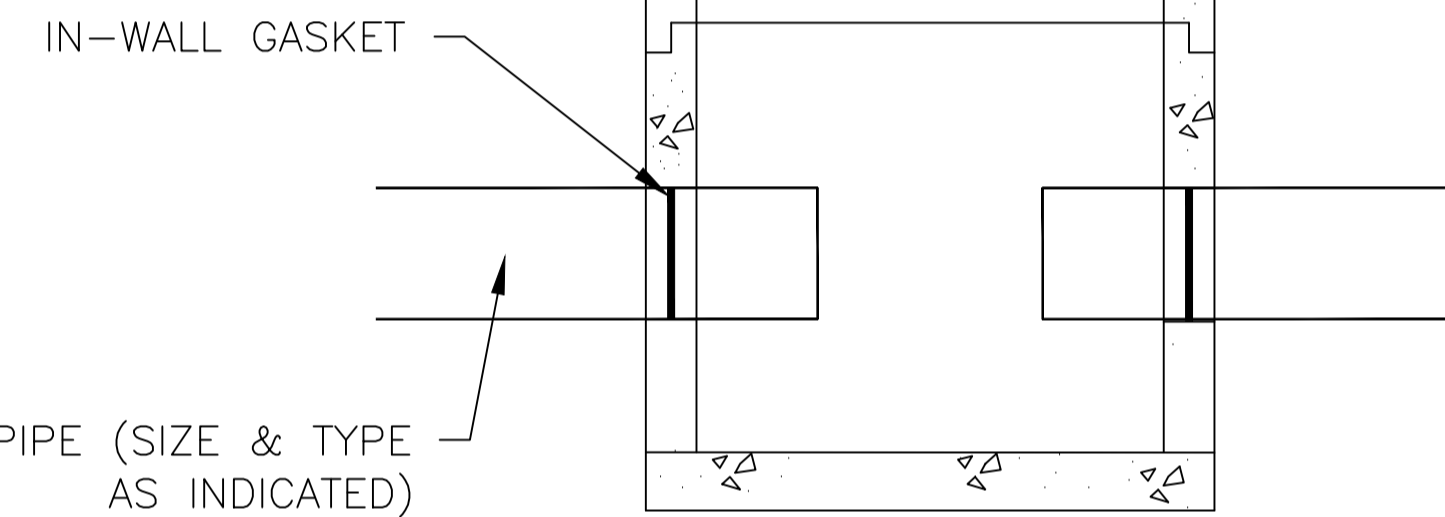
CLAYEY TILL MATERIAL COMPACTED TO 98% MAXIMUM DENSITY (ASTM D698)

NOTES:

- PIPE BEDDING FOUNDATION UNDER PIPE TO BE COMPACTED PRIOR TO PIPE PLACEMENT TO 98% MAXIMUM DENSITY. (ASTM D698)
- BEDDING TO BE PLACED AND COMPACTED IN ACCORDANCE WITH PIPE MANUFACTURER'S INSTRUCTIONS.

TYPICAL PIPE TRENCH DETAIL 10

N.T.S.



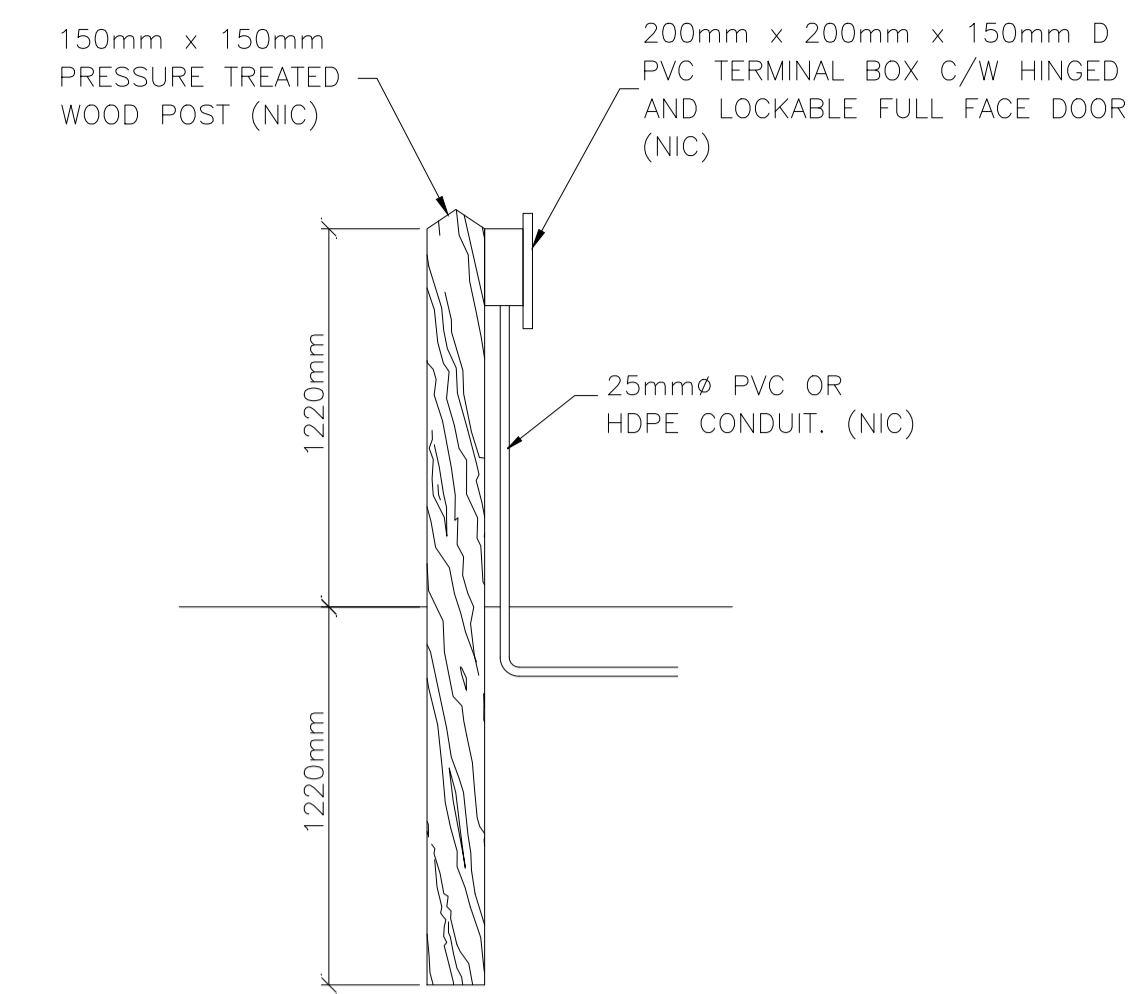
PIPE MANHOLE WALL PENETRATION DETAIL 11

N.T.S.

Construction Sequence

- Environmental protection measures such as sedimentation fences, erosion control structures, temporary pumping and dewatering structures, disposal and/or runoff control measures for suspended solids, etc., to be installed prior to start of work.
- Bench marks for the work to be installed by the Owner.
- Permeability testing of the on-site stored till material to be used by the Contractor responsible for the installation of the clayey till liner, will be completed by the Owner.
- The sub-grade (till surface) to be prepared by the Owner, including the backfilling of the temporary ditch in the proposed Cell No.10, the shaping of all the berms to the specified slopes, the shaping of the sub-grade under the leachate collection system, the proof rolling of the compacted sub-grade (till surface) and the installation of the underdrain c/w the geotextile envelope. The contractor will shape the leak detection sump within the sub grade.
- The Owner will install the underdrain system piping from the inside of the proposed Cell No.10, under the North berm, and all the way to the proposed manholes on the perimeter of the cell.
- The Owner will install the leachate collection and the leakage detection systems' piping located under the North berm and outside the proposed Cell No.10. The leachate collection and leakage detection pipes will be installed from the discharged manholes to up to the North berm inside surface for the proposed Cell No.10.
- The backfilling of the newly installed infrastructures on the perimeter of the proposed Cell No.10 will be by the Owner.
- The Contractor responsible for the installation of the clayey till liner, will backfill and compact the North berm where piping was installed. **It will be very important that this backfilling work be carried out as soon as the Owner has completed the piping installation in order not to delay the construction.**
- The Contractor responsible for the 600 mm clayey till liner installation, will install the liner in a minimum of three (3) layers (2 x 225mm and 1 x 150mm), including transportation of tested till material from on-site storage to Cell No.10, and compaction of the liner to the specified values.
- The Contractor responsible for the clayey till liner installation, will install a thicker liner under the leachate collection pipe and leakage detection pipe as shown on the drawing details.
- The Owner will excavate the North and South berms' anchor trenches.
- The existing geosynthetic liner system at the edge of the existing Cell No.9 will be exposed by the Owner, for the HDPE liner Contractor to be able to tie-in the proposed geosynthetic liner of Cell No.10.
- The Owner will install and provide the two (2) HDPE pipe penetration seals as per drawing.
- The Owner will install the geosynthetic clay liner strip (GCL) under the proposed leachate collection pipe. (L #10)
- The HDPE liner Contractor will install the geosynthetic liner components, including the 60 mils HDPE secondary membrane, the secondary HDPE geonet, the 80 mils textured and non-textured HDPE primary geomembrane, the primary HDPE geonet and the geotextile being shown as part of the geosynthetic liner system. Welding of the primary and secondary HDPE geomembranes to the pipe penetration seal boxes will be by the HDPE liner Contractor, along with all welding and tie-ins of HDPE geomembrane layers.
- The installation of the leakage detection pipe, between the primary and secondary HDPE membranes, will be the responsibility of the Owner, including the installation of the geotextile envelope. The contractor will be responsible for the excavation of the trench for the system.
- The installation of the leachate collection pipe will be the responsibility of the Owner, including the installation of the leachate collection piezometers' system components.
- The Owner will be responsible for the excavation and backfilling work for the North and South side roadway construction, including all ditching related work.
- The Owner will install the filter granular material Type A and the screened gravel Type B.
- The Owner will construct the proposed temporary berm between the proposed Cell No.10 and the future Cell No.11.
- The Owner will excavate the proposed temporary ditch in the future Cell No.11.

Note: All work to be completed as per specification and drawings

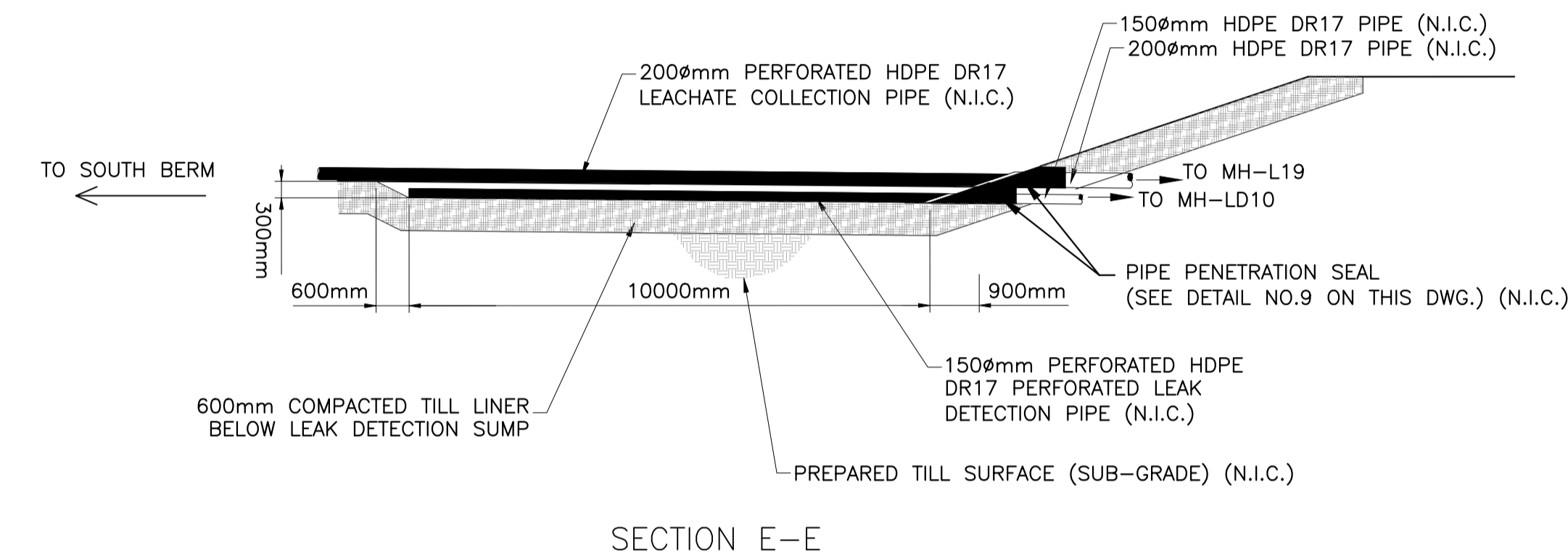


PIEZOMETER WIRE BOX DETAIL 12

N.T.S.

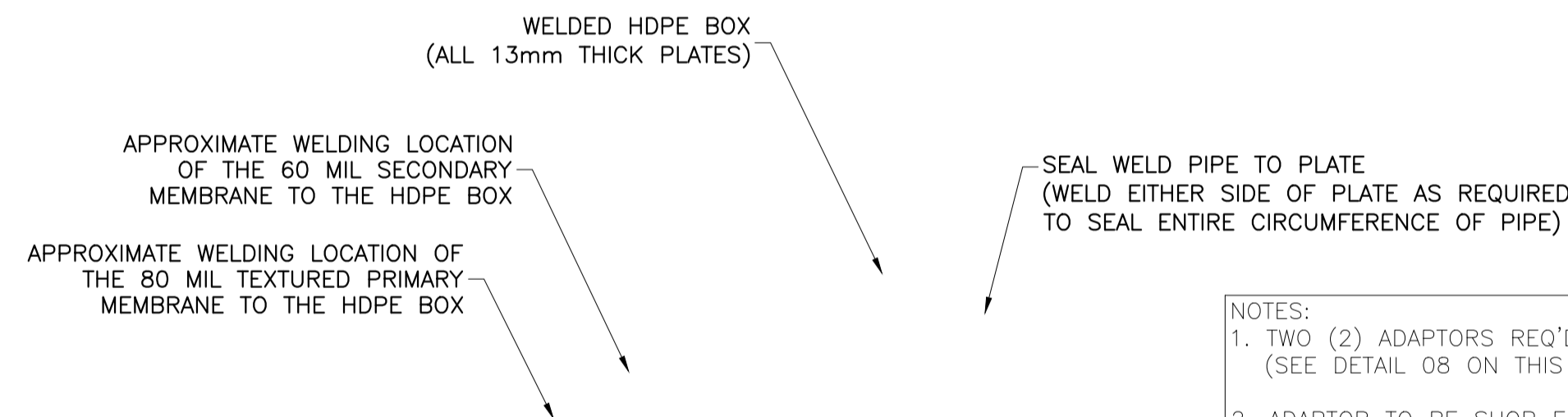
General Notes

- Contractors will be responsible to visit the construction site to familiarize themselves with actual site conditions. Visit to be coordinated with CSRNO.
- All work to be carried out in compliance with the province of New Brunswick Environmental Regulations.
- All work to be carried out in compliance and meet the requirements laid out in the province of New Brunswick Occupational Health and Safety Regulations.
- The Owner will be responsible for the installation of bench marks for the work. The Contractor will be responsible of all survey services required to complete his work.
- The Owner will be responsible for the backfilling of the temporary ditch in the proposed Cell No.10.
- The Owner will be responsible for insuring that existing geosynthetic liner system at the edge of the existing Cell No.9 is exposed to be able to tie-in the proposed geosynthetic liner of Cell No.10.
- Preparation of the till sub-grade surface and proof rolling of this surface, will be the responsibility of the Owner. Owner will also be responsible for the excavation and backfilling of the North and South berms' anchor trenches.
- The Owner will be responsible for permeability testing of the on-site stored till material to be used for the 600mm thick clayey till liner.
- Supply and installation of all piping work, will be the responsibility of the Owner. The Contractor will be responsible for the coordination, backfilling and compaction work of the North berm upon the installation of the piping by the Owner. **It will be very important that the backfilling of the North berm be completed as soon as requested by Owner in order not to delay the geosynthetic liner installation.**
- The Owner will be responsible for the excavation and backfilling work for the North and South side roadway construction, including all ditching related work.
- The Owner will be responsible for the supply and installation of any HDPE pipe penetration seals as per details on drawings.
- The Owner will be responsible for the supply and installation of the filter granular material Type A and for the screened gravel Type B.
- The Owner will be responsible for the supply and installation of the leachate collection piezometers' system components.
- The Owner will be responsible for the construction of proposed temporary berm between the proposed Cell No.10 and the future Cell No.11, along with all material specified for the construction.
- The intent of these drawings is to define the work that is to be done by the contractors and the CSRNO. All work and materials identified as not in contract (NIC) will be done by the CSRNO. All work related to construction of the clay liner (including excavation for the leak detection sump) will be done by the Clay Liner Contractor (refer to specifications 597-18-3A) and all the work related to the geosynthetic liner (including geomembranes, geonets and geotextiles) will be done by the Geosynthetic Liner Contractor (refer to specifications 597-18-3)



LEAK DETECTION SUMP DETAIL 08

N.T.S.



SINGLE PIPE PENETRATION SEAL DETAIL (NIC) 09

N.T.S.

NOTES:

- TWO (2) ADAPTORS REQ'D PER LANDFILL CELL. (SEE DETAIL 08 ON THIS DWG.)
- ADAPTOR TO BE SHOP FABRICATED. HDPE WELD ALL JOINTS.
- SET FABRICATED PENETRATION IN PLACE AND FILL WITH CONCRETE. BACKFILL WITH COMPACTED TILL TO MATCH SURROUNDING SURFACES.
- EXTRUSION WELD PRIMARY & SECONDARY HDPE LINERS TO ADAPTER AS INDICATED.
- FILL PENETRATION ADAPTER WITH WATER AND CONFIRM NO LEAKAGE.

MANHOLE

NOTES

0	2021-03-24	ISSUED FOR TENDER	Y.G.
NO.	DATE	REVISIONS	BY: PAR:

A	A DETAIL No	A
B	No DU DETAIL	B/C
	B LOCATION DRAWING No	
	SUR DESSIN No	
	C DRAWING No	
	DESSIN No	

Client Client

C.R.S.N.O. / N.W.R.S.C.

Project Projet

CONSTRUCTION OF CELL # 10

Drawing Title Titre du Plan

TYPICAL DETAILS

Design by: Design par: L.R. Drawn by: Dessine par: J. BELLEFLEUR

Checked by: Verifie par: JP FOURNIER Date: 19/02/06

Scale: Echelle: AS SHOWN Sheet: Feuille: 04 of/de 04

Drawing Number: Numero du Plan: 597-18-3-D2 Rev. 0



APPENDIX D

COVID-19 Protocols



13 janvier, 2022

Protocole travail - Covid-19

La Commission des Services Régionaux du Nord-Ouest (Secteur Déchets Solides) met en place le présent protocole afin de protéger tous et chacun et d'être en mesure de maintenir le bon fonctionnement de nos opérations.

Règles générales

Cafétéria – Maximum 3 personnes à la fois (Distanciation)

Heures de pause à être décaler afin de respecter le maximum de 3 personnes 9 :45 / 10 :00 / 10 :15
après-midis 2 :45 / 3 :00 / 3 :15

Maurice Clavette – Désinfection cafétéria, salle de bain et poigné de portes après les pauses et l'heure du diner

Chaque véhicules ou pièce d'équipement partagé doivent être désinfecté avant et après son utilisation (ex : pickup)

Détails personnels

Gardien nuit travail – (Sans Contact) - Se présenter au travail 5 min seulement avant la fermeture de la balance et quitter le matin dès l'arrivée du premier employé(e). Désinfection des toutes les pièces chaque nuits (notez que les heures normal des quarts de travail seront payés)

Paul Albert – télé-travail

Scott Couturier – télé-travail

Karen Martin – télé-travail (bureau temps partiel)

Sylvie Lebel – (Poste de balance seulement) – Port du masque requis si en présence de Karen

Guilda Roy – (Poste de balance seulement) – Port du masque requis si en présence de Karen

Roger Deschenes – Seul dans son bureau (midi cafétéria avec Philippe et Denis)



Philippe et Denis – Travail ensemble dans le garage (Test rapides à la maison tour les jours – Midi
cafétéria avec Roger)

Luc Blanchette – (Sans contact) Bâtiment de Transbordement / Camion

Michel Montreuille – Sans Contact (Pickup / Pelle / Loader – Diner à la maison)

Bruce Lefebvre – (Sans Contact) – Compacteur

Terry Martin – Pointeur – Éviter contact avec les clients / Port du masque obligatoire pour le client aussi
en présence du client.

Maurice Clavette – Maintenance / Désinfection / Skidsteer

Richard LeBel – télé-travail / bureau / véhicules personnel sur le site

Test Rapides – Nous venons de s’en faire confirmer 50 unités - Les quantités sont limités, nous testerons
dorénavant seulement ceux qui aurais pu être mis en contact avec un cas positif à la Covid ou pour les
personnes présentant des symptômes (tel que stipulé par la province)

Richard LeBel CET,GSC
Directeur du Service de Gestion des Déchets Solides
CSRNO
Bur: 506-263-3470

Cell: 506-739-3157



APPENDIX E

2020 Annual Environmental Monitoring Report



2020 Annual Environmental Monitoring Report

Commission des Services Régionaux Nord-Ouest

Type of Document:

Final

Project Number:

MON-00020736-A7

Prepared By:

Robert Gallagher, M.Eng., P.Eng., Annie Power, B.Sc.

Approved By:

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Date Submitted:

2021-03-31



March 31, 2021

MON-00020736-A7

Commission de services régionaux Nord-Ouest
C.P. 522
Edmundston, NB
E3V 3L2

Attention: Paul Albert, Executive Director

Re: 2020 Environmental Monitoring Annual Report – January 2020 to December 2020

The results of the 2020 annual environmental monitoring program for the Site d'enfouissement Sanitaire de Montagne-de-la-Croix (SEMC) are presented and discussed in the following report. Environmental monitoring locations are shown on Figure 1 (groundwater) and Figure 2 (surface water).

GROUNDWATER

Groundwater monitoring results are provided in Appendix A. All monitoring wells were adequately purged of potentially chemically unrepresentative static groundwater prior to sample collection.

General chemistry and trace metals – the results of the 2020 monitoring program are considered to indicate no evidence of leachate impacts at this time. Chloride, conductivity and ammonia levels continue to be elevated at locations MW6DBR and MW7DBR. However, elevated concentrations of these parameters have been observed at these locations since the inception of monitoring in October 1997. Although elevated conductivity levels were observed at a few other monitoring well locations (e.g. C&D MW3DBR; MW9ST), it is noted that the concentrations of other leachate indicator parameters at these locations do not suggest the presence of any leachate impact.

Trace to low levels of mercury were observed for a few wells in the collective 2020 water quality data, and it is noted that similar findings were observed for previous years. Where detected, mercury levels were within the Guidelines for the Protection of Canadian Drinking Water Quality (GPCDWQ) established by Health Canada.

Copies of trend graphs for select monitoring well parameters (e.g. select major ions, pH, conductivity, select metals; refer to Appendix A) indicate some overall general trends. In general, conductivity, calcium and chloride, and to a lesser extent sodium, magnesium and barium show increasing trends at some locations over time. These trends are also observed for a few parameters (e.g. conductivity,

chloride, calcium, alkalinity, sodium, magnesium) for some wells (notably MW1ST) at the “background” station MW1. It is noted that in recent years, concentrations of several elevated parameters at location MW1ST (e.g. calcium, chloride, conductivity and alkalinity) appear to be stabilizing. It is important to note that at monitoring locations where increasing trends have been noted for a few parameters, elevated concentrations of multiple leachate indicator parameters potentially indicative of leachate impacts have not been observed. As such and based on the above discussion, the observed trends at this time are interpreted to be related to natural geochemical evolution of groundwater in response to overall site development.

SURFACE WATER

Surface water monitoring results are provided in Appendix C. Operational notes concerning the 2020 Wastewater Treatment Process are also included in Appendix C with the sand filter discharge monitoring data.

Discharge event monitoring – pre-discharge sampling of the sand filter effluent in preparation for the spring discharge event was completed on April 15, 2020 and April 27, 2020. Concentrations of all parameters were within the discharge criteria except for iron, chromium and BOD₅. Discharge of the sand filter effluent to the sedimentation pond was subsequently initiated on April 30 and continued until May 25 upon the receipt of the results of acute lethality testing (see below). Four effluent samples were collected during the discharge event. Both the iron and chromium concentrations exceeded their respective discharge criteria for each sampling event. In recent years, it is noted that concentrations of both these parameters in excess of the discharge criteria have been consistently observed in the sand filter effluent results. The analytical results for the remaining parameters were found to comply with the discharge criteria, with the exception BOD₅ which also exceeded the discharge guideline for each of the four sampling events.

For the fall discharge event, pre-discharge sampling was conducted on six occasions from June to September. With the exception of iron, chromium and BOD₅, concentrations of all parameters were within the discharge criteria for the pre-discharge sampling. The concentrations of iron and chromium exceeded their respective discharge criteria for each pre-discharge sampling event and the BOD₅ concentration exceeded the discharge guideline for the two initial sampling events. The fall discharge event commenced on September 21 and continued until November 2. During this period, six additional effluent samples were collected. It is noted that the concentrations of all parameters were found to comply with the discharge criteria with the exception of iron and chromium which exceeded their respective discharge criteria for each sampling event.

Effluent samples were collected from the point of sedimentation pond discharge for acute lethality testing (i.e. 96 hr LC₅₀) during each of the spring and fall discharge events in accordance with the landfill Certificate of Approval to operate on May 19 and September 28, respectively. Sample results are included with the sand filter discharge monitoring data in Appendix C.

Based on the results of the spring testing, the effluent was determined to be acutely lethal to rainbow trout, with a 96 hr LC₅₀ result of 70.7%. Consequently, the Commission de services régionaux Nord-

Ouest (CSRN) terminated the spring discharge event upon obtaining the acute lethality test results. Furthermore, based on these findings, it is noted that the sand filter filtration media (sand/gravel) was subsequently replaced from August 10 to August 14.

The effluent sample collected during the fall discharge event was determined to be non-acutely lethal to rainbow trout under the prescribed testing conditions.

Receiving water sampling – surface water sampling was conducted once prior to each of the spring and fall discharge events. The receiving waters for the sedimentation pond discharge were also sampled twice during each of the spring and fall discharge events.

Big Spring Brook monitoring stations BS1 and BS3 are located upstream and downstream of the point of sedimentation pond discharge, respectively. Similarly, GF1 and GF2 are located along Grande Fourche Rivière upstream and downstream of the confluence of Big Spring Brook and Grande Fourche Rivière, respectively. Monitoring results for the receiving streams were compared to the Canadian Council of the Ministers of the Environment (CCME) Guidelines for the Protection of Freshwater Aquatic Life (FWAL), where applicable.

For the pre-discharge sampling, concentrations of all parameters were noted to be within their respective guideline values, where applicable, with the exception of aluminum (BS1, BS3, GF1 and GF2); iron (BS3); and phenols (BS1, BS3 and GF2).

Concentrations in excess of their respective CCME FWAL guideline values were observed during the spring discharge event for aluminum (BS1 and BS3); iron (BS3); ammonia-N (BS3); phenols (BS3 and GF2); chromium (BS3); and arsenic (BS3). It is noted that the concentrations of several of the above noted parameters (i.e. aluminum, iron and phenols) in excess of their respective guideline criteria have been observed in the receiving stream background water quality based on the results of the pre-discharge sampling and the historical surface water quality database. Concerning arsenic, it is noted that the concentration of this parameter marginally exceeded the guideline value for one of the two discharge sampling events.

Regarding the fall discharge event, parameter concentrations in excess of the CCME FWAL guideline values were noted for aluminum (BS1, BS3, GF1 and GF2); iron (BS1 and BS3); nitrate/nitrite (BS3); phenols (BS3 and GF2); copper (BS3); and chromium (BS3). As indicated above, the presence of iron and aluminum levels in excess of their respective guideline criteria is not interpreted to be a concern based on the background water quality and/or historical results. Furthermore, as previously stated, elevated phenols concentrations in excess of the guideline criterion were observed in the pre-discharge samples collected from upstream monitoring location BS1. Concerning nitrate/nitrite, it is noted that concentrations of this parameter in excess of the guideline value have been observed in the pre-discharge analytical results included in the historical surface water quality database, which suggests that naturally elevated concentrations of nitrate/nitrate can periodically be manifested in the environmental monitoring results. Regarding chromium and copper, it is noted that elevated concentrations of these parameters with respect to their guideline values have respectively been either not observed or rarely observed in the background water quality data. However, it is noted that in

comparison with the initial discharge sampling event (September), much lower concentrations of these and other parameters were observed for the final sampling event (October) for the fall discharge. For the final sampling event, concentrations of all parameters were within their respective FWAL criteria with the exception of iron and aluminum.

The temporal variation in the concentration of selected parameters (i.e. aluminum, iron, nitrate/nitrite and phenols) at the four receiving water monitoring locations since 2003 was reviewed for the current report. In general, although considerable variation in the concentrations of these parameters was observed, no appreciable trends were noted.

Trace to low levels of selected petroleum hydrocarbon parameters were observed in the analytical results for the upstream monitoring locations BS1 (May 25 and September 16) and GF1 (May 25). Trace levels of selected hydrocarbon parameters were also observed at downstream location BS3 (May 25). For the remaining sampling dates at the above noted locations and for all samples collected from downstream location GF2, petroleum hydrocarbons were not detected.

Microbiological parameters (i.e. total coliforms, fecal coliforms and E. coli) were detected for all surface water samples collected from all four monitoring locations, as expected.

LEACHATE COLLECTION AND REMOVAL

Underdrain and leak detection monitoring results for the leachate holding pond and leachate treatment pond are provided in Appendix B. Leachate chemistry results are included with the operational monitoring data in Appendix D.

As noted for previous years, elevated concentrations of selected leachate indicator parameters including ammonia-N, chloride, conductivity, nitrate/nitrite and iron were observed in samples collected from leak detection layer LD1 of the leachate treatment pond (LTP). However, these findings are not considered to be a cause for concern, since significantly lower concentrations were observed in samples from leak detection layer LD2 which is situated below LD1. Although some marginally elevated conductivity levels and nitrate/nitrite concentrations were observed for the January to March results for LD2, low-level parameter concentrations were observed for the remaining months. No elevated indicator parameter concentrations were observed in the results for the underdrain.

Concerning the leachate holding pond (LHP), it is noted that low-levels of nitrate/nitrite were observed in the LHP-LD sampling results for this location throughout the monitoring period. However, the low-level nitrate/nitrite concentrations were not accompanied by elevated concentrations of ammonia-N or other leachate indicator parameters. Regarding the two underdrains (LHP-U1 and LHP-U2), it is noted that low-levels of ammonia-N were observed for all samples collected from LHP-U1. However, these findings were not accompanied by elevated concentrations of other leachate indicator parameters. Furthermore, it is noted that no elevated indicator parameter concentrations were observed in the samples collected from LHP-U2.

Vibrating wire piezometer data are included in Appendix D with the operational monitoring data. Low-level readings of leachate head on the landfill liner of <0.30 m were typically observed. Elevated and/or anomalous readings were noted for the following piezometers:

- Piezometer SN40403 located at the bottom Cell 1 – negative readings ranging from -0.34 m to -0.53 m were observed;
- Piezometer SN40404 located at the bottom of Cell 2 – generally low level negative readings were observed, except for an anomalous reading of 9.5 m for December;
- Piezometer SN50957 located at the bottom of Cell 3 – variable but generally higher level negative readings were typically observed, along with increasing readings for the last half of the year ranging from -0.75 m to -1.1 m;
- Piezometer VW2345 located at the top of Cell 5 – generally negative readings ranging from -0.46 m to -0.62 m were noted for this location, except for anomalously high positive readings on the order of 16.5 m which were reported for September/October. To place the latter readings in context, it is noted that the maximum waste thickness in the landfill cells is approximately 23 m and, as such, it is quite possible that these elevated readings were erroneous. It is also noted that typical vibrating wire readings were recorded at this location for the last two months of the year and subsequent to the anomalous readings;
- Piezometer VW2344 located at the bottom of Cell 5 – marginally elevated positive readings ranging from 0.32 m to 0.58 m were recorded at this location for the monitoring period;
- Piezometer VW6984 located at the bottom of Cell 6 – generally low level heads were calculated, with the exception of the final two readings which were approximately 0.6 m and 0.7 m for November and December, respectively;
- Piezometer VW6986 located at the bottom of Cell 6 – variable but generally elevated negative readings ranging from about -0.62 m to -0.92 m were noted at this monitoring location;
- Piezometer VW15022 located at the bottom of Cell 7 – typically negative readings ranging from -0.27 m to -0.85 m were observed at this location, with the exception of December for which a reading of about 2.65 m was obtained; and,
- Piezometer VW15023 located at the bottom of Cell 7 – a few elevated negative readings ranging from -0.35 to -0.56 were observed.

In the event cells exhibit consistently elevated vibrating wire readings, it is recommended that these readings be reviewed in combination with operational video inspection of the LCR piping. If any blockages are subsequently identified, the feasibility and requirement for remedial options can be assessed at that time.

AQUATIC HABITAT

Aquatic habitat monitoring was conducted by R. A. Currie, Consulting Biologist, on September 18, 2020. It is noted that as a result of the drought like conditions experienced in the province for much of the previous calendar year, the streamflow at each of the four monitoring locations was observed to be lower than normal for the time of year (i.e. September) when the aquatic habitat monitoring is completed. At the upstream Big Spring Brook sampling location BS1, there was no discernable flow as water levels were extremely low and the streambed was characterized by localized areas/pools of standing water.

Electrofishing was conducted at both Grande Fourche Rivière monitoring stations. Benthic invertebrate samples were also collected from the upstream and downstream sampling locations along both Grand Fourche Rivière and Big Spring Brook. The results of the monitoring program are discussed below.

Electrofishing – the results of the electrofishing program indicated the presence of similar fish communities at locations GF1 and GF2. As in all previously completed fish surveys, slimy sculpin (*Cottus cognatus*) was the most abundant fish species collected at both locations, followed by brook trout (*Salvelinus fontinalis*). Similar to historical findings, a few additional incidental fish species were also captured at both monitoring locations for the most recent survey. For the most recent survey, these incidental species collectively included creek chub (*Semotilus atromaculatus*) and white sucker (*Catostomus commersonii*) which were captured at GF1 in addition to lake chub (*Couesius plumbeus*) and three-spine stickleback (*Gasterosteus aculeatus*) which were captured at GF2. Since relatively low numbers of the above noted additional fish species were captured and they are commonly found in study area streams, the presence of these species at the sampling locations is not considered to be significant.

Slimy sculpin was the only species with a sample size large enough to permit meaningful size comparisons between monitoring sites. A total of 61 and 45 individuals were observed at locations GF1 and GF2, respectively. The median fish length was respectively calculated to be 50 mm and 58.5 mm at locations GF1 and GF2. A higher fish density (i.e. number fish caught/second) was also observed for location GF1, which is consistent with the historical fish survey results. The higher sculpin density at GF1 may be attributable to the presence of a better food source and/or spawning habitat at this location.

Although the number of brook trout captured was too small to allow for a meaningful comparison of capture rates between sampling locations, it is noted that nine trout were captured at GF1 and five trout were retrieved at GF2. The measured body lengths of these specimens suggested that fry and yearling age classes were represented at location GF1, whereas yearling and mature fish age classes were represented at location GF2. Although the sample sizes are too small to make any definitive interpretation, the latter findings suggest that GF1 may be characterized by better spawning habitat for these fish whereas GF2 may be characterized by better rearing habitat.

Overall, the results of the 2020 fish survey were very similar to the results obtained for previous years.

Benthic Invertebrate Sampling – samples were collected from each location except BS1 which was characterized by very low water levels with no discernable streamflow at the time of the site visit, and subsequently counted and identified to the genus level of taxonomy. The Shannon-Weaver formula was then employed to calculate an index value representing the degree of community diversity at each monitoring location. In theory, healthy invertebrate communities are comprised of a wide variety of types of organisms. Therefore, the presence of a relatively high number and type of organisms at a given location is reflected by a high index value. In general terms, past experience suggests that diverse invertebrate communities in New Brunswick streams are characterized by a diversity index of 1.0 or greater.

The calculated diversity indices for both the current and selected previous monitoring years are summarized in the following table.

Table 1

Results of Shannon-Weaver Diversity Index Determinations

Site Number	Diversity Index Value									
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
BS1	0.70	1.03	0.92	1.00	0.83	1.14	0.86	0.72	0.64	NA
BS2	1.04	0.97	0.82	1.05	0.93	1.01	1.01	1.01	0.84	1.00
GF1	1.24	1.17	1.21	1.25	1.23	1.29	1.24	1.28	1.12	1.27
GF2	1.16	1.13	1.19	1.35	1.21	1.14	1.18	1.23	1.15	1.28

Note: 1) NA = not applicable as the diversity index could not be calculated.

Calculated diversity indices for the 2020 monitoring year ranged from 1.00 to 1.28 and were generally within the higher range of values observed for previous years. It is noted that the diversity index exceeded the threshold value of 1.0 typically associated with diverse communities in New Brunswick at each monitoring location, including location BS2 situated downstream of the sedimentation pond discharge to Big Spring Brook.

The lower diversity index for BS2 is primarily attributed to the lower number of invertebrate genera identified in the sample collected from this location. In past surveys, the diversity index at this location has been lowered by the disproportionate presence of selected organisms interpreted to be particularly well suited for the habit at this location (i.e. potential for nutrient enrichment from the abundance of leaf litter, etc.). However, notwithstanding the lower index value at this location, it is noted that the calculated value was higher than normal compared with past years and met the criterion typically associated with healthy/diverse invertebrate communities in the province.

The diversity index for the upstream sampling location along Grande Fourche Rivière (GF1) was 1.27. In turn, a similar diversity index of 1.28 was calculated for the downstream sampling location GF2 which was the highest value calculated for the 2020 sampling event. Therefore, the diversity indices for both locations significantly exceed the 1.0 benchmark value typically associated with healthy and diverse population structures.

SITE OPERATIONS SUMMARY

Household Hazardous Waste (HHW) collections were conducted at several municipalities in the CSRN area during 2020. A breakdown of the waste accepted and transported off-site for disposal in a regulatory approved manner is provided in Appendix E.

OTHER

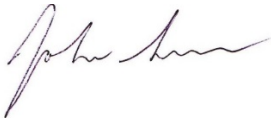
Copies of the 2020 “Imported Construction and Demolition Debris Database” and the “Imported Domestic Waste Database” are provided in Appendix F. The 2020 “Asbestos Disposal Record” is provided in Appendix G.

CLOSING

This report was prepared by Robert Gallagher, M.Eng., P.Eng. and Annie Power, B.Sc., and reviewed by John Sims, M.Sc., P.Eng., P.Geo..

We trust that this information is sufficient for your reference at this time. If you have any questions regarding this report, please contact the undersigned.

Yours very truly,



John Sims, M.Sc., P. Eng., P. Geo.
Project Manager – EXP

cc. Susan Tao, P. Eng. - NBDELG

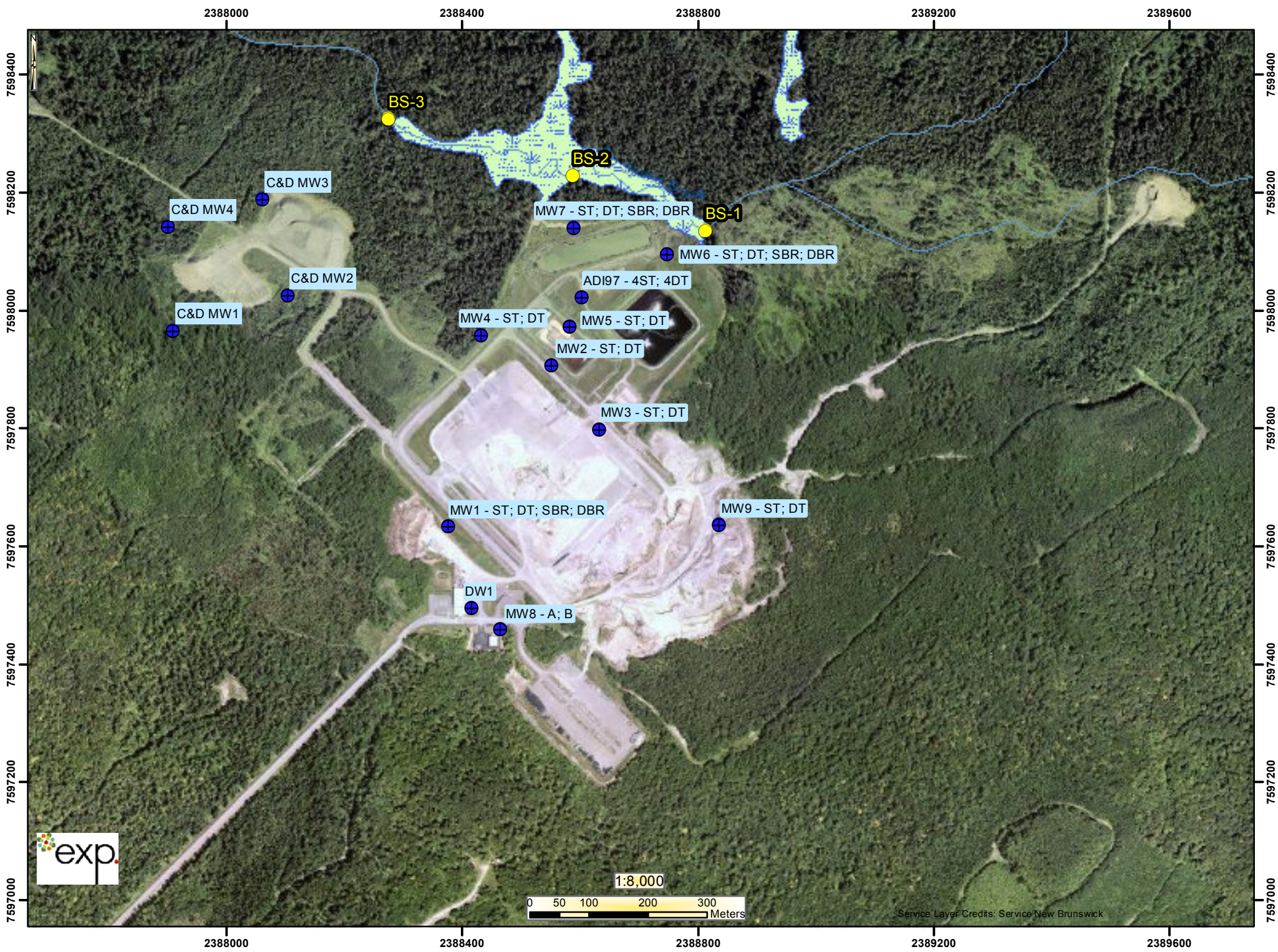


Figure 1. Monitoring Well Location Plan.

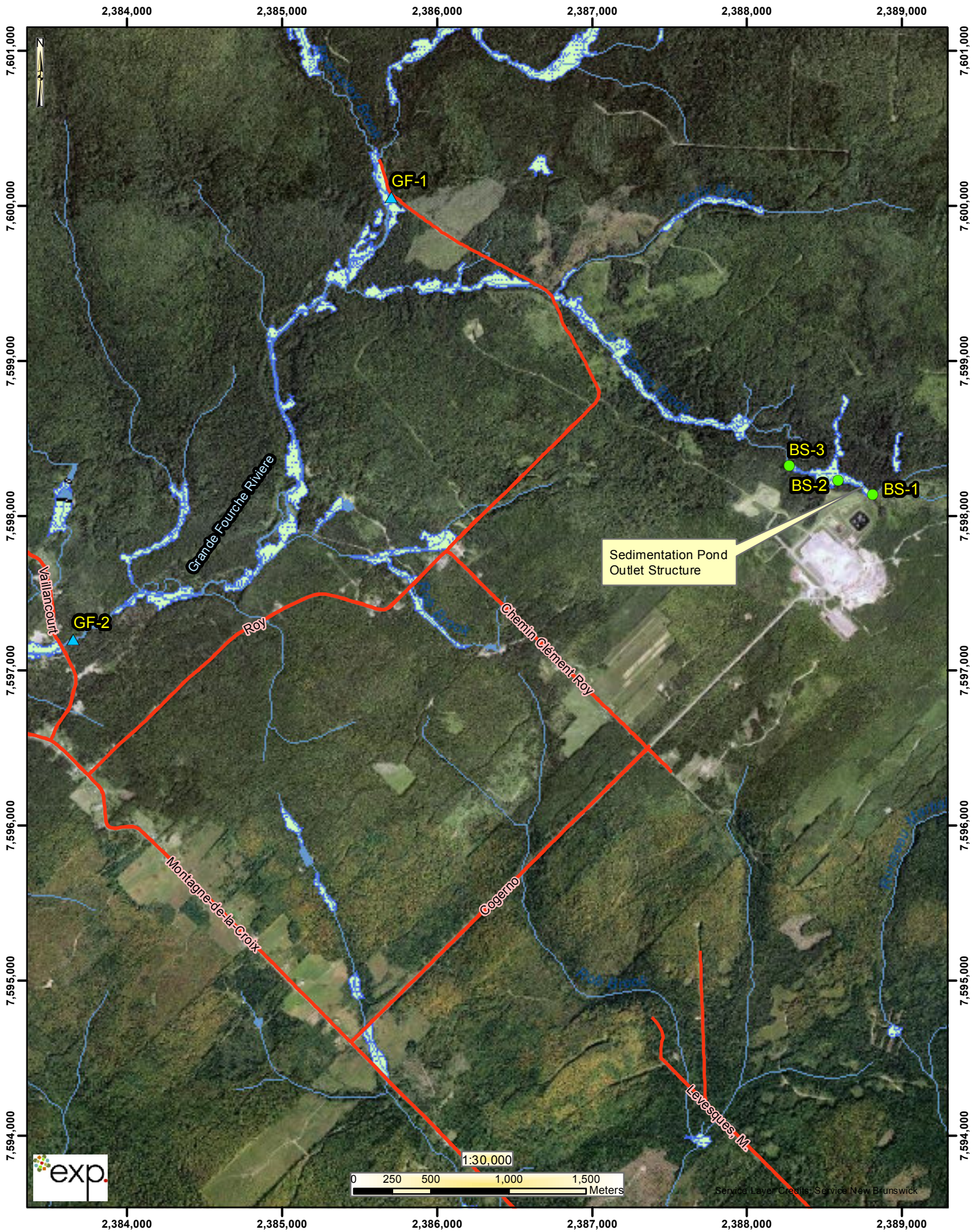


Figure 2. Surface Water Sampling Locations.

List of Tables in Appendices

Appendix	Abbreviation	Table Name
A		<u>Groundwater Monitoring Results</u>
	MW1ST	Monitoring Well 1: Deep Bedrock - General Chemistry
		Monitoring Well 1: Deep Bedrock - Trace Metals
	MW1DT	Monitoring Well 1: Deep Till - General Chemistry
		Monitoring Well 1: Deep Till - Trace Metals
	MW1SBR	Monitoring Well 1: Shallow Bedrock - General Chemistry
		Monitoring Well 1: Shallow Bedrock - Trace Metals
	MW1DBR	Monitoring Well 1: Shallow Till - General Chemistry
		Monitoring Well 1: Shallow Till - Trace Metals
	MW2ST	Monitoring Well 2: Deep Till - General Chemistry
		Monitoring Well 2: Deep Till - Trace Metals
	MW2DT	Monitoring Well 2: Shallow Till - General Chemistry
		Monitoring Well 2: Shallow Till - Trace Metals
	MW3ST	Monitoring Well 3: Deep Till - General Chemistry
		Monitoring Well 3: Deep Till - Trace Metals
	MW3DT	Monitoring Well 3: Shallow Till - General Chemistry
		Monitoring Well 3: Shallow Till - Trace Metals
	MW4ST	Monitoring Well 4: Deep Till - General Chemistry
		Monitoring Well 4: Deep Till - Trace Metals
	MW4DT	Monitoring Well 4: Shallow Till - General Chemistry
		Monitoring Well 4: Shallow Till - Trace Metals
	MW5ST	Monitoring Well 5: Deep Till - General Chemistry
		Monitoring Well 5: Deep Till - Trace Metals
	MW5DT	Monitoring Well 5: Shallow Till - General Chemistry
		Monitoring Well 5: Shallow Till - Trace Metals
	MW6ST	Monitoring Well 6: Deep Bedrock - General Chemistry
		Monitoring Well 6: Deep Bedrock - Trace Metals
	MW6DT	Monitoring Well 6: Deep Till - General Chemistry
		Monitoring Well 6: Deep Till - Trace Metals
	MW6SBR	Monitoring Well 6: Shallow Bedrock - General Chemistry
		Monitoring Well 6: Shallow Bedrock - Trace Metals
MW6DBR	Monitoring Well 6: Shallow Till - General Chemistry	
	Monitoring Well 6: Shallow Till - Trace Metals	
MW7ST	Monitoring Well 7: Deep Bedrock - General Chemistry	
	Monitoring Well 7: Deep Bedrock - Trace Metals	
MW7DT	Monitoring Well 7: Deep Till - General Chemistry	
	Monitoring Well 7: Deep Till - Trace Metals	
MW7SBR	Monitoring Well 7: Shallow Bedrock - General Chemistry	
	Monitoring Well 7: Shallow Bedrock - Trace Metals	
MW7DBR	Monitoring Well 7: Shallow Till - General Chemistry	
	Monitoring Well 7: Shallow Till - Trace Metals	
MW 8A	Monitoring Well 8: Shallow Till - General Chemistry	
	Monitoring Well 8: Shallow Till - Trace Metals	
MW 8B	Monitoring Well 8: Shallow Bedrock - General Chemistry	
	Monitoring Well 8: Shallow Bedrock - Trace Metals	
ADI97-4ST	Monitoring Well ADI97-4: Deep Till - General Chemistry	
	Monitoring Well ADI97-4: Deep Till - Trace Metal	
ADI97-4DT	Monitoring Well ADI97-4: Shallow Till - General Chemistry	
	Monitoring Well ADI97-4: Shallow Till - Trace Metal	
C&D-MW1SBR	C&D Site - Monitoring Well 1: Shallow Bedrock - General Chemistry	
	C&D Site - Monitoring Well 1: Shallow Bedrock - Trace Metals	
C&D-MW2SBR	C&D Site - Monitoring Well 2: Shallow Bedrock - General Chemistry	
	C&D Site - Monitoring Well 2: Shallow Bedrock - Trace Metals	

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Appendix	Abbreviation	Table Name
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B	LT-LD1 LT-LD2 LT-U LHP-LD LHP-U1 LHP-U2	<p><u>Underdrain & Leachate Detection Monitoring Results</u></p> Leachate Treatment Pond - Leak Detection #1 - General Chemistry Leachate Treatment Pond - Leak Detection #1 - Trace Metals Leachate Treatment Pond - Leak Detection #2 - General Chemistry Leachate Treatment Pond - Leak Detection #2 - Trace Metals Leachate Treatment Pond Underdrain - General Chemistry Leachate Treatment Pond Underdrain - Trace Metals Leachate Holding Pond Leak Detection - General Chemistry Leachate Holding Pond Leak Detection - Trace Metals Leachate Holding Pond - Underdrain #1 - General Chemistry Leachate Holding Pond - Underdrain #1 - Trace Metals Leachate Holding Pond - Underdrain #2 - General Chemistry Leachate Holding Pond - Underdrain #2 - Trace Metals Graphs showing Indicator Parameters
C	BS1 BS3 GF1 GF2 General SF Outlet	<p><u>Surface Water & Discharge Monitoring Results</u></p> Big Spring Brook 1 - General Chemistry Big Spring Brook 1 - Trace Metals Big Spring Brook 1 - Hydrocarbon Analysis Big Spring Brook 1 - Microbiological Examination of Water Big Spring Brook 3 - General Chemistry Big Spring Brook 3 - Trace Metals Big Spring Brook 3 - Hydrocarbon Analysis Big Spring Brook 3 - Microbiological Examination of Water Grand Fourche Riviere 1 - General Chemistry Grand Fourche Riviere 1 - Trace Metals Grand Fourche Riviere 1 - Hydrocarbon Analysis Grand Fourche Riviere 1 - Microbiological Examination of Water Grand Fourche Riviere 2 - General Chemistry Grand Fourche Riviere 2 - Trace Metals Grand Fourche Riviere 2 - Hydrocarbon Analysis Grand Fourche Riviere 2 - Microbiological Examination of Water 2018 Environmental Monitoring Operational Notes Buchanan Environmental Ltd. – Rainbow Trout Bioassay Test Results Sand Filter Discharge - General Chemistry Sand Filter Discharge - Trace Metals

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Appendix	Abbreviation	Table Name
D	MHL1 Cell #2 - Outlet LHP Outlet	<u>Operational Monitoring Results</u> Manhole 1 Leachate - General Chemistry Manhole 1 Leachate - Trace Metals Manhole 1 Leachate – Atlantic Must Leachate Treatment Pond - Cell #2 Outlet - General Chemistry Leachate Treatment Pond - Cell #2 Outlet - Trace Metals Leachate Holding Pond Outlet - General Chemistry Leachate Holding Pond Outlet - Trace Metals Vibrating Wire Piezometer Data
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Appendix A – Groundwater Monitoring Results

MW1DBR

Monitoring Well 1: Deep Bedrock - General Chemistry

Laboratory ID:				351141-01	359715-04	373149-04
Client ID:				MW1DBR	MW1DBR	MW1DBR
Sample Station:				MW1DBR	MW1DBR	MW1DBR
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL ¹	Guidelines*	Results	Results	Results
Alkalinity	mg/L	1		170	180	180
Ammonia	mg/L	0.05		0.12	0.1	0.11
Calcium	mg/L	0.05		26.7	27.5	27.6
Chloride	mg/L	0.5	250	0.9	0.7	0.9
Conductivity	µS/cm	1		329	336	333
Copper	mg/L	0.001	1	<0.001	0.002	<0.001
Cyanide	mg/L	0.002				
Iron	mg/L	0.02	0.3	0.34	0.26	0.34
Magnesium	mg/L	0.01		19.4	18.9	19.1
Manganese	mg/L	0.001	0.05	0.029	0.03	0.015
Nitrate + Nitrite	mg/L	0.05	10	<0.05	<0.05	<0.05
o-Phosphate	mg/L	0.01		0.01	<0.01	<0.01
pH		-	6.5-8.5	8.1	7.9	7.8
Phenols	mg/L	0.001				
Potassium	mg/L	0.02		0.27	0.27	0.28
r-Silica	mg/L	0.1		16.7	16.1	16.5
Sodium	mg/L	0.05	200	12.6	13	13.3
Sulfate	mg/L	1	500	8	9	9
Tannin & Lignin	mg/L	0.5				
Total Organic Carbon	mg/L	0.5		1	<0.5	0.9
Turbidity	NTU	0.1	NA	5.5	2.8	1.9
Zinc	mg/L	0.001	5	0.002	0.004	0.008
Calculated Parameters						
Bicarbonate	mg/L	-		168	179	179
Carbonate	mg/L	-		1.99	1.33	1.06
Hydroxide	mg/L	-		0.063	0.04	0.032
Cation sum	meq/L	-		3.51	3.52	3.56
Anion sum	meq/L	-		3.59	3.8	3.81
% difference	mg/L	-		-1.1	-3.85	-3.35
Theoretical Conductivity	µS/cm	-		310	319	320
Hardness	mg/L	-		147	146	148
Ion Sum	mg/L	-		189	196	197
Saturation pH		-		8	7.9	7.9
Langelier Index		-		0.13	-0.03	-0.13
BOD	mg/L	3				
COD	mg/L	10				
DOC	mg/L	0.5				
Color	TCU	5				
Kjeldahl Nitrogen	mg/L	0.25				
Total Phosphorus	mg/L	0.002				
Total Dissolved Solids	mg/L	5				
Total Suspended Solids	mg/L	5		11	5	5
Volatile Suspended Solids	mg/L	5				

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010).

MW1DBR Monitoring Well 1: Deep Bedrock - Trace Metals

Laboratory ID:				351141-01	359715-04	373149-04
Client ID:				MW1DBR	MW1DBR	MW1DBR
Sample Station:				MW1DBR	MW1DBR	MW1DBR
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL ¹	Guidelines*	Results	Results	Results
Aluminium	µg/L	1	100	11	4	35
Antimony	µg/L	0.1	6	<0.1	< 0.1	<0.1
Arsenic	µg/L	1	10	3	3	3
Barium	µg/L	1	1000	210	210	214
Beryllium	µg/L	0.1		<0.1	< 0.1	< 0.1
Bismuth	µg/L	0.1		<1	< 1	< 1
Boron	µg/L	1	5000	143	144	148
Cadmium	µg/L	0.1	5	0.02	0.01	<0.01
Calcium	µg/L	50		26700	27500	27600
Chromium	µg/L	1	50	<1	1	<1
Cobalt	µg/L	0.1		<0.1	< 0.1	< 0.1
Copper	µg/L	1	1000	<1	2	<1
Iron	µg/L	20	300	340	260	340
Lead	µg/L	0.1	10	<0.1	< 0.1	0.1
Lithium	µg/L	0.1		15.4	15.4	16
Magnesium	µg/L	10		19400	18900	19100
Manganese	µg/L	1	50	29	30	15
Mercury	µg/L	0.05	1	<0.025	< 0.025	< 0.025
Molybdenum	µg/L	0.1		2.4	2.3	2.2
Nickel	µg/L	1		<1	< 1	< 1
Potassium	µg/L	20		270	270	280
Rubidium	µg/L	0.1		0.5	0.5	0.6
Selenium	µg/L	1	10	<1	< 1	< 1
Silver	µg/L	0.1		<0.1	< 0.1	< 0.1
Sodium	µg/L	50	200000	12600	13000	13300
Strontium	µg/L	1		1350	1330	1410
Tellurium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Thallium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Tin	µg/L	0.1		<0.1	< 0.1	< 0.1
Uranium	µg/L	0.1	20	0.4	0.4	0.4
Vanadium	µg/L	1		<1	< 1	< 1
Zinc	µg/L	1	5000	2	4	8

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010).

MW1DT

Monitoring Well 1: Deep Till - General Chemistry

Laboratory ID:				351141-02	359715-02	373149-02
Client ID:				MW1DT	MW1DT	MW1DT
Sample Station:				MW1DT	MW1DT	MW1DT
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL ¹	Guidelines*	Results	Results	Results
Alkalinity	mg/L	1		70	70	74
Ammonia	mg/L	0.05		<0.05	<0.05	<0.05
Calcium	mg/L	0.05		27.4	25.1	28.5
Chloride	mg/L	0.5	250	27.1	18.1	25.4
Conductivity	µS/cm	1		230	207	225
Copper	mg/L	0.001	1	<0.001	0.004	<0.001
Cyanide	mg/L	0.002				
Iron	mg/L	0.02	0.3	<0.02	0.02	<0.02
Magnesium	mg/L	0.01		3.93	3.84	4.24
Manganese	mg/L	0.001	0.05	<0.001	<0.001	<0.001
Nitrate + Nitrite	mg/L	0.05	10	0.56	0.34	0.57
o-Phosphate	mg/L	0.01		<0.01	<0.01	<0.01
pH		-	6.5-8.5	7.8	7.4	7.3
Phenols	mg/L	0.001				
Potassium	mg/L	0.02		0.42	0.40	0.42
r-Silica	mg/L	0.1		8.2	7.8	8.2
Sodium	mg/L	0.05	200	9.14	6.21	7.95
Sulfate	mg/L	1	500	4	4	4
Tannin & Lignin	mg/L	0.5				
Total Organic Carbon	mg/L	0.5		0.6	<0.5	<0.5
Turbidity	NTU	0.1	NA	34.1	141	15.7
Zinc	mg/L	0.001	5	0.001	0.004	0.001
Calculated Parameters						
Bicarbonate	mg/L	-		69.6	69.8	73.9
Carbonate	mg/L	-		0.413	0.165	0.139
Hydroxide	mg/L	-		0.032	0.013	0.010
Cation sum	meq/L	-		2.1	1.85	2.13
Anion sum	meq/L	-		2.29	2.02	2.32
% difference	mg/L	-		-4.29	-4.32	-4.3
Theoretical Conductivity	µS/cm	-		222	192	223
Hardness	mg/L	-		84.6	78.5	88.6
Ion Sum	mg/L	-		125	110	126
Saturation pH		-		8.3	8.3	8.3
Langelier Index		-		-0.51	-0.94	-0.97
BOD	mg/L	3				
COD	mg/L	10				
DOC	mg/L	0.5				
Color	TCU	5				
Kjeldahl Nitrogen	mg/L	0.25				
Total Phosphorus	mg/L	0.002				
Total Dissolved Solids	mg/L	5				
Total Suspended Solids	mg/L	5		108	293	187
Volatile Suspended Solids	mg/L	5				

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010).

MW1DT Monitoring Well 1: Deep Till - Trace Metals

Laboratory ID:				351141-02	359715-02	373149-02
Client ID:				MW1DT	MW1DT	MW1DT
Sample Station:				MW1DT	MW1DT	MW1DT
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL ¹	Guidelines*	Results	Results	Results
Aluminium	µg/L	1	100	7	3	10
Antimony	µg/L	0.1	6	<0.1	< 0.1	< 0.1
Arsenic	µg/L	1	10	<1	< 1	< 1
Barium	µg/L	1	1000	58	49	54
Beryllium	µg/L	0.1		<0.1	< 0.1	< 0.1
Bismuth	µg/L	0.1		<1	< 1	< 1
Boron	µg/L	1	5000	5	3	4
Cadmium	µg/L	0.1	5	<0.01	0.01	<0.01
Calcium	µg/L	50		27400	25100	28500
Chromium	µg/L	1	50	<1	< 1	< 1
Cobalt	µg/L	0.1		<0.1	< 0.1	< 0.1
Copper	µg/L	1	1000	<1	4	<1
Iron	µg/L	20	300	<20	20	<20
Lead	µg/L	0.1	10	<0.1	0.2	<0.1
Lithium	µg/L	0.1		1.5	1.3	1.5
Magnesium	µg/L	10		3930	3840	4240
Manganese	µg/L	1	50	<1	< 1	< 1
Mercury	µg/L	0.05	1	<0.025	< 0.025	< 0.025
Molybdenum	µg/L	0.1		<0.1	< 0.1	< 0.1
Nickel	µg/L	1		<1	< 1	< 1
Potassium	µg/L	20		420	400	420
Rubidium	µg/L	0.1		0.2	0.2	0.2
Selenium	µg/L	1	10	<1	< 1	< 1
Silver	µg/L	0.1		<0.1	< 0.1	< 0.1
Sodium	µg/L	50	200000	9140	6210	7950
Strontium	µg/L	1		178	160	180
Tellurium	µg/L	0.1		<0.1	< 0.1	< 0.1
Thallium	µg/L	0.1		<0.1	< 0.1	< 0.1
Tin	µg/L	0.1		<0.1	< 0.1	< 0.1
Uranium	µg/L	0.1	20	<0.1	< 0.1	< 0.1
Vanadium	µg/L	1		<1	< 1	< 1
Zinc	µg/L	1	5000	1	4	1

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010).

MW1SBR

Monitoring Well 1: Shallow Bedrock - General Chemistry

Laboratory ID:				351141-03	359715-03	373149-03
Client ID:				MW1SBR	MW1SBR	MW1SBR
Sample Station:				MW1SBR	MW1SBR	MW1SBR
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL ¹	Guidelines*	Results	Results	Results
Alkalinity	mg/L	1		180	180	190
Ammonia	mg/L	0.05		<0.05	<0.05	<0.05
Calcium	mg/L	0.05		30.9	30.7	30.8
Chloride	mg/L	0.5	250	0.9	2	1.5
Conductivity	µS/cm	1		378	378	379
Copper	mg/L	0.001	1	<0.001	<0.001	<0.001
Cyanide	mg/L	0.002				
Iron	mg/L	0.02	0.3	0.08	<0.02	0.06
Magnesium	mg/L	0.01		25.1	23.6	24.2
Manganese	mg/L	0.001	0.05	0.179	0.201	0.211
Nitrate + Nitrite	mg/L	0.05	10	<0.05	0.07	<0.05
o-Phosphate	mg/L	0.01		<0.01	<0.01	<0.01
pH		-	6.5-8.5	7.9	7.7	7.7
Phenols	mg/L	0.001				
Potassium	mg/L	0.02		0.52	0.51	0.53
r-Silica	mg/L	0.1		17.1	16.8	17
Sodium	mg/L	0.05	200	11.7	11.1	11.7
Sulfate	mg/L	1	500	25	21	23
Tannin & Lignin	mg/L	0.5				
Total Organic Carbon	mg/L	0.5		0.9	<0.5	<0.5
Turbidity	NTU	0.1	NA	15.5	16.2	24.4
Zinc	mg/L	0.001	5	0.008	<0.001	0.022
Calculated Parameters						
Bicarbonate	mg/L	-		179	179	189
Carbonate	mg/L	-		1.33	0.844	0.891
Hydroxide	mg/L	-		0.040	0.025	0.025
Cation sum	meq/L	-		4.14	3.98	4.06
Anion sum	meq/L	-		4.14	4.1	4.32
% difference	mg/L	-		-0.02	-1.46	-3.05
Theoretical Conductivity	µS/cm	-		367	357	369
Hardness	mg/L	-		180	174	177
Ion Sum	mg/L	-		221	216	225
Saturation pH		-		7.9	7.9	7.9
Langelier Index		-		0.01	-0.19	-0.17
BOD	mg/L	3				
COD	mg/L	10				
DOC	mg/L	0.05				
Color	TCU	5				
Kjeldahl Nitrogen	mg/L	0.25				
Total Phosphorus	mg/L	0.002				
Total Dissolved Solids	mg/L	5				
Total Suspended Solids	mg/L	5		44	85	50
Volatile Suspended Solids	mg/L	5				

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010).

MW1SBR Monitoring Well 1: Shallow Bedrock - Trace Metals

Laboratory ID:				351141-03	359715-03	373149-03
Client ID:				MW1SBR	MW1SBR	MW1SBR
Sample Station:				MW1SBR	MW1SBR	MW1SBR
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL ¹	Guidelines*	Results	Results	Results
Aluminium	µg/L	1	100	34	3	10
Antimony	µg/L	0.1	6	<0.1	< 0.1	< 0.1
Arsenic	µg/L	1	10	2	2	3
Barium	µg/L	1	1000	110	108	107
Beryllium	µg/L	0.1		<0.1	< 0.1	< 0.1
Bismuth	µg/L	0.1		<1	< 1	< 1
Boron	µg/L	1	5000	65	58	63
Cadmium	µg/L	0.1	5	0.02	0.02	<0.01
Calcium	µg/L	50		30900	30700	30800
Chromium	µg/L	1	50	<1	1	1
Cobalt	µg/L	0.1		0.3	0.2	0.2
Copper	µg/L	1	1000	<1	< 1	< 1
Iron	µg/L	20	300	80	< 20	60
Lead	µg/L	0.1	10	<0.1	< 0.1	0.1
Lithium	µg/L	0.1		7.5	6.7	7
Magnesium	µg/L	10		25100	23600	24200
Manganese	µg/L	1	50	179	201	211
Mercury	µg/L	0.05	1	<0.025	< 0.025	< 0.025
Molybdenum	µg/L	0.1		0.6	0.6	0.6
Nickel	µg/L	1		<1	< 1	< 1
Potassium	µg/L	20		520	510	530
Rubidium	µg/L	0.1		0.4	0.4	0.4
Selenium	µg/L	1	10	<1	< 1	< 1
Silver	µg/L	0.1		<0.1	< 0.1	< 0.1
Sodium	µg/L	50	200000	11700	11100	11700
Strontium	µg/L	1		405	379	399
Tellurium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Thallium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Tin	µg/L	0.1		<0.1	< 0.1	< 0.1
Uranium	µg/L	0.1	20	<0.1	< 0.1	< 0.1
Vanadium	µg/L	1		< 1	< 1	< 1
Zinc	µg/L	1	5000	8	< 1	22

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010).

MW1ST

Monitoring Well 1: Shallow Till - General Chemistry

Laboratory ID:				351141-04	359715-01	373149-01
Client ID:				MW1ST	MW1ST	MW1ST
Sample Station:				MW1ST	MW1ST	MW1ST
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL ¹	Guidelines*	Results	Results	Results
Alkalinity	mg/L	1		250	320	290
Ammonia	mg/L	0.05		<0.05	<0.05	<0.05
Calcium	mg/L	0.05		107	103	89.8
Chloride	mg/L	0.5	250	18	32	27
Conductivity	µS/cm	1		521	661	580
Copper	mg/L	0.001	1	0.002	0.003	0.004
Cyanide	mg/L	0.002				
Iron	mg/L	0.02	0.3	0.12	0.11	0.15
Magnesium	mg/L	0.01		20.5	18.8	17.6
Manganese	mg/L	0.001	0.05	1.38	0.613	1.63
Nitrate + Nitrite	mg/L	0.05	10	0.21	0.16	0.13
o-Phosphate	mg/L	0.01		0.02	<0.01	<0.01
pH		-	6.5-8.5	6.7	6.4	6.7
Phenols	mg/L	0.001				
Potassium	mg/L	0.02		0.96	0.89	0.99
r-Silica	mg/L	0.1		13.1	14.3	14.1
Sodium	mg/L	0.05	200	14.2	13	12.5
Sulfate	mg/L	1	500	5	9	8
Tannin & Lignin	mg/L	0.5				
Total Organic Carbon	mg/L	0.5		11	4.9	8.4
Turbidity	NTU	0.1	NA	296	211	19.2
Zinc	mg/L	0.001	5	0.008	0.004	0.005
Calculated Parameters						
Bicarbonate	mg/L	-		250	320	290
Carbonate	mg/L	-		0.118	0.076	0.137
Hydroxide	mg/L	-		0.003	0.001	0.003
Cation sum	meq/L	-		7.73	7.3	6.57
Anion sum	meq/L	-		5.63	7.5	6.74
% difference	mg/L	-		15.7	-1.33	-1.29
Theoretical Conductivity	µS/cm	-		580	639	576
Hardness	mg/L	-		352	335	297
Ion Sum	mg/L	-		334	388	349
Saturation pH		-		7.2	7.2	7.3
Langelier Index		-		-0.55	-0.76	-0.55
BOD						
BOD	mg/L	3				
COD						
COD	mg/L	10				
DOC						
DOC	mg/L	0.5				
Color						
Color	TCU	5				
Kjeldahl Nitrogen						
Kjeldahl Nitrogen	mg/L	0.25				
Total Phosphorus						
Total Phosphorus	mg/L	0.002				
Total Dissolved Solids						
Total Dissolved Solids	mg/L	5				
Total Suspended Solids						
Total Suspended Solids	mg/L	5		543	441	567
Volatile Suspended Solids						
Volatile Suspended Solids	mg/L	5				

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010).

MW1ST Monitoring Well 1: Shallow Till - Trace Metals

Laboratory ID:				351141-04	359715-01	373149-01
Client ID:				MW1ST	MW1ST	MW1ST
Sample Station:				MW1ST	MW1ST	MW1ST
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL¹	Guidelines*	Results	Results	Results
Aluminium	µg/L	1	100	20	12	21
Antimony	µg/L	0.1	6	<0.1	< 0.1	< 0.1
Arsenic	µg/L	1	10	<1	< 1	< 1
Barium	µg/L	1	1000	50	47	48
Beryllium	µg/L	0.1		<0.1	< 0.1	< 0.1
Bismuth	µg/L	0.1		<1	< 1	< 1
Boron	µg/L	1	5000	6	6	7
Cadmium	µg/L	0.1	5	0.09	0.05	0.08
Calcium	µg/L	50		107000	103000	89800
Chromium	µg/L	1	50	2	5	4
Cobalt	µg/L	0.1		0.9	0.8	1
Copper	µg/L	1	1000	2	3	4
Iron	µg/L	20	300	120	110	150
Lead	µg/L	0.1	10	<0.1	0.1	0.1
Lithium	µg/L	0.1		4.7	3.7	4.5
Magnesium	µg/L	10		20500	18800	17600
Manganese	µg/L	1	50	1380	613	1630
Mercury	µg/L	0.05	1	0.05	< 0.025	< 0.025
Molybdenum	µg/L	0.1		<0.1	< 0.1	0.1
Nickel	µg/L	1		5	3	6
Potassium	µg/L	20		960	890	990
Rubidium	µg/L	0.1		0.4	0.3	0.4
Selenium	µg/L	1	10	<1	< 1	< 1
Silver	µg/L	0.1		<0.1	< 0.1	< 0.1
Sodium	µg/L	50	200000	14200	13000	12500
Strontium	µg/L	1		576	552	510
Tellurium	µg/L	0.1		<0.1	< 0.1	< 0.1
Thallium	µg/L	0.1		<0.1	< 0.1	< 0.1
Tin	µg/L	0.1		<0.1	< 0.1	< 0.1
Uranium	µg/L	0.1	20	1.1	1.1	0.9
Vanadium	µg/L	1		<1	< 1	< 1
Zinc	µg/L	1	5000	8	4	5

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010).

MW2DT

Monitoring Well 2: Deep Till - General Chemistry

Laboratory ID:				351141-05	359715-06	373149-6
Client ID:				MW2DT	MW2DT	MW2DT
Sample Station:				MW2DT	MW2DT	MW2DT
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL ¹	Guidelines*	Results	Results	Results
Alkalinity	mg/L	1		120	130	140
Ammonia	mg/L	0.05		<0.05	<0.05	<0.05
Calcium	mg/L	0.05		58.6	59.3	59.6
Chloride	mg/L	0.5	250	55.3	57.5	60.6
Conductivity	µS/cm	1		434	447	447
Copper	mg/L	0.001	1	<0.001	<0.001	<0.001
Cyanide	mg/L	0.002				
Iron	mg/L	0.02	0.3	<0.02	<0.02	<0.02
Magnesium	mg/L	0.01		7.94	8.17	8.45
Manganese	mg/L	0.001	0.05	<0.001	<0.001	<0.001
Nitrate + Nitrite	mg/L	0.05	10	0.78	0.75	0.85
o-Phosphate	mg/L	0.01		0.01	<0.01	<0.01
pH		-	6.5-8.5	7.9	7.8	7.8
Phenols	mg/L	0.001				
Potassium	mg/L	0.02		0.81	0.85	0.84
r-Silica	mg/L	0.1		11.5	11.3	11.5
Sodium	mg/L	0.05	200	13.5	12.9	13.4
Sulfate	mg/L	1	500	7	8	8
Tannin & Lignin	mg/L	0.5				
Total Organic Carbon	mg/L	0.5		<0.5	<0.5	<0.5
Turbidity	NTU	0.1	NA	2.1	1.7	2.9
Zinc	mg/L	0.001	5	<0.001	0.001	<0.001
Calculated Parameters						
Bicarbonate	mg/L	-		119	129	139
Carbonate	mg/L	-		0.889	0.766	0.825
Hydroxide	mg/L	-		0.04	0.032	0.032
Cation sum	meq/L	-		4.19	4.21	4.27
Anion sum	meq/L	-		4.16	4.44	4.73
% difference	mg/L	-		0.31	-2.61	-5.11
Theoretical Conductivity	µS/cm	-		410	423	439
Hardness	mg/L	-		179	182	184
Ion Sum	mg/L	-		231	241	252
Saturation pH		-		7.8	7.7	7.7
Langelier Index		-		0.11	0.05	0.08
BOD	mg/L	3				
COD	mg/L	10				
DOC	mg/L	0.5				
Color	TCU	5				
Kjeldahl Nitrogen	mg/L	0.25				
Total Phosphorus	mg/L	0.002				
Total Dissolved Solids	mg/L	5				
Total Suspended Solids	mg/L	5		27	<5	6
Volatile Suspended Solids	mg/L	5				

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010).

MW2DT Monitoring Well 2: Deep Till - Trace Metals

Laboratory ID:				351141-05	359715-06	373149-06
Client ID:				MW2DT	MW2DT	MW2DT
Sample Station:				MW2DT	MW2DT	MW2DT
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL¹	Guidelines*	Results	Results	Results
Aluminium	µg/L	1	100	5	8	5
Antimony	µg/L	0.1	6	0.1	< 0.1	< 0.1
Arsenic	µg/L	1	10	< 1	< 1	< 1
Barium	µg/L	1	1000	53	54	53
Beryllium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Bismuth	µg/L	0.1		< 1	< 1	< 1
Boron	µg/L	1	5000	9	9	10
Cadmium	µg/L	0.1	5	<0.01	< 0.01	< 0.01
Calcium	µg/L	50		58600	59300	59600
Chromium	µg/L	1	50	<1	1	<1
Cobalt	µg/L	0.1		< 0.1	< 0.1	< 0.1
Copper	µg/L	1	1000	<1	< 1	< 1
Iron	µg/L	20	300	<20	< 20	< 20
Lead	µg/L	0.1	10	<0.1	< 0.1	< 0.1
Lithium	µg/L	0.1		3.7	3.8	4
Magnesium	µg/L	10		7940	8170	8450
Manganese	µg/L	1	50	<1	< 1	< 1
Mercury	µg/L	0.05	1	< 0.025	< 0.025	< 0.025
Molybdenum	µg/L	0.1		0.1	0.1	0.1
Nickel	µg/L	1		<1	< 1	< 1
Potassium	µg/L	20		810	850	840
Rubidium	µg/L	0.1		0.6	0.6	0.6
Selenium	µg/L	1	10	< 1	< 1	< 1
Silver	µg/L	0.1		< 0.1	< 0.1	< 0.1
Sodium	µg/L	50	200000	13500	12900	13400
Strontium	µg/L	1		380	370	394
Tellurium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Thallium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Tin	µg/L	0.1		<0.1	< 0.1	< 0.1
Uranium	µg/L	0.1	20	0.5	0.5	0.5
Vanadium	µg/L	1		<1	< 1	< 1
Zinc	µg/L	1	5000	<1	1	<1

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010).

MW2ST

Monitoring Well 2: Shallow Till - General Chemistry

Laboratory ID:				351141-06	359715-05	373149-05
Client ID:				MW2ST	MW2ST	MW2ST
Sample Station:				MW2ST	MW2ST	MW2ST
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL ¹	Guidelines*	Results	Results	Results
Alkalinity	mg/L	1		220	200	260
Ammonia	mg/L	0.05		<0.05	<0.05	<0.05
Calcium	mg/L	0.05		55.3	53.9	71.5
Chloride	mg/L	0.5	250	6.1	4.8	5.9
Conductivity	µS/cm	1		423	415	478
Copper	mg/L	0.001	1	0.001	0.002	<0.001
Cyanide	mg/L	0.002				
Iron	mg/L	0.02	0.3	<0.02	0.05	0.02
Magnesium	mg/L	0.01		16	11	12.5
Manganese	mg/L	0.001	0.05	<0.001	<0.001	0.008
Nitrate + Nitrite	mg/L	0.05	10	0.52	0.19	0.09
o-Phosphate	mg/L	0.01		<0.01	<0.01	<0.01
pH		-	6.5-8.5	8	7.6	7.6
Phenols	mg/L	0.001				
Potassium	mg/L	0.02		1.56	0.91	1.05
r-Silica	mg/L	0.1		9	10.2	11.6
Sodium	mg/L	0.05	200	12.1	11.6	12.7
Sulfate	mg/L	1	500	10	8	10
Tannin & Lignin	mg/L	0.5				
Total Organic Carbon	mg/L	0.5		1.9	0.9	1.2
Turbidity	NTU	0.1	NA	292	99	97.2
Zinc	mg/L	0.001	5	0.002	0.003	0.003
Calculated Parameters						
Bicarbonate	mg/L	-		218	199	259
Carbonate	mg/L	-		2.05	0.745	0.969
Hydroxide	mg/L	-		0.05	0.02	0.02
Cation sum	meq/L	-		4.64	4.13	5.18
Anion sum	meq/L	-		4.81	4.31	5.58
% difference	mg/L	-		-1.8	-2.2	-3.71
Theoretical Conductivity	µS/cm	-		415	372	466
Hardness	mg/L	-		204	180	230
Ion Sum	mg/L	-		247	223	284
Saturation pH		-		7.6	7.6	7.4
Langelier Index		-		0.44	0	0.22
BOD	mg/L	3				
COD	mg/L	10				
DOC	mg/L	0.05				
Color	TCU	5				
Kjeldahl Nitrogen	mg/L	0.25				
Total Phosphorus	mg/L	0.002				
Total Dissolved Solids	mg/L	5				
Total Suspended Solids	mg/L	5		179	147	129
Volatile Suspended Solids	mg/L	5				

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality. Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010).

MW2ST

Monitoring Well 2: Shallow Till - Trace Metals

Laboratory ID:				351141-06	359715-05	373149-05
Client ID:				MW2ST	MW2ST	MW2ST
Sample Station:				MW2ST	MW2ST	MW2ST
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL¹	Guidelines*	Results	Results	Results
Aluminium	µg/L	1	100	3	5	12
Antimony	µg/L	0.1	6	0.2	0.2	0.2
Arsenic	µg/L	1	10	1	2	2
Barium	µg/L	1	1000	65	64	83
Beryllium	µg/L	0.1		<0.1	< 0.1	< 0.1
Bismuth	µg/L	0.1		<1	< 1	< 1
Boron	µg/L	1	5000	29	23	30
Cadmium	µg/L	0.1	5	<0.01	< 0.01	< 0.01
Calcium	µg/L	50		55300	53900	71500
Chromium	µg/L	1	50	<1	1	2
Cobalt	µg/L	0.1		<0.1	< 0.1	< 0.1
Copper	µg/L	1	1000	1	2	<1
Iron	µg/L	20	300	<20	50	20
Lead	µg/L	0.1	10	<0.1	< 0.1	< 0.1
Lithium	µg/L	0.1		1.4	1.3	1.6
Magnesium	µg/L	10		16000	11000	12500
Manganese	µg/L	1	50	<1	< 1	8
Mercury	µg/L	0.05	1	<0.025	< 0.025	< 0.025
Molybdenum	µg/L	0.1		1.4	1.6	1.7
Nickel	µg/L	1		1	< 1	< 1
Potassium	µg/L	20		1560	910	1050
Rubidium	µg/L	0.1		0.5	0.3	0.4
Selenium	µg/L	1	10	<1	< 1	< 1
Silver	µg/L	0.1		<0.1	< 0.1	< 0.1
Sodium	µg/L	50	200000	12100	11600	12700
Strontium	µg/L	1		397	405	515
Tellurium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Thallium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Tin	µg/L	0.1		<0.1	< 0.1	< 0.1
Uranium	µg/L	0.1	20	1.4	1.4	1.7
Vanadium	µg/L	1		<1	< 1	< 1
Zinc	µg/L	1	5000	2	3	3

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010).

MW3DT

Monitoring Well 3: Deep Till - General Chemistry

Laboratory ID:				351141-07	359715-07	373149-07
Client ID:				MW3DT	MW3DT	MW3DT
Sample Station:				MW3DT	MW3DT	MW3DT
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL¹	Guidelines*	Results	Results	Results
Alkalinity	mg/L	1		100	120	130
Ammonia	mg/L	0.05		<0.05	<0.05	<0.05
Calcium	mg/L	0.05		52	52.2	52.4
Chloride	mg/L	0.5	250	83.1	91.6	67.6
Conductivity	µS/cm	1		492	553	460
Copper	mg/L	0.001	1	<0.001	0.002	0.002
Cyanide	mg/L	0.002				
Iron	mg/L	0.02	0.3	0.03	<0.02	0.13
Magnesium	mg/L	0.01		13	13.5	11.8
Manganese	mg/L	0.001	0.05	0.004	<0.001	0.02
Nitrate + Nitrite	mg/L	0.05	10	0.52	0.58	0.48
o-Phosphate	mg/L	0.01		<0.01	<0.01	<0.01
pH		-	6.5-8.5	8	7.9	7.9
Phenols	mg/L	0.001				
Potassium	mg/L	0.02		0.8	0.91	0.81
r-Silica	mg/L	0.1		10.2	10.3	10.5
Sodium	mg/L	0.05	200	20.9	22.4	19.7
Sulfate	mg/L	1	500	5	6	7
Tannin & Lignin	mg/L	0.5				
Total Organic Carbon	mg/L	0.5		0.6	<0.5	<0.5
Turbidity	NTU	0.1	NA	375	281	299
Zinc	mg/L	0.001	5	<0.001	0.003	0.003
Calculated Parameters						
Bicarbonate	mg/L	-		99	119	129
Carbonate	mg/L	-		0.931	0.889	0.963
Hydroxide	mg/L	-		0.05	0.04	0.04
Cation sum	meq/L	-		4.6	4.71	4.47
Anion sum	meq/L	-		4.48	5.15	4.68
% difference	mg/L	-		1.23	-4.4	-2.34
Theoretical Conductivity	µS/cm	-		455	490	447
Hardness	mg/L	-		183	186	179
Ion Sum	mg/L	-		248	273	251
Saturation pH		-		7.9	7.8	7.8
Langelier Index		-		0.08	0.05	0.09
BOD	mg/L	3				
COD	mg/L	10				
DOC	mg/L	0.5				
Color	TCU	5				
Kjeldahl Nitrogen	mg/L	0.25				
Total Phosphorus	mg/L	0.002				
Total Dissolved Solids	mg/L	5				
Total Suspended Solids	mg/L	5		4570	1900	1190
Volatile Suspended Solids	mg/L	5				

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010).

MW3DT

Monitoring Well 3: Deep Till - Trace Metals

Laboratory ID:				351141-07	359715-07	373149-07
Client ID:				MW3DT	MW3DT	MW3DT
Sample Station:				MW3DT	MW3DT	MW3DT
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL ¹	CCME*	Results	Results	Results
Aluminium	µg/L	1	100	13	5	68
Antimony	µg/L	0.1	6	< 0.1	< 0.1	< 0.1
Arsenic	µg/L	1	10	<1	< 1	< 1
Barium	µg/L	1	1000	105	125	108
Beryllium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Bismuth	µg/L	0.1		< 1	< 1	< 1
Boron	µg/L	1	5000	7	7	8
Cadmium	µg/L	0.1	5	< 0.01	< 0.01	< 0.01
Calcium	µg/L	50		52000	52200	52400
Chromium	µg/L	1	50	<1	< 1	1
Cobalt	µg/L	0.1		<0.1	< 0.1	0.2
Copper	µg/L	1	1000	<1	2	2
Iron	µg/L	20	300	30	< 20	130
Lead	µg/L	0.1	10	<0.1	< 0.1	0.3
Lithium	µg/L	0.1		3.5	3.8	3.7
Magnesium	µg/L	10		13000	13500	11800
Manganese	µg/L	1	50	4	< 1	20
Mercury	µg/L	0.05	1	0.09	0.08	0.09
Molybdenum	µg/L	0.1		0.2	0.1	0.1
Nickel	µg/L	1		<1	< 1	<1
Potassium	µg/L	20		800	910	810
Rubidium	µg/L	0.1		0.6	0.8	0.8
Selenium	µg/L	1	10	< 1	< 1	<1
Silver	µg/L	0.1		< 0.1	< 0.1	<0.1
Sodium	µg/L	50	200000	20900	22400	19700
Strontium	µg/L	1		328	359	325
Tellurium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Thallium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Tin	µg/L	0.1		<0.1	< 0.1	< 0.1
Uranium	µg/L	0.1	20	0.3	0.4	0.4
Vanadium	µg/L	1		<1	< 1	< 1
Zinc	µg/L	1	5000	<1	3	3

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010).

MW3ST

Monitoring Well 3: Shallow Till - General Chemistry

Laboratory ID:				351141-08	Dry	Dry
Client ID:				MW3ST	MW3ST	MW3ST
Sample Station:				MW3ST	MW3ST	MW3ST
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL¹	Guidelines*	Results	Results	Results
Alkalinity	mg/L	1		150		
Ammonia	mg/L	0.05		<0.05		
Calcium	mg/L	0.05		52.6		
Chloride	mg/L	0.5	250	25.3		
Conductivity	µS/cm	1		404		
Copper	mg/L	0.001	1	0.004		
Cyanide	mg/L	0.002				
Iron	mg/L	0.02	0.3	0.02		
Magnesium	mg/L	0.01		10.9		
Manganese	mg/L	0.001	0.05	<0.001		
Nitrate + Nitrite	mg/L	0.05	10	0.35		
o-Phosphate	mg/L	0.01		0.01		
pH		-	6.5-8.5	8		
Phenols	mg/L	0.001				
Potassium	mg/L	0.02		0.91		
r-Silica	mg/L	0.1		11.3		
Sodium	mg/L	0.05	200	11.7		
Sulfate	mg/L	1	500	24		
Tannin & Lignin	mg/L	0.5				
Total Organic Carbon	mg/L	0.5		1		
Turbidity	NTU	0.1	NA	93		
Zinc	mg/L	0.001	5	0.004		
Calculated Parameters						
Bicarbonate	mg/L	-		149		
Carbonate	mg/L	-		1.4		
Hydroxide	mg/L	-		0.05		
Cation sum	meq/L	-		4.06		
Anion sum	meq/L	-		4.24		
% difference	mg/L	-		-2.18		
Theoretical Conductivity	µS/cm	-		392		
Hardness	mg/L	-		176		
Ion Sum	mg/L	-		230		
Saturation pH		-		7.7		
Langelier Index		-		0.26		
BOD	mg/L	3				
COD	mg/L	10				
DOC	mg/L	0.5				
Color	TCU	5				
Kjeldahl Nitrogen	mg/L	0.25				
Total Phosphorus	mg/L	0.002				
Total Dissolved Solids	mg/L	5				
Total Suspended Solids	mg/L	5		57		
Volatile Suspended Solids	mg/L	5				

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value

MW3ST

Monitoring Well 3: Shallow Till - Trace Metals

Laboratory ID:				351141-08	Dry	Dry
Client ID:				MW3ST	MW3ST	MW3ST
Sample Station:				MW3ST	MW3ST	MW3ST
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL¹	Guidelines*	Results	Results	Results
Aluminium	µg/L	1	100	7		
Antimony	µg/L	0.1	6	0.1		
Arsenic	µg/L	1	10	<1		
Barium	µg/L	1	1000	30		
Beryllium	µg/L	0.1		<0.1		
Bismuth	µg/L	0.1		<1		
Boron	µg/L	1	5000	12		
Cadmium	µg/L	0.1	5	<0.01		
Calcium	µg/L	50		52600		
Chromium	µg/L	1	50	1		
Cobalt	µg/L	0.1		<0.1		
Copper	µg/L	1	1000	4		
Iron	µg/L	20	300	20		
Lead	µg/L	0.1	10	0.2		
Lithium	µg/L	0.1		1.2		
Magnesium	µg/L	10		10900		
Manganese	µg/L	1	50	<1		
Mercury	µg/L	0.05	1	<0.025		
Molybdenum	µg/L	0.1		1.7		
Nickel	µg/L	1		<1		
Potassium	µg/L	20		910		
Rubidium	µg/L	0.1		0.2		
Selenium	µg/L	1	10	<1		
Silver	µg/L	0.1		<0.1		
Sodium	µg/L	50	200000	11700		
Strontium	µg/L	1		352		
Tellurium	µg/L	0.1		<0.1		
Thallium	µg/L	0.1		<0.1		
Tin	µg/L	0.1		<0.1		
Uranium	µg/L	0.1	20	2.5		
Vanadium	µg/L	1		<1		
Zinc	µg/L	1	5000	4		

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010).

MW4DT

Monitoring Well 4: Deep Till - General Chemistry

Laboratory ID:				351141-09	359715-09	373149-09
Client ID:				MW4DT	MW4DT	MW4DT
Sample Station:				MW4DT	MW4DT	MW4DT
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL¹	Guidelines*	Results	Results	Results
Alkalinity	mg/L	1		140	140	150
Ammonia	mg/L	0.05		<0.05	<0.05	<0.05
Calcium	mg/L	0.05		41.8	41.6	45.2
Chloride	mg/L	0.5	250	1.8	2.5	1.6
Conductivity	µS/cm	1		274	284	289
Copper	mg/L	0.001	1	0.002	0.002	0.001
Cyanide	mg/L	0.002				
Iron	mg/L	0.02	0.3	<0.02	<0.02	<0.02
Magnesium	mg/L	0.01		8.07	7.78	8.09
Manganese	mg/L	0.001	0.05	<0.001	<0.001	<0.001
Nitrate + Nitrite	mg/L	0.05	10	0.12	0.15	0.08
o-Phosphate	mg/L	0.01		<0.01	<0.01	<0.01
pH		-	6.5-8.5	7.8	7.2	7.5
Phenols	mg/L	0.001				
Potassium	mg/L	0.02		0.42	0.46	0.46
r-Silica	mg/L	0.1		10.1	9.9	10.4
Sodium	mg/L	0.05	200	3.07	3.31	3.49
Sulfate	mg/L	1	500	4	4	5
Tannin & Lignin	mg/L	0.5				
Total Organic Carbon	mg/L	0.5		0.6	<0.5	0.6
Turbidity	NTU	0.1	NA	4.2	5.8	6.4
Zinc	mg/L	0.001	5	0.003	0.002	0.002
Calculated Parameters						
Bicarbonate	mg/L	-		139	140	150
Carbonate	mg/L	-		0.825	0.208	0.444
Hydroxide	mg/L	-		0.032	0.008	0.016
Cation sum	meq/L	-		2.89	2.87	3.08
Anion sum	meq/L	-		2.94	2.96	3.15
% difference	mg/L	-		-0.79	-1.54	-1.07
Theoretical Conductivity	µS/cm	-		264	264	281
Hardness	mg/L	-		138	136	146
Ion Sum	mg/L	-		155	156	166
Saturation pH		-		7.8	7.8	7.8
Langelier Index		-		-0.04	-0.64	-0.28
BOD	mg/L	3				
COD	mg/L	10				
DOC	mg/L	0.5				
Color	TCU	5				
Kjeldahl Nitrogen	mg/L	0.25				
Total Phosphorus	mg/L	0.002				
Total Dissolved Solids	mg/L	5				
Total Suspended Solids	mg/L	5		15	20	13
Volatile Suspended Solids	mg/L	5				

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010).

MW4DT

Monitoring Well 4: Deep Till - Trace Metals

Laboratory ID:				351141-09	359715-09	373149-09
Client ID:				MW4DT	MW4DT	MW4DT
Sample Station:				MW4DT	MW4DT	MW4DT
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL ¹	Guidelines*	Results	Results	Results
Aluminium	µg/L	1	100	5	2	7
Antimony	µg/L	0.1	6	< 0.1	< 0.1	< 0.1
Arsenic	µg/L	1	10	< 1	< 1	< 1
Barium	µg/L	1	1000	35	35	37
Beryllium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Bismuth	µg/L	0.1		< 1	< 1	< 1
Boron	µg/L	1	5000	7	7	8
Cadmium	µg/L	0.1	5	<0.01	0.01	<0.01
Calcium	µg/L	50		41800	41600	45200
Chromium	µg/L	1	50	<1	< 1	1
Cobalt	µg/L	0.1		< 0.1	< 0.1	< 0.1
Copper	µg/L	1	1000	2	2	1
Iron	µg/L	20	300	<20	< 20	< 20
Lead	µg/L	0.1	10	0.1	< 0.1	< 0.1
Lithium	µg/L	0.1		1.7	1.8	1.9
Magnesium	µg/L	10		8070	7780	8090
Manganese	µg/L	1	50	<1	< 1	<1
Mercury	µg/L	0.05	1	<0.025	< 0.025	< 0.025
Molybdenum	µg/L	0.1		<0.1	< 0.1	< 0.1
Nickel	µg/L	1		<1	< 1	< 1
Potassium	µg/L	20		420	460	460
Rubidium	µg/L	0.1		0.2	0.2	0.3
Selenium	µg/L	1	10	< 1	< 1	< 1
Silver	µg/L	0.1		< 0.1	< 0.1	< 0.1
Sodium	µg/L	50	200000	3070	3310	3490
Strontium	µg/L	1		224	225	243
Tellurium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Thallium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Tin	µg/L	0.1		<0.1	< 0.1	< 0.1
Uranium	µg/L	0.1	20	0.2	0.2	0.2
Vanadium	µg/L	1		< 1	< 1	< 1
Zinc	µg/L	1	5000	3	2	2

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010).

MW4ST

Monitoring Well 4: Shallow Till - General Chemistry

Laboratory ID:				351141-10	359715-08	373149-08
Client ID:				MW4ST	MW4ST	MW4ST
Sample Station:				MW4ST	MW4ST	MW4ST
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL¹	Guidelines*	Results	Results	Results
Alkalinity	mg/L	1		120	170	120
Ammonia	mg/L	0.05		<0.05	<0.05	<0.05
Calcium	mg/L	0.05		39.5	53.1	38.8
Chloride	mg/L	0.5	250	2.1	2.6	2.6
Conductivity	µS/cm	1		242	326	237
Copper	mg/L	0.001	1	0.003	<0.001	0.004
Cyanide	mg/L	0.002				
Iron	mg/L	0.02	0.3	0.04	<0.02	0.04
Magnesium	mg/L	0.01		5.63	6.83	4.91
Manganese	mg/L	0.001	0.05	0.001	<0.001	0.005
Nitrate + Nitrite	mg/L	0.05	10	0.12	0.11	0.08
o-Phosphate	mg/L	0.01		<0.01	<0.01	<0.01
pH		-	6.5-8.5	8.1	7.8	7.9
Phenols	mg/L	0.001				
Potassium	mg/L	0.02		0.47	0.55	0.55
r-Silica	mg/L	0.1		9.1	10.3	10.2
Sodium	mg/L	0.05	200	2.92	3.66	3.23
Sulfate	mg/L	1	500	7	5	9
Tannin & Lignin	mg/L	0.5				
Total Organic Carbon	mg/L	0.5		0.8	0.6	<0.5
Turbidity	NTU	0.1	NA	229	85.2	101
Zinc	mg/L	0.001	5	0.004	<0.001	0.007
Calculated Parameters						
Bicarbonate	mg/L	-		119	169	119
Carbonate	mg/L	-		1.4	1	0.889
Hydroxide	mg/L	-		0.063	0.032	0.04
Cation sum	meq/L	-		2.58	3.39	2.5
Anion sum	meq/L	-		2.61	3.58	2.66
% difference	mg/L	-		-0.67	-2.83	-3.24
Theoretical Conductivity	µS/cm	-		239	312	239
Hardness	mg/L	-		122	161	117
Ion Sum	mg/L	-		140	186	143
Saturation pH		-		7.9	7.7	7.9
Langelier Index		-		0.17	0.13	-0.04
BOD	mg/L	3				
COD	mg/L	10				
DOC	mg/L	0.5				
Color	TCU	5				
Kjeldahl Nitrogen	mg/L	0.25				
Total Phosphorus	mg/L	0.002				
Total Dissolved Solids	mg/L	5				
Total Suspended Solids	mg/L	5		415	176	190
Volatile Suspended Solids	mg/L	5				

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010).

MW4ST

Monitoring Well 4: Shallow Till - Trace Metals

Laboratory ID:				351141-10	359715-08	373149-08
Client ID:				MW4ST	MW4ST	MW4ST
Sample Station:				MW4ST	MW4ST	MW4ST
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL ¹	Guidelines*	Results	Results	Results
Aluminium	µg/L	1	100	21	2	13
Antimony	µg/L	0.1	6	< 0.1	< 0.1	< 0.1
Arsenic	µg/L	1	10	< 1	< 1	< 1
Barium	µg/L	1	1000	11	16	13
Beryllium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Bismuth	µg/L	0.1		< 1	< 1	< 1
Boron	µg/L	1	5000	5	5	7
Cadmium	µg/L	0.1	5	<0.01	< 0.01	< 0.01
Calcium	µg/L	50		39500	53100	38800
Chromium	µg/L	1	50	<1	1	<1
Cobalt	µg/L	0.1		< 0.1	< 0.1	< 0.1
Copper	µg/L	1	1000	3	< 1	4
Iron	µg/L	20	300	40	< 20	40
Lead	µg/L	0.1	10	0.2	< 0.1	0.2
Lithium	µg/L	0.1		1.5	2.1	1.6
Magnesium	µg/L	10		5630	6830	4910
Manganese	µg/L	1	50	1	< 1	5
Mercury	µg/L	0.05	1	0.03	< 0.025	< 0.025
Molybdenum	µg/L	0.1		0.1	< 0.1	0.2
Nickel	µg/L	1		<1	< 1	< 1
Potassium	µg/L	20		470	550	550
Rubidium	µg/L	0.1		0.1	< 0.1	0.1
Selenium	µg/L	1	10	<1	< 1	< 1
Silver	µg/L	0.1		< 0.1	< 0.1	< 0.1
Sodium	µg/L	50	200000	2920	3660	3230
Strontium	µg/L	1		199	265	191
Tellurium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Thallium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Tin	µg/L	0.1		<0.1	< 0.1	< 0.1
Uranium	µg/L	0.1	20	0.4	0.4	0.5
Vanadium	µg/L	1		< 1	< 1	< 1
Zinc	µg/L	1	5000	4	< 1	7

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010).

MW5DT

Monitoring Well 5: Deep Till - General Chemistry

Laboratory ID:				351141-11	359715-11	373149-11
Client ID:				MW5DT	MW5DT	MW5DT
Sample Station:				MW5DT	MW5DT	MW5DT
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL¹	Guidelines*	Results	Results	Results
Alkalinity	mg/L	1		170	170	180
Ammonia	mg/L	0.05		<0.05	<0.05	<0.05
Calcium	mg/L	0.05		55.4	52.6	57.8
Chloride	mg/L	0.5	250	13.4	13.1	14.3
Conductivity	µS/cm	1		365	377	374
Copper	mg/L	0.001	1	0.004	<0.001	<0.001
Cyanide	mg/L	0.002				
Iron	mg/L	0.02	0.3	<0.02	<0.02	0.03
Magnesium	mg/L	0.01		10.2	9.74	9.58
Manganese	mg/L	0.001	0.05	<0.001	<0.001	0.002
Nitrate + Nitrite	mg/L	0.05	10	0.34	0.3	0.23
o-Phosphate	mg/L	0.01		<0.01	<0.01	<0.01
pH		-	6.5-8.5	8.1	7.7	7.6
Phenols	mg/L	0.001				
Potassium	mg/L	0.02		0.6	0.61	0.61
r-Silica	mg/L	0.1		11.2	10.8	11.3
Sodium	mg/L	0.05	200	3.37	3.37	3.42
Sulfate	mg/L	1	500	6	6	7
Tannin & Lignin	mg/L	0.5				
Total Organic Carbon	mg/L	0.5		0.8	0.7	0.6
Turbidity	NTU	0.1	NA	14	18.8	15.4
Zinc	mg/L	0.001	5	0.006	<0.001	0.003
Calculated Parameters						
Bicarbonate	mg/L	-		168	169	179
Carbonate	mg/L	-		1.99	0.797	0.671
Hydroxide	mg/L	-		0.063	0.025	0.02
Cation sum	meq/L	-		3.77	3.59	3.84
Anion sum	meq/L	-		3.92	3.91	4.16
% difference	mg/L	-		-2.05	-4.32	-4.04
Theoretical Conductivity	µS/cm	-		350	341	363
Hardness	mg/L	-		180	172	184
Ion Sum	mg/L	-		205	201	215
Saturation pH		-		7.7	7.7	7.6
Langelier Index		-		0.44	0.03	-0.01
BOD	mg/L	3				
COD	mg/L	10				
DOC	mg/L	0.5				
Color	TCU	5				
Kjeldahl Nitrogen	mg/L	0.25				
Total Phosphorus	mg/L	0.002				
Total Dissolved Solids	mg/L	5				
Total Suspended Solids	mg/L	5		35	57	30
Volatile Suspended Solids	mg/L	5				

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value

MW5DT

Monitoring Well 5: Deep Till - Trace Metals

Laboratory ID:				351141-11	359715-11	373149-11
Client ID:				MW5DT	MW5DT	MW5DT
Sample Station:				MW5DT	MW5DT	MW5DT
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL ¹	Guidelines*	Results	Results	Results
Aluminium	µg/L	1	100	3	2	19
Antimony	µg/L	0.1	6	< 0.1	< 0.1	< 0.1
Arsenic	µg/L	1	10	< 1	< 1	< 1
Barium	µg/L	1	1000	35	34	34
Beryllium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Bismuth	µg/L	0.1		< 1	< 1	< 1
Boron	µg/L	1	5000	8	7	9
Cadmium	µg/L	0.1	5	<0.01	< 0.01	< 0.01
Calcium	µg/L	50		55400	52600	57800
Chromium	µg/L	1	50	<1	< 1	< 1
Cobalt	µg/L	0.1		< 0.1	< 0.1	< 0.1
Copper	µg/L	1	1000	4	< 1	< 1
Iron	µg/L	20	300	< 20	< 20	30
Lead	µg/L	0.1	10	0.2	< 0.1	< 0.1
Lithium	µg/L	0.1		3	2.9	2.9
Magnesium	µg/L	10		10200	9740	9580
Manganese	µg/L	1	50	<1	< 1	2
Mercury	µg/L	0.05	1	<0.025	< 0.025	< 0.025
Molybdenum	µg/L	0.1		0.2	< 0.1	< 0.1
Nickel	µg/L	1		<1	< 1	< 1
Potassium	µg/L	20		600	610	610
Rubidium	µg/L	0.1		0.3	0.3	0.3
Selenium	µg/L	1	10	<1	< 1	< 1
Silver	µg/L	0.1		< 0.1	< 0.1	< 0.1
Sodium	µg/L	50	200000	3370	3370	3420
Strontium	µg/L	1		374	362	375
Tellurium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Thallium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Tin	µg/L	0.1		<0.1	< 0.1	< 0.1
Uranium	µg/L	0.1	20	0.6	0.6	0.6
Vanadium	µg/L	1		< 1	< 1	< 1
Zinc	µg/L	1	5000	6	< 1	3

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010).

MW5ST

Monitoring Well 5: Shallow Till - General Chemistry

Laboratory ID:				351141-12	359715-10	373149-10
Client ID:				MW5ST	MW5ST	MW5ST
Sample Station:				MW5ST	MW5ST	MW5ST
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL ¹	Guidelines*	Results	Results	Results
Alkalinity	mg/L	1		120	120	110
Ammonia	mg/L	0.05		<0.05	<0.05	<0.05
Calcium	mg/L	0.05		37	37.8	33
Chloride	mg/L	0.5	250	4.1	7.8	7.1
Conductivity	µS/cm	1		255	278	233
Copper	mg/L	0.001	1	0.004	<0.001	<0.001
Cyanide	mg/L	0.002				
Iron	mg/L	0.02	0.3	0.05	<0.02	<0.02
Magnesium	mg/L	0.01		6.3	6.51	5.44
Manganese	mg/L	0.001	0.05	0.017	<0.001	0.002
Nitrate + Nitrite	mg/L	0.05	10	0.34	0.42	0.27
o-Phosphate	mg/L	0.01		0.02	0.02	0.03
pH		-	6.5-8.5	7.5	6.7	7
Phenols	mg/L	0.001				
Potassium	mg/L	0.02		0.59	0.64	0.66
r-Silica	mg/L	0.1		8.9	9.2	9.6
Sodium	mg/L	0.05	200	5.35	5.8	5.33
Sulfate	mg/L	1	500	7	8	7
Tannin & Lignin	mg/L	0.5				
Total Organic Carbon	mg/L	0.5		1.1	0.8	0.7
Turbidity	NTU	0.1	NA	9.4	30.8	5.6
Zinc	mg/L	0.001	5	0.003	0.002	0.004
Calculated Parameters						
Bicarbonate	mg/L	-		120	120	110
Carbonate	mg/L	-		0.356	0.056	0.103
Hydroxide	mg/L	-		0.016	0.003	0.005
Cation sum	meq/L	-		2.62	2.69	2.34
Anion sum	meq/L	-		2.68	2.82	2.57
% difference	mg/L	-		-1.3	-2.27	-4.52
Theoretical Conductivity	µS/cm	-		245	257	230
Hardness	mg/L	-		118	121	105
Ion Sum	mg/L	-		144	151	136
Saturation pH		-		8	7.9	8
Langelier Index		-		-0.45	-1.25	-1.04
BOD	mg/L	3				
COD	mg/L	10				
DOC	mg/L	0.5				
Color	TCU	5				
Kjeldahl Nitrogen	mg/L	0.25				
Total Phosphorus	mg/L	0.002				
Total Dissolved Solids	mg/L	5				
Total Suspended Solids	mg/L	5		17	46	19
Volatile Suspended Solids	mg/L	5				

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value

MW5ST

Monitoring Well 5: Shallow Till - Trace Metals

Laboratory ID:				351141-12	359715-10	373149-10
Client ID:				MW5ST	MW5ST	MW5ST
Sample Station:				MW5ST	MW5ST	MW5ST
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL ¹	Guidelines*	Results	Results	Results
Aluminium	µg/L	1	100	19	3	11
Antimony	µg/L	0.1	6	< 0.1	< 0.1	< 0.1
Arsenic	µg/L	1	10	< 1	< 1	< 1
Barium	µg/L	1	1000	24	24	22
Beryllium	µg/L	0.1		<0.1	< 0.1	< 0.1
Bismuth	µg/L	0.1		< 1	< 1	< 1
Boron	µg/L	1	5000	13	13	15
Cadmium	µg/L	0.1	5	<0.01	< 0.01	< 0.01
Calcium	µg/L	50		37000	37800	33000
Chromium	µg/L	1	50	<1	< 1	< 1
Cobalt	µg/L	0.1		0.5	< 0.1	< 0.1
Copper	µg/L	1	1000	4	< 1	< 1
Iron	µg/L	20	300	50	< 20	< 20
Lead	µg/L	0.1	10	0.3	< 0.1	< 0.1
Lithium	µg/L	0.1		0.4	0.4	0.5
Magnesium	µg/L	10		6300	6510	5440
Manganese	µg/L	1	50	17	< 1	2
Mercury	µg/L	0.05	1	< 0.025	< 0.025	< 0.025
Molybdenum	µg/L	0.1		<0.1	< 0.1	< 0.1
Nickel	µg/L	1		1	< 1	< 1
Potassium	µg/L	20		590	640	660
Rubidium	µg/L	0.1		0.3	0.3	0.5
Selenium	µg/L	1	10	< 1	< 1	< 1
Silver	µg/L	0.1		< 0.1	< 0.1	< 0.1
Sodium	µg/L	50	200000	5350	5800	5330
Strontium	µg/L	1		212	218	187
Tellurium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Thallium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Tin	µg/L	0.1		< 0.1	< 0.1	< 0.1
Uranium	µg/L	0.1	20	0.1	< 0.1	< 0.1
Vanadium	µg/L	1		< 1	< 1	< 1
Zinc	µg/L	1	5000	3	2	4

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010).

MW6DBR

Monitoring Well 6: Deep Bedrock - General Chemistry

Laboratory ID:				351141-13	359715-15	373149-15
Client ID:				MW6DBR	MW6DBR	MW6DBR
Sample Station:				MW6DBR	MW6DBR	MW6DBR
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL¹	Guidelines*	Results	Results	Results
Alkalinity	mg/L	1		180	200	190
Ammonia	mg/L	0.05		0.17	0.29	0.23
Calcium	mg/L	0.05		64.8	78.9	85.4
Chloride	mg/L	0.5	250	359	465	484
Conductivity	µS/cm	1		1470	1960	1920
Copper	mg/L	0.001	1	<0.002	<0.002	<0.002
Cyanide	mg/L	0.002				
Iron	mg/L	0.02	0.3	0.12	0.84	0.74
Magnesium	mg/L	0.01		42	48.9	49.9
Manganese	mg/L	0.001	0.05	0.231	0.19	0.291
Nitrate + Nitrite	mg/L	0.05	10	<0.05	<0.05	<0.05
o-Phosphate	mg/L	0.01		<0.01	<0.01	<0.01
pH		-	6.5-8.5	8.1	7.9	7.8
Phenols	mg/L	0.001				
Potassium	mg/L	0.02		0.68	0.7	0.8
r-Silica	mg/L	0.1		11	10.9	11.1
Sodium	mg/L	0.05	200	183	218	229
Sulfate	mg/L	1	500	<1	<1	<1
Tannin & Lignin	mg/L	0.5				
Total Organic Carbon	mg/L	0.5		<0.5	<0.5	<0.5
Turbidity	NTU	0.1	NA	1.1	7.6	2.6
Zinc	mg/L	0.001	5	<0.002	<0.002	0.003
Calculated Parameters						
Bicarbonate	mg/L	-		178	198	189
Carbonate	mg/L	-		2.1	1.48	1.12
Hydroxide	mg/L	-		0.063	0.04	0.032
Cation sum	meq/L	-		14.7	17.5	18.4
Anion sum	meq/L	-		13.7	17.1	17.5
% difference	mg/L	-		3.42	1.22	2.7
Theoretical Conductivity	µS/cm	-		1320	1590	1650
Hardness	mg/L	-		335	398	419
Ion Sum	mg/L	-		771	946	977
Saturation pH		-		7.7	7.5	7.5
Langelier Index		-		0.44	0.35	0.26
BOD	mg/L	3				
COD	mg/L	10				
DOC	mg/L	0.5				
Color	TCU	5				
Kjeldahl Nitrogen	mg/L	0.25				
Total Phosphorus	mg/L	0.002				
Total Dissolved Solids	mg/L	5				
Total Suspended Solids	mg/L	5		<5	<5	<5
Volatile Suspended Solids	mg/L	5				

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010).

MW6DBR

Monitoring Well 6: Deep Bedrock - Trace Metals

Laboratory ID:				351141-13	359715-15	373149-15
Client ID:				MW6DBR	MW6DBR	MW6DBR
Sample Station:				MW6DBR	MW6DBR	MW6DBR
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL¹	Guidelines*	Results	Results	Results
Aluminium	µg/L	1	100	8	13	29
Antimony	µg/L	0.1	6	<0.2	< 0.2	<0.1
Arsenic	µg/L	1	10	<2	< 2	2
Barium	µg/L	1	1000	1070	1450	1620
Beryllium	µg/L	0.1		<0.2	< 0.2	<0.1
Bismuth	µg/L	0.1		<2	< 2	<1
Boron	µg/L	1	5000	144	157	159
Cadmium	µg/L	0.1	5	<0.02	< 0.02	<0.01
Calcium	µg/L	50		64800	78900	85400
Chromium	µg/L	1	50	<2	< 2	<1
Cobalt	µg/L	0.1		<0.2	0.2	0.3
Copper	µg/L	1	1000	<2	< 2	<1
Iron	µg/L	20	300	120	840	740
Lead	µg/L	0.1	10	<0.2	< 0.2	2.7
Lithium	µg/L	0.1		43.4	56.5	59
Magnesium	µg/L	10		42000	48900	49900
Manganese	µg/L	1	50	231	190	291
Mercury	µg/L	0.05	1	0.03	< 0.025	< 0.025
Molybdenum	µg/L	0.1		0.5	0.3	0.4
Nickel	µg/L	1		<2	< 2	<1
Potassium	µg/L	20		680	700	800
Rubidium	µg/L	0.1		0.9	1.1	1.2
Selenium	µg/L	1	10	<2	< 2	<1
Silver	µg/L	0.1		<0.2	< 0.2	<0.1
Sodium	µg/L	50	200000	183000	218000	229000
Strontium	µg/L	1		1910	2480	2560
Tellurium	µg/L	0.1		<0.2	< 0.2	<0.1
Thallium	µg/L	0.1		<0.2	< 0.2	<0.1
Tin	µg/L	0.1		<0.2	< 0.2	<0.1
Uranium	µg/L	0.1	20	<0.2	< 0.2	<0.1
Vanadium	µg/L	1		<2	< 2	1
Zinc	µg/L	1	5000	<2	< 2	3

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010).

MW6DT

Monitoring Well 6: Deep Till - General Chemistry

Laboratory ID:				351141-14	359715-13	373149-13
Client ID:				MW6DT	MW6DT	MW6DT
Sample Station:				MW6DT	MW6DT	MW6DT
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL¹	Guidelines*	Results	Results	Results
Alkalinity	mg/L	1		110	120	110
Ammonia	mg/L	0.05		<0.05	<0.05	<0.05
Calcium	mg/L	0.05		27.4	27.2	27.2
Chloride	mg/L	0.5	250	3.2	2.7	3.7
Conductivity	µS/cm	1		228	246	228
Copper	mg/L	0.001	1	0.005	<0.001	<0.001
Cyanide	mg/L	0.002				
Iron	mg/L	0.02	0.3	<0.02	<0.02	0.04
Magnesium	mg/L	0.01		9.78	9.69	8.18
Manganese	mg/L	0.001	0.05	<0.001	<0.001	0.005
Nitrate + Nitrite	mg/L	0.05	10	0.17	0.1	<0.05
o-Phosphate	mg/L	0.01		<0.01	<0.01	<0.01
pH		-	6.5-8.5	8.2	7.8	7.7
Phenols	mg/L	0.001				
Potassium	mg/L	0.02		0.53	0.54	0.54
r-Silica	mg/L	0.1		7.9	7.9	8
Sodium	mg/L	0.05	200	4.92	5.05	3.52
Sulfate	mg/L	1	500	6	6	6
Tannin & Lignin	mg/L	0.5				
Total Organic Carbon	mg/L	0.5		<0.5	<0.5	<0.5
Turbidity	NTU	0.1	NA	4.7	13.4	3.1
Zinc	mg/L	0.001	5	0.003	<0.001	0.007
Calculated Parameters						
Bicarbonate	mg/L	-		108	119	109
Carbonate	mg/L	-		1.61	0.708	0.516
Hydroxide	mg/L	-		0.079	0.032	0.025
Cation sum	meq/L	-		2.4	2.39	2.2
Anion sum	meq/L	-		2.43	2.61	2.43
% difference	mg/L	-		-0.52	-4.38	-4.91
Theoretical Conductivity	µS/cm	-		222	227	213
Hardness	mg/L	-		109	108	102
Ion Sum	mg/L	-		128	133	124
Saturation pH		-		8.1	8.1	8.1
Langelier Index		-		0.08	-0.28	-0.42
BOD	mg/L	3				
COD	mg/L	10				
DOC	mg/L	0.5				
Color	TCU	5				
Kjeldahl Nitrogen	mg/L	0.25				
Total Phosphorus	mg/L	0.002				
Total Dissolved Solids	mg/L	5				
Total Suspended Solids	mg/L	5		132	188	46
Volatile Suspended Solids	mg/L	5				

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010)

MW6DT

Monitoring Well 6: Deep Till - Trace Metals

Laboratory ID:				351141-14	359715-13	373149-13
Client ID:				MW6DT	MW6DT	MW6DT
Sample Station:				MW6DT	MW6DT	MW6DT
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL ¹	Guidelines*	Results	Results	Results
Aluminium	µg/L	1	100	3	2	24
Antimony	µg/L	0.1	6	< 0.1	< 0.1	< 0.1
Arsenic	µg/L	1	10	< 1	< 1	< 1
Barium	µg/L	1	1000	17	18	16
Beryllium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Bismuth	µg/L	0.1		< 1	< 1	< 1
Boron	µg/L	1	5000	15	14	15
Cadmium	µg/L	0.1	5	<0.01	< 0.01	0.01
Calcium	µg/L	50		27400	27200	27200
Chromium	µg/L	1	50	<1	< 1	< 1
Cobalt	µg/L	0.1		<0.1	< 0.1	< 0.1
Copper	µg/L	1	1000	5	< 1	< 1
Iron	µg/L	20	300	<20	< 20	40
Lead	µg/L	0.1	10	0.2	< 0.1	0.1
Lithium	µg/L	0.1		2	1.9	1.3
Magnesium	µg/L	10		9780	9690	8180
Manganese	µg/L	1	50	<1	< 1	5
Mercury	µg/L	0.05	1	0.04	< 0.025	< 0.025
Molybdenum	µg/L	0.1		0.5	0.4	0.3
Nickel	µg/L	1		<1	< 1	< 1
Potassium	µg/L	20		530	540	540
Rubidium	µg/L	0.1		<0.1	< 0.1	0.1
Selenium	µg/L	1	10	<1	< 1	3
Silver	µg/L	0.1		< 0.1	< 0.1	< 0.1
Sodium	µg/L	50	200000	4920	5050	3520
Strontium	µg/L	1		232	239	206
Tellurium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Thallium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Tin	µg/L	0.1		<0.1	< 0.1	< 0.1
Uranium	µg/L	0.1	20	0.5	0.5	0.3
Vanadium	µg/L	1		<1	< 1	< 1
Zinc	µg/L	1	5000	3	< 1	7

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010)

MW6SBR

Monitoring Well 6: Shallow Bedrock - General Chemistry

Laboratory ID:				351141-15	359715-14	373149-14
Client ID:				MW6SBR	MW6SBR	MW6SBR
Sample Station:				MW6SBR	MW6SBR	MW6SBR
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL¹	Guidelines*	Results	Results	Results
Alkalinity	mg/L	1		90	100	100
Ammonia	mg/L	0.05		<0.05	<0.05	<0.05
Calcium	mg/L	0.05		21.8	21.2	21.2
Chloride	mg/L	0.5	250	3.3	3.9	4.6
Conductivity	µS/cm	1		200	216	215
Copper	mg/L	0.001	1	<0.001	<0.001	<0.001
Cyanide	mg/L	0.002				
Iron	mg/L	0.02	0.3	<0.02	<0.02	0.03
Magnesium	mg/L	0.01		9.2	8.84	8.4
Manganese	mg/L	0.001	0.05	<0.001	<0.001	0.002
Nitrate + Nitrite	mg/L	0.05	10	0.3	0.24	0.2
o-Phosphate	mg/L	0.01		<0.01	0.01	<0.01
pH		-	6.5-8.5	8.2	8	7.8
Phenols	mg/L	0.001				
Potassium	mg/L	0.02		0.41	0.42	0.41
r-Silica	mg/L	0.1		7.7	7.6	8
Sodium	mg/L	0.05	200	8.21	7.46	7.22
Sulfate	mg/L	1	500	5	6	7
Tannin & Lignin	mg/L	0.5				
Total Organic Carbon	mg/L	0.5		<0.5	<0.5	<0.5
Turbidity	NTU	0.1	NA	0.1	5.3	0.3
Zinc	mg/L	0.001	5	<0.001	<0.001	0.002
Calculated Parameters						
Bicarbonate	mg/L	-		88.6	99	99.4
Carbonate	mg/L	-		1.32	0.931	0.59
Hydroxide	mg/L	-		0.079	0.05	0.032
Cation sum	meq/L	-		2.21	2.12	2.08
Anion sum	meq/L	-		2.02	2.25	2.29
% difference	mg/L	-		4.63	-2.97	-4.88
Theoretical Conductivity	µS/cm	-		196	202	202
Hardness	mg/L	-		92.3	89.3	87.5
Ion Sum	mg/L	-		112	117	119
Saturation pH		-		8.3	8.3	8.3
Langelier Index		-		-0.1	-0.27	-0.46
BOD	mg/L	3				
COD	mg/L	10				
DOC	mg/L	0.5				
Color	TCU	5				
Kjeldahl Nitrogen	mg/L	0.25				
Total Phosphorus	mg/L	0.002				
Total Dissolved Solids	mg/L	5				
Total Suspended Solids	mg/L	5		<5	29	8
Volatile Suspended Solids	mg/L	5				

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010)

MW6SBR

Monitoring Well 6: Shallow Bedrock - Trace Metals

Laboratory ID:				351141-15	359715-14	373149-14
Client ID:				MW6SBR	MW6SBR	MW6SBR
Sample Station:				MW6SBR	MW6SBR	MW6SBR
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL ¹	Guidelines*	Results	Results	Results
Aluminium	µg/L	1	100	2	4	19
Antimony	µg/L	0.1	6	< 0.1	< 0.1	< 0.1
Arsenic	µg/L	1	10	< 1	< 1	< 1
Barium	µg/L	1	1000	36	36	35
Beryllium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Bismuth	µg/L	0.1		< 1	< 1	< 1
Boron	µg/L	1	5000	17	15	17
Cadmium	µg/L	0.1	5	<0.01	< 0.01	< 0.01
Calcium	µg/L	50		21800	21200	21200
Chromium	µg/L	1	50	<1	< 1	< 1
Cobalt	µg/L	0.1		< 0.1	< 0.1	< 0.1
Copper	µg/L	1	1000	<1	< 1	< 1
Iron	µg/L	20	300	< 20	< 20	30
Lead	µg/L	0.1	10	<0.1	< 0.1	0.2
Lithium	µg/L	0.1		1.9	1.8	1.8
Magnesium	µg/L	10		9200	8840	8400
Manganese	µg/L	1	50	< 1	< 1	2
Mercury	µg/L	0.05	1	< 0.025	< 0.025	< 0.025
Molybdenum	µg/L	0.1		0.4	0.4	0.4
Nickel	µg/L	1		< 1	< 1	< 1
Potassium	µg/L	20		410	420	410
Rubidium	µg/L	0.1		0.3	0.3	0.3
Selenium	µg/L	1	10	< 1	< 1	< 1
Silver	µg/L	0.1		< 0.1	< 0.1	< 0.1
Sodium	µg/L	50	200000	8210	7460	7220
Strontium	µg/L	1		242	238	237
Tellurium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Thallium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Tin	µg/L	0.1		< 0.1	< 0.1	< 0.1
Uranium	µg/L	0.1	20	0.4	0.5	0.5
Vanadium	µg/L	1		< 1	< 1	< 1
Zinc	µg/L	1	5000	<1	< 1	2

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010)

MW6ST

Monitoring Well 6: Shallow Till - General Chemistry

Laboratory ID:				351141-16	359715-12	373149-12
Client ID:				MW6ST	MW6ST	MW6ST
Sample Station:				MW6ST	MW6ST	MW6ST
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL ¹	Guidelines*	Results	Results	Results
Alkalinity	mg/L	1		320	320	350
Ammonia	mg/L	0.05		<0.05	<0.05	<0.05
Calcium	mg/L	0.05		96.8	92.1	105
Chloride	mg/L	0.5	250	4.2	3.9	4.1
Conductivity	µS/cm	1		604	594	609
Copper	mg/L	0.001	1	<0.001	<0.001	0.001
Cyanide	mg/L	0.002				
Iron	mg/L	0.02	0.3	8.35	3.19	9.88
Magnesium	mg/L	0.01		17.1	15.6	15.6
Manganese	mg/L	0.001	0.05	1.8	1.06	1.98
Nitrate + Nitrite	mg/L	0.05	10	<0.05	<0.05	<0.05
o-Phosphate	mg/L	0.01		<0.01	<0.01	<0.01
pH		-	6.5-8.5	7.4	7.2	7.4
Phenols	mg/L	0.001				
Potassium	mg/L	0.02		0.55	0.7	0.58
r-Silica	mg/L	0.1		15.6	15.6	17.3
Sodium	mg/L	0.05	200	7.84	8.91	7.61
Sulfate	mg/L	1	500	13	15	15
Tannin & Lignin	mg/L	0.5				
Total Organic Carbon	mg/L	0.5		2.5	1.8	2.2
Turbidity	NTU	0.1	NA	70.9	66.8	65.4
Zinc	mg/L	0.001	5	0.004	0.001	0.001
Calculated Parameters						
Bicarbonate	mg/L	-		319	320	349
Carbonate	mg/L	-		0.754	0.476	0.825
Hydroxide	mg/L	-		0.013	0.008	0.013
Cation sum	meq/L	-		7.11	6.5	7.47
Anion sum	meq/L	-		6.78	6.82	7.42
% difference	mg/L	-		2.33	-2.42	0.34
Theoretical Conductivity	µS/cm	-		569	557	604
Hardness	mg/L	-		312	294	326
Ion Sum	mg/L	-		360	351	391
Saturation pH		-		7.2	7.2	7.1
Langelier Index		-		0.22	0	0.29
BOD	mg/L	3				
COD	mg/L	10				
DOC	mg/L	0.5				
Color	TCU	5				
Kjeldahl Nitrogen	mg/L	0.25				
Total Phosphorus	mg/L	0.002				
Total Dissolved Solids	mg/L	5				
Total Suspended Solids	mg/L	5		57	68	51
Volatile Suspended Solids	mg/L	5				

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value

MW6ST

Monitoring Well 6: Shallow Till - Trace Metals

Laboratory ID:				351141-18	359715-12	373149-12
Client ID:				MW6ST	MW6ST	MW6ST
Sample Station:				MW6ST	MW6ST	MW6ST
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL ¹	Guidelines*	Results	Results	Results
Aluminium	µg/L	1	100	5	3	5
Antimony	µg/L	0.1	6	< 0.1	< 0.1	< 0.1
Arsenic	µg/L	1	10	9	7	14
Barium	µg/L	1	1000	126	102	149
Beryllium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Bismuth	µg/L	0.1		< 1	< 1	< 1
Boron	µg/L	1	5000	19	15	24
Cadmium	µg/L	0.1	5	< 0.01	< 0.01	< 0.01
Calcium	µg/L	50		96800	92100	105000
Chromium	µg/L	1	50	<1	1	2
Cobalt	µg/L	0.1		1.2	0.4	1.3
Copper	µg/L	1	1000	<1	< 1	1
Iron	µg/L	20	300	8350	3190	9880
Lead	µg/L	0.1	10	<0.1	< 0.1	< 0.1
Lithium	µg/L	0.1		1.9	2.2	2.1
Magnesium	µg/L	10		17100	15600	15600
Manganese	µg/L	1	50	1800	1060	1980
Mercury	µg/L	0.05	1	<0.025	< 0.025	< 0.025
Molybdenum	µg/L	0.1		0.2	0.3	0.3
Nickel	µg/L	1		3	< 1	1
Potassium	µg/L	20		550	700	580
Rubidium	µg/L	0.1		0.2	0.2	0.3
Selenium	µg/L	1	10	< 1	< 1	< 1
Silver	µg/L	0.1		< 0.1	< 0.1	< 0.1
Sodium	µg/L	50	200000	7840	8910	7610
Strontium	µg/L	1		680	626	715
Tellurium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Thallium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Tin	µg/L	0.1		<0.1	< 0.1	< 0.1
Uranium	µg/L	0.1	20	1.3	1.7	1.2
Vanadium	µg/L	1		<1	< 1	< 1
Zinc	µg/L	1	5000	4	1	1

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010)

MW7DBR

Monitoring Well 7: Deep Bedrock - General Chemistry

Laboratory ID:				351141-17	359715-19	373149-19
Client ID:				MW7DBR	MW7DBR	MW7DBR
Sample Station:				MW7DBR	MW7DBR	MW7DBR
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL ¹	Guidelines*	Results	Results	Results
Alkalinity	mg/L	1		230	230	230
Ammonia	mg/L	0.05		0.16	0.12	0.2
Calcium	mg/L	0.05		37.2	35.7	40.6
Chloride	mg/L	0.5	250	403	389	401
Conductivity	µS/cm	1		1740	1720	1750
Copper	mg/L	0.001	1	0.003	<0.002	0.001
Cyanide	mg/L	0.002				
Iron	mg/L	0.02	0.3	0.26	0.32	0.49
Magnesium	mg/L	0.01		21	20	20.6
Manganese	mg/L	0.001	0.05	0.03	0.03	0.031
Nitrate + Nitrite	mg/L	0.05	10	<0.05	<0.05	0.05
o-Phosphate	mg/L	0.01		<0.01	<0.01	<0.01
pH		-	6.5-8.5	8.2	7.9	8
Phenols	mg/L	0.001				
Potassium	mg/L	0.02		0.52	0.5	0.56
r-Silica	mg/L	0.1		9.9	9.9	10.1
Sodium	mg/L	0.05	200	298	283	294
Sulfate	mg/L	1	500	3	4	1
Tannin & Lignin	mg/L	0.5				
Total Organic Carbon	mg/L	0.5		<0.5	<0.5	<0.5
Turbidity	NTU	0.1	NA	4.7	3.1	2.6
Zinc	mg/L	0.001	5	0.003	0.003	0.006
Calculated Parameters						
Bicarbonate	mg/L	-		227	228	228
Carbonate	mg/L	-		3.37	1.7	2.14
Hydroxide	mg/L	-		0.079	0.04	0.05
Cation sum	meq/L	-		16.6	15.8	16.6
Anion sum	meq/L	-		16	15.7	15.9
% difference	mg/L	-		1.72	0.4	1.95
Theoretical Conductivity	µS/cm	-		1490	1440	1480
Hardness	mg/L	-		179	172	186
Ion Sum	mg/L	-		913	883	909
Saturation pH		-		7.8	7.8	7.8
Langelier Index		-		0.4	0.09	0.24
BOD	mg/L	3				
COD	mg/L	10				
DOC	mg/L	0.5				
Color	TCU	5				
Kjeldahl Nitrogen	mg/L	0.25				
Total Phosphorus	mg/L	0.002				
Total Dissolved Solids	mg/L	5				
Total Suspended Solids	mg/L	5		12	<5	<5
Volatile Suspended Solids	mg/L	5				

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value

MW7DBR

Monitoring Well 7: Deep Bedrock - Trace Metals

Laboratory ID:				351141-17	359715-19	373149-19
Client ID:				MW7DBR	MW7DBR	MW7DBR
Sample Station:				MW7DBR	MW7DBR	MW7DBR
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL ¹	Guidelines*	Results	Results	Results
Aluminium	µg/L	1	100	4	13	45
Antimony	µg/L	0.1	6	<0.2	< 0.2	<0.1
Arsenic	µg/L	1	10	4	4	4
Barium	µg/L	1	1000	740	720	780
Beryllium	µg/L	0.1		<0.2	< 0.2	<0.1
Bismuth	µg/L	0.1		<2	< 2	<1
Boron	µg/L	1	5000	207	206	210
Cadmium	µg/L	0.1	5	<0.02	< 0.02	0.34
Calcium	µg/L	50		37200	35700	40600
Chromium	µg/L	1	50	<2	< 2	<1
Cobalt	µg/L	0.1		<0.2	< 0.2	<0.1
Copper	µg/L	1	1000	3	< 2	1
Iron	µg/L	20	300	260	320	490
Lead	µg/L	0.1	10	<0.2	< 0.2	0.7
Lithium	µg/L	0.1		89.6	87.7	90.5
Magnesium	µg/L	10		21000	20000	20600
Manganese	µg/L	1	50	30	30	31
Mercury	µg/L	0.05	1	<0.025	0.27	<0.025
Molybdenum	µg/L	0.1		0.3	0.3	0.2
Nickel	µg/L	1		<2	< 2	<1
Potassium	µg/L	20		520	500	560
Rubidium	µg/L	0.1		0.9	0.9	1
Selenium	µg/L	1	10	<2	< 2	<1
Silver	µg/L	0.1		<0.2	< 0.2	<0.1
Sodium	µg/L	50	200000	298000	283000	294000
Strontium	µg/L	1		945	928	1040
Tellurium	µg/L	0.1		<0.2	< 0.2	<0.1
Thallium	µg/L	0.1		<0.2	< 0.2	<0.1
Tin	µg/L	0.1		<0.2	< 0.2	<0.1
Uranium	µg/L	0.1	20	<0.2	< 0.2	<0.1
Vanadium	µg/L	1		<2	< 2	<1
Zinc	µg/L	1	5000	3	3	6

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010)

MW7DT

Monitoring Well 7: Deep Till - General Chemistry

Laboratory ID:				351141-18	359715-17	373149-17
Client ID:				MW7DT	MW7DT	MW7DT
Sample Station:				MW7DT	MW7DT	MW7DT
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL ¹	Guidelines*	Results	Results	Results
Alkalinity	mg/L	1		120	130	140
Ammonia	mg/L	0.05		<0.05	<0.05	<0.05
Calcium	mg/L	0.05		36.9	37.8	40.5
Chloride	mg/L	0.5	250	5.2	4.7	5.4
Conductivity	µS/cm	1		268	278	280
Copper	mg/L	0.001	1	0.006	0.002	0.003
Cyanide	mg/L	0.002				
Iron	mg/L	0.02	0.3	0.75	<0.02	0.02
Magnesium	mg/L	0.01		7.89	7.12	7.15
Manganese	mg/L	0.001	0.05	0.148	0.035	0.058
Nitrate + Nitrite	mg/L	0.05	10	0.08	0.05	0.06
o-Phosphate	mg/L	0.01		<0.01	<0.01	<0.01
pH		-	6.5-8.5	7.7	7.1	7.2
Phenols	mg/L	0.001				
Potassium	mg/L	0.02		0.58	0.54	0.56
r-Silica	mg/L	0.1		7.7	7.7	7.8
Sodium	mg/L	0.05	200	5.83	4.94	4.87
Sulfate	mg/L	1	500	7	7	8
Tannin & Lignin	mg/L	0.5				
Total Organic Carbon	mg/L	0.5		0.8	0.6	0.9
Turbidity	NTU	0.1	NA	659	164	388
Zinc	mg/L	0.001	5	0.005	0.003	0.004
Calculated Parameters						
Bicarbonate	mg/L	-		119	130	140
Carbonate	mg/L	-		0.563	0.154	0.208
Hydroxide	mg/L	-		0.025	0.006	0.008
Cation sum	meq/L	-		2.81	2.7	2.84
Anion sum	meq/L	-		2.7	2.88	3.12
% difference	mg/L	-		1.98	-3.19	-4.73
Theoretical Conductivity	µS/cm	-		252	256	272
Hardness	mg/L	-		125	124	131
Ion Sum	mg/L	-		146	149	160
Saturation pH		-		8	7.9	7.9
Langelier Index		-		-0.26	-0.81	-0.66
BOD	mg/L	3				
COD	mg/L	10				
DOC	mg/L	0.5				
Color	TCU	5				
Kjeldahl Nitrogen	mg/L	0.25				
Total Phosphorus	mg/L	0.002				
Total Dissolved Solids	mg/L	5				
Total Suspended Solids	mg/L	5		1060	285	523
Volatile Suspended Solids	mg/L	5				

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value

MW7DT

Monitoring Well 7: Deep Till - Trace Metals

Laboratory ID:				351141-18	359715-17	373149-17
Client ID:				MW7DT	MW7DT	MW7DT
Sample Station:				MW7DT	MW7DT	MW7DT
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL ¹	Guidelines*	Results	Results	Results
Aluminium	µg/L	1	100	483	3	12
Antimony	µg/L	0.1	6	< 0.1	< 0.1	< 0.1
Arsenic	µg/L	1	10	< 1	< 1	< 1
Barium	µg/L	1	1000	32	24	27
Beryllium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Bismuth	µg/L	0.1		< 1	< 1	< 1
Boron	µg/L	1	5000	16	13	16
Cadmium	µg/L	0.1	5	0.01	0.01	0.01
Calcium	µg/L	50		36900	37800	40500
Chromium	µg/L	1	50	2	< 1	< 1
Cobalt	µg/L	0.1		1.1	< 0.1	< 0.1
Copper	µg/L	1	1000	6	2	3
Iron	µg/L	20	300	750	< 20	20
Lead	µg/L	0.1	10	1.1	< 0.1	< 0.1
Lithium	µg/L	0.1		1.6	0.8	0.7
Magnesium	µg/L	10		7890	7120	7150
Manganese	µg/L	1	50	148	35	58
Mercury	µg/L	0.05	1	0.15	< 0.025	0.05
Molybdenum	µg/L	0.1		0.2	0.3	0.4
Nickel	µg/L	1		2	< 1	< 1
Potassium	µg/L	20		580	540	560
Rubidium	µg/L	0.1		0.8	0.3	0.3
Selenium	µg/L	1	10	< 1	< 1	< 1
Silver	µg/L	0.1		< 0.1	< 0.1	< 0.1
Sodium	µg/L	50	200000	5830	4940	4870
Strontium	µg/L	1		220	218	223
Tellurium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Thallium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Tin	µg/L	0.1		< 0.1	< 0.1	< 0.1
Uranium	µg/L	0.1	20	0.6	0.4	0.4
Vanadium	µg/L	1		< 1	< 1	< 1
Zinc	µg/L	1	5000	5	3	4

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010)

MW7SBR

Monitoring Well 7: Shallow Bedrock - General Chemistry

Laboratory ID:				351141-19	359715-18	373149-18
Client ID:				MW7SBR	MW7SBR	MW7SBR
Sample Station:				MW7SBR	MW7SBR	MW7SBR
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL ¹	Guidelines*	Results	Results	Results
Alkalinity	mg/L	1		130	140	150
Ammonia	mg/L	0.05		<0.05	<0.05	<0.05
Calcium	mg/L	0.05		39	41.2	40.4
Chloride	mg/L	0.5	250	9.6	12.8	11.8
Conductivity	µS/cm	1		298	309	304
Copper	mg/L	0.001	1	0.002	0.002	<0.001
Cyanide	mg/L	0.002				
Iron	mg/L	0.02	0.3	<0.02	<0.02	<0.02
Magnesium	mg/L	0.01		8.87	9.07	9.22
Manganese	mg/L	0.001	0.05	<0.001	<0.001	<0.001
Nitrate + Nitrite	mg/L	0.05	10	0.09	0.11	0.07
o-Phosphate	mg/L	0.01		<0.01	<0.01	0.01
pH		-	6.5-8.5	8.1	7.9	7.8
Phenols	mg/L	0.001				
Potassium	mg/L	0.02		0.53	0.52	0.55
r-Silica	mg/L	0.1		9.4	9.2	9.5
Sodium	mg/L	0.05	200	8.58	8.88	8.82
Sulfate	mg/L	1	500	8	8	9
Tannin & Lignin	mg/L	0.5				
Total Organic Carbon	mg/L	0.5		<0.5	<0.5	<0.5
Turbidity	NTU	0.1	NA	21.4	6.4	4.8
Zinc	mg/L	0.001	5	<0.001	0.003	0.002
Calculated Parameters						
Bicarbonate	mg/L	-		128	139	149
Carbonate	mg/L	-		1.52	1.04	0.884
Hydroxide	mg/L	-		0.063	0.04	0.032
Cation sum	meq/L	-		3.06	3.2	3.17
Anion sum	meq/L	-		3.04	3.33	3.52
% difference	mg/L	-		0.34	-2	-5.23
Theoretical Conductivity	µS/cm	-		282	301	307
Hardness	mg/L	-		134	140	139
Ion Sum	mg/L	-		164	176	181
Saturation pH		-		7.9	7.9	7.8
Langelier Index		-		0.19	0.04	-0.03
BOD	mg/L	3				
COD	mg/L	10				
DOC	mg/L	0.5				
Color	TCU	5				
Kjeldahl Nitrogen	mg/L	0.25				
Total Phosphorus	mg/L	0.002				
Total Dissolved Solids	mg/L	5				
Total Suspended Solids	mg/L	5		52	29	26
Volatile Suspended Solids	mg/L	5				

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010)

MW7SBR

Monitoring Well 7: Shallow Bedrock - Trace Metals

Laboratory ID:				351141-19	359715-18	373149-18
Client ID:				MW7SBR	MW7SBR	MW7SBR
Sample Station:				MW7SBR	MW7SBR	MW7SBR
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL ¹	Guidelines*	Results	Results	Results
Aluminium	µg/L	1	100	2	3	10
Antimony	µg/L	0.1	6	< 0.1	< 0.1	< 0.1
Arsenic	µg/L	1	10	< 1	< 1	< 1
Barium	µg/L	1	1000	29	29	29
Beryllium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Bismuth	µg/L	0.1		< 1	< 1	< 1
Boron	µg/L	1	5000	14	14	14
Cadmium	µg/L	0.1	5	<0.01	< 0.01	< 0.01
Calcium	µg/L	50		39000	41200	40400
Chromium	µg/L	1	50	<1	< 1	< 1
Cobalt	µg/L	0.1		< 0.1	< 0.1	< 0.1
Copper	µg/L	1	1000	2	2	<1
Iron	µg/L	20	300	< 20	< 20	< 20
Lead	µg/L	0.1	10	<0.1	< 0.1	< 0.1
Lithium	µg/L	0.1		3.1	3.1	3
Magnesium	µg/L	10		8870	9070	9220
Manganese	µg/L	1	50	<1	< 1	< 1
Mercury	µg/L	0.05	1	<0.025	< 0.025	< 0.025
Molybdenum	µg/L	0.1		0.2	0.2	0.2
Nickel	µg/L	1		<1	< 1	< 1
Potassium	µg/L	20		530	520	550
Rubidium	µg/L	0.1		0.2	0.3	0.3
Selenium	µg/L	1	10	< 1	< 1	< 1
Silver	µg/L	0.1		< 0.1	< 0.1	< 0.1
Sodium	µg/L	50	200000	8580	8880	8820
Strontium	µg/L	1		284	289	292
Tellurium	µg/L	0.1		<0.1	< 0.1	< 0.1
Thallium	µg/L	0.1		<0.1	< 0.1	< 0.1
Tin	µg/L	0.1		<0.1	< 0.1	< 0.1
Uranium	µg/L	0.1	20	0.5	0.5	0.6
Vanadium	µg/L	1		< 1	< 1	< 1
Zinc	µg/L	1	5000	<1	3	2

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010)

MW7ST

Monitoring Well 7: Shallow Till - General Chemistry

Laboratory ID:				351141-20	359715-16	373149-16
Client ID:				MW7ST	MW7ST	MW7ST
Sample Station:				MW7ST	MW7ST	MW7ST
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL ¹	Guidelines*	Results	Results	Results
Alkalinity	mg/L	1		120	130	140
Ammonia	mg/L	0.05		<0.05	<0.05	<0.05
Calcium	mg/L	0.05		39.6	38.6	42.7
Chloride	mg/L	0.5	250	5.7	5	6.1
Conductivity	µS/cm	1		270	277	295
Copper	mg/L	0.001	1	<0.001	<0.001	<0.001
Cyanide	mg/L	0.002				
Iron	mg/L	0.02	0.3	<0.02	<0.02	0.03
Magnesium	mg/L	0.01		6.95	6.96	7.44
Manganese	mg/L	0.001	0.05	0.064	0.054	0.058
Nitrate + Nitrite	mg/L	0.05	10	0.07	0.06	0.06
o-Phosphate	mg/L	0.01		0.02	<0.01	<0.01
pH		-	6.5-8.5	7.8	6.9	7.1
Phenols	mg/L	0.001				
Potassium	mg/L	0.02		0.52	0.53	0.59
r-Silica	mg/L	0.1		6.8	6.5	7.4
Sodium	mg/L	0.05	200	4.03	4.06	4.42
Sulfate	mg/L	1	500	7	7	8
Tannin & Lignin	mg/L	0.5				
Total Organic Carbon	mg/L	0.5		0.9	0.7	0.7
Turbidity	NTU	0.1	NA	4.5	6.8	6.3
Zinc	mg/L	0.001	5	<0.001	0.002	0.002
Calculated Parameters						
Bicarbonate	mg/L	-		119	130	140
Carbonate	mg/L	-		0.708	0.097	0.165
Hydroxide	mg/L	-		0.032	0.004	0.006
Cation sum	meq/L	-		2.74	2.69	2.95
Anion sum	meq/L	-		2.71	2.89	3.14
% difference	mg/L	-		0.51	-3.55	-3.05
Theoretical Conductivity	µS/cm	-		252	256	279
Hardness	mg/L	-		128	125	137
Ion Sum	mg/L	-		144	148	162
Saturation pH		-		7.9	7.9	7.8
Langelier Index		-		-0.13	-1	-0.73
BOD	mg/L	3				
COD	mg/L	10				
DOC	mg/L	0.5				
Color	TCU	5				
Kjeldahl Nitrogen	mg/L	0.25				
Total Phosphorus	mg/L	0.002				
Total Dissolved Solids	mg/L	5				
Total Suspended Solids	mg/L	5		9	27	19
Volatile Suspended Solids	mg/L	5				

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010)

MW7ST

Monitoring Well 7: Shallow Till - Trace Metals

Laboratory ID:				351141-20	359715-16	373149-16
Client ID:				MW7ST	MW7ST	MW7ST
Sample Station:				MW7ST	MW7ST	MW7ST
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL ¹	Guidelines*	Results	Results	Results
Aluminium	µg/L	1	100	2	6	12
Antimony	µg/L	0.1	6	< 0.1	< 0.1	< 0.1
Arsenic	µg/L	1	10	< 1	< 1	< 1
Barium	µg/L	1	1000	25	24	26
Beryllium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Bismuth	µg/L	0.1		< 1	< 1	< 1
Boron	µg/L	1	5000	10	9	14
Cadmium	µg/L	0.1	5	<0.01	< 0.01	0.01
Calcium	µg/L	50		39600	38600	42700
Chromium	µg/L	1	50	<1	< 1	< 1
Cobalt	µg/L	0.1		<0.1	< 0.1	< 0.1
Copper	µg/L	1	1000	<1	< 1	< 1
Iron	µg/L	20	300	<20	< 20	30
Lead	µg/L	0.1	10	<0.1	< 0.1	0.4
Lithium	µg/L	0.1		0.5	0.5	0.6
Magnesium	µg/L	10		6950	6960	7440
Manganese	µg/L	1	50	64	54	58
Mercury	µg/L	0.05	1	<0.025	< 0.025	< 0.025
Molybdenum	µg/L	0.1		<0.1	< 0.1	< 0.1
Nickel	µg/L	1		<1	< 1	< 1
Potassium	µg/L	20		520	530	590
Rubidium	µg/L	0.1		0.4	0.4	0.5
Selenium	µg/L	1	10	<1	< 1	< 1
Silver	µg/L	0.1		<0.1	< 0.1	< 0.1
Sodium	µg/L	50	200000	4030	4060	4420
Strontium	µg/L	1		208	201	220
Tellurium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Thallium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Tin	µg/L	0.1		<0.1	< 0.1	< 0.1
Uranium	µg/L	0.1	20	< 0.1	< 0.1	< 0.1
Vanadium	µg/L	1		< 1	< 1	< 1
Zinc	µg/L	1	5000	<1	2	2

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010)

MW 8 A

Monitoring Well 8: Shallow Till - General Chemistry

Laboratory ID:				351141-21	359715-20	373149-22
Client ID:				MW8A	MW8A	MW8A
Sample Station:				MW8A	MW8A	MW8A
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL ¹	Guidelines*	Results	Results	Results
Alkalinity	mg/L	1		48	101	73
Ammonia	mg/L	0.05		<0.05	<0.05	<0.05
Calcium	mg/L	0.05		17.7	36.3	26.6
Chloride	mg/L	0.5	250	3	1	2.1
Conductivity	µS/cm	1		126	223	164
Copper	mg/L	0.001	1	<0.001	<0.001	<0.001
Cyanide	mg/L	0.002				
Iron	mg/L	0.02	0.3	0.05	<0.02	<0.02
Magnesium	mg/L	0.01		1.96	3.67	2.69
Manganese	mg/L	0.001	0.05	0.001	<0.001	0.002
Nitrate + Nitrite	mg/L	0.05	10	<0.05	<0.05	<0.05
o-Phosphate	mg/L	0.01		<0.01	<0.01	<0.01
pH		-	6.5-8.5	7.6	7.8	7.3
Phenols	mg/L	0.001				
Potassium	mg/L	0.02		0.21	0.29	0.28
r-Silica	mg/L	0.1		6	6.2	7.6
Sodium	mg/L	0.05	200	2.36	1.54	2.57
Sulfate	mg/L	1	500	9	13	13
Tannin & Lignin	mg/L	0.5				
Total Organic Carbon	mg/L	0.5		1.9	<0.5	1.4
Turbidity	NTU	0.1	NA	78.5	25.4	96.9
Zinc	mg/L	0.001	5	0.002	<0.001	<0.001
Calculated Parameters						
Bicarbonate	mg/L	-		85.5	100	72.9
Carbonate	mg/L	-		0.507	0.595	0.137
Hydroxide	mg/L	-		0.032	0.032	0.01
Cation sum	meq/L	-		1.98	2.19	1.67
Anion sum	meq/L	-		2.07	2.32	1.79
% difference	mg/L	-		-2.37	-2.86	-3.5
Theoretical Conductivity	µS/cm	-		195	213	168
Hardness	mg/L	-		93.7	106	77.5
Ion Sum	mg/L	-		115	124	99
Saturation pH		-		8.2	8	8.3
Langelier Index		-		-0.35	-0.23	-0.99
BOD	mg/L	3				
COD	mg/L	10				
DOC	mg/L	0.5				
Color	TCU	5				
Kjeldahl Nitrogen	mg/L	0.25				
Total Phosphorus	mg/L	0.002				
Total Dissolved Solids	mg/L	5				
Total Suspended Solids	mg/L	5		110	38	157
Volatile Suspended Solids	mg/L	5				

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010)

MW 8 A

Monitoring Well 8: Shallow Till - Trace Metals

Laboratory ID:				351141-21	359715-20	373149-22
Client ID:				MW8A	MW8A	MW8A
Sample Station:				MW8A	MW8A	MW8A
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL ¹	Guidelines*	Results	Results	Results
Aluminium	µg/L	1	100	53	5	9
Antimony	µg/L	0.1	6	< 0.1	< 0.1	< 0.1
Arsenic	µg/L	1	10	< 1	< 1	< 1
Barium	µg/L	1	1000	82	122	121
Beryllium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Bismuth	µg/L	0.1		< 1	< 1	< 1
Boron	µg/L	1	5000	2	2	3
Cadmium	µg/L	0.1	5	<0.01	< 0.01	< 0.01
Calcium	µg/L	50		17700	36300	26600
Chromium	µg/L	1	50	<1	< 1	< 1
Cobalt	µg/L	0.1		<0.1	< 0.1	< 0.1
Copper	µg/L	1	1000	<1	< 1	< 1
Iron	µg/L	20	300	50	< 20	< 20
Lead	µg/L	0.1	10	<0.1	< 0.1	< 0.1
Lithium	µg/L	0.1		0.5	0.7	0.8
Magnesium	µg/L	10		1960	3670	2690
Manganese	µg/L	1	50	1	< 1	2
Mercury	µg/L	0.05	1	0.03	< 0.025	0.05
Molybdenum	µg/L	0.1		<0.1	< 0.1	< 0.1
Nickel	µg/L	1		<1	< 1	< 1
Potassium	µg/L	20		210	290	280
Rubidium	µg/L	0.1		0.3	0.3	0.3
Selenium	µg/L	1	10	<1	< 1	< 1
Silver	µg/L	0.1		< 0.1	< 0.1	< 0.1
Sodium	µg/L	50	200000	2360	1540	2570
Strontium	µg/L	1		86	166	128
Tellurium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Thallium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Tin	µg/L	0.1		<0.1	< 0.1	< 0.1
Uranium	µg/L	0.1	20	< 0.1	< 0.1	< 0.1
Vanadium	µg/L	1		< 1	< 1	< 1
Zinc	µg/L	1	5000	2	< 1	< 1

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010)

MW 8 B

Monitoring Well 8: Shallow Bedrock - General Chemistry

Laboratory ID:				351141-22	359715-21	373149-23
Client ID:				MW8B	MW8B	MW8B
Sample Station:				MW8B	MW8B	MW8B
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL ¹	Guidelines*	Results	Results	Results
Alkalinity	mg/L	1		38	91	50
Ammonia	mg/L	0.05		<0.05	<0.05	<0.05
Calcium	mg/L	0.05		16.8	27.8	18.5
Chloride	mg/L	0.5	250	1.7	0.7	2
Conductivity	µS/cm	1		116	200	129
Copper	mg/L	0.001	1	<0.001	<0.001	<0.001
Cyanide	mg/L	0.002				
Iron	mg/L	0.02	0.3	0.02	<0.02	<0.02
Magnesium	mg/L	0.01		2.26	4.76	2.58
Manganese	mg/L	0.001	0.05	0.003	<0.001	0.007
Nitrate + Nitrite	mg/L	0.05	10	<0.05	<0.05	<0.05
o-Phosphate	mg/L	0.01		<0.01	<0.01	<0.01
pH		-	6.5-8.5	7.5	7.9	7.2
Phenols	mg/L	0.001				
Potassium	mg/L	0.02		0.18	0.27	0.23
r-Silica	mg/L	0.1		5.8	6.7	7.2
Sodium	mg/L	0.05	200	1.67	1.29	1.68
Sulfate	mg/L	1	500	15	9	12
Tannin & Lignin	mg/L	0.5				
Total Organic Carbon	mg/L	0.5		0.9	<0.5	1.3
Turbidity	NTU	0.1	NA	14.8	18.8	36.2
Zinc	mg/L	0.001	5	0.002	<0.001	0.005
Calculated Parameters						
Bicarbonate	mg/L	-		37.9	90.3	49.9
Carbonate	mg/L	-		0.113	0.674	0.074
Hydroxide	mg/L	-		0.016	0.04	0.008
Cation sum	meq/L	-		1.1	1.84	1.21
Anion sum	meq/L	-		1.12	2.03	1.31
% difference	mg/L	-		-0.76	-4.76	-3.57
Theoretical Conductivity	µS/cm	-		115	182	126
Hardness	mg/L	-		51.3	89	56.8
Ion Sum	mg/L	-		67	106	75
Saturation pH		-		8.8	8.2	8.6
Langelier Index		-		-1.26	-0.28	-1.4
BOD						
BOD	mg/L	3				
COD						
COD	mg/L	10				
DOC						
DOC	mg/L	0.5				
Color						
Color	TCU	5				
Kjeldahl Nitrogen						
Kjeldahl Nitrogen	mg/L	0.25				
Total Phosphorus						
Total Phosphorus	mg/L	0.002				
Total Dissolved Solids						
Total Dissolved Solids	mg/L	5				
Total Suspended Solids						
Total Suspended Solids	mg/L	5		26	34	58
Volatile Suspended Solids						
Volatile Suspended Solids	mg/L	5				

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010)

MW 8 B

Monitoring Well 8: Shallow Bedrock - Trace Metals

Laboratory ID:				351141-22	359715-21	373149-23
Client ID:				MW8B	MW8B	MW8B
Sample Station:				MW8B	MW8B	MW8B
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL ¹	Guidelines*	Results	Results	Results
Aluminium	µg/L	1	100	22	3	8
Antimony	µg/L	0.1	6	< 0.1	< 0.1	< 0.1
Arsenic	µg/L	1	10	< 1	< 1	< 1
Barium	µg/L	1	1000	58	97	71
Beryllium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Bismuth	µg/L	0.1		< 1	< 1	< 1
Boron	µg/L	1	5000	1	2	3
Cadmium	µg/L	0.1	5	<0.01	< 0.01	< 0.01
Calcium	µg/L	50		16800	27800	18500
Chromium	µg/L	1	50	< 1	< 1	< 1
Cobalt	µg/L	0.1		0.3	< 0.1	1.7
Copper	µg/L	1	1000	<1	< 1	< 1
Iron	µg/L	20	300	20	< 20	< 20
Lead	µg/L	0.1	10	<0.1	< 0.1	< 0.1
Lithium	µg/L	0.1		0.3	0.9	0.6
Magnesium	µg/L	10		2260	4760	2580
Manganese	µg/L	1	50	3	< 1	7
Mercury	µg/L	0.05	1	<0.025	< 0.025	< 0.025
Molybdenum	µg/L	0.1		<0.1	0.2	<0.1
Nickel	µg/L	1		<1	< 1	2
Potassium	µg/L	20		180	270	230
Rubidium	µg/L	0.1		0.2	0.3	0.3
Selenium	µg/L	1	10	<1	< 1	< 1
Silver	µg/L	0.1		< 0.1	< 0.1	< 0.1
Sodium	µg/L	50	200000	1670	1290	1680
Strontium	µg/L	1		80	147	92
Tellurium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Thallium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Tin	µg/L	0.1		<0.1	< 0.1	< 0.1
Uranium	µg/L	0.1	20	< 0.1	< 0.1	< 0.1
Vanadium	µg/L	1		< 1	< 1	< 1
Zinc	µg/L	1	5000	2	< 1	5

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010)

MW 9-DT

Monitoring Well 9: Deep Till - General Chemistry

Laboratory ID:				351141-23	359715-22	Dry
Client ID:				MW 9-DT	MW 9-DT	MW9DT
Sample Station:				MW 9-DT	MW 9-DT	MW9DT
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL¹	Guidelines*	Results	Results	Results
Alkalinity	mg/L	1		82	95	
Ammonia	mg/L	0.05		<0.05	<0.05	
Calcium	mg/L	0.05		23.4	24	
Chloride	mg/L	0.5	250	0.9	1.2	
Conductivity	µS/cm	1		175	198	
Copper	mg/L	0.001	1	0.005	0.002	
Cyanide	mg/L	0.002				
Iron	mg/L	0.02	0.3	0.19	<0.02	
Magnesium	mg/L	0.01		7	6.82	
Manganese	mg/L	0.001	0.05	0.009	<0.001	
Nitrate + Nitrite	mg/L	0.05	10	0.25	0.18	
o-Phosphate	mg/L	0.01		<0.01	<0.01	
pH		-	6.5-8.5	8	8.1	
Phenols	mg/L	0.001				
Potassium	mg/L	0.02		0.47	0.47	
r-Silica	mg/L	0.1		8.4	8.3	
Sodium	mg/L	0.05	200	2.28	2.6	
Sulfate	mg/L	1	500	5	6	
Tannin & Lignin	mg/L	0.5				
Total Organic Carbon	mg/L	0.5		<0.5	<0.5	
Turbidity	NTU	0.1	NA	26.5	25.9	
Zinc	mg/L	0.001	5	0.004	0.003	
Calculated Parameters						
Bicarbonate	mg/L	-		81.2	93.8	
Carbonate	mg/L	-		0.763	1.11	
Hydroxide	mg/L	-		0.05	0.063	
Cation sum	meq/L	-		1.87	1.88	
Anion sum	meq/L	-		1.79	2.07	
% difference	mg/L	-		2.19	-4.7	
Theoretical Conductivity	µS/cm	-		170	184	
Hardness	mg/L	-		87.3	88	
Ion Sum	mg/L	-		99	108	
Saturation pH		-		8.3	8.2	
Langelier Index		-		-0.3	-0.13	
BOD	mg/L	3				
COD	mg/L	10				
DOC	mg/L	0.5				
Color	TCU	5				
Kjeldahl Nitrogen	mg/L	0.25				
Total Phosphorus	mg/L	0.002				
Total Dissolved Solids	mg/L	5				
Total Suspended Solids	mg/L	5		126	174	
Volatile Suspended Solids	mg/L	5				

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010)

MW 9-DT

Monitoring Well 9: Deep Till - Trace Metals

Laboratory ID:				351141-23	359715-22	Dry
Client ID:				MW9-DT	MW9DT	MW9DT
Sample Station:				MW9-DT	MW9DT	MW9DT
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL ¹	Guidelines*	Results	Results	Results
Aluminium	µg/L	1	100	65	10	
Antimony	µg/L	0.1	6	< 0.1	0.2	
Arsenic	µg/L	1	10	< 1	< 1	
Barium	µg/L	1	1000	44	42	
Beryllium	µg/L	0.1		< 0.1	< 0.1	
Bismuth	µg/L	0.1		< 1	< 1	
Boron	µg/L	1	5000	8	8	
Cadmium	µg/L	0.1	5	<0.01	< 0.01	
Calcium	µg/L	50		23400	24000	
Chromium	µg/L	1	50	<1	< 1	
Cobalt	µg/L	0.1		0.2	< 0.1	
Copper	µg/L	1	1000	5	2	
Iron	µg/L	20	300	190	< 20	
Lead	µg/L	0.1	10	0.5	< 0.1	
Lithium	µg/L	0.1		2.3	2.3	
Magnesium	µg/L	10		7000	6820	
Manganese	µg/L	1	50	9	< 1	
Mercury	µg/L	0.05	1	< 0.025	< 0.025	
Molybdenum	µg/L	0.1		0.4	0.2	
Nickel	µg/L	1		<1	< 1	
Potassium	µg/L	20		470	470	
Rubidium	µg/L	0.1		0.3	0.2	
Selenium	µg/L	1	10	<1	< 1	
Silver	µg/L	0.1		< 0.1	< 0.1	
Sodium	µg/L	50	200000	2280	2600	
Strontium	µg/L	1		166	175	
Tellurium	µg/L	0.1		< 0.1	< 0.1	
Thallium	µg/L	0.1		< 0.1	< 0.1	
Tin	µg/L	0.1		<0.1	< 0.1	
Uranium	µg/L	0.1	20	0.3	0.3	
Vanadium	µg/L	1		<1	< 1	
Zinc	µg/L	1	5000	4	3	

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010)

MW 9-ST

Monitoring Well 9: Shallow Till - General Chemistry

Laboratory ID:				351141-24	Dry	Dry
Client ID:				MW 9-ST	MW 9-ST	MW 9-ST
Sample Station:				MW 9-ST	MW 9-ST	MW 9-ST
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL¹	Guidelines*	Results	Results	Results
Alkalinity	mg/L	1		220		
Ammonia	mg/L	0.05		<0.05		
Calcium	mg/L	0.05		269		
Chloride	mg/L	0.5	250	1.2		
Conductivity	µS/cm	1		1500		
Copper	mg/L	0.001	1	0.027		
Cyanide	mg/L	0.002				
Iron	mg/L	0.02	0.3	0.72		
Magnesium	mg/L	0.01		54.9		
Manganese	mg/L	0.001	0.05	0.021		
Nitrate + Nitrite	mg/L	0.05	10	0.3		
o-Phosphate	mg/L	0.01		0.01		
pH		-	6.5-8.5	7.9		
Phenols	mg/L	0.001				
Potassium	mg/L	0.02		1.94		
r-Silica	mg/L	0.1		11		
Sodium	mg/L	0.05	200	19.9		
Sulfate	mg/L	1	500	740		
Tannin & Lignin	mg/L	0.5				
Total Organic Carbon	mg/L	0.5		0.6		
Turbidity	NTU	0.1	NA	118		
Zinc	mg/L	0.001	5	0.014		
Calculated Parameters						
Bicarbonate	mg/L	-		218		
Carbonate	mg/L	-		1.63		
Hydroxide	mg/L	-		0.04		
Cation sum	meq/L	-		18.9		
Anion sum	meq/L	-		19.9		
% difference	mg/L	-		-2.48		
Theoretical Conductivity	µS/cm	-		1790		
Hardness	mg/L	-		898		
Ion Sum	mg/L	-		1230		
Saturation pH		-		7		
Langelier Index		-		0.87		
BOD	mg/L	3				
COD	mg/L	10				
DOC	mg/L	0.5				
Color	TCU	5				
Kjeldahl Nitrogen	mg/L	0.25				
Total Phosphorus	mg/L	0.002				
Total Dissolved Solids	mg/L	5				
Total Suspended Solids	mg/L	5		227		
Volatile Suspended Solids	mg/L	5				

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010)

MW 9-ST

Monitoring Well 9: Shallow Till - Trace Metals

	Units	MDL ¹	Guidelines*	Results	Results	Results
Laboratory ID:				351141-24	Dry	Dry
Client ID:				MW 9-ST	MW 9-ST	MW 9-ST
Sample Station:				MW 9-ST	MW 9-ST	MW 9-ST
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL ¹	Guidelines*	Results	Results	Results
Aluminium	µg/L	1	100	253		
Antimony	µg/L	0.1	6	0.2		
Arsenic	µg/L	1	10	<2		
Barium	µg/L	1	1000	40		
Beryllium	µg/L	0.1		<0.2		
Bismuth	µg/L	0.1		<2		
Boron	µg/L	1	5000	18		
Cadmium	µg/L	0.1	5	0.04		
Calcium	µg/L	50		269000		
Chromium	µg/L	1	50	<2		
Cobalt	µg/L	0.1		0.5		
Copper	µg/L	1	1000	27		
Iron	µg/L	20	300	720		
Lead	µg/L	0.1	10	1.6		
Lithium	µg/L	0.1		5.1		
Magnesium	µg/L	10		54900		
Manganese	µg/L	1	50	21		
Mercury	µg/L	0.05	1	<0.025		
Molybdenum	µg/L	0.1		2		
Nickel	µg/L	1		<2		
Potassium	µg/L	20		1940		
Rubidium	µg/L	0.1		0.5		
Selenium	µg/L	1	10	4		
Silver	µg/L	0.1		<0.2		
Sodium	µg/L	50	200000	19900		
Strontium	µg/L	1		1510		
Tellurium	µg/L	0.1		<0.2		
Thallium	µg/L	0.1		<0.2		
Tin	µg/L	0.1		<0.2		
Uranium	µg/L	0.1	20	15.4		
Vanadium	µg/L	1		<2		
Zinc	µg/L	1	5000	14		

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010)

ADI97-4DT Monitoring Well ADI97-4 Deep Till - General Chemistry

Laboratory ID:				351141-25	359715-24	373149-21
Client ID:				ADI974DT	ADI974DT	ADI974DT
Sample Station:				ADI974DT	ADI974DT	ADI974DT
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL¹	Guidelines*	Results	Results	Results
Alkalinity	mg/L	1		140	150	220
Ammonia	mg/L	0.05		<0.05	<0.05	<0.05
Calcium	mg/L	0.05		46.6	44.8	69.7
Chloride	mg/L	0.5	250	7.9	5.4	10.6
Conductivity	µS/cm	1		297	309	434
Copper	mg/L	0.001	1	<0.001	<0.001	0.002
Cyanide	mg/L	0.002				
Iron	mg/L	0.02	0.3	<0.02	<0.02	<0.02
Magnesium	mg/L	0.01		6.87	7.03	10.6
Manganese	mg/L	0.001	0.05	<0.001	<0.001	<0.001
Nitrate + Nitrite	mg/L	0.05	10	0.38	0.12	0.41
o-Phosphate	mg/L	0.01		<0.01	<0.01	<0.01
pH		-	6.5-8.5	8.1	7.8	7.7
Phenols	mg/L	0.001				
Potassium	mg/L	0.02		0.52	0.51	0.7
r-Silica	mg/L	0.1		10	9.9	12.9
Sodium	mg/L	0.05	200	3.74	3.72	6.37
Sulfate	mg/L	1	500	5	6	12
Tannin & Lignin	mg/L	0.5				
Total Organic Carbon	mg/L	0.5		<0.5	0.5	1
Turbidity	NTU	0.1	NA	23	11.9	10.4
Zinc	mg/L	0.001	5	0.001	0.001	0.002
Calculated Parameters						
Bicarbonate	mg/L	-		138	149	219
Carbonate	mg/L	-		1.64	0.884	1.03
Hydroxide	mg/L	-		0.063	0.032	0.025
Cation sum	meq/L	-		3.07	2.99	4.65
Anion sum	meq/L	-		3.15	3.28	4.97
% difference	mg/L	-		-1.37	-4.69	-3.41
Theoretical Conductivity	µS/cm	-		286	285	428
Hardness	mg/L	-		145	141	218
Ion Sum	mg/L	-		168	169	259
Saturation pH		-		7.8	7.8	7.5
Langelier Index		-		0.3	0.01	0.24
BOD	mg/L	3				
COD	mg/L	10				
DOC	mg/L	0.5				
Color	TCU	5				
Kjeldahl Nitrogen	mg/L	0.25				
Total Phosphorus	mg/L	0.002				
Total Dissolved Solids	mg/L	5				
Total Suspended Solids	mg/L	5		67	28	45
Volatile Suspended Solids	mg/L	5				

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010)

ADI97-4DT

Monitoring Well ADI97-4 Deep Till - Trace Metals

Laboratory ID:				351141-25	359715-24	373149-21
Client ID:				ADI974DT	ADI97-4DT	ADI97-4DT
Sample Station:				ADI974DT	ADI97-4DT	ADI97-4DT
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL ¹	Guidelines*	Results	Results	Results
Aluminium	µg/L	1	100	3	4	7
Antimony	µg/L	0.1	6	< 0.1	< 0.1	< 0.1
Arsenic	µg/L	1	10	< 1	< 1	< 1
Barium	µg/L	1	1000	25	24	42
Beryllium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Bismuth	µg/L	0.1		< 1	< 1	< 1
Boron	µg/L	1	5000	7	6	21
Cadmium	µg/L	0.1	5	<0.01	< 0.01	< 0.01
Calcium	µg/L	50		46600	44800	69700
Chromium	µg/L	1	50	<1	< 1	< 1
Cobalt	µg/L	0.1		< 0.1	< 0.1	0.1
Copper	µg/L	1	1000	<1	< 1	2
Iron	µg/L	20	300	< 20	< 20	<20
Lead	µg/L	0.1	10	<0.1	< 0.1	0.1
Lithium	µg/L	0.1		2.5	2.4	3.4
Magnesium	µg/L	10		6870	7030	10600
Manganese	µg/L	1	50	<1	< 1	< 1
Mercury	µg/L	0.05	1	< 0.025	< 0.025	< 0.025
Molybdenum	µg/L	0.1		<0.1	< 0.1	< 0.1
Nickel	µg/L	1		<1	< 1	< 1
Potassium	µg/L	20		520	510	700
Rubidium	µg/L	0.1		0.2	0.2	0.3
Selenium	µg/L	1	10	< 1	< 1	< 1
Silver	µg/L	0.1		< 0.1	< 0.1	< 0.1
Sodium	µg/L	50	200000	3740	3720	6370
Strontium	µg/L	1		282	281	427
Tellurium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Thallium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Tin	µg/L	0.1		<0.1	< 0.1	< 0.1
Uranium	µg/L	0.1	20	0.5	0.6	0.7
Vanadium	µg/L	1		< 1	< 1	< 1
Zinc	µg/L	1	5000	1	1	2

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010)

ADI97-4ST

Monitoring Well ADI97-4 Shallow Till - General Chemistry

Laboratory ID:				351141-26	359715-23	373149-20
Client ID:				ADI974ST	ADI974ST	ADI974ST
Sample Station:				ADI974ST	ADI974ST	ADI974ST
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL ¹	Guidelines*	Results	Results	Results
Alkalinity	mg/L	1		120	140	140
Ammonia	mg/L	0.05		<0.05	<0.05	<0.05
Calcium	mg/L	0.05		36.2	40.5	40.6
Chloride	mg/L	0.5	250	5.8	8.9	11.1
Conductivity	µS/cm	1		266	314	312
Copper	mg/L	0.001	1	0.005	<0.001	<0.001
Cyanide	mg/L	0.002				
Iron	mg/L	0.02	0.3	0.18	<0.02	<0.02
Magnesium	mg/L	0.01		6.63	7.72	7.82
Manganese	mg/L	0.001	0.05	0.019	<0.001	<0.001
Nitrate + Nitrite	mg/L	0.05	10	0.4	0.32	0.54
o-Phosphate	mg/L	0.01		<0.01	0.02	0.02
pH		-	6.5-8.5	7.4	6.8	7
Phenols	mg/L	0.001				
Potassium	mg/L	0.02		0.7	0.75	1.08
r-Silica	mg/L	0.1		6.9	7.2	7.7
Sodium	mg/L	0.05	200	7.83	7.81	11.9
Sulfate	mg/L	1	500	9	11	16
Tannin & Lignin	mg/L	0.5				
Total Organic Carbon	mg/L	0.5		0.9	0.9	1.4
Turbidity	NTU	0.1	NA	14.4	20.9	12
Zinc	mg/L	0.001	5	0.006	0.001	<0.001
Calculated Parameters						
Bicarbonate	mg/L	-		120	140	140
Carbonate	mg/L	-		0.283	0.083	0.132
Hydroxide	mg/L	-		0.013	0.003	0.005
Cation sum	meq/L	-		2.72	3.02	3.21
Anion sum	meq/L	-		2.78	3.3	3.48
% difference	mg/L	-		-1.02	-4.54	-4.02
Theoretical Conductivity	µS/cm	-		255	291	311
Hardness	mg/L	-		118	133	134
Ion Sum	mg/L	-		148	171	184
Saturation pH		-		8	7.9	7.9
Langelier Index		-		-0.57	-1.06	-0.86
BOD	mg/L	3				
COD	mg/L	10				
DOC	mg/L	0.5				
Color	TCU	5				
Kjeldahl Nitrogen	mg/L	0.25				
Total Phosphorus	mg/L	0.002				
Total Dissolved Solids	mg/L	5				
Total Suspended Solids	mg/L	5		37	49	21
Volatile Suspended Solids	mg/L	5				

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010)

ADI97-4ST

Monitoring Well ADI97-4 Shallow Till - Trace Metals

Laboratory ID:				351141-26	359715-23	373149-20
Client ID:				ADI974ST	ADI97-4ST	ADI97-4ST
Sample Station:				ADI974ST	ADI97-4ST	ADI97-4ST
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13	2020/10/26
	Units	MDL¹	Guidelines*	Results	Results	Results
Aluminium	µg/L	1	100	69	6	3
Antimony	µg/L	0.1	6	< 0.1	< 0.1	< 0.1
Arsenic	µg/L	1	10	< 1	< 1	< 1
Barium	µg/L	1	1000	31	31	42
Beryllium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Bismuth	µg/L	0.1		< 1	< 1	< 1
Boron	µg/L	1	5000	28	32	68
Cadmium	µg/L	0.1	5	<0.01	< 0.01	< 0.01
Calcium	µg/L	50		36200	40500	40600
Chromium	µg/L	1	50	<1	< 1	1
Cobalt	µg/L	0.1		0.2	< 0.1	0.2
Copper	µg/L	1	1000	5	< 1	< 1
Iron	µg/L	20	300	180	< 20	< 20
Lead	µg/L	0.1	10	0.5	< 0.1	< 0.1
Lithium	µg/L	0.1		0.5	0.4	0.2
Magnesium	µg/L	10		6630	7720	7820
Manganese	µg/L	1	50	19	< 1	< 1
Mercury	µg/L	0.05	1	< 0.025	< 0.025	< 0.025
Molybdenum	µg/L	0.1		<0.1	0.1	<0.1
Nickel	µg/L	1		<1	< 1	1
Potassium	µg/L	20		700	750	1080
Rubidium	µg/L	0.1		0.4	0.4	0.7
Selenium	µg/L	1	10	< 1	< 1	< 1
Silver	µg/L	0.1		< 0.1	< 0.1	< 0.1
Sodium	µg/L	50	200000	7830	7810	11900
Strontium	µg/L	1		200	228	233
Tellurium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Thallium	µg/L	0.1		< 0.1	< 0.1	< 0.1
Tin	µg/L	0.1		<0.1	< 0.1	< 0.1
Uranium	µg/L	0.1	20	0.2	0.4	<0.1
Vanadium	µg/L	1		< 1	< 1	< 1
Zinc	µg/L	1	5000	6	1	<1

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010)

C&D MW1SBR

C&D Site - Monitoring Well 1: Shallow Bedrock - General Chemistry

Laboratory ID:				351141-27	359715-25
Client ID:				MW1SBR	MW1SBR
Sample Station:				MW1SBR	MW1SBR
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13
	Units	MDL¹	Guidelines*	Results	Results
Alkalinity	mg/L	1		66	73
Ammonia	mg/L	0.05		<0.05	0.05
Calcium	mg/L	0.05		16	16
Chloride	mg/L	0.5	250	0.6	0.5
Conductivity	µS/cm	1		142	151
Copper	mg/L	0.001	1	<0.001	0.003
Cyanide	mg/L	0.002			
Iron	mg/L	0.02	0.3	0.04	0.48
Magnesium	mg/L	0.01		6.29	6.26
Manganese	mg/L	0.001	0.05	<0.001	0.055
Nitrate + Nitrite	mg/L	0.05	10	0.16	0.12
o-Phosphate	mg/L	0.01		<0.01	<0.01
pH		-	6.5-8.5	7.8	7.7
Phenols	mg/L	0.001			
Potassium	mg/L	0.02		0.34	0.35
r-Silica	mg/L	0.1		10	9.8
Sodium	mg/L	0.05	200	3.13	3.05
Sulfate	mg/L	1	500	4	4
Tannin & Lignin	mg/L	0.5			
Total Organic Carbon	mg/L	0.5		0.6	1.3
Turbidity	NTU	0.1	NA	434	801
Zinc	mg/L	0.001	5	<0.001	0.007
Calculated Parameters					
Bicarbonate	mg/L	-		65.6	72.6
Carbonate	mg/L	-		0.389	0.342
Hydroxide	mg/L	-		0.032	0.025
Cation sum	meq/L	-		1.46	1.49
Anion sum	meq/L	-		1.43	1.56
% difference	mg/L	-		1.14	-2.56
Theoretical Conductivity	µS/cm	-		136	141
Hardness	mg/L	-		65.9	65.7
Ion Sum	mg/L	-		81	86
Saturation pH		-		8.5	8.5
Langelier Index		-		-0.75	-0.8
BOD	mg/L	3			
COD	mg/L	10			
Color	TCU	5			
Kjeldahl Nitrogen	mg/L	0.25			
Total Phosphorus	mg/L	0.002			
Total Dissolved Solids	mg/L	5			
Total Suspended Solids	mg/L	5		1270	1060
Volatile Suspended Solids	mg/L	5			

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010)

C&D MW1SBR

C&D Site - Monitoring Well 1: Shallow Bedrock - Trace Metals

Laboratory ID:				351141-27	359715-25
Client ID:				C+D MW1SBR	C+D MW1SBR
Sample Station:				C+D MW1SBR	C+D MW1SBR
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13
	Units	MDL¹	Guidelines*	Results	Results
Aluminium	µg/L	1	100	27	306
Antimony	µg/L	0.1	6	<0.1	< 0.1
Arsenic	µg/L	1	10	<1	< 1
Barium	µg/L	1	1000	8	17
Beryllium	µg/L	0.1		<0.1	< 0.1
Bismuth	µg/L	0.1		<1	< 1
Boron	µg/L	1	5000	7	7
Cadmium	µg/L	0.1	5	<0.01	0.01
Calcium	µg/L	50		16000	16000
Chromium	µg/L	1	50	<1	< 1
Cobalt	µg/L	0.1		<0.1	0.8
Copper	µg/L	1	1000	<1	3
Iron	µg/L	20	300	40	480
Lead	µg/L	0.1	10	<0.1	0.9
Lithium	µg/L	0.1		1.8	2.2
Magnesium	µg/L	10		6290	6260
Manganese	µg/L	1	50	<1	55
Mercury	µg/L	0.05	1	0.06	0.06
Molybdenum	µg/L	0.1		0.4	0.2
Nickel	µg/L	1		<1	2
Potassium	µg/L	20		340	350
Rubidium	µg/L	0.1		0.2	0.6
Selenium	µg/L	1	10	<1	< 1
Silver	µg/L	0.1		<0.1	< 0.1
Sodium	µg/L	50	200000	3130	3050
Strontium	µg/L	1		133	135
Tellurium	µg/L	0.1		<0.1	< 0.1
Thallium	µg/L	0.1		< 0.1	< 0.1
Tin	µg/L	0.1		<0.1	0.1
Uranium	µg/L	0.1	20	0.1	0.2
Vanadium	µg/L	1		< 1	< 1
Zinc	µg/L	1	5000	<1	7

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010)

C&D MW2SBR

C&D Site - Monitoring Well 2: Shallow Bedrock - General Chemistry

Laboratory ID:				351141-28	359715-26
Client ID:				C+D MW2SBR	C+D MW2SBR
Sample Station:				C+D MW2SBR	C+D MW2SBR
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13
	Units	MDL¹	Guidelines*	Results	Results
Alkalinity	mg/L	1		180	190
Ammonia	mg/L	0.05		<0.05	<0.05
Calcium	mg/L	0.05		36.8	36.4
Chloride	mg/L	0.5	250	1.1	0.8
Conductivity	µS/cm	1		352	370
Copper	mg/L	0.001	1	<0.001	<0.001
Cyanide	mg/L	0.002			
Iron	mg/L	0.02	0.3	<0.02	0.09
Magnesium	mg/L	0.01		19.4	19.1
Manganese	mg/L	0.001	0.05	0.023	0.107
Nitrate + Nitrite	mg/L	0.05	10	<0.05	<0.05
o-Phosphate	mg/L	0.01		<0.01	0.02
pH		-	6.5-8.5	8.1	7.9
Phenols	mg/L	0.001			
Potassium	mg/L	0.02		0.74	2.22
r-Silica	mg/L	0.1		12.6	12.8
Sodium	mg/L	0.05	200	7.78	9.48
Sulfate	mg/L	1	500	11	12
Tannin & Lignin	mg/L	0.5			
Total Organic Carbon	mg/L	0.5		0.7	0.7
Turbidity	NTU	0.1	NA	22.6	216
Zinc	mg/L	0.001	5	0.002	0.002
Calculated Parameters					
Bicarbonate	mg/L	-		178	189
Carbonate	mg/L	-		2.1	1.41
Hydroxide	mg/L	-		0.063	0.04
Cation sum	meq/L	-		3.79	3.87
Anion sum	meq/L	-		3.86	4.07
% difference	mg/L	-		-0.86	-2.57
Theoretical Conductivity	µS/cm	-		337	348
Hardness	mg/L	-		172	170
Ion Sum	mg/L	-		199	209
Saturation pH		-		7.8	7.8
Langelier Index		-		0.29	0.11
BOD	mg/L	3			
COD	mg/L	10			
Color	TCU	5			
Kjeldahl Nitrogen	mg/L	0.25			
Total Phosphorus	mg/L	0.002			
Total Dissolved Solids	mg/L	5			
Total Suspended Solids	mg/L	5		99	580
Volatile Suspended Solids	mg/L	5			

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010)

C&D MW2SBR

C&D Site - Monitoring Well 2: Shallow Bedrock - Trace Metals

Laboratory ID:				351141-28	359715-26
Client ID:				C+D MW2SBR	C+D MW2SBR
Sample Station:				C+D MW2SBR	C+D MW2SBR
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13
	Units	MDL¹	Guidelines*	Results	Results
Aluminium	µg/L	1	100	4	38
Antimony	µg/L	0.1	6	0.5	0.3
Arsenic	µg/L	1	10	1	2
Barium	µg/L	1	1000	171	142
Beryllium	µg/L	0.1		<0.1	< 0.1
Bismuth	µg/L	0.1		<1	< 1
Boron	µg/L	1	5000	28	45
Cadmium	µg/L	0.1	5	<0.01	< 0.01
Calcium	µg/L	50		36800	36400
Chromium	µg/L	1	50	<1	< 1
Cobalt	µg/L	0.1		<0.1	0.2
Copper	µg/L	1	1000	<1	< 1
Iron	µg/L	20	300	<20	90
Lead	µg/L	0.1	10	<0.1	0.1
Lithium	µg/L	0.1		5.9	15.4
Magnesium	µg/L	10		19400	19100
Manganese	µg/L	1	50	23	107
Mercury	µg/L	0.05	1	<0.025	0.07
Molybdenum	µg/L	0.1		0.6	1.6
Nickel	µg/L	1		<1	< 1
Potassium	µg/L	20		740	2220
Rubidium	µg/L	0.1		0.4	1.2
Selenium	µg/L	1	10	<1	< 1
Silver	µg/L	0.1		<0.1	< 0.1
Sodium	µg/L	50	200000	7780	9480
Strontium	µg/L	1		279	284
Tellurium	µg/L	0.1		<0.1	< 0.1
Thallium	µg/L	0.1		<0.1	< 0.1
Tin	µg/L	0.1		<0.1	< 0.1
Uranium	µg/L	0.1	20	0.5	0.7
Vanadium	µg/L	1		<1	< 1
Zinc	µg/L	1	5000	2	2

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010)

C&D MW3DBR

C&D Site - Monitoring Well 3: Deep Bedrock - General Chemistry

Laboratory ID:				351141-29	359715-27
Client ID:				C+D MW3DBR	C+D MW3DBR
Sample Station:				C+D MW3DBR	C+D MW3DBR
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13
	Units	MDL¹	Guidelines*	Results	Results
Alkalinity	mg/L	1		620	480
Ammonia	mg/L	0.05		0.07	<0.05
Calcium	mg/L	0.05		193	167
Chloride	mg/L	0.5	250	3	2.3
Conductivity	µS/cm	1		1180	1040
Copper	mg/L	0.001	1	<0.002	<0.002
Cyanide	mg/L	0.002			
Iron	mg/L	0.02	0.3	0.05	0.11
Magnesium	mg/L	0.01		49.2	43.4
Manganese	mg/L	0.001	0.05	5.69	0.359
Nitrate + Nitrite	mg/L	0.05	10	0.27	0.06
o-Phosphate	mg/L	0.01		<0.01	<0.01
pH		-	6.5-8.5	7.2	6.8
Phenols	mg/L	0.001			
Potassium	mg/L	0.02		1.34	1.3
r-Silica	mg/L	0.1		15.2	12.8
Sodium	mg/L	0.05	200	4.7	6.2
Sulfate	mg/L	1	500	88	119
Tannin & Lignin	mg/L	0.5			
Total Organic Carbon	mg/L	0.5		4.8	3.1
Turbidity	NTU	0.1	NA	63.3	26.4
Zinc	mg/L	0.001	5	0.015	0.006
Calculated Parameters					
Bicarbonate	mg/L	-		619	480
Carbonate	mg/L	-		0.922	0.285
Hydroxide	mg/L	-		0.008	0.003
Cation sum	meq/L	-		14.1	12.2
Anion sum	meq/L	-		14.3	12.1
% difference	mg/L	-		-0.67	0.37
Theoretical Conductivity	µS/cm	-		1140	1020
Hardness	mg/L	-		684	596
Ion Sum	mg/L	-		740	646
Saturation pH		-		6.7	6.8
Langelier Index		-		0.53	-0.03
BOD	mg/L	3			
COD	mg/L	10			
Color	TCU	5			
Kjeldahl Nitrogen	mg/L	0.25			
Total Phosphorus	mg/L	0.002			
Total Dissolved Solids	mg/L	5			
Total Suspended Solids	mg/L	5		125	60
Volatile Suspended Solids	mg/L	5			

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010)

C&D MW3DBR

C&D Site - Monitoring Well 3: Deep Bedrock - Trace Metals

Laboratory ID:				351141-29	359715-27
Client ID:				C+D MW3DBR	C+D MW3SBR
Sample Station:				C+D MW3DBR	C+D MW3SBR
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13
	Units	MDL¹	Guidelines*	Results	Results
Aluminium	µg/L	1	100	2	15
Antimony	µg/L	0.1	6	0.5	< 0.2
Arsenic	µg/L	1	10	<2	< 2
Barium	µg/L	1	1000	55	35
Beryllium	µg/L	0.1		<0.2	< 0.2
Bismuth	µg/L	0.1		<2	< 2
Boron	µg/L	1	5000	7	9
Cadmium	µg/L	0.1	5	0.04	< 0.02
Calcium	µg/L	50		193000	167000
Chromium	µg/L	1	50	<2	< 2
Cobalt	µg/L	0.1		6.3	0.3
Copper	µg/L	1	1000	<2	< 2
Iron	µg/L	20	300	50	110
Lead	µg/L	0.1	10	<0.2	< 0.2
Lithium	µg/L	0.1		2.5	3.8
Magnesium	µg/L	10		49200	43400
Manganese	µg/L	1	50	5690	359
Mercury	µg/L	0.05	1	0.06	< 0.025
Molybdenum	µg/L	0.1		1.1	0.3
Nickel	µg/L	1		18	3
Potassium	µg/L	20		1340	1300
Rubidium	µg/L	0.1		0.5	0.4
Selenium	µg/L	1	10	<2	< 2
Silver	µg/L	0.1		<0.2	< 0.2
Sodium	µg/L	50	200000	4700	6200
Strontium	µg/L	1		1020	894
Tellurium	µg/L	0.1		<0.2	< 0.2
Thallium	µg/L	0.1		<0.2	< 0.2
Tin	µg/L	0.1		<0.2	< 0.2
Uranium	µg/L	0.1	20	3.6	3.3
Vanadium	µg/L	1		<2	< 2
Zinc	µg/L	1	5000	15	6

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010)

C&D MW4SBR

C&D Site - Monitoring Well 4: Shallow Bedrock - General Chemistry

Laboratory ID:				351141-30	359715-28
Client ID:				MW4SBR	MW4SBR
Sample Station:				MW4SBR	MW4SBR
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13
	Units	MDL¹	Guidelines*	Results	Results
Alkalinity	mg/L	1		37	44
Ammonia	mg/L	0.05		<0.05	<0.05
Calcium	mg/L	0.05		9.92	11.5
Chloride	mg/L	0.5	250	1.4	1.2
Conductivity	µS/cm	1		86	101
Copper	mg/L	0.001	1	<0.001	0.004
Cyanide	mg/L	0.002			
Iron	mg/L	0.02	0.3	0.03	0.13
Magnesium	mg/L	0.01		2.5	2.9
Manganese	mg/L	0.001	0.05	0.002	0.001
Nitrate + Nitrite	mg/L	0.05	10	0.21	0.12
o-Phosphate	mg/L	0.01		<0.01	<0.01
pH		-	6.5-8.5	7.4	6.8
Phenols	mg/L	0.001			
Potassium	mg/L	0.02		0.32	0.32
r-Silica	mg/L	0.1		9.1	9.4
Sodium	mg/L	0.05	200	2.08	2.21
Sulfate	mg/L	1	500	4	4
Tannin & Lignin	mg/L	0.5			
Total Organic Carbon	mg/L	0.5		1.5	0.8
Turbidity	NTU	0.1	NA	351	174
Zinc	mg/L	0.001	5	0.002	0.005
Calculated Parameters					
Bicarbonate	mg/L	-		36.9	44
Carbonate	mg/L	-		0.087	0.026
Hydroxide	mg/L	-		0.013	0.003
Cation sum	meq/L	-		0.801	0.924
Anion sum	meq/L	-		0.877	1
% difference	mg/L	-		-4.53	-4.2
Theoretical Conductivity	µS/cm	-		83	93
Hardness	mg/L	-		35.1	40.7
Ion Sum	mg/L	-		53	59
Saturation pH		-		9	8.8
Langelier Index		-		-1.58	-2.04
BOD	mg/L	3			
COD	mg/L	10			
Color	TCU	5			
Kjeldahl Nitrogen	mg/L	0.25			
Total Phosphorus	mg/L	0.002			
Total Dissolved Solids	mg/L	5			
Total Suspended Solids	mg/L	5		655	364
Volatile Suspended Solids	mg/L	5			

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010)

C&D MW4SBR

C&D Site - Monitoring Well 4: Shallow Bedrock - Trace Metals

Laboratory ID:				359715-28	359715-28
Client ID:				C+D MW4SBR	C+D MW4SBR
Sample Station:				C+D MW4SBR	C+D MW4SBR
Date: (YYYY/MM/DD)				2020/04/27	2020/07/13
	Units	MDL¹	Guidelines*	Results	Results
Aluminium	µg/L	1	100	22	69
Antimony	µg/L	0.1	6	<0.1	< 0.1
Arsenic	µg/L	1	10	<1	< 1
Barium	µg/L	1	1000	10	11
Beryllium	µg/L	0.1		<0.1	< 0.1
Bismuth	µg/L	0.1		<1	< 1
Boron	µg/L	1	5000	18	20
Cadmium	µg/L	0.1	5	<0.01	< 0.01
Calcium	µg/L	50		9920	11500
Chromium	µg/L	1	50	1	< 1
Cobalt	µg/L	0.1		<0.1	< 0.1
Copper	µg/L	1	1000	<1	4
Iron	µg/L	20	300	30	130
Lead	µg/L	0.1	10	<0.1	0.3
Lithium	µg/L	0.1		0.8	0.9
Magnesium	µg/L	10		2500	2900
Manganese	µg/L	1	50	2	1
Mercury	µg/L	0.05	1	0.06	< 0.025
Molybdenum	µg/L	0.1		<0.1	< 0.1
Nickel	µg/L	1		<1	< 1
Potassium	µg/L	20		320	320
Rubidium	µg/L	0.1		0.2	0.3
Selenium	µg/L	1	10	<1	< 1
Silver	µg/L	0.1		<0.1	< 0.1
Sodium	µg/L	50	200000	2080	2210
Strontium	µg/L	1		57	65
Tellurium	µg/L	0.1		<0.1	< 0.1
Thallium	µg/L	0.1		<0.1	< 0.1
Tin	µg/L	0.1		<0.1	< 0.1
Uranium	µg/L	0.1	20	<0.1	< 0.1
Vanadium	µg/L	1		<1	< 1
Zinc	µg/L	1	5000	2	5

¹ Method Detection Limit

* Guideline values provided for comparative purposes only. Guideline values can be exceeded depending on site specific natural water quality.

Shaded cells indicate elevated analyte concentrations relative to guideline value (Health Canada 2010)

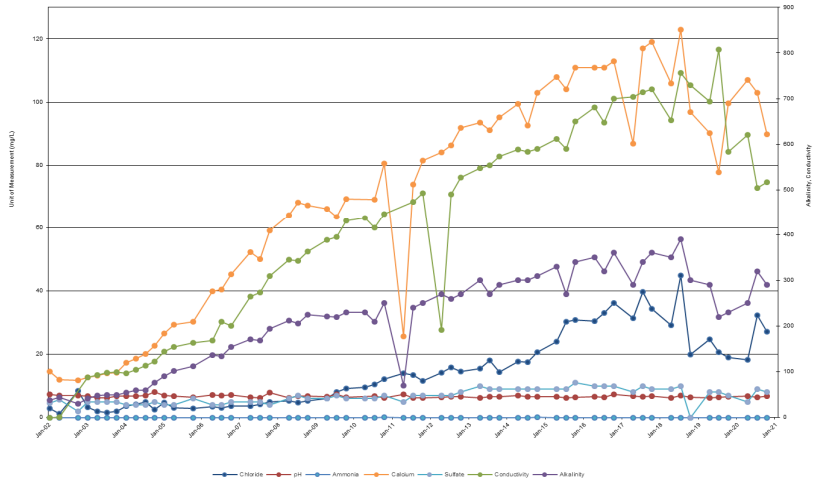
Monitoring Wells Groundwater Elevations

MW	TOC Elevation	Static Water Level Elevation (m)			
		Jan/20	Apr/20	Jul/20	Oct/20
MW1ST	290.538	not	286.24	285.74	285.93
MW1DT	290.217	sampled	278.72	275.94	276.12
MW1SBR	290.184		277.40	275.54	275.71
MW1DBR	290.092		279.03	276.25	271.36
MW2ST	265.581		262.85	263.35	362.38
MW2DT	265.671		263.57	263.73	262.25
MW3ST	269.672		263.37	261.70	Dry
MW3DT	269.519		264.51	262.32	262.10
MW4ST	265.317		264.24	262.57	263.10
MW4DT	265.086		264.29	261.79	262.54
MW5ST	265.234		261.46	260.84	261.45
MW5DT	265.137		261.44	260.83	261.49
MW6ST	260.878		260.03	259.71	259.66
MW6DT	260.757		overflow	overflow	overflow
MW6SBR	260.766		overflow	overflow	overflow
MW6DBR	260.792		overflow	overflow	overflow
MW7ST	261.163		259.36	259.00	259.26
MW7DT	260.64		258.97	258.63	258.02
MW7SBR	260.699		259.42	259.04	258.51
MW7DBR	260.945		260.01	259.48	259.10
MW 8A	295.115		292.47	287.15	291.80
MW 8B	295.201		292.41	289.94	291.78
ADI97-4ST	262.04		260.29	259.62	260.05
ADI97-4DT	261.99		260.34	259.60	259.60
MW9ST			3.16 (water level)	Dry	Dry
MW9DT			12.38 (water level)	12.92 (water level)	Dry

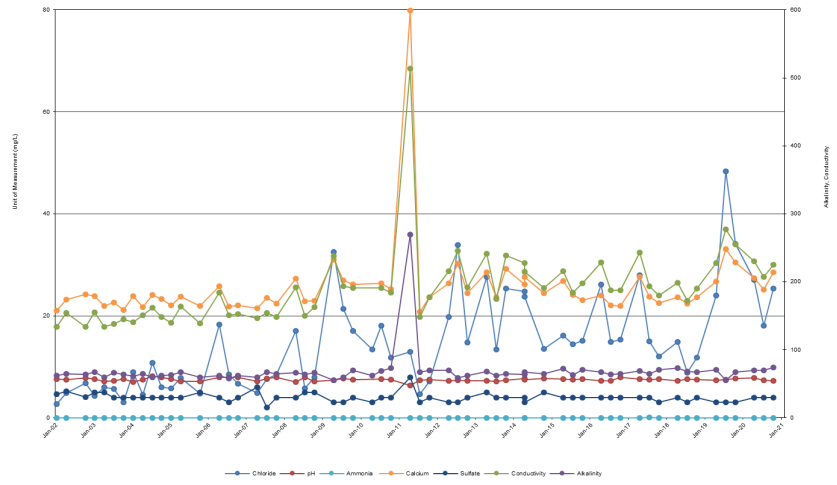
Groundwater Field Parameters

Monitoring Well	Parameter	Measurement	Date of Sample			
			Jan-20	Apr-20	Jul-20	Oct-20
MW1ST	pH		not sampled	7.3	7.9	7.0
	Temp	(deg.C)		5.4	8.3	8.1
	Conductivity	umhos		348	608	478
	Dissolved Oxygen	mg/l		8.62	7.98	3.68
MW1DT	pH			7.8	8.0	7.8
	Temp	(deg.C)		5.8	7.8	6.2
	Conductivity	umhos		236	186	225
	Dissolved Oxygen	mg/l		15.51	15.02	10.34
MW1SBR	pH			8.0	9.5	9.2
	Temp	(deg.C)		7.3	10.3	7.1
	Conductivity	umhos		400	350	443
	Dissolved Oxygen	mg/l		4.48	4.28	5.77
MW1DBR	pH			8.2	7.8	7.7
	Temp	(deg.C)		6.0	9.6	6.6
	Conductivity	umhos		348	317	239
	Dissolved Oxygen	mg/l		3.67	4.03	4.34
MW2ST	pH			7.9	8.3	8.0
	Temp	(deg.C)		10.1	9.2	10.8
	Conductivity	umhos		466	281	315
	Dissolved Oxygen	mg/l		7.61	7.39	3.16
MW2DT	pH			7.9	7.1	7.3
	Temp	(deg.C)		6.9	7.5	11.2
	Conductivity	umhos		444	231	464
	Dissolved Oxygen	mg/l		5.29	7.10	5.11
MW3ST	pH			8.0	Dry	Dry
	Temp	(deg.C)		9.8		
	Conductivity	umhos		443		
	Dissolved Oxygen	mg/l		9.20		
MW3DT	pH			8.0	8.1	8.9
	Temp	(deg.C)		10.2	12.7	10.3
	Conductivity	umhos		512	507	495
	Dissolved Oxygen	mg/l		9.45	9.37	6.94
MW4ST	pH			7.9	8.0	7.5
	Temp	(deg.C)		5.6	11.1	7.1
	Conductivity	umhos		254	358	319
	Dissolved Oxygen	mg/l		3.11	2.40	5.18
MW4DT	pH			7.7	8.0	7.6
	Temp	(deg.C)		6.8	12.6	7.6
	Conductivity	umhos		290	396	250
	Dissolved Oxygen	mg/l		5.25	6.33	5.76
MW5ST	pH			7.0	8.3	9.9
	Temp	(deg.C)		5.5	10.0	10.3
	Conductivity	umhos		271	267	247
	Dissolved Oxygen	mg/l		4.94	4.56	3.19
MW5DT	pH			7.5	8.1	8.2
	Temp	(deg.C)		7.7	9.4	8.1
	Conductivity	umhos		377	347	395
	Dissolved Oxygen	mg/l		2.39	3.07	3.23
MW6ST	pH			7.4	7.8	7.7
	Temp	(deg.C)		4.9	9.5	5.3
	Conductivity	umhos		648	553	2020
	Dissolved Oxygen	mg/l		2.05	1.60	7.51
MW6DT	pH			8.2	7.7	7.6
	Temp	(deg.C)		7.0	7.4	5.9
	Conductivity	umhos		230	201	205
	Dissolved Oxygen	mg/l		7.71	4.10	4.61
MW6SBR	pH			7.6	8.4	4.3
	Temp	(deg.C)		6.9	7.0	5.2
	Conductivity	umhos		208	205	216
	Dissolved Oxygen	mg/l		7.81	11.10	8.48
MW6DBR	pH			7.8	7.7	7.6
	Temp	(deg.C)		6.8	7.6	8.3
	Conductivity	umhos		1872	1747	572
	Dissolved Oxygen	mg/l		2.31	1.10	2.75
MW7ST	pH			7.3	7.7	7.4
	Temp	(deg.C)		6.6	8.4	7.6
	Conductivity	umhos		285	250	290
	Dissolved Oxygen	mg/l		2.91	3.09	5.38
MW7DT	pH			7.4	8.3	8.6
	Temp	(deg.C)		6.6	9.8	7.0
	Conductivity	umhos		279	263	304
	Dissolved Oxygen	mg/l		2.27	2.23	3.29
MW7SBR	pH			8.2	8.1	8.0
	Temp	(deg.C)		6.9	8.4	6.5
	Conductivity	umhos		312	276	188.3
	Dissolved Oxygen	mg/l		2.01	1.95	4.28
MW7DBR	pH			8.0	7.9	7.7
	Temp	(deg.C)		6.6	9.9	6.6
	Conductivity	umhos		1811	1568	1332
	Dissolved Oxygen	mg/l		1.17	1.09	5.21
ADI97-4ST	pH			7.0	7.8	8.8
	Temp	(deg.C)		5.5	8.9	9.9
	Conductivity	umhos		282	292	347
	Dissolved Oxygen	mg/l		3.94	3.10	5.60
ADI97-4DT	pH			7.5	7.7	7.5
	Temp	(deg.C)		6.6	8.0	8.2
	Conductivity	umhos		314	274	446
	Dissolved Oxygen	mg/l		4.07	4.50	2.60
MW 8ST	pH			7.6	8.3	8.7
	Temp	(deg.C)		4.6	7.9	7.9
	Conductivity	umhos		134.6	187	152.2
	Dissolved Oxygen	mg/l		13.59	14.60	8.68
MW 8SBR	pH			7.3	8.2	7.9
	Temp	(deg.C)		5.2	7.1	7.3
	Conductivity	umhos		121.6	172	141
	Dissolved Oxygen	mg/l		14.07	13.99	9.42
MW 9ST	pH			7.6	Dry	Dry
	Temp	(deg.C)		5.0		
	Conductivity	umhos		1602		
	Dissolved Oxygen	mg/l		7.54		
MW 9DT	pH			8.1	8.4	Dry
	Temp	(deg.C)		7.0	9.9	
	Conductivity	umhos		203	165	
	Dissolved Oxygen	mg/l		11.18	11.80	

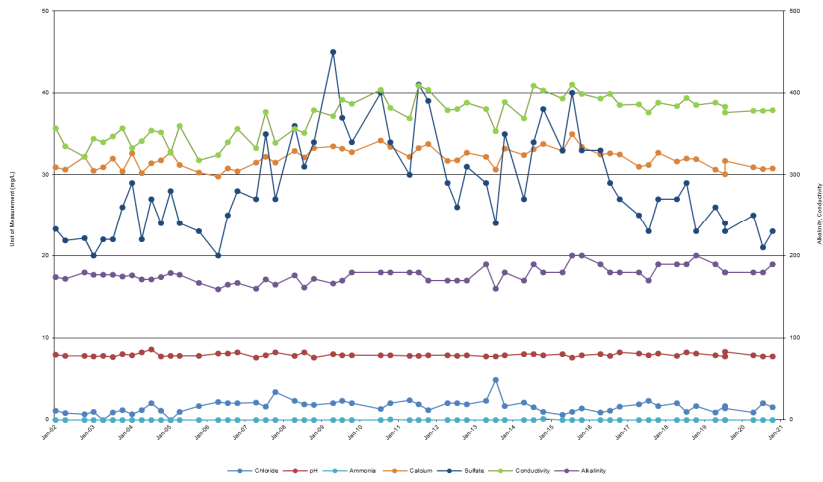
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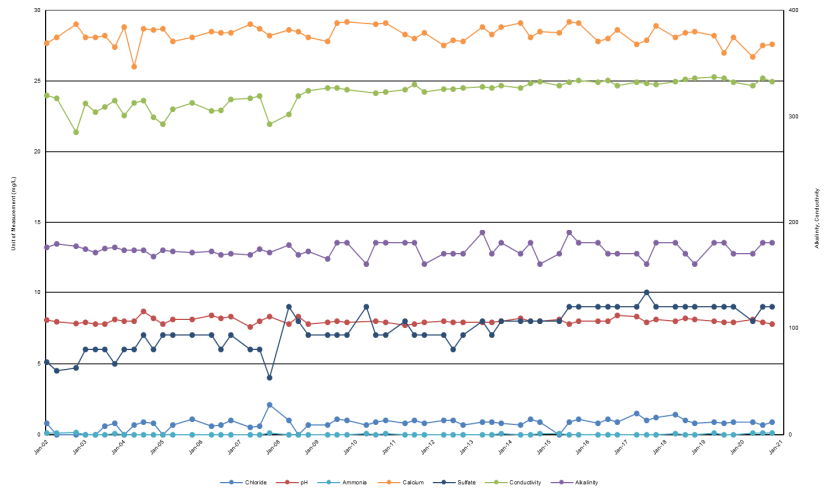
MW1DT



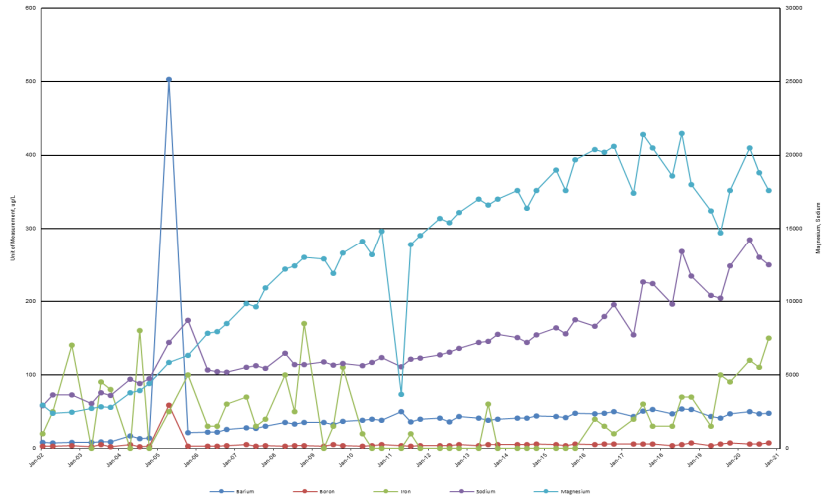
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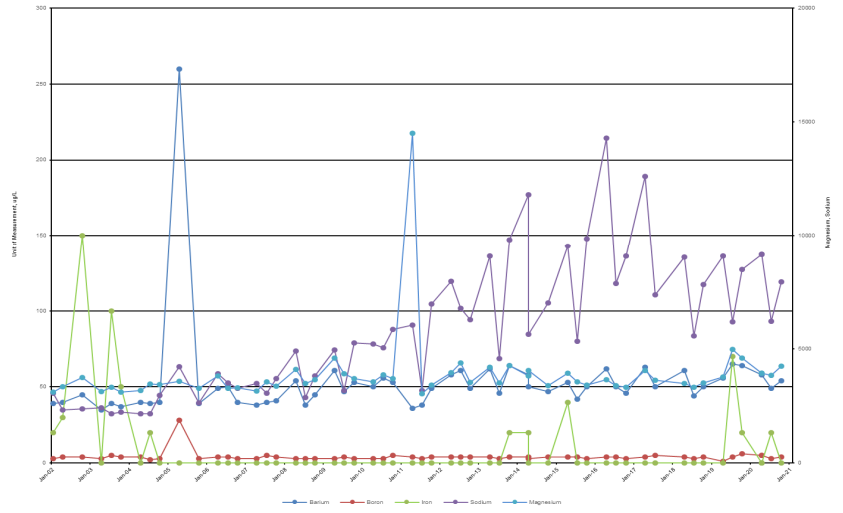
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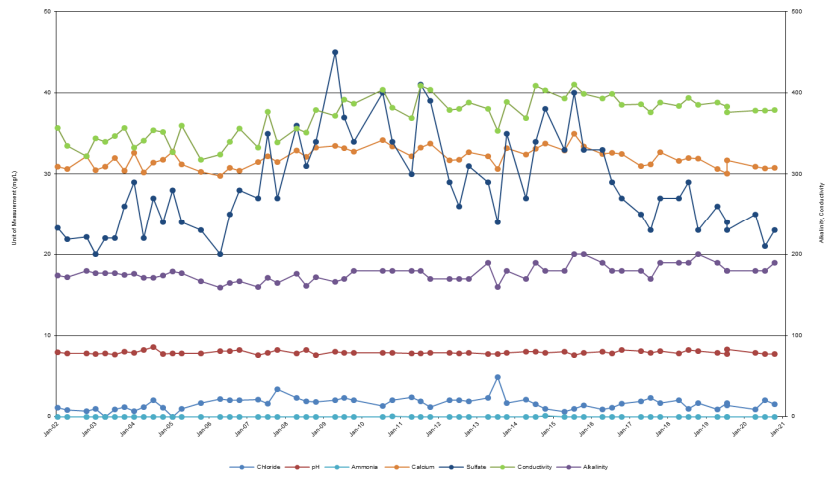
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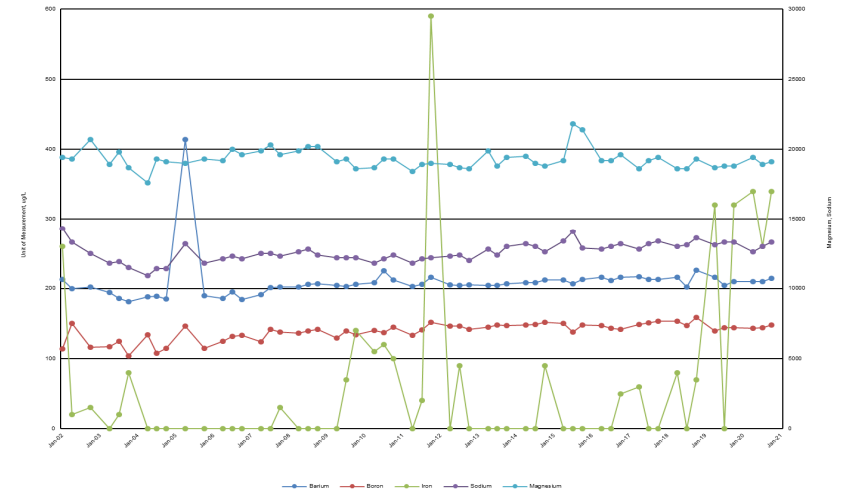
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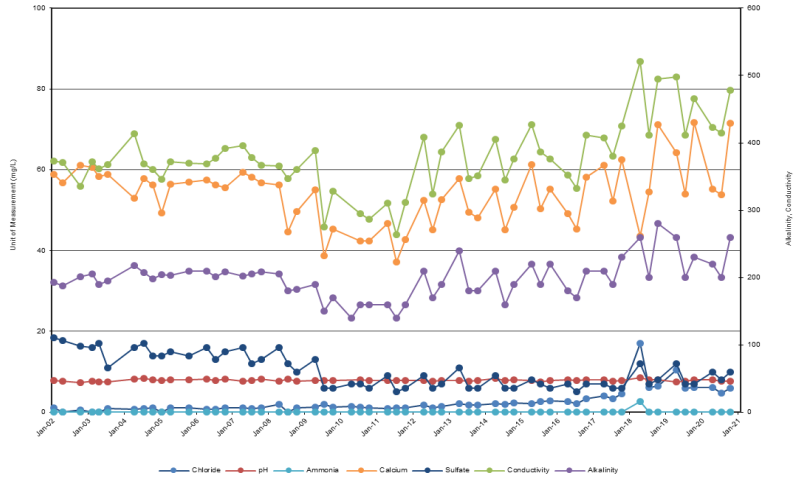
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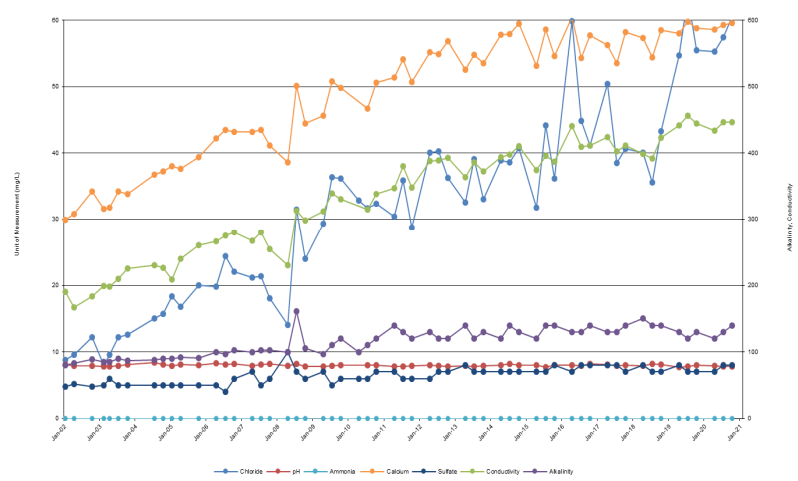
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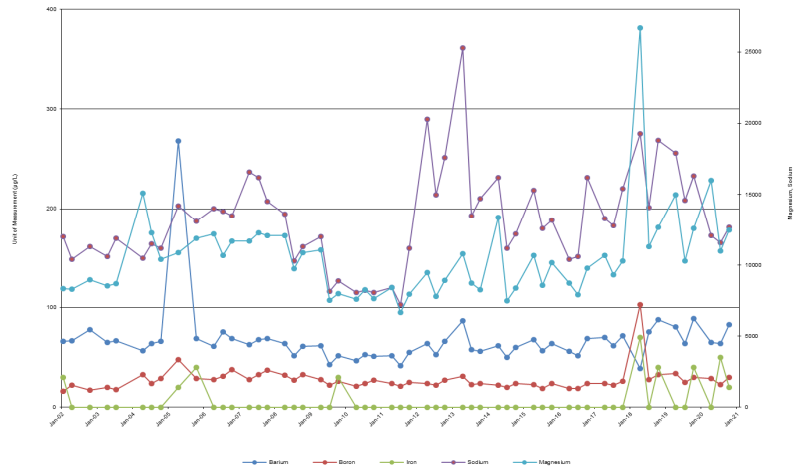
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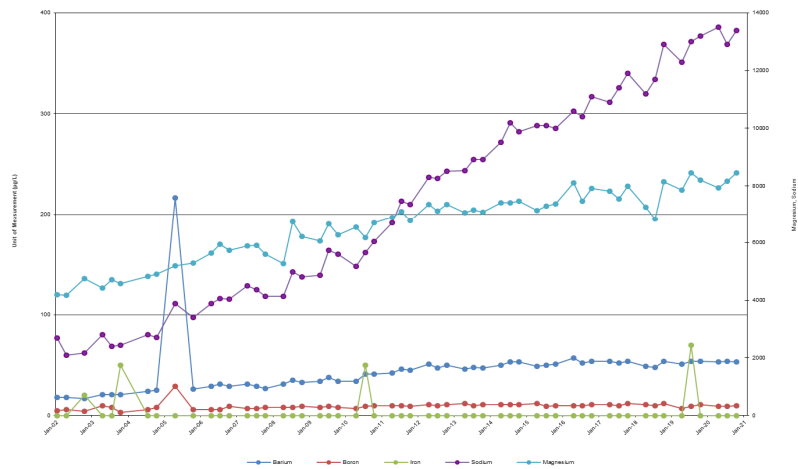
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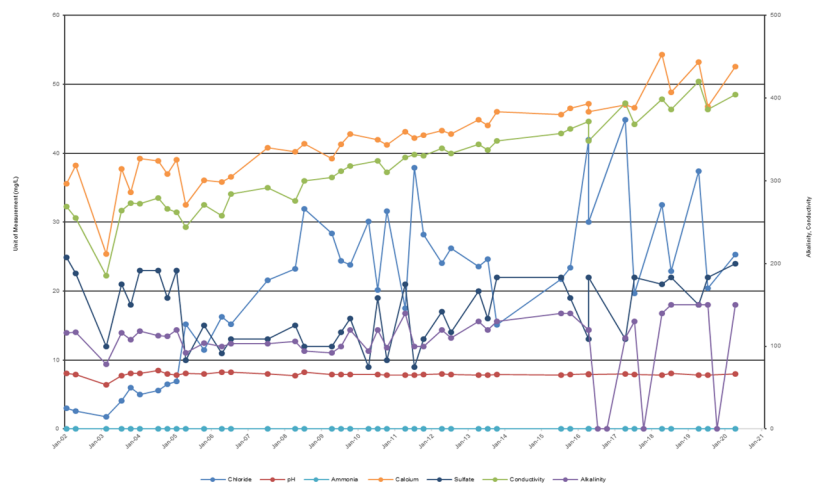
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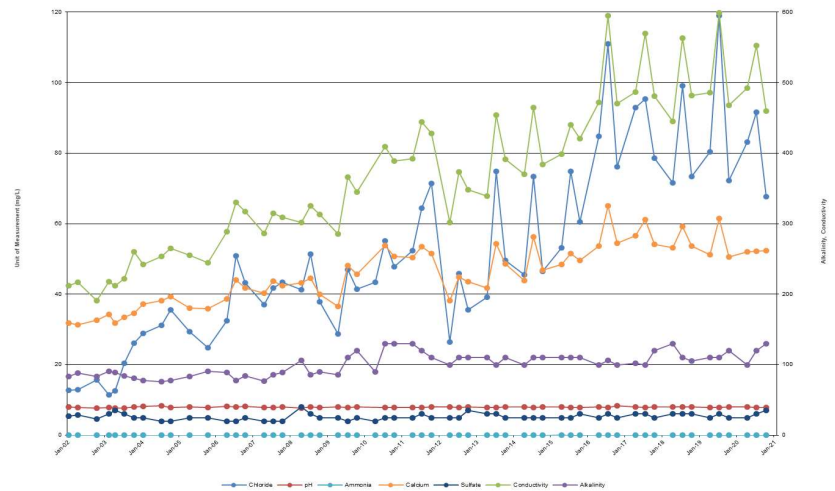
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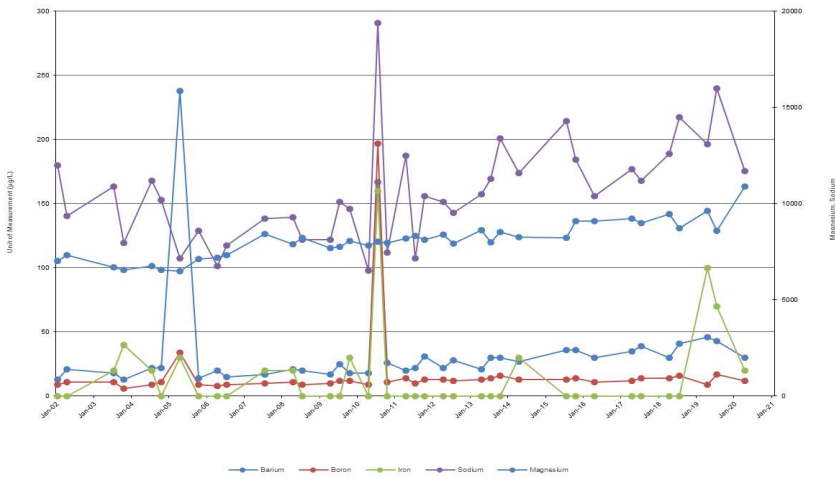
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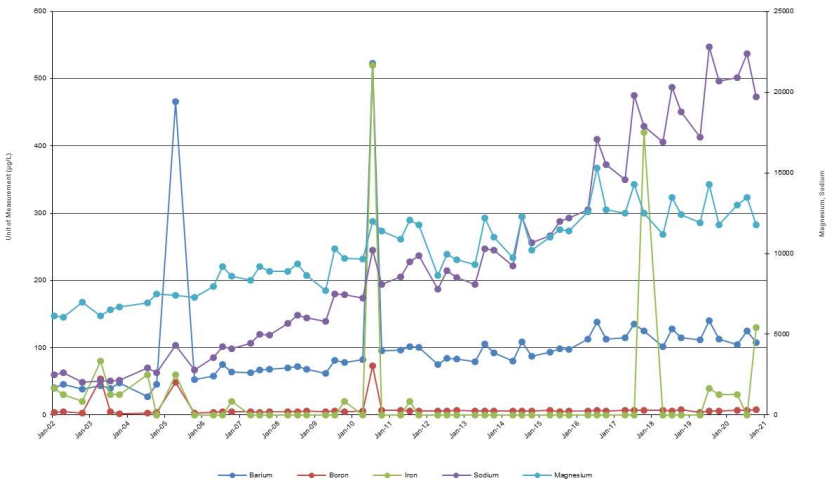
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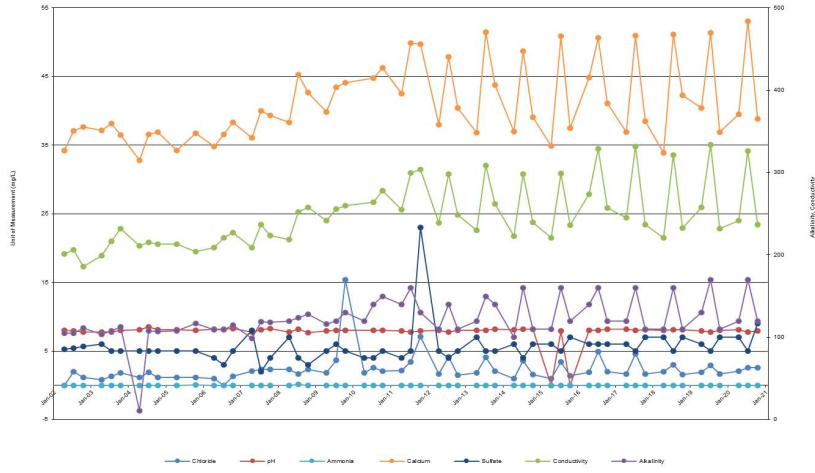
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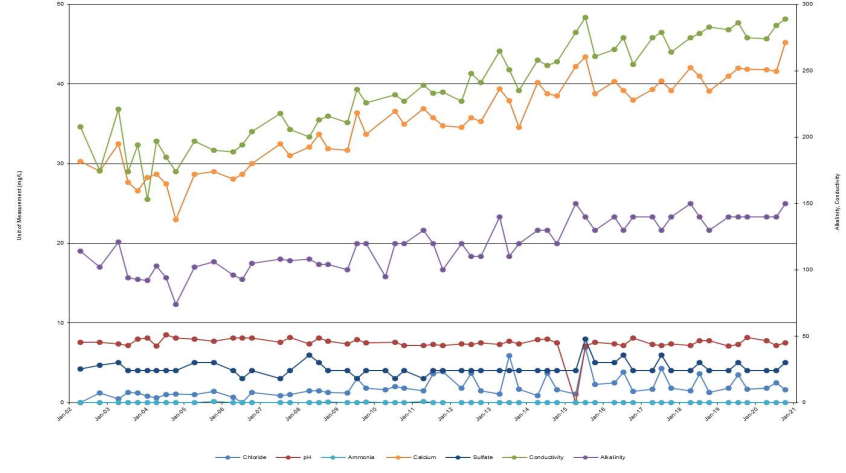
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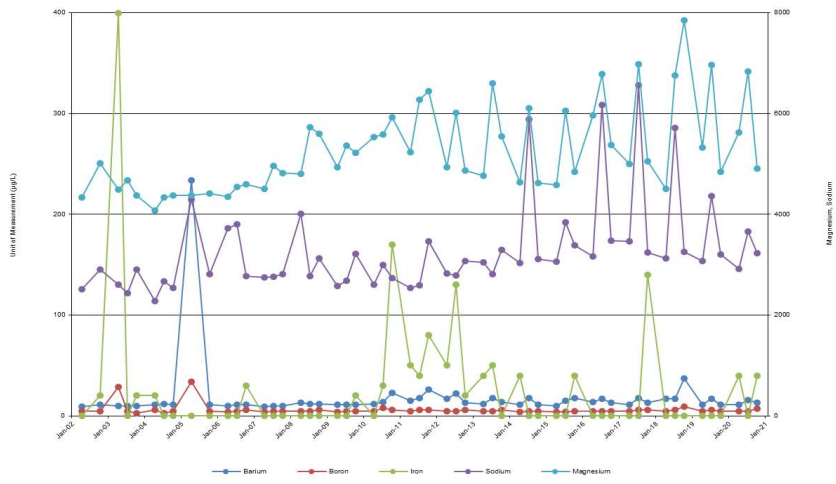
MW4ST



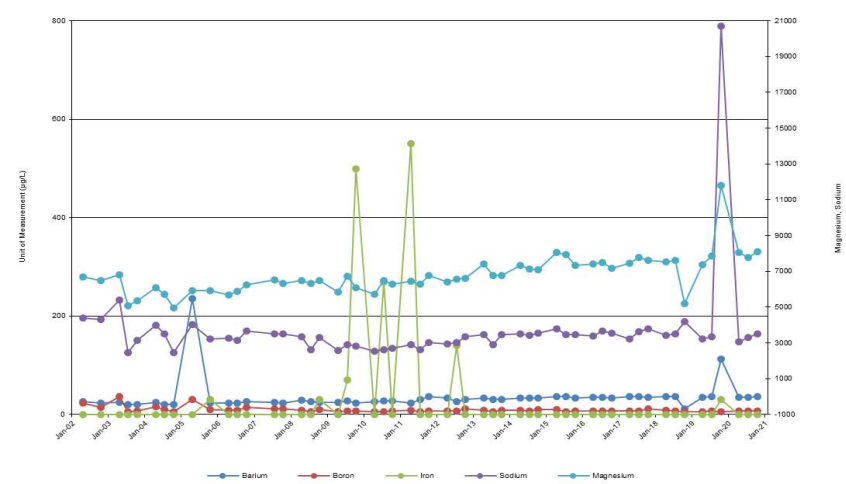
MW4DT



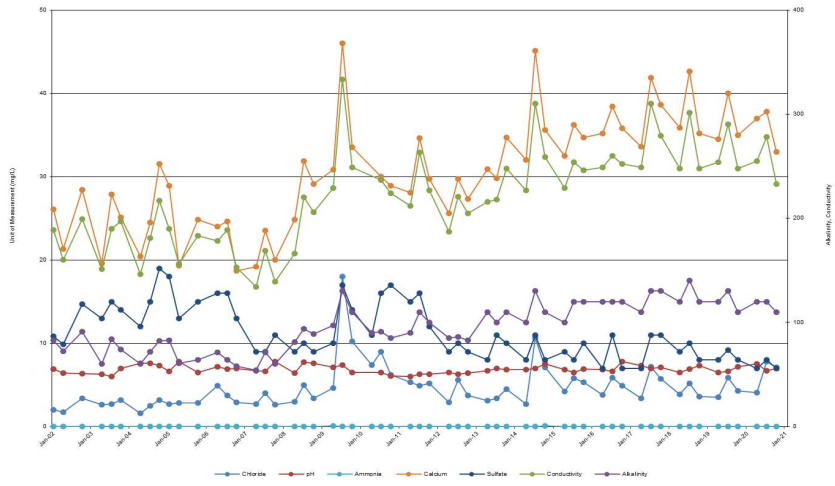
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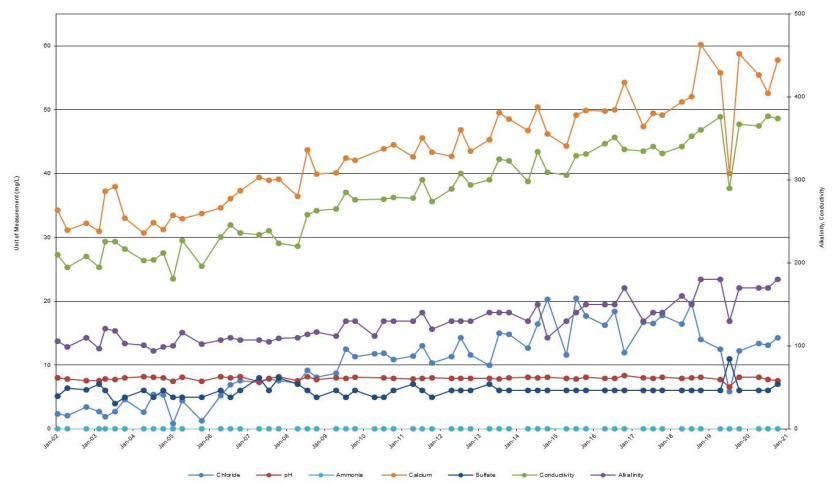
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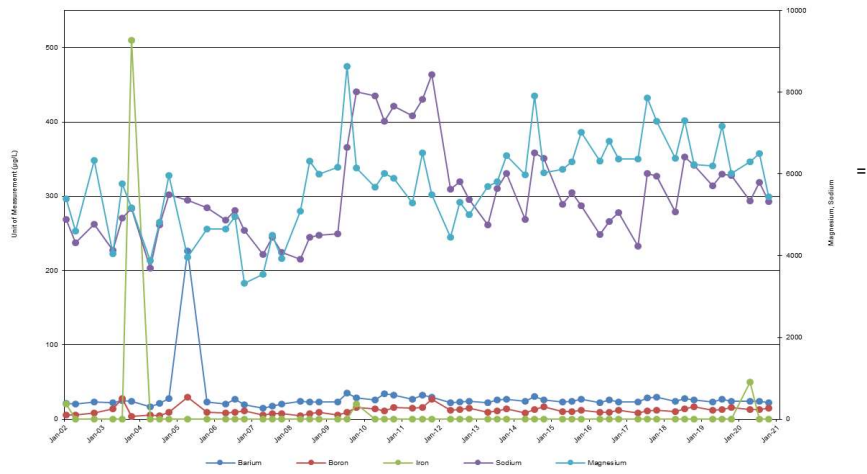
MW5ST



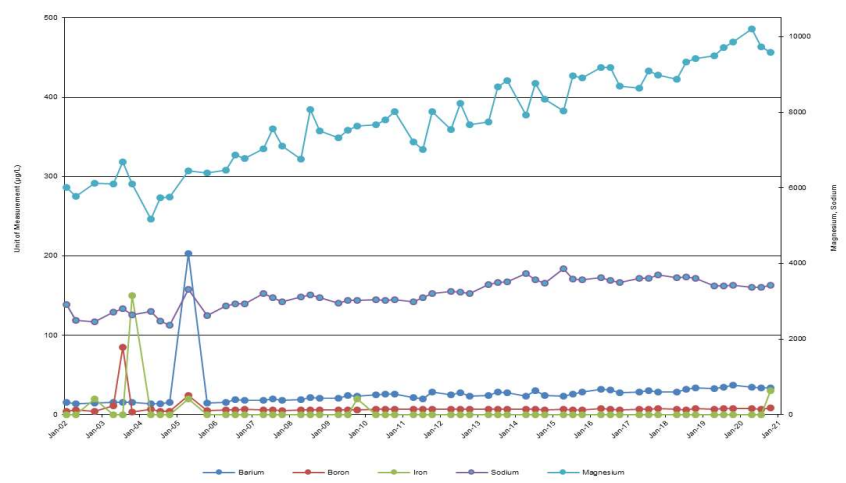
MW5DT



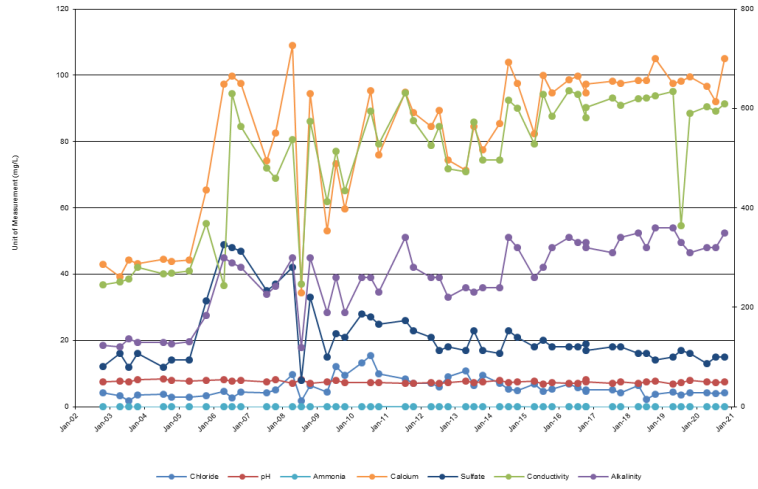
MW5ST



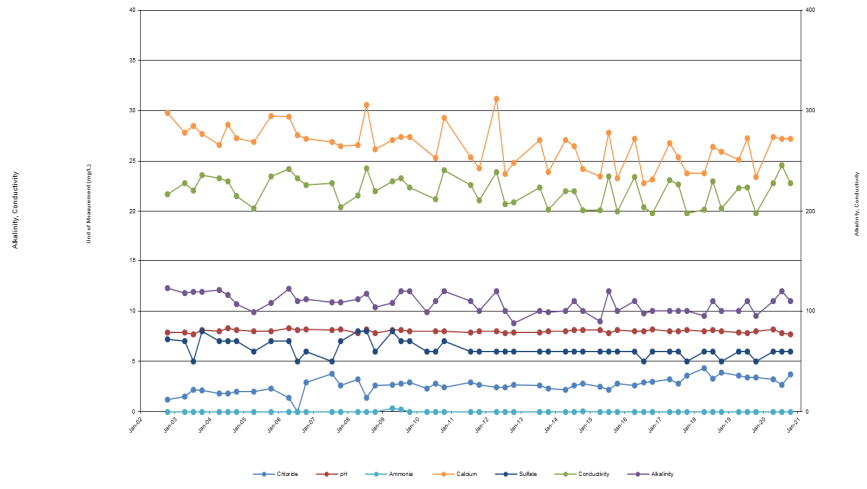
MW5DT



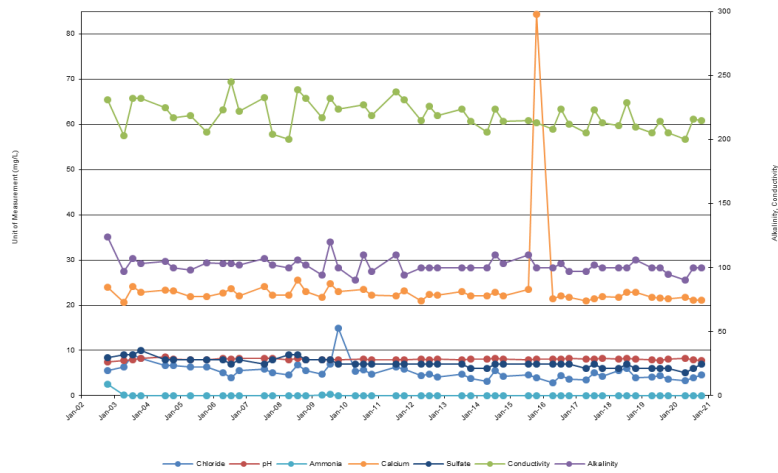
MW6ST



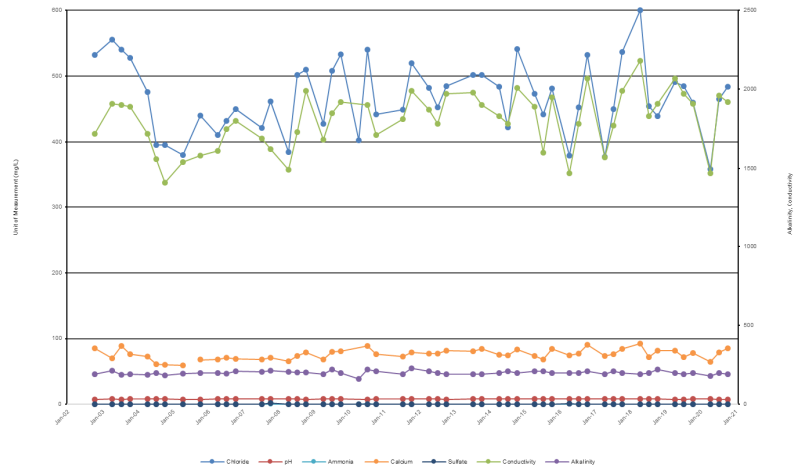
MW6DT



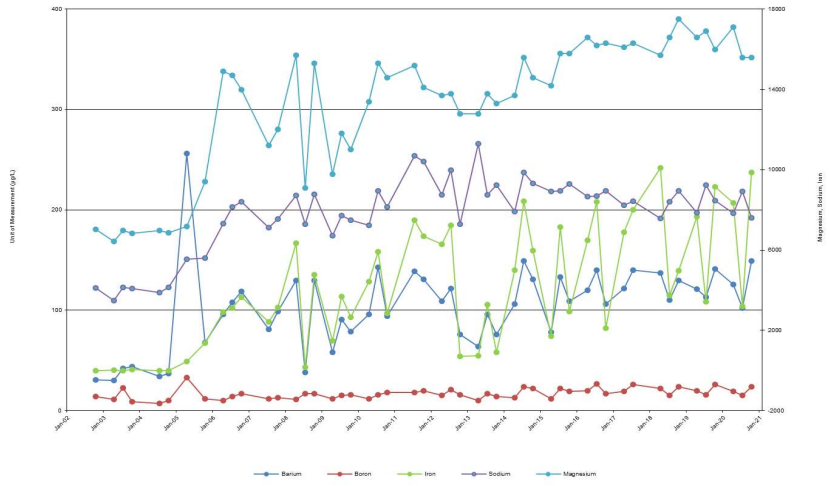
MW6SBR



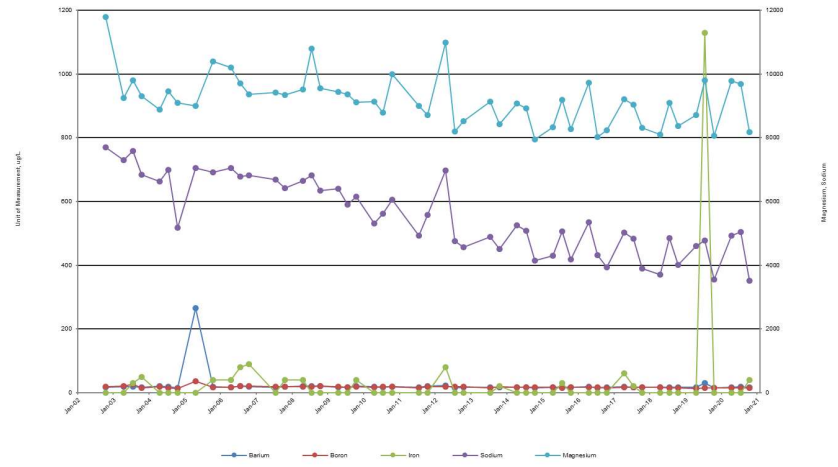
MW6DBR



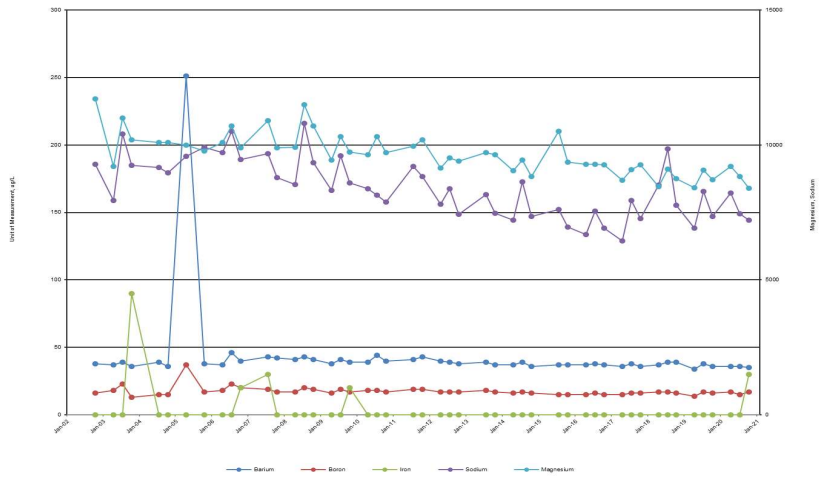
MW6ST



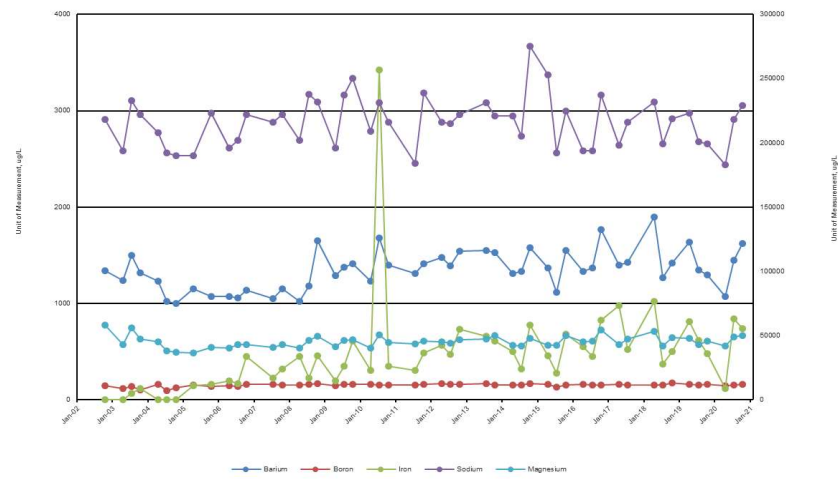
MW6DT



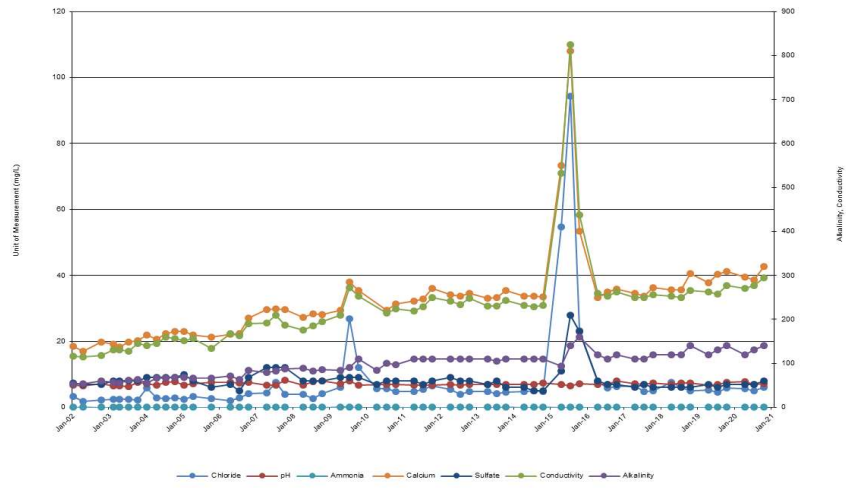
MW6SBR



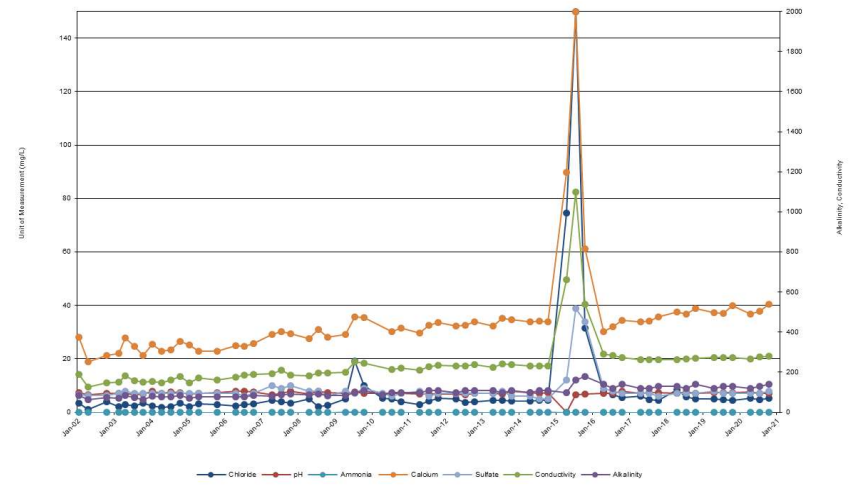
MW6DBR



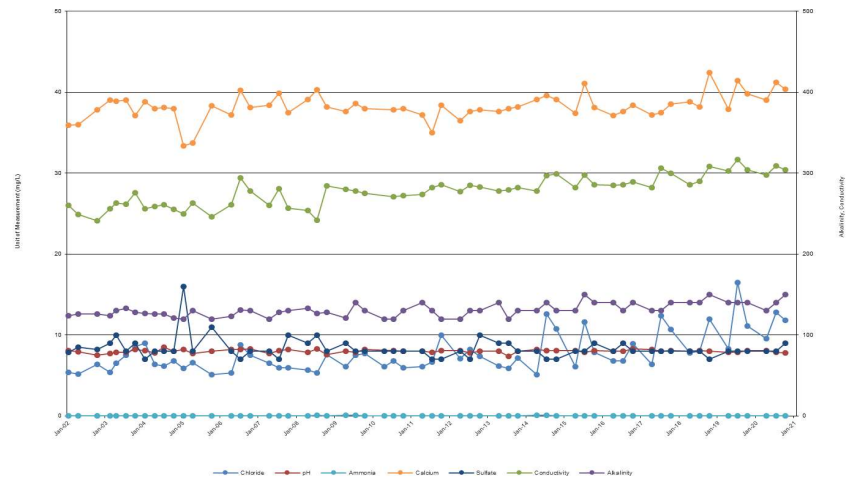
MW7ST



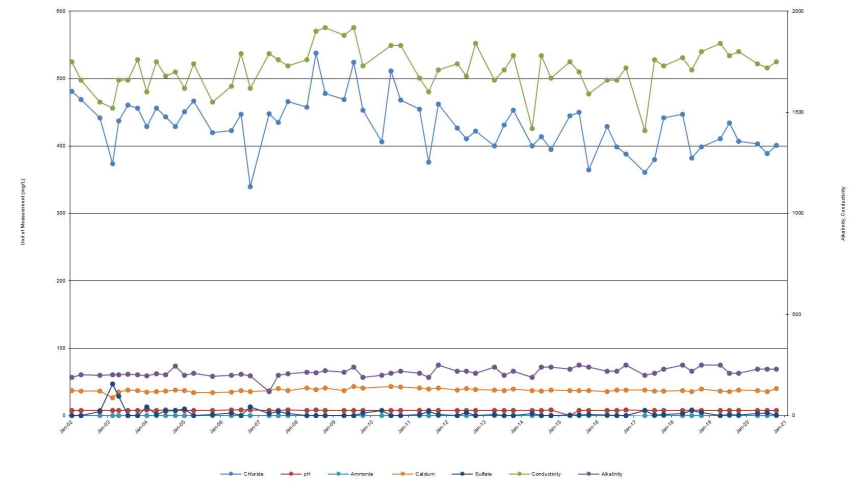
MW7DT



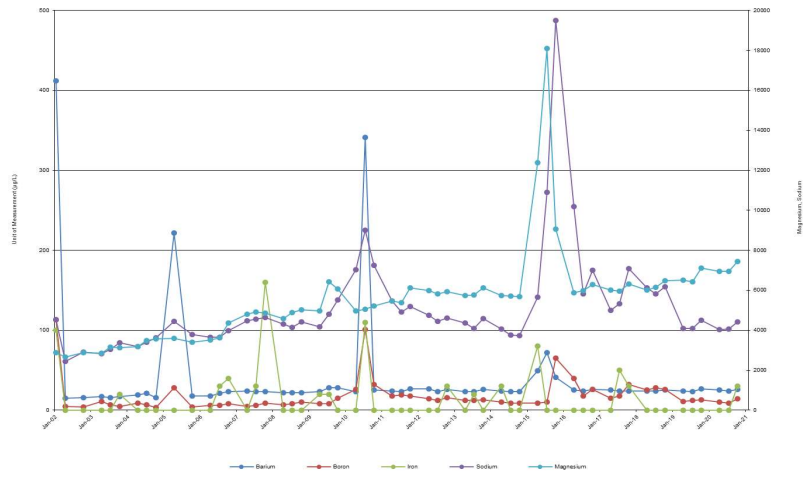
MW7SBR



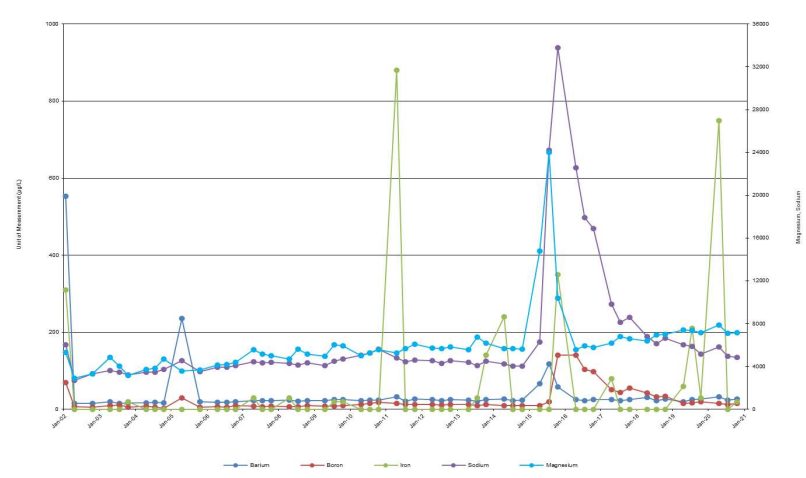
MW7DBR



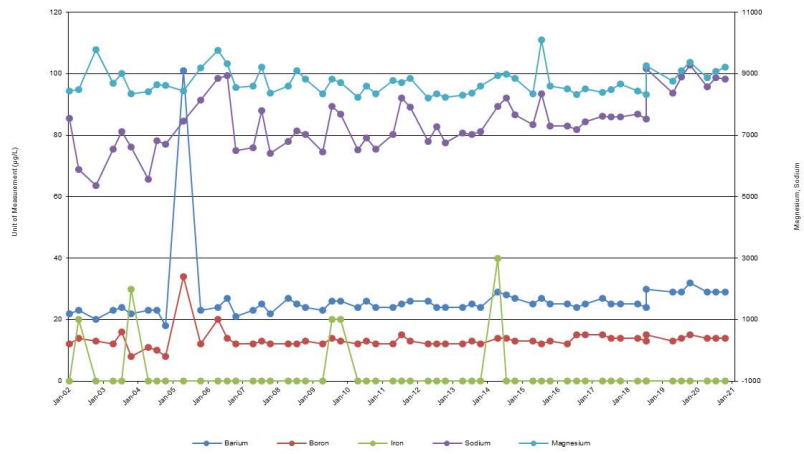
MW7ST



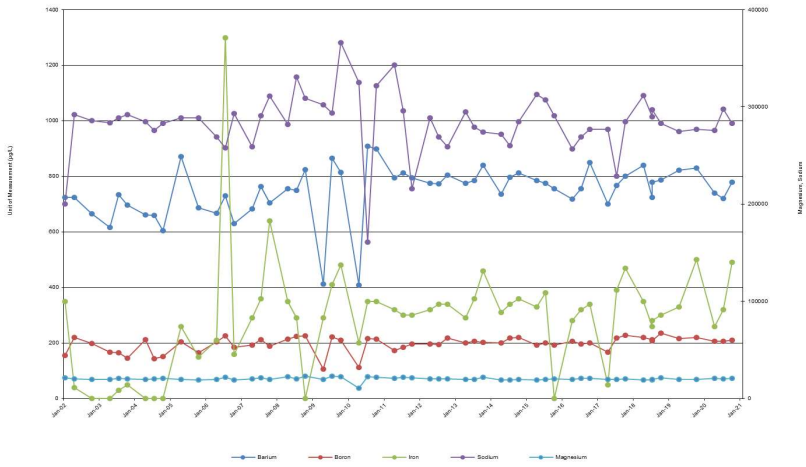
MW7DT



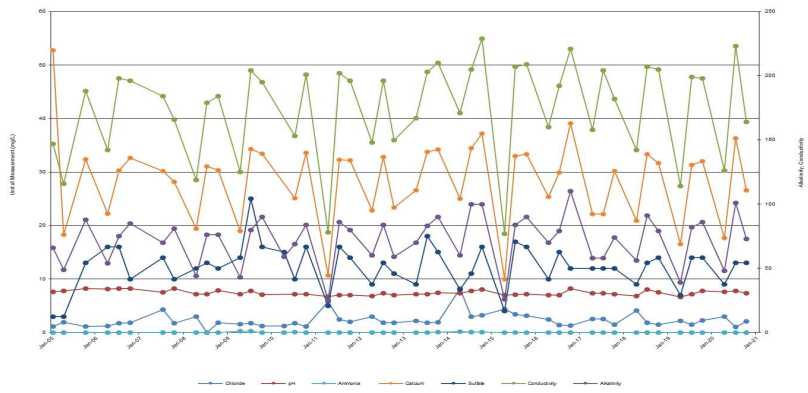
MW7SBR



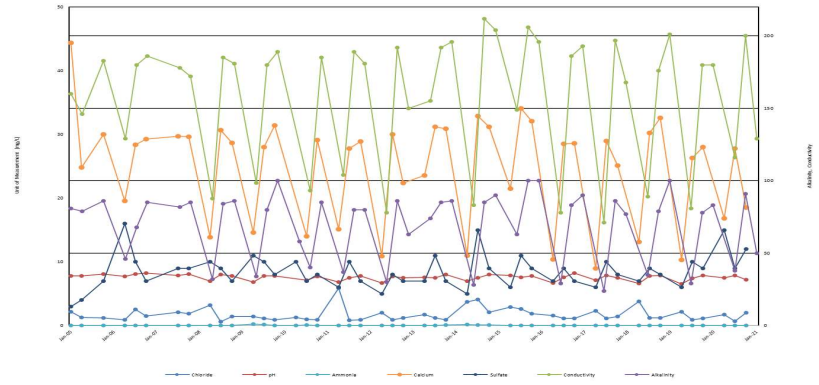
MW7DBR



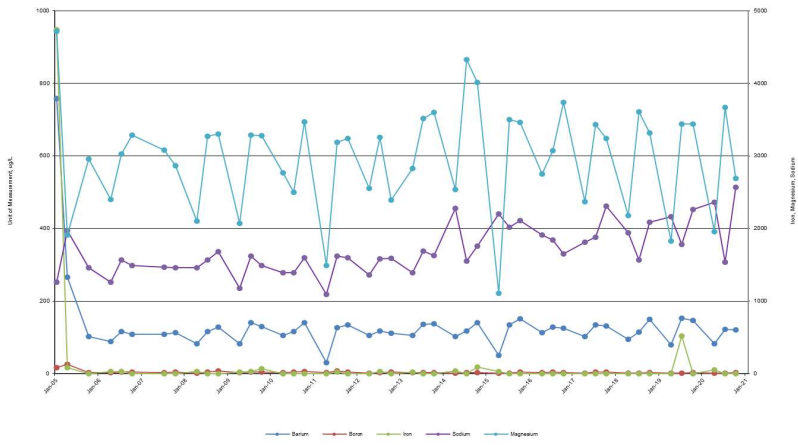
MW 8A



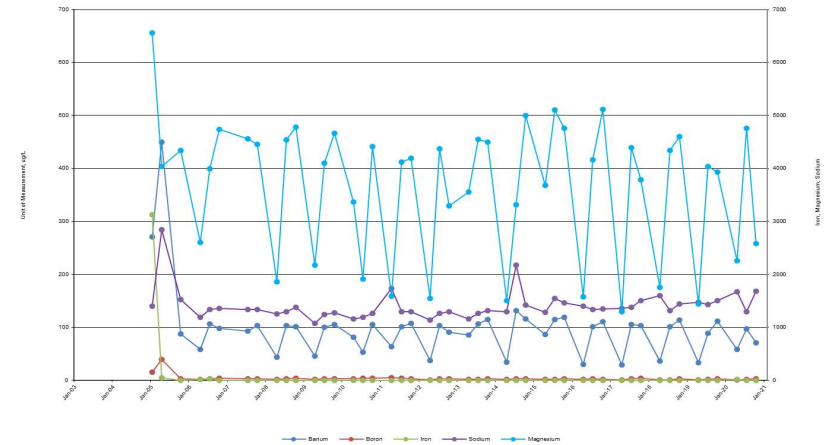
MW 8B



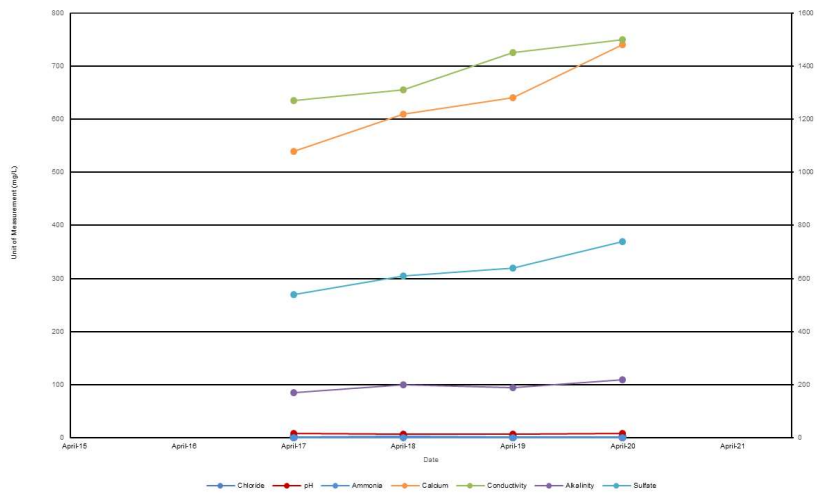
MW 8A



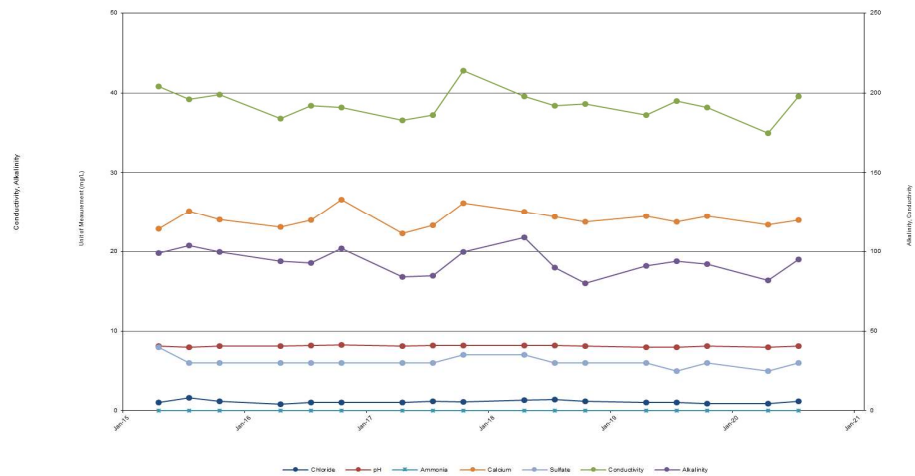
MW 8B



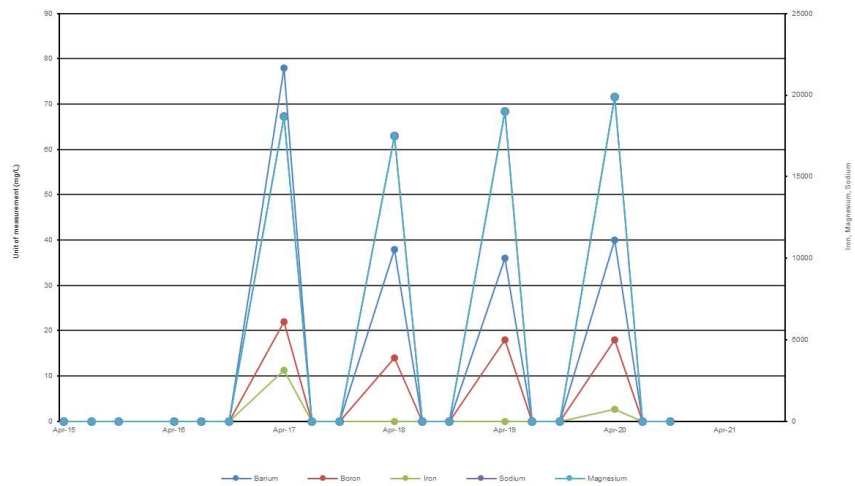
MW9ST



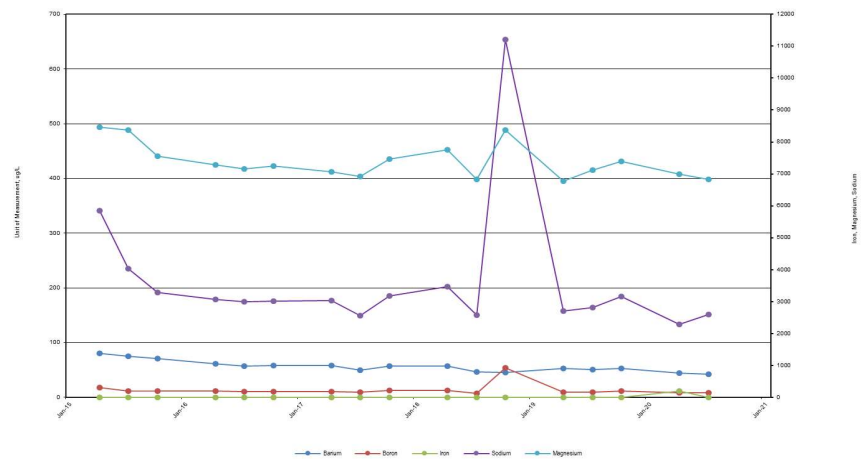
MW 9DT



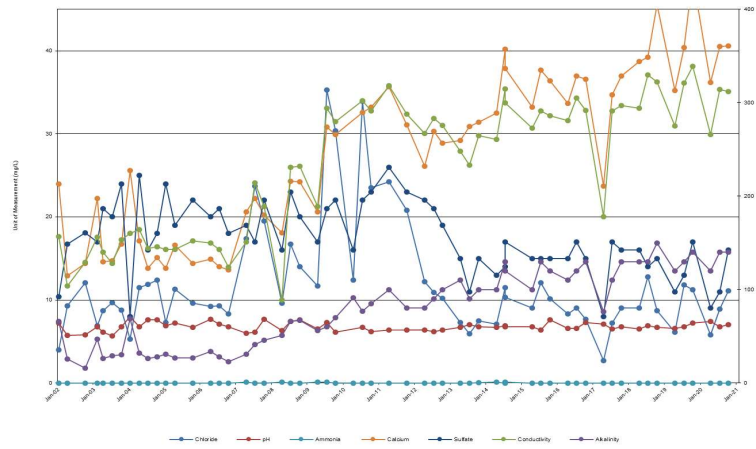
MW9ST



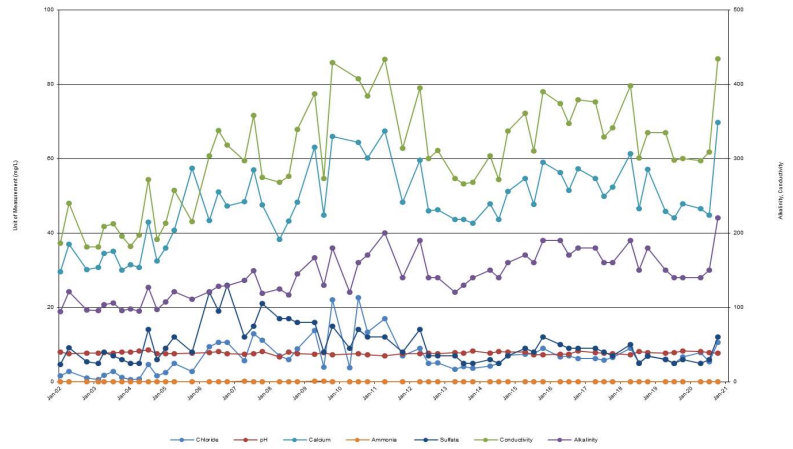
MW 9 DT



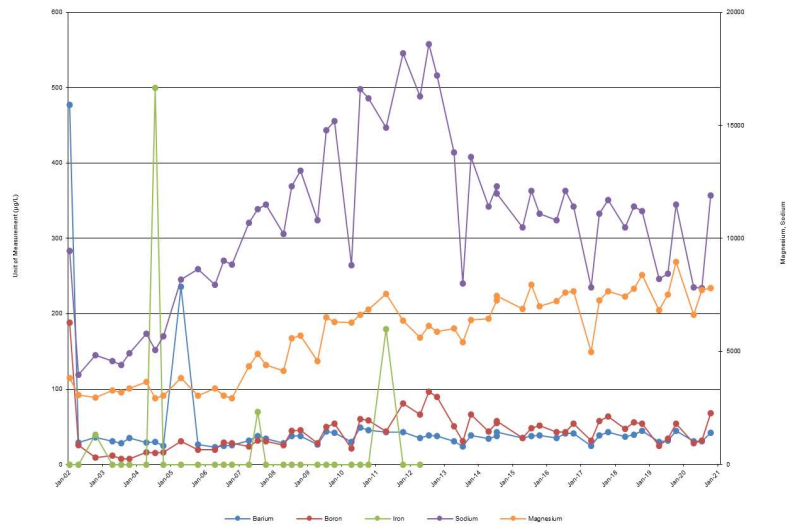
ADI97-4ST



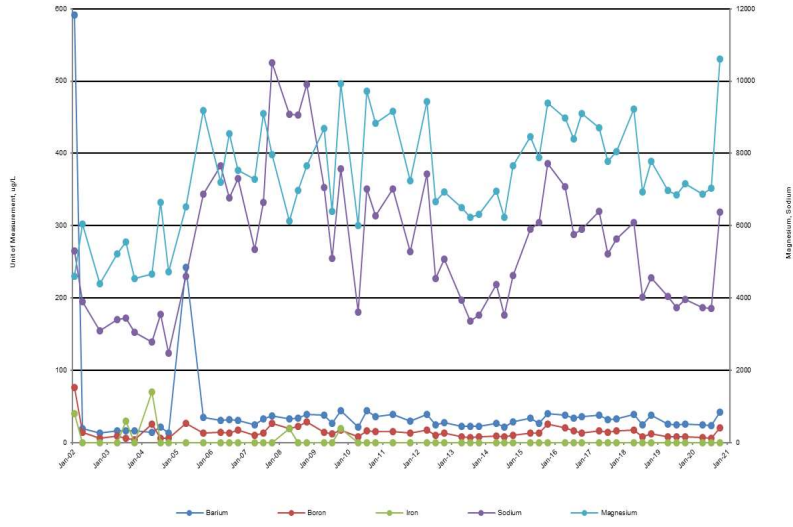
ADI97-4DT



ADI97-4ST



ADI97-4DT



Appendix B – Underdrain & Leachate Detection Monitoring Results

LT-LD1 Leachate Treatment Pond - Leak Detection 1 - General Chemistry

						351141-31	353192-02	356659-2	359715-29	366596-2	368235-02	373149-24	376476-4	378120-2
Laboratory ID:														
Client ID:			LT LD1	LT LD1	LT LD1	LT LD1	LT LD1	LT LD1	LT LD1	LT LD1	LT LD1	LT LD1	LT LD1	LT LD1
Sample Station:			LT LD1	LT LD1	LT LD1	LT LD1	LT LD1	LT LD1	LT LD1	LT LD1	LT LD1	LT LD1	LT LD1	LT LD1
Date: (YYYY/MM/DD)			2020/1	2020/2	2020/3	2020/04/27	2020/05/19	2020/06/15	2020/07/13	2020/08/31	2020/09/14	2020/10/26	2020/11/19	2020/12/03
	Units	MDL ¹	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results
Alkalinity	mg/L	1	not	not	not									
Ammonia	mg/L	0.05	sampled	sampled	sampled	<5	<5	<5	<25	<25	<25	<25	<25	30
Calcium	mg/L	0.05												
Chloride	mg/L	0.5				940	990	830	900	1000	1000	900	750	1100
Conductivity	µS/cm	1				6860	6980	4740	7210	6620	7000	6820	5000	6860
Copper	mg/L	0.001												
Cyanide	mg/L	0.002												
Iron	mg/L	0.02												
Magnesium	mg/L	0.01												
Manganese	mg/L	0.001												
Nitrate + Nitrite	mg/L	0.05				6	8	<5	<25	<25	<25	<25	<25	<25
o-Phosphate	mg/L	0.01												
pH		-				7.2	7.2	7.5	7.1	7.2	7	6.9	7.4	7.1
Phenols	mg/L	0.001												
Potassium	mg/L	0.02												
r-Silica	mg/L	0.1												
Sodium	mg/L	0.05												
Sulfate	mg/L	1				2900	2800	2200	<500	1500	<500	<500	<500	<500
Tannin & Lignin	mg/L	0.5												
Total Organic Carbon	mg/L	0.5				1280	1400	1090	1200	1200	1300	1800	1390	1540
Turbidity	NTU	0.1												
Zinc	mg/L	0.001												
Calculated Parameters														
Bicarbonate	mg/L	-												
Carbonate	mg/L	-												
Hydroxide	mg/L	-												
Cation sum	meq/L	-												
Anion sum	meq/L	-												
% difference	mg/L	-												
Theoretical Conductivity	µS/cm	-												
Hardness	mg/L	-												
Ion Sum	mg/L	-												
Saturation pH		-												
Langelier Index		-												
BOD	mg/L	3												
COD	mg/L	10												
Color	TCU	5												
Kjeldahl Nitrogen	mg/L	0.25												
Total Phosphorus	mg/L	0.002												
Total Dissolved Solids	mg/L	5				7220	7680	6080	7660	6910	7290	7170	6800	7100
Total Suspended Solids	mg/L	5												
Volatile Suspended Solids	mg/L	5												

¹ Method Detection Limit

LT-LD1 Leachate Treatment Pond - Leak Detection 1 - Trace Metals

Laboratory ID:						351141-31	353192-02	356659-2	359715-29	366596-2	368235-02	373149-24	376476-4	378120-2
Client ID:			LT LD1	LT LD1	LT LD1	LT LD1	LT LD1	LT LD1	LT-LD1	LT-LD1	LT-LD1	LT-LD1	LT-LD1	LT LD1
Sample Station:			LT LD1	LT LD1	LT LD1	LT LD1	LT LD1	LT LD1	LT-LD1	LT-LD1	LT-LD1	LT-LD1	LT-LD1	LT LD1
Date: (YYYY/MM/DD)			2020/1	2020/2	2020/3	2020/04/27	2020/05/19	2020/06/15	2020/07/13	2020/08/31	2020/09/14	2020/10/26	2020/11/19	2020/12/03
	Units	MDL¹	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results
Aluminium	µg/L	1	not	not	not									
Antimony	µg/L	0.1	sampled	sampled	sampled									
Arsenic	µg/L	1												
Barium	µg/L	1												
Beryllium	µg/L	0.1												
Bismuth	µg/L	0.1												
Boron	µg/L	1												
Cadmium	µg/L	0.1												
Calcium	µg/L	50												
Chromium	µg/L	1												
Cobalt	µg/L	0.1												
Copper	µg/L	1				20	40	40	30	30	20	20	40	46
Iron	µg/L	20				23700	24400	27600	42100	39400	52700	38000	40400	57100
Lead	µg/L	0.1												
Lithium	µg/L	0.1												
Magnesium	µg/L	10												
Manganese	µg/L	1				2830	3000	2090	3380	2760	3230	2120	2170	3190
Mercury	µg/L	0.05												
Molybdenum	µg/L	0.1												
Nickel	µg/L	1												
Potassium	µg/L	20												
Rubidium	µg/L	0.1												
Selenium	µg/L	1												
Silver	µg/L	0.1												
Sodium	µg/L	50				702000	759000	559000	754000	645000	741000	598000	595000	745000
Strontium	µg/L	1												
Tellurium	µg/L	0.1												
Thallium	µg/L	0.1												
Tin	µg/L	0.1												
Uranium	µg/L	0.1												
Vanadium	µg/L	1												
Zinc	µg/L	1												

¹ Method Detection Limit

LT-LD2 Leachate Treatment Pond - Leak Detection 2 - General Chemistry

			343253-4	345757-2	348829-2	351141-32	353193-03	356659-3	359715-30	366596-3	368235-03	373149-25	376476-5	378120-3
Laboratory ID:			LT LD2	LT LD2	LT LD2	LT LD2	LT LD2	LT LD2	LT LD2	LT LD2	LT-LD2	LT-LD2	LT-LD2	LT-LD2
Client ID:			LT LD2	LT LD2	LT LD2	LT LD2	LT LD2	LT LD2	LT LD2	LT LD2	LT-LD2	LT-LD2	LT-LD2	LT-LD2
Sample Station:			LT LD2	LT LD2	LT LD2	LT LD2	LT LD2	LT LD2	LT LD2	LT LD2	LT-LD2	LT-LD2	LT-LD2	LT-LD2
Date: (YYYY/MM/DD)			2020/01/23	2020/02/19	2020/03/24	2020/04/27	2020/05/19	2020/06/15	2020/07/13	2020/08/31	2020/09/14	2020/10/26	2020/11/19	2020/12/03
	Units	MDL ¹	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results
Alkalinity	mg/L	1												
Ammonia	mg/L	0.05	<0.05	<0.05	<0.05	0.08	0.06	0.08	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Calcium	mg/L	0.05												
Chloride	mg/L	0.5	30	35.7	35.5	1.9	1.7	2.6	2.4	2.4	2.3	3.7	6.4	7.8
Conductivity	µS/cm	1	386	435	456	72	187	109	123	136	134	156	186	288
Copper	mg/L	0.001												
Cyanide	mg/L	0.002												
Iron	mg/L	0.02												
Magnesium	mg/L	0.01												
Manganese	mg/L	0.001												
Nitrate + Nitrite	mg/L	0.05	3.8	4.3	3.4	0.28	0.4	0.71	0.81	0.84	0.88	0.92	0.89	0.9
o-Phosphate	mg/L	0.01												
pH	-	-	8.3	8.3	8.1	7.9	7.9	7.8	8.5	8.4	8.4	8.5	8.7	8.4
Phenols	mg/L	0.001												
Potassium	mg/L	0.02												
r-Silica	mg/L	0.1												
Sodium	mg/L	0.05												
Sulfate	mg/L	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Tannin & Lignin	mg/L	0.5												
Total Organic Carbon	mg/L	0.5	8.4	9	8.8	3.3	3.2	3.1	3.1	2.6	2.5	4.7	5.2	5.1
Turbidity	NTU	0.1												
Zinc	mg/L	0.001												
Calculated Parameters														
Bicarbonate	mg/L	-												
Carbonate	mg/L	-												
Hydroxide	mg/L	-												
Cation sum	meq/L	-												
Anion sum	meq/L	-												
% difference	mg/L	-												
Theoretical Conductivity	µS/cm	-												
Hardness	mg/L	-												
Ion Sum	mg/L	-												
Saturation pH	-	-												
Langelier Index	-	-												
BOD	mg/L	3												
COD	mg/L	10												
Color	TCU	5												
Kjeldahl Nitrogen	mg/L	0.25												
Total Phosphorus	mg/L	0.002												
Total Dissolved Solids	mg/L	5	227	246	270	44	58	74	84	78	80	109	144	124
Total Suspended Solids	mg/L	5												
Volatile Suspended Solids	mg/L	5												

¹ Method Detection Limit

LT-LD2 Leachate Treatment Pond - Leak Detection 2 - Trace Metals

Laboratory ID:			343253-4	345757-2	348829-2	351141-32	353193-03	356659-3	359715-30	366596-3	368235-03	373149-25	376476-5	378120-3
Client ID:			LT LD2	LT LD2	LT LD2	LT LD2	LT LD2	LT LD2	LT-LD2	LT-LD2	LT-LD2	LT-LD2	LT-LD2	LT-LD2
Sample Station:			LT LD2	LT LD2	LT LD2	LT LD2	LT LD2	LT LD2	LT-LD2	LT-LD2	LT-LD2	LT-LD2	LT-LD2	LT-LD2
Date: (YYYY/MM/DD)			2020/01/23	2020/02/19	2020/03/24	2020/04/27	2020/05/19	2020/06/15	2020/07/13	2020/08/31	2020/09/14	2020/10/26	2020/11/19	2020/12/03
	Units	MDL ¹	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results
Aluminium	µg/L	1												
Antimony	µg/L	0.1												
Arsenic	µg/L	1												
Barium	µg/L	1												
Beryllium	µg/L	0.1												
Bismuth	µg/L	0.1												
Boron	µg/L	1												
Cadmium	µg/L	0.1												
Calcium	µg/L	50												
Chromium	µg/L	1												
Cobalt	µg/L	0.1												
Copper	µg/L	1	2	2	2	1	1	1	2	2	2	7	3	3
Iron	µg/L	20	100	100	110	140	150	150	190	90	70	330	610	570
Lead	µg/L	0.1												
Lithium	µg/L	0.1												
Magnesium	µg/L	10												
Manganese	µg/L	1	7	16	17	4	7	7	10	6	5	11	18	22
Mercury	µg/L	0.05												
Molybdenum	µg/L	0.1												
Nickel	µg/L	1												
Potassium	µg/L	20												
Rubidium	µg/L	0.1												
Selenium	µg/L	1												
Silver	µg/L	0.1												
Sodium	µg/L	50	24400	32800	35500	2410	3030	3860	4110	5120	5020	6250	8420	10400
Strontium	µg/L	1												
Tellurium	µg/L	0.1												
Thallium	µg/L	0.1												
Tin	µg/L	0.1												
Uranium	µg/L	0.1												
Vanadium	µg/L	1												
Zinc	µg/L	1												

¹ Method Detection Limit

LT-U Leachate Treatment Pond Underdrain - Trace Metals

Laboratory ID:			343253-5	345757-1	348829-1	351141-33	353192-1	356659-1	359715-31	359715-31	366596-1	368235-01	373149-26	376476-3	378120-1
Client ID:			LT-U	LT-U	LT-U	LT-U	LT-U	LT-U	LT-U	LT-U	LT-U	LT-U	LT-U	LT-U	LT-U
Sample Station:			LT-U	LT-U	LT-U	LT-U	LT-U	LT-U	LT-U	LT-U	LT-U	LT-U	LT-U	LT-U	LT-U
Date: (YYYY/MM/DD)			2020/01/23	2020/02/19	2020/03/24	2020/04/27	2020/05/19	2020/06/15	2020/07/13	2020/07/13	2020/08/31	2020/09/14	2020/10/26	2020/11/19	2020/12/03
	Units	MDL ¹	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results
Aluminium	µg/L	1													
Antimony	µg/L	0.1													
Arsenic	µg/L	1													
Barium	µg/L	1													
Beryllium	µg/L	0.1													
Bismuth	µg/L	0.1													
Boron	µg/L	1													
Cadmium	µg/L	0.1													
Calcium	µg/L	50													
Chromium	µg/L	1													
Cobalt	µg/L	0.1													
Copper	µg/L	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Iron	µg/L	20	<20	<20	<20	40	40	20	100	100	<20	50	90	<20	<20
Lead	µg/L	0.1													
Lithium	µg/L	0.1													
Magnesium	µg/L	10													
Manganese	µg/L	1	2	3	<1	6	5	5	3	3	1	2	3	<1	<1
Mercury	µg/L	0.05													
Molybdenum	µg/L	0.1													
Nickel	µg/L	1													
Potassium	µg/L	20													
Rubidium	µg/L	0.1													
Selenium	µg/L	1													
Silver	µg/L	0.1													
Sodium	µg/L	50	4720	5600	5320	5640	5690	5670	5310	5310	5190	5180	5520	5030	5380
Strontium	µg/L	1													
Tellurium	µg/L	0.1													
Thallium	µg/L	0.1													
Tin	µg/L	0.1													
Uranium	µg/L	0.1													
Vanadium	µg/L	1													
Zinc	µg/L	1													

¹ Method Detection Limit

LHP-LD Leachate Holding Pond Leak Detection - General Chemistry

			343253-1	345757-5	348829-5	351141-34	353192-6	356659-6	359715-32	366596-6	368235-06	373149-27	376476-8	378120-6
Laboratory ID:			LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD
Client ID:			LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD
Sample Station:			LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD
Date: (YYYY/MM/DD)			2020/01/23	2020/02/19	2020/03/24	2020/04/27	2020/05/19	2020/06/15	2020/07/13	2020/08/31	2020/09/14	2020/10/26	2020/11/19	2020/12/03
	Units	MDL ¹	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results
Alkalinity	mg/L	1												
Ammonia	mg/L	0.05	<0.05	<0.05	<0.05	<0.05	0.07	0.09	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Calcium	mg/L	0.05												
Chloride	mg/L	0.5	24	23.4	22.4	24.8	22.3	25.1	23.7	19.8	18.4	15.5	15.2	17.7
Conductivity	µS/cm	1	516	547	513	549	558	549	525	447	435	335	409	411
Copper	mg/L	0.001												
Cyanide	mg/L	0.002												
Iron	mg/L	0.02												
Magnesium	mg/L	0.01												
Manganese	mg/L	0.001												
Nitrate + Nitrite	mg/L	0.05	6.7	7.1	5.7	6.8	6.1	6.9	6.1	5.5	5.4	3.9	4.6	4.6
o-Phosphate	mg/L	0.01												
pH		-	9	8.9	8.6	8.8	8.7	8.4	8.4	8.3	8.4	8.1	8.3	8.4
Phenols	mg/L	0.001												
Potassium	mg/L	0.02												
r-Silica	mg/L	0.1												
Sodium	mg/L	0.05												
Sulfate	mg/L	1	5	6	6	6	6	5	5	4	4	4	3	2
Tannin & Lignin	mg/L	0.5												
Total Organic Carbon	mg/L	0.5	2.6	2.1	1.9	2.2	2.6	2.8	2.6	2.4	2.4	2.2	2.5	2
Turbidity	NTU	0.1												
Zinc	mg/L	0.001												
Calculated Parameters														
Bicarbonate	mg/L	-												
Carbonate	mg/L	-												
Hydroxide	mg/L	-												
Cation sum	meq/L	-												
Anion sum	meq/L	-												
% difference	mg/L	-												
Theoretical Conductivity	µS/cm	-												
Hardness	mg/L	-												
Ion Sum	mg/L	-												
Saturation pH		-												
Langelier Index		-												
BOD	mg/L	3												
COD	mg/L	10												
Color	TCU	5												
Kjeldahl Nitrogen	mg/L	0.25												
Total Phosphorus	mg/L	0.002												
Total Dissolved Solids	mg/L	5	304	320	309	330	406	422	323	255	264	202	336	248
Total Suspended Solids	mg/L	5												
Volatile Suspended Solids	mg/L	5												

¹ Method Detection Limit

LHP-LD Leachate Holding Pond Leak Detection - Trace Metals

			343253-1	345757-5	348829-5	351141-34	353192-6	356659-6	359715-32	366596-6	368235-06	373149-27	376476-8	378120-6
Laboratory ID:			LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD
Client ID:			LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD
Sample Station:			LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD	LHP-LD
Date: (YYYY/MM/DD)			2020/01/23	2020/02/19	2020/03/24	2020/04/27	2020/05/19	2020/06/15	2020/07/13	2020/08/31	2020/09/14	2020/10/26	2020/11/19	2020/12/03
	Units	MDL ¹	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results
Aluminium	µg/L	1												
Antimony	µg/L	0.1												
Arsenic	µg/L	1												
Barium	µg/L	1												
Beryllium	µg/L	0.1												
Bismuth	µg/L	0.1												
Boron	µg/L	1												
Cadmium	µg/L	0.1												
Calcium	µg/L	50												
Chromium	µg/L	1												
Cobalt	µg/L	0.1												
Copper	µg/L	1	1	<1	1	<1	1	<1	1	2	1	1	1	1
Iron	µg/L	20	30	<20	70	20	30	20	50	20	<20	100	20	20
Lead	µg/L	0.1												
Lithium	µg/L	0.1												
Magnesium	µg/L	10												
Manganese	µg/L	1	2	3	5	6	9	7	9	6	4	11	4	4
Mercury	µg/L	0.05												
Molybdenum	µg/L	0.1												
Nickel	µg/L	1												
Potassium	µg/L	20												
Rubidium	µg/L	0.1												
Selenium	µg/L	1												
Silver	µg/L	0.1												
Sodium	µg/L	50	37100	40900	42500	47200	48300	41800	42800	35300	32600	26200	31200	31200
Strontium	µg/L	1												
Tellurium	µg/L	0.1												
Thallium	µg/L	0.1												
Tin	µg/L	0.1												
Uranium	µg/L	0.1												
Vanadium	µg/L	1												
Zinc	µg/L	1												

¹ Method Detection Limit

LHP-U1 Leachate Holding Pond - Underdrain 1 - General Chemistry

Laboratory ID:			343253-2	245757-3	348829-3	351141-35	353192-4	356659-4	359715-33	366596-4	368235-04	373149-28	376476-6	3781120-4
Client ID:			LHP-U1	LHP-U1	LHP-U1	LHP-U1	LHP-U1	LHP-U1	LHP-U1	LHP-U1	LHP-U1	LHP-U1	LHP-U1	LHP-U1
Sample Station:			LHP-U1	LHP-U1	LHP-U1	LHP-U1	LHP-U1	LHP-U1	LHP-U1	LHP-U1	LHP-U1	LHP-U1	LHP-U1	LHP-U1
Date: (YYYY/MM/DD)			2020/01/23	2020/02/19	2020/03/24	2020/04/27	2020/05/19	2020/06/15	2020/07/13	2020/08/31	2020/09/14	2020/10/26	2020/11/19	2020/12/03
	Units	MDL ¹	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results
Alkalinity	mg/L	1												
Ammonia	mg/L	0.05	0.19	0.25	0.5	2.2	0.57	0.29	0.21	0.12	0.11	0.14	0.12	0.11
Calcium	mg/L	0.05												
Chloride	mg/L	0.5	15.3	14.6	13.5	27.1	20.1	17.2	17.1	14.1	13.3	14.1	13.2	15.3
Conductivity	µS/cm	1	272	271	267	379	334	285	278	262	254	279	275	197
Copper	mg/L	0.001												
Cyanide	mg/L	0.002												
Iron	mg/L	0.02												
Magnesium	mg/L	0.01												
Manganese	mg/L	0.001												
Nitrate + Nitrite	mg/L	0.05	0.23	0.24	0.21	0.24	0.15	0.29	0.3	0.23	0.23	0.24	0.22	0.23
o-Phosphate	mg/L	0.01												
pH		-	7.5	7.5	7.8	7.7	7.5	7.9	7.6	7.5	7.5	7.5	7.8	7.8
Phenols	mg/L	0.001												
Potassium	mg/L	0.02												
r-Silica	mg/L	0.1												
Sodium	mg/L	0.05												
Sulfate	mg/L	1	5	5	5	<5	6	5	6	6	6	8	7	7
Tannin & Lignin	mg/L	0.5												
Total Organic Carbon	mg/L	0.5	3.6	3.5	4.6	25	14.3	3.8	2.1	1	0.9	1	0.8	0.9
Turbidity	NTU	0.1												
Zinc	mg/L	0.001												
Calculated Parameters														
Bicarbonate	mg/L	-												
Carbonate	mg/L	-												
Hydroxide	mg/L	-												
Cation sum	meq/L	-												
Anion sum	meq/L	-												
% difference	mg/L	-												
Theoretical Conductivity	µS/cm	-												
Hardness	mg/L	-												
Ion Sum	mg/L	-												
Saturation pH		-												
Langelier Index		-												
BOD	mg/L	3												
COD	mg/L	10												
Color	TCU	5												
Kjeldahl Nitrogen	mg/L	0.25												
Total Phosphorus	mg/L	0.002												
Total Dissolved Solids	mg/L	5	149	144	153	256	204	169	151	135	137	150	150	148
Total Suspended Solids	mg/L	5												
Volatile Suspended Solids	mg/L	5												

¹ Method Detection Limit

LHP-U1 Leachate Holding Pond - Underdrain 1 - Trace Metals

Laboratory ID:			343253-2	345757-3	348829-3	351141-35	353192-4	356659-4	359715-33	366596-4	368235-04	373149-28	376476-6	3781120-4
Client ID:			LHP-U1	LHP-U1	LHP-U1	LHP-U1	LHP-U1	LHP-U1	LHP-U1	LHP-U1	LHP-U1	LHP-U1	LHP-U1	LHP-U1
Sample Station:			LHP-U1	LHP-U1	LHP-U1	LHP-U1	LHP-U1	LHP-U1	LHP-U1	LHP-U1	LHP-U1	LHP-U1	LHP-U1	LHP-U1
Date: (YYYY/MM/DD)			2020/01/23	2020/02/19	2020/03/24	2020/04/27	2020/05/19	2020/06/15	2020/07/13	2020/08/31	2020/09/14	2020/10/26	2020/11/19	2020/12/03
	Units	MDL ¹	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results
Aluminium	µg/L	1												
Antimony	µg/L	0.1												
Arsenic	µg/L	1												
Barium	µg/L	1												
Beryllium	µg/L	0.1												
Bismuth	µg/L	0.1												
Boron	µg/L	1												
Cadmium	µg/L	0.1												
Calcium	µg/L	50												
Chromium	µg/L	1												
Cobalt	µg/L	0.1												
Copper	µg/L	1	<1	<1	<1	2	2	1	<1	<1	<1	<1	<1	<1
Iron	µg/L	20	1430	860	500	1270	930	580	480	510	430	670	470	710
Lead	µg/L	0.1												
Lithium	µg/L	0.1												
Magnesium	µg/L	10												
Manganese	µg/L	1	437	543	415	779	854	523	391	309	295	460	315	461
Mercury	µg/L	0.05												
Molybdenum	µg/L	0.1												
Nickel	µg/L	1												
Potassium	µg/L	20												
Rubidium	µg/L	0.1												
Selenium	µg/L	1												
Silver	µg/L	0.1												
Sodium	µg/L	50	5220	6150	6640	14000	10100	7140	6410	5390	5130	5660	5030	5360
Strontium	µg/L	1												
Tellurium	µg/L	0.1												
Thallium	µg/L	0.1												
Tin	µg/L	0.1												
Uranium	µg/L	0.1												
Vanadium	µg/L	1												
Zinc	µg/L	1												

¹ Method Detection Limit

LHP-U2 Leachate Holding Pond - Underdrain 2 - General Chemistry

			343253-3	345757-4	358829-4	351141-36	353192-5	356659-5	359715-34	366596-5	368235-05	373149-29	376476-7	378120-5
Laboratory ID:			LHP-U2	LHP-U2	LHP-U2	LHP-U2	LHP-U2	LHP-U2	LHP-U2	LHP-U2	LHP-U2	LHP-U2	LHP-U2	LHP-U2
Client ID:			LHP-U2	LHP-U2	LHP-U2	LHP-U2	LHP-U2	LHP-U2	LHP-U2	LHP-U2	LHP-U2	LHP-U2	LHP-U2	LHP-U2
Sample Station:			LHP-U2	LHP-U2	LHP-U2	LHP-U2	LHP-U2	LHP-U2	LHP-U2	LHP-U2	LHP-U2	LHP-U2	LHP-U2	LHP-U2
Date: (YYYY/MM/DD)			2020/01/23	2020/02/19	2020/03/24	2020/04/27	2020/05/19	2020/06/15	2020/07/13	2020/08/31	2020/09/14	2020/10/26	2020/11/19	2020/12/03
	Units	MDL ¹	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results
Alkalinity	mg/L	1												
Ammonia	mg/L	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.06	<0.05	<0.05	<0.05	<0.05	<0.05
Calcium	mg/L	0.05												
Chloride	mg/L	0.5	2.9	3.2	2.7	3.3	2.4	2.9	2.7	2.9	2.8	2.3	2.7	3
Conductivity	µS/cm	1	228	223	214	216	217	222	225	206	199	186	204	224
Copper	mg/L	0.001												
Cyanide	mg/L	0.002												
Iron	mg/L	0.02												
Magnesium	mg/L	0.01												
Manganese	mg/L	0.001												
Nitrate + Nitrite	mg/L	0.05	0.22	0.19	0.16	0.19	0.18	0.27	0.23	0.26	0.26	0.27	0.25	0.23
o-Phosphate	mg/L	0.01												
pH		-	7.9	7.8	8	8	8	8	8	8	8.1	7.9	8.1	8.2
Phenols	mg/L	0.001												
Potassium	mg/L	0.02												
r-Silica	mg/L	0.1												
Sodium	mg/L	0.05												
Sulfate	mg/L	1	5	5	6	5	6	6	6	5	6	6	6	5
Tannin & Lignin	mg/L	0.5												
Total Organic Carbon	mg/L	0.5	0.8	0.6	<0.5	1	0.5	0.5	0.5	<0.5	<0.5	<0.5	0.8	<0.5
Turbidity	NTU	0.1												
Zinc	mg/L	0.001												
Calculated Parameters														
Bicarbonate	mg/L	-												
Carbonate	mg/L	-												
Hydroxide	mg/L	-												
Cation sum	meq/L	-												
Anion sum	meq/L	-												
% difference	mg/L	-												
Theoretical Conductivity	µS/cm	-												
Hardness	mg/L	-												
Ion Sum	mg/L	-												
Saturation pH		-												
Langelier Index		-												
BOD	mg/L	3												
COD	mg/L	10												
Color	TCU	5												
Kjeldahl Nitrogen	mg/L	0.25												
Total Phosphorus	mg/L	0.002												
Total Dissolved Solids	mg/L	5	120	108	118	116	112	118	120	104	102	96	112	104
Total Suspended Solids	mg/L	5												
Volatile Suspended Solids	mg/L	5												

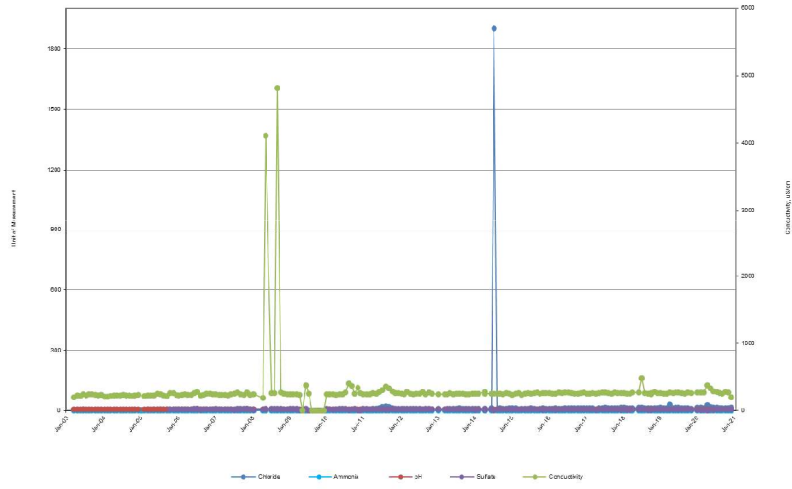
¹ Method Detection Limit

LHP-U2 Leachate Holding Pond - Underdrain 2 - Trace Metals

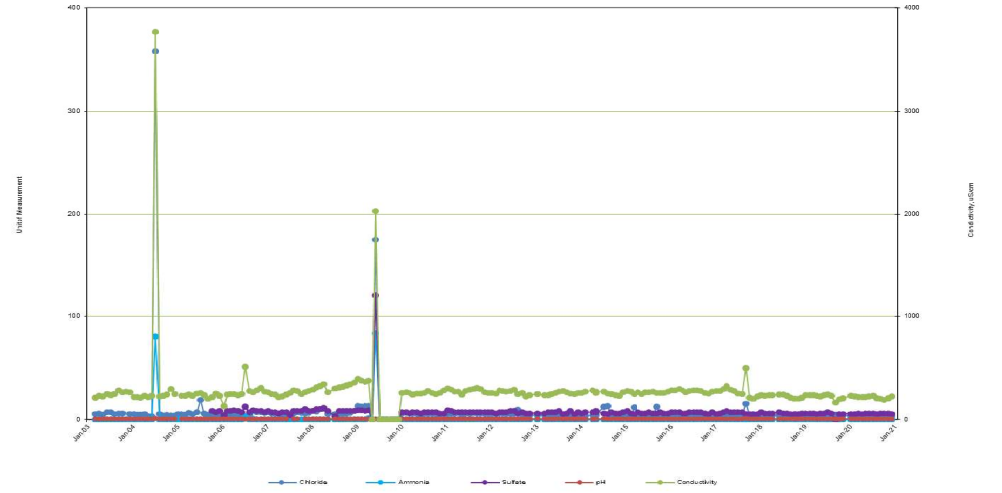
Laboratory ID:			343253-3	345757-4	358829-4	351141-36	353192-5	356659-5	359715-34	366596-5	368235-05	373149-29	376476-7	378120-5
Client ID:			LHP-U2	LHP-U2	LHP-U2	LHP-U2	LHP-U2	LHP-U2	LHP-U2	LHP-U2	LHP-U2	LHP-U2	LHP-U2	LHP-U2
Sample Station:			LHP-U2	LHP-U2	LHP-U2	LHP-U2	LHP-U2	LHP-U2	LHP-U2	LHP-U2	LHP-U2	LHP-U2	LHP-U2	LHP-U2
Date: (YYYY/MM/DD)			2020/01/23	2020/02/19	2020/03/24	2020/04/27	2020/05/19	2020/06/15	2020/07/13	2020/08/31	2020/09/14	2020/10/26	2020/11/19	2020/12/03
	Units	MDL¹	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results
Aluminium	µg/L	1												
Antimony	µg/L	0.1												
Arsenic	µg/L	1												
Barium	µg/L	1												
Beryllium	µg/L	0.1												
Bismuth	µg/L	0.1												
Boron	µg/L	1												
Cadmium	µg/L	0.1												
Calcium	µg/L	50												
Chromium	µg/L	1												
Cobalt	µg/L	0.1												
Copper	µg/L	1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Iron	µg/L	20	20	<20	<20	<20	<20	<20	20	<20	<20	20	<20	<20
Lead	µg/L	0.1												
Lithium	µg/L	0.1												
Magnesium	µg/L	10												
Manganese	µg/L	1	30	14	17	74	14	7	9	5	2	2	3	2
Mercury	µg/L	0.05												
Molybdenum	µg/L	0.1												
Nickel	µg/L	1												
Potassium	µg/L	20												
Rubidium	µg/L	0.1												
Selenium	µg/L	1												
Silver	µg/L	0.1												
Sodium	µg/L	50	5270	5970	5620	5110	5220	5370	5500	5330	5020	6100	5840	6120
Strontium	µg/L	1												
Tellurium	µg/L	0.1												
Thallium	µg/L	0.1												
Tin	µg/L	0.1												
Uranium	µg/L	0.1												
Vanadium	µg/L	1												
Zinc	µg/L	1												

¹ Method Detection Limit

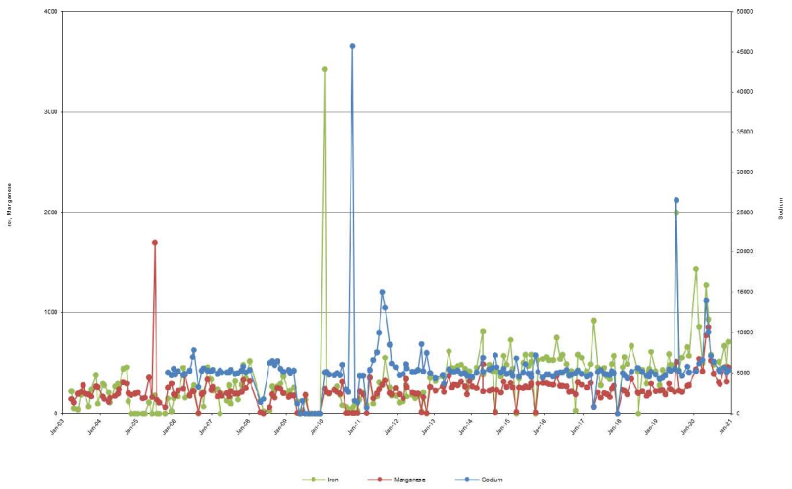
LHP-U1



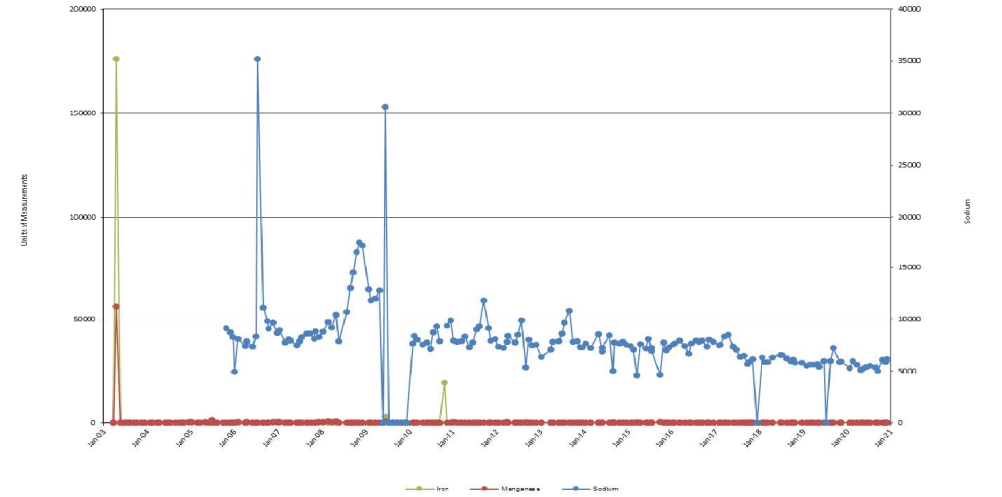
LHP-U2



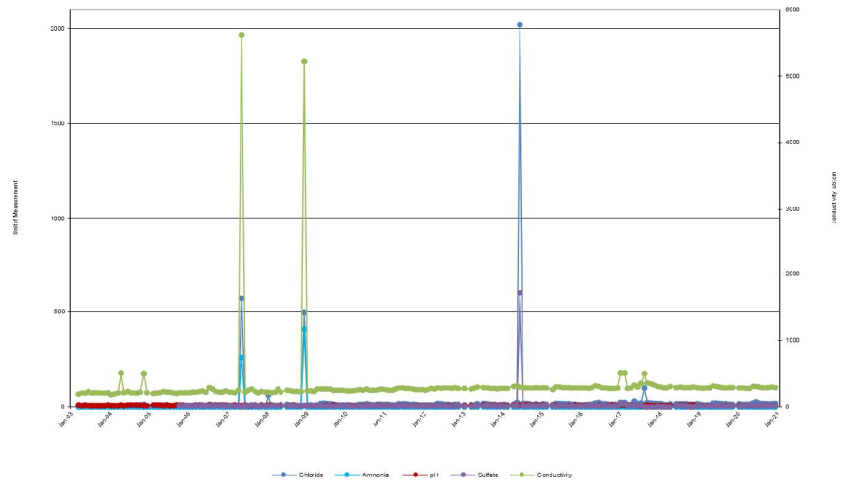
LHP-U1



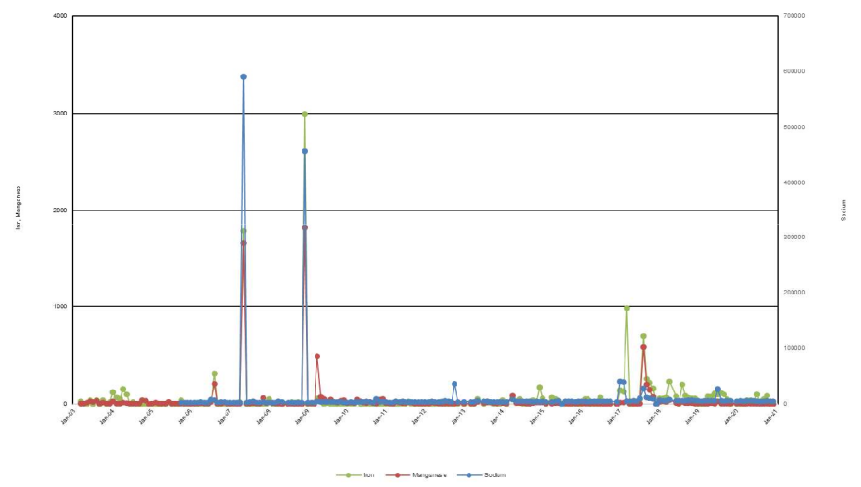
LHP-U2



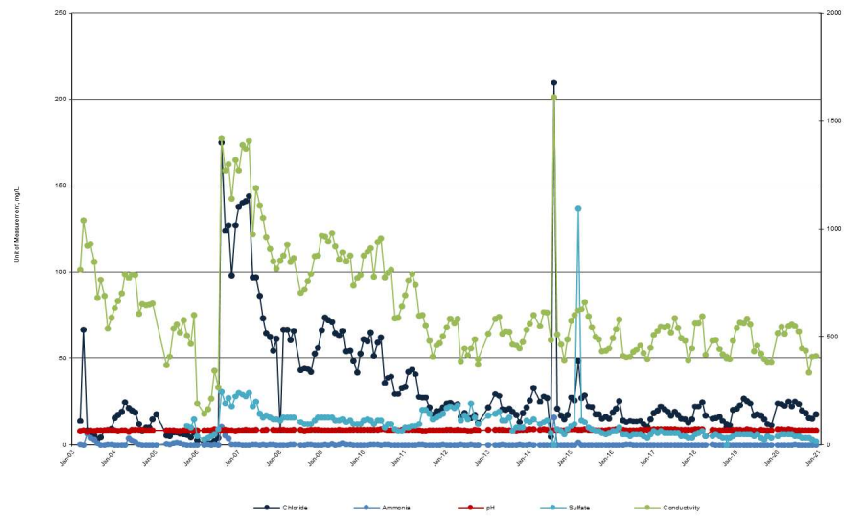
LT-U



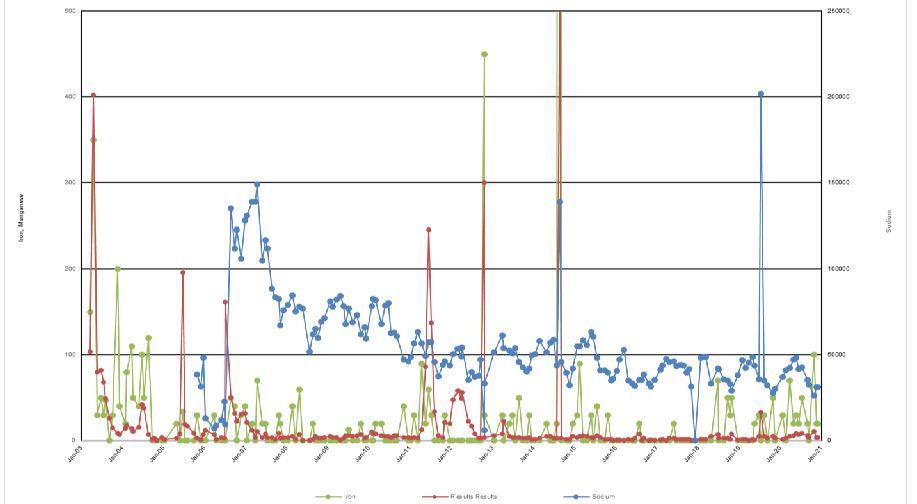
LT-U



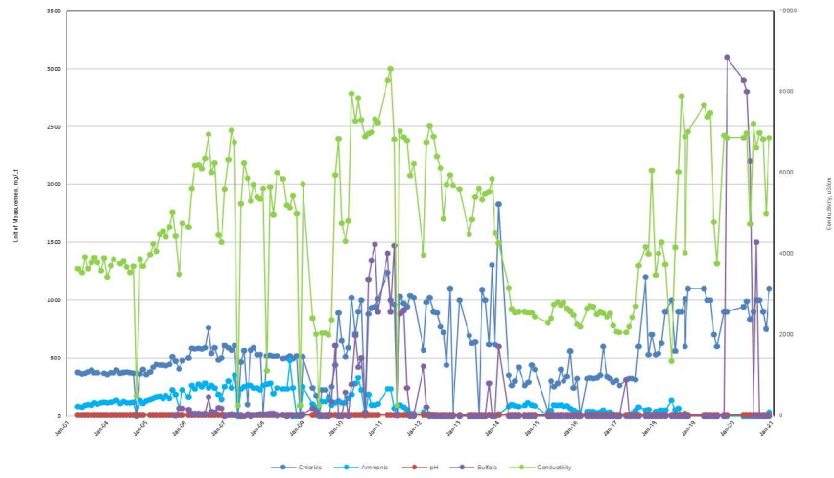
LHP-LD



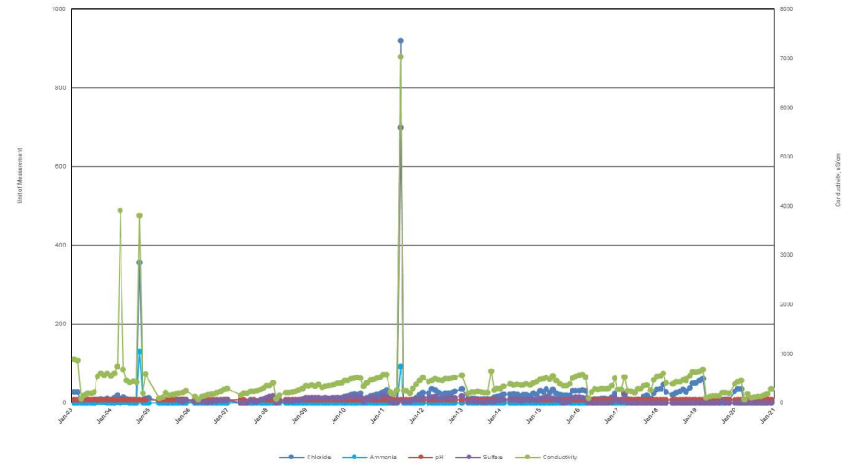
LHP-LD



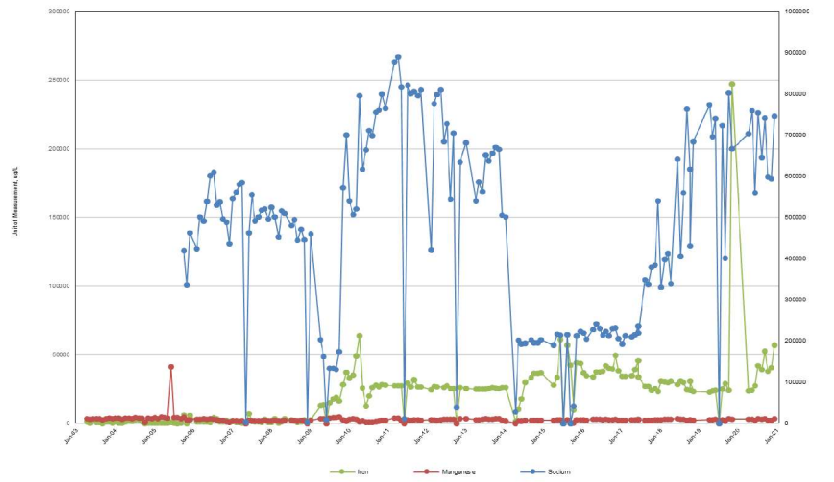
LT-LD1



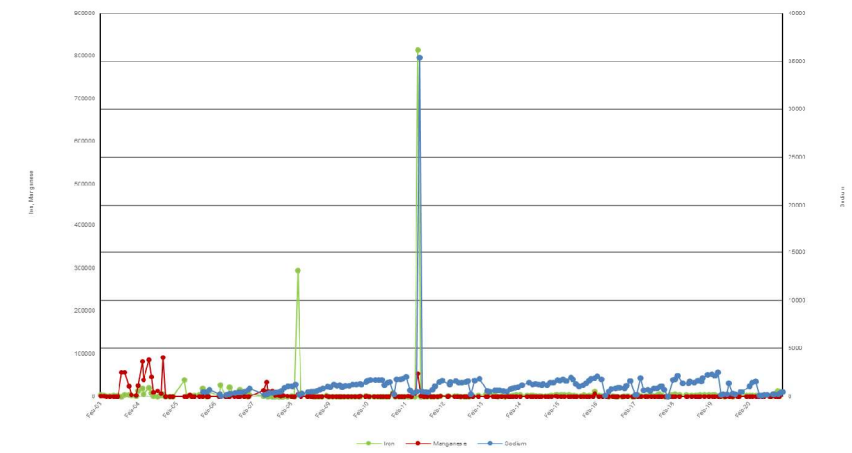
LT-LD2



LT-LD1



LT-LD2



Appendix C – Surface Water and Discharge Monitoring Results

BS1 Big Spring Brook 1 - General Chemistry Analysis

				350316-1	353186-1	353963-1	368584-1	370008-1	372918-1
Laboratory ID:									
Client ID:				BS1	BS1	BS1	BS1	BS1	BS1
Sample Station:				BS1	BS1	BS1	BS1	BS1	BS1
Date: (YYYY/MM/DD)				2020/04/15	2020/05/20	2020/05/25	2020/09/16	2020/09/29	2020/10/22
	Units	Guidelines	MDL¹	Results	Results	Results	Results	Results	Results
Alkalinity	mg/L		1	9	39	47	65	37	9
Ammonia	mg/L	factsheet	0.05	<0.05	<0.05	0.08	<0.05	<0.05	<0.05
Calcium	mg/L		0.05						
Chloride	mg/L		0.5						
Conductivity	µS/cm		1						
Copper	mg/L	0.002 - 0.004	0.001						
Cyanide	mg/L	0.005	0.010	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01
Iron	mg/L	0.3	0.02						
Magnesium	mg/L		0.01						
Manganese	mg/L		0.001						
Nitrate + Nitrite	mg/L	3.00	0.05	0.14	0.12	0.25	0.1	<0.05	0.09
o-Phosphate	mg/L		0.01						
pH		6.5 - 9.0	-	6.5	7.4	7.6	8	8	7.8
Phenols	mg/L	0.004	0.001	0.006	<0.001	0.003	<0.001	<0.001	<0.001
Potassium	mg/L		0.02						
r-Silica	mg/L		0.1						
Sodium	mg/L		0.05						
Sulfate	mg/L		1						
Tannin & Lignin	mg/L		0.5						
Total Organic Carbon	mg/L		0.5						
Turbidity	NTU	Narrative	0.1						
Zinc	mg/L	0.030	0.001						
Calculated Parameters									
Bicarbonate	mg/L		-						
Carbonate	mg/L		-						
Hydroxide	mg/L		-						
Cation sum	meq/L		-						
Anion sum	meq/L		-						
% difference	mg/L		-						
Theoretical Conductivity	µS/cm		-						
Hardness	mg/L		-	0.2	39.3	48.3	60.3	69.7	14.7
Ion Sum	mg/L		-						
Saturation pH			-						
Langelier Index			-						
BOD	mg/L		3						
COD	mg/L		10						
Color	TCU		5						
Kjeldahl Nitrogen	mg/L		0.25						
Nitrate	mg/L		0.05	0.14	0.14	0.25	0.1	0.1	0.09
Nitrite	mg/L		0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Total Phosphorus	mg/L		0.002						
Total Dissolved Solids	mg/L		5						
Total Suspended Solids	mg/L		5	18	10	17	<5	<5	6
Volatile Suspended Solids	mg/L		5						
Total Chlorine	mg/L	0.05		<0.05	0.05	0.06	<0.05	0.05	<0.1

¹ Method Detection Limit

Guidelines - CCME Guidelines for the Protection of Freshwater Aquatic Life

BS1 Big Spring Brook 1 - Trace Metals Analysis

Laboratory ID:				350316-1	353186-1	353963-1	368584-1	370008-1	372918-1
Client ID:				BS1	BS1	BS1	BS1	BS1	BS1
Sample Station:				BS1	BS1	BS1	BS1	BS1	BS1
Date: (YYYY/MM/DD)				2020/04/15	2020/05/20	2020/05/25	2020/09/16	2020/09/29	2020/10/22
	Units	Guidelines	MDL ¹	Results	Results	Results	Results	Results	Results
Aluminium	µg/L	5 - 100	1	331	129	92	42	31	158
Antimony	µg/L		0.1						
Arsenic	µg/L	5	1	<1	<1	<1	<1	<1	<1
Barium	µg/L		1						
Beryllium	µg/L		0.1						
Bismuth	µg/L		0.1						
Boron	µg/L		1						
Cadmium	µg/L	0.090	0.1	0.01	<0.01	<0.01	<0.01	<0.01	0.01
Calcium	µg/L		50	3400	11200	13600	16100	18700	4230
Chromium	µg/L	9	1	<1	<1	<1	<1	<1	<1
Cobalt	µg/L		0.1						
Copper	µg/L	2 - 4	1	<1	<1	<1	<1	<1	<1
Iron	µg/L	300	20	290	140	150	230	160	340
Lead	µg/L	1 - 7	0.1	0.2	0.1	0.1	<0.1	<0.1	0.2
Lithium	µg/L		0.1						
Magnesium	µg/L		10	800	2780	3490	4890	5590	1000
Manganese	µg/L		1						
Mercury	µg/L	0.026	0.05	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Molybdenum	µg/L	73	0.1	<0.1	<0.1	<0.1	0.1	0.2	<0.1
Nickel	µg/L	25 - 150	1	<1	<1	<1	<1	<1	<1
Potassium	µg/L		20						
Rubidium	µg/L		0.1						
Selenium	µg/L	1	1	<1	<1	<1	<1	<1	<1
Silver	µg/L	0.25	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Sodium	µg/L		50						
Strontium	µg/L		1						
Tellurium	µg/L		0.1						
Thallium	µg/L	0.8	0.1						
Tin	µg/L		0.1						
Uranium	µg/L		0.1						
Vanadium	µg/L		1						
Zinc	µg/L	30	1	4	2	2	<1	2	4

¹ Method Detection Limit
 Guidelines - CCME Guidelines for the Protection of Freshwater Aquatic Life

BS1

Big Spring Brook 1 - Hydrocarbon Analysis

RPC Sample ID:			350316-1	353186-1	353963-1	368584-1	370008-1	372918-1
Client Sample ID:			BS1	BS1	BS1	BS1	BS1	BS1
Date Sampled:			2020/04/15	2020/05/19	2020/05/25	2020/09/16	2020/09/29	2020/10/22
Matrix:			water	water	water	water	water	water
Analytes	Units	RL						
Benzene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Toluene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Ethylbenzene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Xylenes	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
VPH C6-C10 (Less BTEX)	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
EPH >C10-C21	mg/L	0.05						
TPH >C10 - C16	mg/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
TPH >C16 - C21	mg/L	0.05	< 0.05	< 0.05	0.17	0.17	< 0.05	< 0.05
EPH >C21-C32	mg/L	0.1	< 0.1	< 0.1	0.2	0.2	< 0.1	< 0.1
Modified TPH Tier 1	mg/L	0.1	< 0.1	< 0.1	0.4	0.4	< 0.1	< 0.1
VPH Surrogate (IBB)	%		98	96	96	98	97	94
EPH Surrogate (IBB)	%		108	105	105	112	102	108
EPH Surrogate (C32)	%		110	101	101	112	110	113
Resemblance			UP	ND	ND	ND	ND	ND
Return to Baseline at C32			Yes	Yes	Yes	Yes	Yes	Yes

This report relates only to the sample(s) and information provided to the laboratory.

RL = Reporting Limit

BS1

Big Spring Brook 1 -Microbiological Examination of Water

Laboratory ID:		350316-1	353186-1	353963-1	368584-01	370008-1	372918-1
Client ID:		BS1	BS1	BS1	BS1	BS1	BS1
Sample Station:		BS1	BS1	BS1	BS1	BS1	BS1
Date: (YYYY/MM/DD)		15-Apr-20	19-May-20	25-May-20	16-Sep-20	29-Sep-20	22-Oct-20
	Units	Results	Results	Results	Results	Results	Results
Coliforms (AOAC 990.11)	100mL	1,188	200	332	622	6,818	1,234
Faecal Coliforms (SM9222D)	100mL	616	8	12	26	3,248	146
E. coli (AOAC 990.11)	100mL	616	8	12	26	3,248	146

¹ Method Detection Limit

na - not available

BS3

Big Spring Brook 3 - General Chemistry Analysis

				350316-2	353186-2	353963-2	368584-2	370008-2	372918-2
Laboratory ID:				BS3	BS3	BS3	BS3	BS3	BS3
Client ID:				BS3	BS3	BS3	BS3	BS3	BS3
Sample Station:				BS3	BS3	BS3	BS3	BS3	BS3
Date: (YYYY/MM/DD)				2020/04/15	2020/05/20	2020/05/25	2020/09/16	2020/09/29	2020/10/22
	Units	Guidelines	MDL¹	Results	Results	Results	Results	Results	Results
Alkalinity	mg/L		1	11	90	140	69	130	18
Ammonia	mg/L	factsheet	0.05	<0.05	5.3	5.3	<0.05	<0.5	<0.05
Calcium	mg/L		0.05						
Chloride	mg/L		0.5						
Conductivity	µS/cm		1						
Copper	mg/L	0.002 - 0.004	0.001						
Cyanide	mg/L	0.005	0.010	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Iron	mg/L	0.3	0.02						
Magnesium	mg/L		0.01						
Manganese	mg/L		0.001						
Nitrate + Nitrite	mg/L	3.0	0.05	0.3	0.14	0.4	0.15	11.4	1.39
o-Phosphate	mg/L		0.01						
pH		6.5 - 9.0	-	6.7	7.8	7.8	8	7.9	7.6
Phenols	mg/L	0.004	0.001	0.005	<0.001	0.137	<0.001	0.071	<0.001
Potassium	mg/L		0.02						
r-Silica	mg/L		0.1						
Sodium	mg/L		0.05						
Sulfate	mg/L		1						
Tannin & Lignin	mg/L		0.5						
Total Organic Carbon	mg/L		0.5						
Turbidity	NTU	Narrative	0.1						
Zinc	mg/L	0.030	0.001						
Calculated Parameters									
Bicarbonate	mg/L		-						
Carbonate	mg/L		-						
Hydroxide	mg/L		-						
Cation sum	meq/L		-						
Anion sum	meq/L		-						
% difference	mg/L		-						
Theoretical Conductivity	µS/cm		-						
Hardness	mg/L		-	11.8	11.8	101.0	64.7	170.0	18.7
Ion Sum	mg/L		-						
Saturation pH			-						
Langelier Index			-						
BOD	mg/L		3						
COD	mg/L		10						
Color	TCU		5						
Kjeldahl Nitrogen	mg/L		0.25						
Nitrate	mg/L		0.05						
Nitrite	mg/L		0.05						
Total Phosphorus	mg/L		0.002						
Total Dissolved Solids	mg/L		5						
Total Suspended Solids	mg/L		5	18	<5	8	9	15	9
Volatile Suspended Solids	mg/L		5						
Total Chlorine	mg/L	0.05		<0.05	<0.05	<0.05	0.15	<0.2	<0.1

¹ Method Detection Limit

Guidelines - CCME Guidelines for the Protection of Freshwater Aquatic Life

NA - Not Available

BS3

Big Spring Brook 3 - Trace Metals Analysis

				350316-2	353186-2	353963-2	368584-2	370008-2	372918-2
Laboratory ID:				BS3	BS3	BS3	BS3	BS3	BS3
Client ID:				BS3	BS3	BS3	BS3	BS3	BS3
Sample Station:				BS3	BS3	BS3	BS3	BS3	BS3
Date: (YYYY/MM/DD)				2020/04/15	2020/05/19	2020/05/25	2020/09/16	2020/09/29	2020/10/22
	Units	Guidelines	MDL ¹	Results	Results	Results	Results	Results	Results
Aluminum	µg/L	5 - 100	1	392	424	566	305	1240	594
Antimony	µg/L		0.1						
Arsenic	µg/L	5	1	<1	3	6	<1	5	<1
Barium	µg/L		1						
Beryllium	µg/L		0.1						
Bismuth	µg/L		0.1						
Boron	µg/L		1						
Cadmium	µg/L	0.090	0.1	0.02	<0.01	0.05	<0.01	0.05	<0.01
Calcium	µg/L		50	3900	10200	16400	18000	35300	4420
Chromium	µg/L	9	1	<1	15	27	1	34	3
Cobalt	µg/L		0.1						
Copper	µg/L	2 - 4	1	1	<1	1	<1	5	1
Iron	µg/L	300	20	340	580	870	580	2610	650
Lead	µg/L	1 - 7	0.1	0.5	0.4	0.7	0.3	1.4	0.5
Lithium	µg/L		0.1						
Magnesium	µg/L		10	1060	8550	14500	4800	19900	1870
Manganese	µg/L		1						
Mercury	µg/L	0.026	0.05	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Molybdenum	µg/L	73	0.1	<0.1	0.4	0.8	0.1	1.2	0.1
Nickel	µg/L	25 - 150	1	<1	5	8	<1	11	2
Potassium	µg/L		20						
Rubidium	µg/L		0.1						
Selenium	µg/L	1	1	<1	<1	<1	<1	<1	<1
Silver	µg/L	0.25	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Sodium	µg/L		50						
Strontium	µg/L		1						
Tellurium	µg/L		0.1						
Thallium	µg/L	0.8	0.1						
Tin	µg/L		0.1						
Uranium	µg/L		0.1						
Vanadium	µg/L		1						
Zinc	µg/L	30	1	9	7	9	<1	10	4

¹ Method Detection Limit

Guidelines - CCME Guidelines for the Protection of Freshwater Aquatic Life

BS3

Big Spring Brook 3 - Hydrocarbon Analysis

Hydrocarbon Analysis in Water (Atlantic MUST)

RPC Sample ID:			350316-2	353186-2	353963-2	368584-2	370008-2	372918-2
Client Sample ID:			BS3	BS3	BS3	BS3	BS3	BS3
Date Sampled:			15-Apr-20	19-May-20	25-May-20	16-Sep-20	29-Sep-20	22-Oct-20
Matrix:			water	water	water	water	water	water
Analytes	Units	RL						
Benzene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Toluene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Ethylbenzene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Xylenes	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
VPH C6-C10 (Less BTEX)	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
EPH >C10-C21	mg/L	0.05						
TPH >C10 - C16	mg/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
TPH >C16 - C21	mg/L	0.05	< 0.05	< 0.05	0.06	< 0.05	< 0.05	< 0.05
EPH >C21-C32	mg/L	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Modified TPH Tier 1	mg/L	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
VPH Surrogate (IBB)	%		104	99	100	101	95	97
EPH Surrogate (IBB)	%		106	106	106	114	101	107
EPH Surrogate (C32)	%		109	103	107	116	102	115
Resemblance			ND	ND	ND	ND	ND	ND
Return to Baseline at C32			Yes	Yes	Yes	Yes	Yes	Yes

BS3

Big Spring Brook 3 -Microbiological Examination of Water

Laboratory ID:		350316-02	353186-2	353963-2	368584-02	370008-2	372918-2
Client ID:		BS3	BS3	BS3	BS3	BS3	BS3
Sample Station:		BS3	BS3	BS3	BS3	BS3	BS3
Date: (YYYY/MM/DD)		15-Apr-20	19-May-20	25-May-20	16-Sep-20	29-Sep-20	22-Oct-20
	Units	Results	Results	Results	Results	Results	Results
Coliforms (AOAC 990.11)	100mL	1,504	128	196	346	1,488	3,852
Faecal Coliforms (SM9222D)	100mL	400	8	4	40	618	304
E. coli (AOAC 990.11)	100mL	400	8	4	32	618	190

¹ Method Detection Limit

na - not available

GF1

Grand Fourche Riviere 1 - General Chemistry Analysis

				350316-3	353186-3	353963-3	368584-3	370008-3	372918-3
Laboratory ID:				GF1	GF1	GF1	GF1	GF1	GF1
Client ID:				GF1	GF1	GF1	GF1	GF1	GF1
Sample Station:				GF1	GF1	GF1	GF1	GF1	GF1
Date: (YYYY/MM/DD)				2020/04/15	2020/05/20	2020/05/25	2020/09/16	2020/09/29	2020/10/22
	Units	Guidelines	MDL¹	Results	Results	Results	Results	Results	Results
Alkalinity	mg/L		1	9	14	16	35	38	12
Ammonia	mg/L	factsheet	0.05	<0.05	<0.05	0.11	0.05	<0.05	<0.05
Calcium	mg/L		0.05						
Chloride	mg/L		0.5						
Conductivity	µS/cm		1						
Copper	mg/L	0.002 - 0.004	0.001						
Cyanide	mg/L	0.005	0.010	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Iron	mg/L	0.3	0.02						
Magnesium	mg/L		0.01						
Manganese	mg/L		0.001						
Nitrate + Nitrite	mg/L	3.0	0.05	0.48	0.26	0.14	<0.05	<0.05	0.24
o-Phosphate	mg/L		0.01						
pH		6.5 - 9.0	-	6.9	7.5	7.6	7.7	7.8	7.6
Phenols	mg/L	0.004	0.001	0.003	<0.001	<0.001	<0.001	<0.001	<0.001
Potassium	mg/L		0.02						
r-Silica	mg/L		0.1						
Sodium	mg/L		0.05						
Sulfate	mg/L		1						
Tannin & Lignin	mg/L		0.5						
Total Organic Carbon	mg/L		0.5						
Turbidity	NTU	Narrative	0.1						
Zinc	mg/L	0.030	0.001						
Calculated Parameters									
Bicarbonate	mg/L		-						
Carbonate	mg/L		-						
Hydroxide	mg/L		-						
Cation sum	meq/L		-						
Anion sum	meq/L		-						
% difference	mg/L		-						
Theoretical Conductivity	µS/cm		-						
Hardness	mg/L		-	12.2	14.5	17.2	30.7	34.0	12.6
Ion Sum	mg/L		-						
Saturation pH			-						
Langelier Index			-						
BOD	mg/L		3						
COD	mg/L		10						
Color	TCU		5						
Kjeldahl Nitrogen	mg/L		0.25						
Nitrate	mg/L		0.05						
Nitrite	mg/L		0.05						
Total Phosphorus	mg/L		0.002						
Total Dissolved Solids	mg/L		5						
Total Suspended Solids	mg/L		5	12	<5	<5	<5	<5	<5
Volatile Suspended Solids	mg/L		5						
Total Chlorine	mg/L	0.05		<0.05	<0.05	0.05	0.05	0.06	<0.1

¹ Method Detection Limit

Guidelines - CCME Guidelines for the Protection of Freshwater Aquatic Life

GF1 Grand Fourche Riviere 1 - Trace Metals Analysis

Laboratory ID:				350316-3	353186-3	353693-3	368584-3	370008-3	372918-3
Client ID:				GF1	GF1	GF1	GF1	GF1	GF1
Sample Station:				GF1	GF1	GF1	GF1	GF1	GF1
Date: (YYYY/MM/DD)				2020/04/15	2020/05/20	2020/05/25	2020/09/16	2020/09/29	2020/10/22
	Units	Guidelines	MDL¹	Results	Results	Results	Results	Results	Results
Aluminium	µg/L	5 - 100	1	210	78	63	64	49	118
Antimony	µg/L		0.1						
Arsenic	µg/L	5	1	<1	<1	<1	1	<1	<1
Barium	µg/L		1						
Beryllium	µg/L		0.1						
Bismuth	µg/L		0.1						
Boron	µg/L		1						
Cadmium	µg/L	0.090	0.1	0.02	<0.01	<0.01	<0.01	<0.01	<0.01
Calcium	µg/L		50	3450	4070	4730	8920	9970	3450
Chromium	µg/L	9	1	<1	<1	<1	<1	<1	<1
Cobalt	µg/L		0.1						
Copper	µg/L	2 - 4	1	<1	2	<1	<1	<1	<1
Iron	µg/L	300	20	260	100	110	220	150	190
Lead	µg/L	1 - 7	0.1	0.4	0.1	0.1	0.2	<0.1	0.2
Lithium	µg/L		0.1						
Magnesium	µg/L		10	870	1060	1300	2050	2200	980
Manganese	µg/L		1						
Mercury	µg/L	0.026	0.05	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Molybdenum	µg/L	73	0.1	<0.1	<0.1	<0.1	0.1	0.2	<0.1
Nickel	µg/L	25 - 150	1	<1	<1	<1	<1	<1	<1
Potassium	µg/L		20						
Rubidium	µg/L		0.1						
Selenium	µg/L	1	1	<1	<1	<1	<1	<1	<1
Silver	µg/L	0.25	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Sodium	µg/L		50						
Strontium	µg/L		1						
Tellurium	µg/L		0.1						
Thallium	µg/L	0.8	0.1						
Tin	µg/L		0.1						
Uranium	µg/L		0.1						
Vanadium	µg/L		1						
Zinc	µg/L	30	1	7	2	2	1	2	3

¹ Method Detection Limit

Guidelines - CCME Guidelines for the Protection of Freshwater Aquatic Life

GF1

Grand Fourche Riviere 1 - Hydrocarbons Analysis

Hydrocarbon Analysis in Water (Atlantic MUST)

RPC Sample ID:			350316-3	353186-3	353963-3	368584-3	370008-3	372918-3
Client Sample ID:			GF1	GF1	GF1	GF1	GF1	GF1
Date Sampled:			15-Apr-20	19-May-20	25-May-20	16-Sep-20	29-Sep-20	22-Oct-20
Matrix:			water	water	water	water	water	water
Analytes	Units	RL						
Benzene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Toluene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Ethylbenzene	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Xylenes	mg/L	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
VPH C6-C10 (Less BTEX)	mg/L	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
TPH >C10 - C16	mg/L	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
TPH >C16 - C21	mg/L	0.05	<0.05	0.06	0.07	<0.05	<0.05	<0.05
EPH >C21-C32	mg/L	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Modified TPH Tier 1	mg/L	0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
VPH Surrogate (IBB)	%		106	98	95	99	92	95
EPH Surrogate (IBB)	%		109	105	108	109	101	106
EPH Surrogate (C32)	%		113	101	110	111	111	109
Resemblance			ND	ND	ND	ND	ND	ND
Return to Baseline at C32			Yes	Yes	Yes	Yes	Yes	Yes

GF1

Grand Fourche Riviere 1 - Microbiological Examination of Water

Laboratory ID:		350316-3	353186-3	353963-3	368584-03	370008-3	372918-3
Client ID:		GF1	GF1	GF1	GF1	GF1	GF1
Sample Station:		GF1	GF1	GF1	GF1	GF1	GF1
Date: (YYYY/MM/DD)		15-Apr-20	19-May-20	25-May-20	16-Sep-20	29-Sep-20	22-Oct-20
	Units	Results	Results	Results	Results	Results	Results
Coliforms (AOAC 990.11)	100mL	1688	476	1192	554	330	1,428
Faecal Coliforms (SM9222D)	100mL	378	48	16	382	114	98
E. coli (AOAC 990.11)	100mL	378	28	16	382	114	98

¹ Method Detection Limit

na - not available

GF2

Grand Fourche Riviere 2 - General Chemistry Analysis

Laboratory ID:				350316-4	353186-4	353963-4	368584-4	370008-4	372918-4
Client ID:				GF2	GF2	GF2	GF2	GF2	GF2
Sample Station:				GF2	GF2	GF2	GF2	GF2	GF2
Date: (YYYY/MM/DD)				2020/04/15	2020/05/19	2020/05/25	2020/09/16	2020/09/29	2020/10/22
	Units	Guidelines	MDL ¹	Results	Results	Results	Results	Results	Results
Alkalinity	mg/L		1	10	19	23	39	45	12
Ammonia	mg/L	factsheet	0.05	<0.05	0.29	0.53	<0.05	<0.05	<0.05
Calcium	mg/L		0.05						
Chloride	mg/L		0.5						
Conductivity	µS/cm		1						
Copper	mg/L	0.002 - 0.004	0.001						
Cyanide	mg/L	0.005	0.010	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01
Iron	mg/L	0.3	0.02						
Magnesium	mg/L		0.01						
Manganese	mg/L		0.001						
Nitrate + Nitrite	mg/L	3.0	0.05	0.38	0.25	0.33	<0.05	0.92	0.37
o-Phosphate	mg/L		0.01						
pH		6.5 - 9.0	-	6.6	7.4	7.5	7.7	7.7	7.5
Phenols	mg/L	0.004	0.001	0.007	0.004	0.009	<0.001	0.007	<0.001
Potassium	mg/L		0.02						
r-Silica	mg/L		0.1						
Sodium	mg/L		0.05						
Sulfate	mg/L		1						
Tannin & Lignin	mg/L		0.5						
Total Organic Carbon	mg/L		0.5						
Turbidity	NTU	Narrative	0.1						
Zinc	mg/L	0.030	0.001						
Calculated Parameters									
Bicarbonate	mg/L		-						
Carbonate	mg/L		-						
Hydroxide	mg/L		-						
Cation sum	meq/L		-						
Anion sum	meq/L		-						
% difference	mg/L		-						
Theoretical Conductivity	µS/cm		-						
Hardness	mg/L		-	13.9	16.9	22.9	33.0	46.0	11.6
Ion Sum	mg/L		-						
Saturation pH			-						
Langelier Index			-						
BOD	mg/L		3						
COD	mg/L		10						
Color	TCU		5						
Kjeldahl Nitrogen	mg/L		0.25						
Nitrate	mg/L		0.05						
Nitrite	mg/L		0.05						
Total Phosphorus	mg/L		0.002						
Total Dissolved Solids	mg/L		5						
Total Suspended Solids	mg/L		5	<5	<5	5	<5	<5	5
Volatile Suspended Solids	mg/L		5						
Total Chlorine	mg/L	0.05		<0.05	<0.05	0.07	<0.05	0.07	<0.05

¹ Method Detection Limit

Guidelines - CCME Guidelines for the Protection of Freshwater Aquatic Life

GF2 Grand Fourche Riviere 2 - Trace Metals Analysis

Laboratory ID:				350316-4	353186-4	353963-4	368584-4	370008-4	372918-4
Client ID:				GF2	GF2	GF2	GF2	GF2	GF2
Sample Station:				GF2	GF2	GF2	GF2	GF2	GF2
Date: (YYYY/MM/DD)				2020/04/15	2020/05/19	2020/05/25	2020/09/16	2020/09/29	2020/10/22
	Units	Guidelines	MDL¹	Results	Results	Results	Results	Results	Results
Aluminum	µg/L	5 - 100	1	137	86	96	65	92	122
Antimony	µg/L		0.1						
Arsenic	µg/L	5	1	<1	<1	<1	<1	<1	<1
Barium	µg/L		1						
Beryllium	µg/L		0.1						
Bismuth	µg/L		0.1						
Boron	µg/L		1						
Cadmium	µg/L	0.090	0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Calcium	µg/L		50	3700	4300	5470	9300	12600	3020
Chromium	µg/L	8.9	1	<1	1	2	<1	2	<1
Cobalt	µg/L		0.1						
Copper	µg/L	2 - 4	1	<1	<1	<1	<1	<1	<1
Iron	µg/L	300	20	120	120	160	190	260	60
Lead	µg/L	1 - 7	0.1	<0.1	0.1	0.1	0.1	0.2	0.1
Lithium	µg/L		0.1						
Magnesium	µg/L		10	1140	1510	2060	2370	3520	980
Manganese	µg/L		1						
Mercury	µg/L	0.026	0.05	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025
Molybdenum	µg/L	73	0.1	<0.1	<0.1	<0.1	0.1	0.2	<0.1
Nickel	µg/L	25 - 150	1	<1	<1	<1	<1	1	<1
Potassium	µg/L		20						
Rubidium	µg/L		0.1						
Selenium	µg/L	1	1	<1	<1	<1	<1	<1	<1
Silver	µg/L	0.25	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Sodium	µg/L		50						
Strontium	µg/L		1						
Tellurium	µg/L		0.1						
Thallium	µg/L	0.8	0.1						
Tin	µg/L		0.1						
Uranium	µg/L		0.1						
Vanadium	µg/L		1						
Zinc	µg/L	30	1	3	1	3	<1	3	1

¹ Method Detection Limit

Guidelines - CCME Guidelines for the Protection of Freshwater Aquatic Life

GF2

Grand Fourche Riviere 2 - Microbiological Examination of Water

Laboratory ID:		350316-4	353186-4	353963-4	368584-4	370008-4	372918-4
Client ID:		GF2	GF2	GF2	GF2	GF2	GF2
Sample Station:		GF2	GF2	GF2	GF2	GF2	GF2
Date: (YYYY/MM/DD)		27-Apr-20	19-May-20	25-May-20	16-Sep-20	29-Sep-20	22-Oct-20
	Units	Results	Results	Results	Results	Results	Results
Coliforms (AOAC 990.11)	100mL	910	344	1,308	660	1,128	1,530
Faecal Coliforms (SM9222D)	100mL	198	16	4	146	16	64
E. coli (AOAC 990.11)	100mL	198	16	4	146	16	64

¹ Method Detection Limit

na - not available

FISH TOXICITY REPORT (LC₅₀)

CLIENT INFORMATION	TEST FACILITY INFORMATION
Northwest Regional Service Commission 248 chemin clement Roy Riviere-Verte, NB Contact: Scott Couturier	Harris Industrial Testing Service Ltd. 1320 Ashdale Rd., South Rawdon Nova Scotia B0N 1Z0 Ph: 902 757-0232 Fax: 902 757-2839 office@harrisindustrial.info

SAMPLE INFORMATION (Client-provided data italicised)	GENERAL TEST INFORMATION
Lab Identification #: 20-248 <i>Sample Name/Location: 190520</i> <i>Sampling Method: Grab</i> Sample Homogenized: Yes <i>Sampler Name: M. Clavette</i> <i>Date & Time Sampled: May 19 2020 0900 hrs</i> <i>Date & Time Received: May 21 2020 1457 hrs</i> Sample Description: Dark brown, opaque liquid	Reference Method: EPS 1/RM/13 2 nd Ed. Dec. 2000 with Feb. 2016 Amendments Type: LC50 Tox 9A General Test Procedures held on file Test Organism: <i>Oncorhynchus mykiss</i> (Rainbow trout)

PRE-TEST PARAMETERS	SAMPLE PRE-TREATMENT
Pre-test Temp. (°C): 15.0 Pre-test D.O. (mg/L): 4.5 Pre-test D.O. Saturation (%): 46 Pre-test pH: 7.6 pH Adjusted: No Sample Conductivity (µS/cm): 934	Mandatory 30 minute Pre-aeration: Yes Rate (ml/min/L): 6.5 ± 1 Time: 0920 hrs D.O. (mg/L): 6.1 D.O. Saturation (%): 61 Pre-aeration Continued: Yes Duration: 45 min. @ 0950 hrs D.O. (mg/L): 7.8 D.O. Saturation (%): 78 Aeration continued throughout test by airstone @ 6.5 ± 1 ml/min/L

TEST CONDITIONS		
Date & Time Test Initiated: May 22 2020 1040 Hrs Date & Time Test Terminated: May 26 2020 1040 Hrs Fish Batch #: 312 % Mortality over 7 days prior to test: 0 Test Volume (L): 20 Depth (cm): 36.2 Replicates: No Number of fish per vessel: 10	Loading Density (g/L): 0.49 Mean Fork Length (mm): 44 ± 5.9 SD Range (mm): 33 - 54 Mean Wet Weight (g): 0.98 ± 0.33 SD Range (g): 0.38 – 1.40	Deviations from Test Method: No Description: N/A Temperature: 15 ± 1°C Photoperiod: 16L/8D Lux: 100 – 500 Static Test, Duration: 96 hours Control/Dilution Water: HITS Well Water

TEST PARAMETERS							
		INITIAL (0 hrs)			FINAL (96 hrs)		
CONC. %	TEMP. °C	D.O. mg/L	pH	COND. µS/cm	TEMP. °C	D.O. mg/L	pH
100	15.0	7.9	7.8	915	15.0	9.5	8.2
50	14.5	9.1	7.8	547	14.5	9.9	8.2
25	14.5	10.1	7.9	355	14.5	10.2	8.1
12.5	14.5	10.0	7.9	218	14.5	9.3	7.8
6.25	14.5	10.0	7.9	190	14.5	9.9	7.8
Control	14.5	10.2	7.9	173	14.5	10.0	7.8

TEST RESULTS

CONC. %	TOTAL MORTALITY #				PERCENT MORTALITY %			
	24 hrs	48 hrs	72 hrs	96 hrs	24 hrs	48 hrs	72 hrs	96 hrs
100	0/10	10/10	10/10	10/10	0	100	100	100
50	0/10	0/10	0/10	0/10	0	0	0	0
25	0/10	0/10	0/10	0/10	0	0	0	0
12.5	0/10	0/10	0/10	0/10	0	0	0	0
6.25	0/10	0/10	0/10	0/10	0	0	0	0
Control	0/10	0/10	0/10	0/10	0	0	0	0

CONC. %	TOTAL STRESS #				PERCENT STRESS %			
	24 hrs	48 hrs	72 hrs	96 hrs	24 hrs	48 hrs	72 hrs	96 hrs
100	10/10	0/10	0/10	0/10	100	0	0	0
50	0/10	0/10	0/10	0/10	0	0	0	0
25	0/10	0/10	0/10	0/10	0	0	0	0
12.5	0/10	0/10	0/10	0/10	0	0	0	0
6.25	0/10	0/10	0/10	0/10	0	0	0	0
Control	0/10	0/10	0/10	0/10	0	0	0	0

96 HR LC₅₀ RESULTS

LC₅₀ Value (%): 70.7
Result: Fail
95% Confidence Limits (%): 50 - 100
Statistical Method: Untrimmed Spearman
 Karber - CETIS

REFERENCE TOXICANT DATA

Performed under laboratory conditions as above, no deviations

Batch: 312 Test Date: May 12 – 16 2020

Reference Substance: Phenol

LC₅₀ Value: 11.8 mg/L
 95% Confidence Limits: 10.1 – 13.8 mg/L
 Historical Mean: 11.0 mg/L
 Warning Limits ± 2 SD: 8.19 – 14.9 mg/L

COMMENTS

Test meets all conditions for test validity.

TEST AUTHORIZATION AND VERIFICATION

Analyst(s): J. Fraser & K. Marks

Verified by: D. Robinson

Date: May 26 2020

Signed: 

REFERENCES

Tidepool Scientific Software, 2001 - 2014. Comprehensive Environmental Toxicity Information System – CETIS v1.8.7.20

Accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA Inc.).

The test included in this report is within the scope of this accreditation.

Results apply to the sample as received. Results reported apply only to the sample tested. Results are based on nominal concentrations.

FISH TOXICITY REPORT (LC₅₀)

CLIENT INFORMATION	TEST FACILITY INFORMATION
Northwest Regional Service Commission 248 chemin clement Roy Riviere-Verte, NB Contact: Scott Couturier	Harris Industrial Testing Service Ltd. 1320 Ashdale Rd., South Rawdon Nova Scotia B0N 1Z0 Ph: 902 757-0232 Fax: 902 757-2839 office@harrisindustrial.info

SAMPLE INFORMATION (Client-provided data italicised)	GENERAL TEST INFORMATION
Lab Identification #: 20-501 <i>Sample Name/Location: End of Discharge</i> <i>Sampling Method: Grab</i> Sample Homogenized: Yes <i>Sampler Name: M. Clavette</i> <i>Date & Time Sampled: Sep. 28 2020 0900 hrs</i> <i>Date & Time Received: Sep. 30 2020 1445 hrs</i> Sample Description: Reddish-brown, opaque liquid.	Reference Method: EPS 1/RM/13 2 nd Ed. Dec. 2000 with Feb. 2016 Amendments Type: LC50 Tox 9A General Test Procedures held on file Test Organism: <i>Oncorhynchus mykiss</i> (Rainbow trout)

PRE-TEST PARAMETERS	SAMPLE PRE-TREATMENT
Pre-test Temp. (°C): 16.0 Pre-test D.O. (mg/L): 8.4 Pre-test D.O. Saturation (%): 90 Pre-test pH: 7.9 pH Adjusted: No Sample Conductivity (µS/cm): 1884	Mandatory 30 minute Pre-aeration: Yes Rate (ml/min/L): 6.5 ± 1 Time: 1530 hrs D.O. (mg/L): 9.1 D.O. Saturation (%): 92 Pre-aeration Continued: No Duration: -- min. @ -- hrs D.O. (mg/L): -- D.O. Saturation (%): -- Aeration continued throughout test by airstone @ 6.5 ± 1 ml/min/L

TEST CONDITIONS	
Date & Time Test Initiated: Sep. 30 2020 1600 Hrs Date & Time Test Terminated: Oct. 04 2020 1600 Hrs Loading Density (g/L): 0.28 Fish Batch #: 317 % Mortality over 7 days prior to test: 0 Test Volume (L): 16 Depth (cm): 28.3 Replicates: No Number of fish per vessel: 10	Deviations from Test Method: No Description: N/A Temperature: 15 ± 1°C Photoperiod: 16L/8D Lux: 100 – 500 Static Test, Duration: 96 hours Control/Dilution Water: HITS Well Water
Mean Fork Length (mm): 36 ± 3.0 SD Range (mm): 32 - 41 Mean Wet Weight (g): 0.44 ± 0.16 SD Range (g): 0.25 – 0.76	

TEST PARAMETERS							
		INITIAL (0 hrs)			FINAL (96 hrs)		
CONC. %	TEMP. °C	D.O. mg/L	pH	COND. µS/cm	TEMP. °C	D.O. mg/L	pH
100	15.5	9.1	8.0	1893	15.5	9.9	8.4
50	15.5	9.7	8.0	1116	15.5	9.8	8.2
25	14.5	10.1	8.0	619	15.0	9.9	8.1
12.5	15.0	10.0	7.9	426	15.0	9.9	8.0
6.25	15.5	10.0	7.8	272	15.0	10.0	7.9
Control	15.5	10.0	7.8	158	15.0	9.8	7.7

TEST RESULTS

CONC. %	TOTAL MORTALITY #				PERCENT MORTALITY %			
	24 hrs	48 hrs	72 hrs	96 hrs	24 hrs	48 hrs	72 hrs	96 hrs
100	0/10	0/10	0/10	0/10	0	0	0	0
50	0/10	0/10	0/10	0/10	0	0	0	0
25	0/10	0/10	0/10	0/10	0	0	0	0
12.5	0/10	0/10	0/10	0/10	0	0	0	0
6.25	0/10	0/10	0/10	0/10	0	0	0	0
Control	0/10	0/10	0/10	0/10	0	0	0	0

CONC. %	TOTAL STRESS #				PERCENT STRESS %			
	24 hrs	48 hrs	72 hrs	96 hrs	24 hrs	48 hrs	72 hrs	96 hrs
100	0/10	0/10	0/10	0/10	0	0	0	0
50	0/10	0/10	0/10	0/10	0	0	0	0
25	0/10	0/10	0/10	0/10	0	0	0	0
12.5	0/10	0/10	0/10	0/10	0	0	0	0
6.25	0/10	0/10	0/10	0/10	0	0	0	0
Control	0/10	0/10	0/10	0/10	0	0	0	0

96 HR LC₅₀ RESULTS

LC₅₀ Value (%): Non-Lethal
Result: Pass
95% Confidence Limits (%): N/A
Statistical Method: N/A

REFERENCE TOXICANT DATA

Performed under laboratory conditions as above, no deviations

Batch: 317 Test Date: Sep. 14 – 18 2020

Reference Substance: Phenol

LC₅₀ Value: 11.8 mg/L
 95% Confidence Limits: 10.1 – 13.8 mg/L
 Historical Mean: 11.2 mg/L
 Warning Limits ± 2 SD: 8.03 – 15.6 mg/L

COMMENTS

Test meets all conditions for test validity.

TEST AUTHORIZATION AND VERIFICATION

Analyst(s): J. Fraser & K. Marks

Verified by: D. Robinson

Date: Oct. 05 2020

Signed: 

REFERENCES

Tidepool Scientific Software, 2001 - 2014. Comprehensive Environmental Toxicity Information System – CETIS v1.8.7.20

Accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA Inc.).

The test included in this report is within the scope of this accreditation.

Results apply to the sample as received. Results reported apply only to the sample tested. Results are based on nominal concentrations.

RESULTS OF THE 2020 BIOLOGICAL
MONITORING PROGRAM FOR
NW REGIONAL LANDFILL COMMISSION

Submitted to:

Regional Service Commission #1

January, 2021

Prepared by:

R. A. Currie Ltd.
P. O. Box 1484
Fredericton, New Brunswick
E3B 5E3

R. A. CURRIE LTD.
BIOLOGICAL CONSULTANT

06 January, 2021

Mr. Paul Albert, Supervisor
NW Regional Service Commission #1
P. O. Box 522
Edmundston, NB E3V 3L2

Dear Mr. Albert;

Re: Results of the 2020 Biological Monitoring Report for the NW Regional Landfill

We are pleased to provide you with this report of the results of the biological surveys that were conducted in streams in the vicinity of the NW Regional Landfill facility during September, 2020.

Samples of benthic invertebrates were collected from one site in Big Spring Brook, as well as from two locations in the Grande Fourche Riviere that were upstream and downstream of the mouth of Big Spring Brook. The lack of flowing water at Site BS1 prevented us from collecting samples from this upper upstream site in Big Spring Brook. The analysis of the invertebrate samples indicated the lowest total number of invertebrates, and lowest community diversity, were associated with the samples collected from Site BS2. The highest total number of invertebrates was found in the samples from Site GF1, however the invertebrate community diversity was similarly high for samples collected from Sites GF1 and GF2. It is important to note, the community diversity index values for all sites in 2020 was within the range of values associated with healthy invertebrate community structures.

The 2020 fish sampling program showed very similar fish communities occur in the Grande Fourche Riviere both upstream and downstream of the mouth of Big Spring Brook. Four species of fish were found at each location. As in all previous studies, slimy sculpin and brook trout are the most abundant species at each location. The incidental capture of several creek chub and a single small white sucker at the upstream sampling location, as well as several lake chub and a single threespine stickleback at the downstream location, is interesting but not considered significant. In summary, the results of the biological monitoring program that was conducted in streams in the vicinity of the NW Regional Landfill during 2020 are very similar to results from past programs.

We trust this report addresses your requirements. If you have any questions or comments concerning this report, please do not hesitate to contact me.

Sincerely,



R. A. Currie
Biological Consultant

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1.0 INTRODUCTION

On 18 September, 2020, R. Currie and a technician conducted fish and benthic invertebrate sampling in surface waters in the vicinity of the Northwest Regional Landfill Commission #1 landfill facility near Riviere Verte, New Brunswick. This program has been conducted annually since 1998, and forms part of the environmental effects monitoring studies compiled by the facility. This report presents the results of the 2020 monitoring program.

2.0 SAMPLING LOCATIONS

Sampling of aquatic organisms was conducted at two locations in Big Spring Brook (Sites BS1 and BS2), as well as at two locations in the Grande Fourche Riviere (Sites GF1 and GF2). These sampling sites correspond to locations that have been sampled in all previous surveys, and are shown on the sample location map (see Figure 1).

The following sections provide brief descriptions of the locations, and physical characteristics, of the aquatic habitat for each of the sampling sites.

Site BS1

Site BS1 represents the upstream sampling site on Big Spring Brook. This site is accessed through a gate at the rear of the landfill facility. The sampling location is located approximately 30 m upstream of the outfall for the treated landfill discharge into Big Spring Brook. At this location, Big Spring Brook has a channel width of 1-2 m, but depending on rainfall, the wet width may be only 0.5 m. The average depth of the stream at this location is only 0.05 m. The flow velocity at this location is very low and as a result, the stream bottom substrate consists entirely of silt and sand-sized material, as well as a top layer of detritus (decaying leaves). In the immediate vicinity of the sampling site, grass and shrub vegetation (speckled alder) occur on both stream banks and overhang the stream.

On 18 September, 2020 the watercourse at Site BS1 reflected record low flow conditions. For the first time there was no flowing water at this location and the stream consisted of a few tiny isolated puddles.

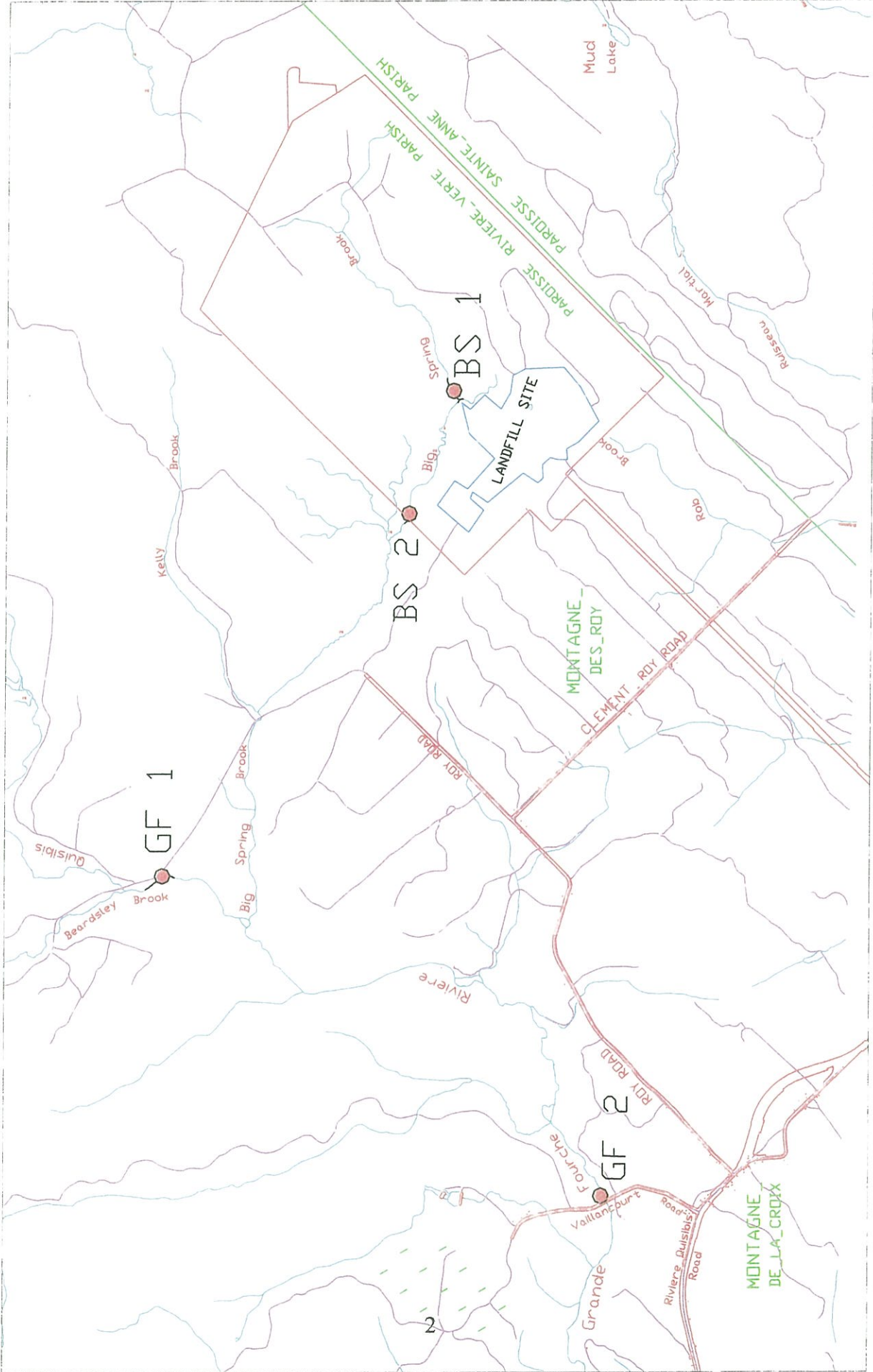


FIGURE 1: Sample Location Map

Site BS2

Site BS2 represents the downstream sampling site on Big Spring Brook. It is located approximately 250 m downstream of the outfall of the treated landfill discharge. The sampling station is located near the property boundary for the landfill facility, and is accessed by means of a trail through the woods. At this point the brook is approximately 2 m wide and 0.1 m deep. The volume of stream flow is noticeably higher than that observed at the upstream site, undoubtedly due to the added flow volume of the landfill discharge, as well as the flow of a small tributary. The stream has a steeper gradient, and a higher flow velocity, at this location. As a result, the stream bottom substrate contains more coarse materials such as gravel and rubble-sized material. Aquatic vegetation (moss or liverwort) is common at Site BS2 where it is attached to the larger, less mobile, rocks in the streambed. At this sampling location, grass, moss, herbaceous vegetation, shrubs and trees occur on both stream banks and overhang the stream.

On 18 September, the water level in the stream appeared to be lower than normal, and the water appeared noticeably turbid. The stream temperature measured 6° C at 11:30 am.

Site GF1

The sampling site GF1 is located on Grand Fourche Riviere, approximately 650 m upstream of the confluence of Big Spring Brook. This site is accessed by means the Quisibis River Road, a forest access road that runs along this section of the river. In the vicinity of the sampling station, the stream is approximately 6-7 m wide and the average depth is 0.25 m. At this location, the stream represents mainly run habitat with several small pool and riffle features. The flow velocity is variable within this stream section, and the stream bottom substrate represents mainly gravel and rubble-size material. The shorelines are vegetated with a variety of vegetation including grass, shrubs and trees, and some of this vegetation overhangs the stream to provide shade and cover for fish.

On 18 September, the water level in Grande Fourche Riviere in the vicinity of Site GF1 reflected lower than normal flow conditions, and appeared to be clear. The water temperature measured 8.5° C at 1 pm.

Site GF2

The sampling site GF2 is located on Grande Fourche Riviere approximately 4 km downstream of the confluence of Big Spring Brook. The sampling location is immediately upstream of the bridge on Vaillancourt Road. At this location the stream is approximately 8 m wide and the

average depth is 0.3 m during normal flow conditions. The stream habitat is primarily riffle and run habitat and the flow velocity is higher than the velocity that occurs at Site GF1. As a result of the faster flow velocity, the substrate is larger (more rock and rubble than gravel). The stream banks are generally stable but there is evidence that high flow events have scoured the channel and rearranged deposits of substrate to form an area with a braided channel. The riparian vegetation consists of grass, shrubs and trees. Aside from a couple of fallen trees that provide large woody debris in the stream, the vegetation generally does not overhang the stream to provide cover for fish.

On 18 September the water level at Site GF2 appeared to reflect lower than normal flow levels for this time of year. The water appeared clear and the temperature measured 11.5° C at 3 pm.

3.0 BENTHIC INVERTEBRATE SURVEY

On 18 September, 2020 samples of resident benthic invertebrate communities were collected from three of the four sampling locations (all locations with the exception of Site BS1) using a surber sampler. This sampling device has been used in all previous surveys. This type of sampler is commonly used to sample aquatic invertebrates living on, and within, gravel and rubble substrates in shallow riffle/run habitat where the current velocity is moderate. The frame of this device delineates a uniform area of streambed (0.3 m x 0.3 m), and the substrate within the frame is vigorously disturbed to a depth of 10 cm with a hand trowel. The disturbance dislodges invertebrates living within the substrate, and they drift downstream into a fine-mesh collecting net that is attached to the sampler. The size of the mesh in the collecting net is 500 microns, and has been the standard mesh size that has been used throughout this sampling program. Additionally, larger pieces of substrate from within the frame were carefully examined for any attached invertebrates, and these were manually removed and placed into the collecting net. Immediately following sample collection, the material contained in the collecting net was transferred to large ziplock bags that were labelled with the sampling location. Four (4) samples were collected from each of the sites using the methodology described above. All of the samples were placed in a large cooler for transport from the field.

It should be noted, for Site BS1, the extended draught conditions that occurred throughout the summer and fall of 2020 resulted in record low flow conditions in many watercourses across the province. As a result of these conditions, on 18 September there was no flowing water in the small tributary at Site BS1 and no samples could be collected from this location.

On the following day, the samples were cleaned. This process involved removing stones, leaves, twigs and other coarse materials from each sample by hand, then placing the remaining material on a 500 micron screen to flush away silt-sized material. The remaining material containing the invertebrates was then placed in labelled glass jars where it was "fixed" with a solution of 10 percent neutralized formalin. The samples were then delivered to *Bio-Identification Associates*, an independent consultant for analysis. It should be noted, this analytical service has been used consistently since the beginning of this monitoring program. Sample analysis involved extracting the invertebrates from the preserved material, the identification of those organisms to the family/genus level of taxonomy, as well as determining the number of individuals of each family/genus in each of the samples.

When the analytical results were received, the data was organized and processed to determine the degree of invertebrate community diversity associated with each of the sampling locations. The Shannon-Weaver formula (Poole, 1974) was used to calculate an index value to represent the degree of community diversity based on the pooled sample data for each of the sites. The Shannon-Weaver formula is based on the following equation:

$$D.I. = -\sum N/NT \times \log N/NT$$

where D.I. = diversity index, N = the number of individuals of a family/genus, and NT = the total number of organisms in the sample (for this study, the four samples from each site were pooled and handled as one large sample). Index values permit the direct comparison of levels of diversity (or resilience) of complex communities. In theory, unstressed, stable communities are composed of a wide variety of organisms, with no overabundance of individuals within any of the types. The large variety of organisms provides overall stability/resilience for the community in the event that if one type of organism were to disappear, some of the remaining types that provide similar ecological functions would buffer the loss of that organism to the community. This scenario describes a diverse community structure, and would be represented by a high index value. On the other hand, if a community were under stress (perhaps due to a toxic pollutant), the more sensitive types of organisms might disappear. However, the more tolerant types of organisms would not only survive, but might even increase in abundance due to decreased competition for resources (food and/or living space), or possibly decreased predation. This situation describes an unhealthy community structure that is inherently unstable, for if some catastrophic event were to eliminate one of the resident groups, the loss of that organism would likely impact the well-being of the entire community. This situation describes a community with low diversity/resilience, and would be represented by a low index value. Experience suggests healthy invertebrate communities living in New Brunswick streams are generally represented by a diversity index value of 1.0 or greater. Conversely, invertebrate

populations with unhealthy community structures are generally represented by diversity index values of less than 1.0.

Table 1 presents the Shannon-Weaver diversity index values for the pooled invertebrate samples that were collected from each of the sampling sites on 18 September, 2020. The index values for recent past surveys (2011 to 2019) are also shown in shown in Table 1 for the purpose of comparison. A complete record of the 2020 benthic invertebrate sample data is provided in Appendix I of this report.

A review of the 2020 invertebrate sample data (see Appendix I) shows the lowest variety of types of invertebrates is associated with the samples collected from Site BS2. The Site BS2 samples contained 9 representatives within the Class/Family designation in comparison to 11 representatives within the samples from both GF1 and GF2. Similarly, 24 invertebrate genera were documented in the samples from Site BS2 in comparison to 52 and 46 genera for Sites GF1 and GF2 respectively. With respect to total number of invertebrates, Site GF1 had 2161 individual organisms, which represented the highest total density of invertebrates for the three sampling location. With a total density of 968 organisms, Site GF2 had the next highest density of individual organisms. The lowest total number of individual organisms is associated with Site BS2 which reported 319 organisms.

With respect to invertebrate community diversity index values, as in all past surveys, the sites with the highest diversity are associated with the sampling locations in the Grande Fourche Riviere. Index values of 1.27 and 1.28 were determined for Sites GF1 and GF2 respectively. These values represent the higher range of values for these locations in previous monitoring programs. These values suggested equally diverse invertebrate communities inhabit both sampling locations in the Grande Fourche Riviere. The lower index value of 1.00 associated with the Site BS2 sample data is mainly a function of the lower variety of invertebrate genera in the samples from this tributary.

As in past surveys, the 2020 invertebrate sample data shows high numbers of several organisms in the samples from both sampling sites on the Grande Fourche Riviere. For the upstream control site (Site GF1), two members of the family *Ephemeroptera* show unusually high densities. Those genera, *Ephemerella* and *Paraleptophlebia* had 188 and 192 in the samples, respectively. Similarly, 480 individuals of the beetle *Optioservus* (family *Coleoptera*) were also reported for this location. Elevated numbers of each of these organisms have been reported at this location in past monitoring programs. The exact reason(s) for the increased numbers of these particular organisms is not known. However, since this appears to be a reoccurring pattern, and since this occurs at the upstream control site, it is assumed that their high numbers reflect natural (probably seasonal) population fluctuations.

TABLE 1
Shannon-Weaver Diversity Index Values for Benthic Invertebrate Samples Collected in
Big Spring Brook and Grande Fourche Riviere from 2011 to 2020

Year	Site Number	Diversity Index Value
2011	BS1	0.70
	BS2	1.04
	GF1	1.24
	GF2	1.16
2012	BS1	1.03
	BS2	0.97
	GF1	1.17
	GF2	1.13
2013	BS1	0.92
	BS2	0.82
	GF1	1.21
	GF2	1.19
2014	BS1	1.01
	BS2	1.05
	GF1	1.25
	GF2	1.35
2015	BS1	0.83
	BS2	0.93
	GF1	1.23
	GF2	1.21
2016	BS1	1.14
	BS2	1.01
	GF1	1.29
	GF2	1.14
2017	BS1	0.86
	BS2	1.01
	GF1	1.24
	GF2	1.18
2018	BS1	0.72
	BS2	1.01
	GF1	1.28
	GF2	1.23
2019	BS1	0.64
	BS2	0.84
	GF1	1.12
	GF2	1.15
2020	BS1	NA
	BS2	1.00
	GF1	1.27
	GF2	1.28

Similarly, high numbers of the beetle *Optioservus* also occurs at Site GF2, downstream of the confluence of Big Spring Brook in 2020. As previously discussed, the elevated representation of this particular organism in the samples from Site GF2 likely reflects natural population cycles.

4.0 FISH COMMUNITY SURVEY

On 18 September, 2020, fish communities were sampled at two locations in the Grande Fourche Riviere. Standard electrofishing procedures for determining the catch per unit of effort were employed to acquire comparative fish population data for Sites GF1 and GF2. The sampling equipment consisted of a Smith-Root Model LR-24 backpack electrofisher which was powered by a 24 volt battery. The unit automatically selected an optimum output power setting for the waters at each site, and those power settings were maintained for the duration of sampling at those locations. The indicated power setting for Site GF1 was 420 volts, while the optimum power setting for Site GF2 was 375 volts. Other default settings on the electrofisher for both locations were as follows: frequency = 30 hertz, pulse width = 4 milliseconds and duty cycle = 12 percent. The water temperature at Site GF1 measured 8.5° C at 1 pm, the temperature at Site GF2 measured 11.5° C at 3 pm.

The sampling methodology for collecting comparative fish data was based on expending similar levels of sampling effort at each location. The sampling procedures involved electrofishing back and forth across the stream in riffle and run habitat while gradually moving upstream. Stunned fish were collected by a technician with a dip net and placed in a bucket that was partially filled with water. When the selected habitat was sampled, the duration of time the electrofisher operated at that site was noted. The captured fish were anesthetized using tricane methanesulfonate (commonly referred to as TMS), identified to species and measured for fork length (sculpin were measured for total length). At the end of this procedure, all of the fish were revived and released back into the stream.

The results of the 2020 fish survey for two sites in the Grande Fourche Riviere are presented in Table 2. The table shows the species of fish captured at each site, as well as the length of individual fish in millimeters. The data presented in Table 2 indicates the fish communities at Site GF1 and Site GF2 are very similar. Four species of fish were found at each location, and brook trout and slimy sculpin represent the most abundant species at both locations. With respect to total density, the data displayed in Table 2 suggests the greatest total density of fish occurs at Site GF1 where a total of 77 fish make up the sample in comparison to 57 fish for Site GF2. When the duration of electrofishing effort to collect those respective fish samples is taken into account, the comparison of total fish density between sites is magnified. At site GF1, 480

TABLE 2
 Summary of Fish Community Surveys at Two Sites in the Grande
 Fourche Riviere on 18 September, 2020

Site GF 1					Site GF 2				
Bk. Trout	Slimy Sculpin	Ck. Chub	White Sucker		Bk. Trout	Slimy Sculpin	Lk. Chub	3-Spine Stick.	
124 mm	60 mm	66 mm	59 mm	41 mm	121 mm	37 mm	62 mm	65 mm	37 mm
57	50	59	63		139	70	74	75	
101	56	52	76		127	80	56	78	
121	39	62	55		118	82	67	99	
102	31	55	41		103	65	72	79	
62	60	49	44			57	36		
71	79	54				60	58		
69	51	51				62	62		
117	52	50				55	55		
	47	50				78	57		
	47	51				67	85		
	60	60				73	67		
	60	46				61	68		
	59	57				59	53		
	70	65				62	60		
	32	32				62	54		
	72	59				40	62		
	52	34				57	37		
	52	31				51	53		
	39	36				38	41		
	29	29				35	35		
	37	33				34	55		
	32	50				38	38		
	29	37							
	32	51							
	31	37							
	32	34							
	34	37							
	25	31							
	32	31							
	31								
<hr/>					<hr/>				
9	61	6	1		5	46	5	1	
<hr/>					<hr/>				
77					57				

seconds of electrofishing effort was required to capture 77 fish. This indicates a capture rate of 0.16 fish per second of electrofisher operation time. At Site GF2, 619 seconds of effort were required to capture the 57 fish that comprised the fish sample at this location. These figures indicate a capture rate of 0.09 fish per second at this location. These capture rates confirm the fact that there is a higher density of fish at Site GF1 in comparison to Site GF2. This premise has been supported by results from previous fish sampling programs.

A closer examination of the 2020 fish survey day indicates as in all past surveys, slimy sculpin is the most abundant species at both locations. Although the density of sculpin is higher at Site GF1, the average size of sculpin at Site GF2 is larger. An examination of the size of sculpin at each location determined the median length of sculpin at Site GF1 is 50 mm (range 25 to 79 mm), while the median range of sculpin at Site GF2 is 58.5 mm (range 34 to 85 mm).

With respect to brook trout, 9 trout representing two age classes were captured in the sampling effort at Site GF1 in comparison to 5 trout representing two age classes at Site GF2. It should be noted, the trout captured at Site GF1 included 4 trout fry (age class 0+) and 5 yearlings (age class 1+), while the trout captured at Site GF2 represented 4 yearlings (age class 1+) and 1 mature fish (age class 2+). This distribution of ages might imply that Site GF1 represents better spawning habitat while Site GF2 represents better rearing habitat. As in past years, the numbers of trout in the samples is too limited to permit meaningful size comparisons of age classes.

In addition to sculpin and brook trout, several creek chub and a small white sucker were found at Site GF1. Similarly, at Site GF2, several lake chub and a single threespine stickleback were reported in addition to the sculpin and trout. In past fish surveys, low numbers of these supplemental species are often reported at these locations. Because these supplemental species represent fish that are commonly found in streams in this area, and since they usually occur in low numbers, their presence/absence at each sampling site is interesting but not considered significant.

5.0 SUMMARY

The most recent biological monitoring program to evaluate benthic invertebrate and fish communities in streams in the vicinity of the Northwest Regional Landfill Commission #1 was conducted on 18 September, 2020. Samples of aquatic invertebrates were collected from one location in Big Spring Brook, as well as from two locations in the Grande Fourche Riviere. Normally an additional site, Site BS1, the upstream location on Big Spring Brook, would also be

sampled however the lack of flowing water in this tributary at this location precluded sample collection. The analysis of these samples indicate the lowest total number, and variety, of invertebrates, as well as the community with the lowest Shannon-Weaver diversity index value, occurs at Site BS2, the downstream site on Big Spring Brook. The results of the invertebrate samples for the two locations in the Grande Fourche Riviere determined the greatest total abundance of organisms was found in samples associated with Site GF1. However, the diversity index values indicate similarly high invertebrate community values for both Site GF1 and Site GF2. These values suggest healthy and diverse invertebrate communities occur in Grande Fourche Riviere both upstream and downstream of the confluence of Big Spring Brook.

With respect to the fish monitoring program, the 2020 sampling results indicate very similar fish communities occur at the two sampling locations in the Grande Fourche Riviere. Four species of fish were found at each location. As in past years, slimy sculpin and brook trout were the most abundant fish species captured at both locations. In addition to these species several creek chub and a single small white sucker were captured at Site GF1, while several lake chub and a single threespine stickleback were captured at Site GF2. With respect fish size comparison between sites, slimy sculpin was the only species that occurred in sufficient numbers to conduct any meaningful size comparison. A review of the measured lengths of sculpin indicates the median length of sculpin is slightly larger at Site GF2, the site that is located downstream of the mouth of Big Spring Brook. The reason for the size difference may be due to fewer small/young sculpin at this location. The catch per unit of effort indicates the highest total density of fish occurs at Site GF1, the upstream sampling location. This fact is consistent with results from all previous studies.

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APPENDIX I

Benthic Invertebrate Sample Data for Samples Collected from Big Spring
Brook and Grande Fourche Riviere, during September, 2020

NW Regional Landfill

Site BS2

18 September, 2020

Class/Familt	Genus	Sample 1	Sample 2	Sample 3	Sample 4	Total	
Ephemeroptera	Baetis	1	3	5	6	15	
	Paraleptophlebia		1			1	
Plecoptera	Leuctra	1	4	22	6	33	
	Paracapnia	1	1	2	3	7	
Trichoptera	Cheumatopsyche			1	3	4	
	Hydropsyche		1			1	
	Neophylax			1		1	
	Parapsyche	1				1	
	Rhyacophila		1			1	
Oligochaeta	Earthworm				1	1	
	Lumbriculus	1	8	4	4	17	
Coleoptera	Optioservus	14	24	12	20	70	
	Promoresia				1	1	
Bivalvia	Sphaerium	20	3	4	7	34	
Megaloptera	Sialis			2	3	5	
Diptera	Antocha	2				2	
	Bezzia		1		2	3	
	Dicranota	9	30	19	12	70	
	Hexatoma		1			1	
Dipt. Chironomidae	Cricotopus	5		1	5	11	
	Diplocladius	1				1	
	Eukiefferiella				2	2	
	Orthocladius	9	14	12	1	36	
	Thienemanniella			1		1	
Total	9	24	65	92	86	76	319
Shannon-Weaver	Diversity Index =	0.995984					

NW Regional Landfill

Site GF1

18 September, 2020

Class/Familt	Genus	Sample 1	Sample 2	Sample 3	Sample 4	Total
Ephemeroptera	Baetis	2			2	4
	Baetisca				1	1
	Ephemerella	46	101	31	10	188
	Heptagenia		2	12	1	15
	Paraleptophlebia	40	61	59	32	192
	Pseudocloeon	1				1
	Stenonema	4	2	1	8	15
Plecoptera	Alloperla	23	15	14	9	61
	Isoperla	6	17	1	1	25
	Leuctra	2	8	7	1	18
	Nemoura		1			1
	Phaëgonophora	21	26	19	23	89
	Taeniopteryx		2			2
Trichoptera	Apatania	3				3
	Cheumatopsyche	14	30	6	8	58
	Dolophilodes		1	1		2
	Glossosoma	27	83	6	9	125
	Hydropsyche	1	7	7	4	19
	Hydroptila	1	12			13
	Lepidostoma	19	47	7	1	74
	Psilotreta	1				1
	Rhyacophila	7	12	4	1	24
Oligochaeta	Lumbriculus	2	2	3	8	15
Odonata	Ophiogomphus		1	1		2
Coleoptera	Optioservus	138	227	51	64	480
	Promoresia	8	17	18	8	51
Gastropoda	Ferrissia	66	107	10	12	195
	Physa	1		1		2
Bivalvia	Pisidium	18	10	3		31
	Sphaerium	8	20		3	31
Platyhelminthes	Dugesia	1				1
	Planaria		5	4	1	10

Diptera	Antocha	4	4	3	1	12
	Atherix	2	2	6	6	16
	Brezzia	10	27	7	6	50
	Chelifera	1	2			3
	Dicranota	2	5			7
	Hexatoma	8	8	4	7	27
	Pilaria		1			1
Dipt. Chironomidae	Cardiocladius	1				1
	Corynoneura		1			1
	Cricotopus	3	2	21	24	50
	Epoicocladius	5	18			23
	Eukiefferiella	2		5	3	10
	Larsia		1			1
	Lauterborniella		2			2
	Microtendipes	8	30		1	39
	Orthocladius		3	1		4
	Parametricnemus		2			2
	Rheopelopia	2	2		1	5
	Stempellina	1	4			5
Tanytarsus	13	131	7	2	153	
Total	11	52	522	1061	320	258
2161						

Shannon-Weaver Diversity Index = 1.271207

NW Regional Landfill

Site GF2

18 September, 2020

Class/Familt	Genus	Sample 1	Sample 2	Sample 3	Sample 4	Total
Ephemeroptera	Baetis	1	4		4	9
	Baetisca	1		1		2
	Ephemerella	22	11	7	6	46
	Paraleptophlebia	11	21	5	8	45
	Pseudocloeon	3	2	2	5	12
	Stenonema	3	2	2	2	9
Plecoptera	Alloperla	26	26	15	10	77
	Isoperla	10	25		2	37
	Leuctra	2	2			4
	Nemoura		2	2	3	7
	Phasgonophora	16	4	16	4	40
	Pteronarcys	2				2
	Taeniopteryx		1			1
Trichoptera	Cheumatopsyche	20	41	1	8	70
	Glossosoma	5	1	1	1	8
	Hydropsyche	16	14	7	2	39
	Hydroptila		1			1
	Lepidostoma	5	2	11	2	20
	Rhyacophila	10	21	4	4	39
Oligochaeta	Lumbriculus	1		4	9	14
Odonata	Ophiogomphus	2				2
Coleoptera	Optioservus	76	62	77	32	247
	Promoesia	4	4	6	2	16
Gastropoda	Ferrissia	1		2	24	27
	Physa			2		2
Bivalvia	Pisidium	2				2
	Sphaerium	4				4
Platyhelminthes	Dugesia		1			1
Diptera	Antocha	2	7	4	1	14
	Atherix	2	6	1	9	18
	Bezzia	6	7	3	4	20
	Dicranota	3	14	1	4	22
	Hexatoma	6	9	13	7	35
	Oreogeton			1		1
	Pilaria		2			2
	Simulium	1				1

Dipt. Chironomidae	Corynoneura		1				1
	Cricotopus	5	3	6	33		47
	Diplocladius		1				1
	Epoicodladius	1		2			3
	Microtendipes	2	2				4
	Orthocladius				4		4
	Parametriocnemus		1				1
	Rheopelopia		1	2			3
	Tanytarsus	1	5				6
	Thienemanniella			2			2
Total	11	46	272	306	200	190	968

Shannon-Weaver Diversity Index = 1.277245

SF Outlet Sand Filter Discharge - General Chemistry

Laboratory ID:			350323-1	351141-40	351969-1	352640-1	353204-3	353985-1	354842-1	355630-1	359715-38	366595-3	367630-1	368228-03	370052-1	370998-1	371694-1	372559-1	373149-32	374409-1
Client ID:			SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet
Sample Station:			SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet
Date: (YYYY/MM/DD)			4/15/2020	4/27/2020	5/4/2020	5/11/2020	5/20/2020	5/25/2020	6/1/2020	6/8/2020	7/13/2020	8/31/2020	9/9/2020	9/14/2020	9/29/2020	10/5/2020	10/13/2020	10/19/2020	10/26/2020	11/2/2020
	Units	Guidelines*	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results
Alkalinity	mg/L																			
Ammonia	mg/L		400	420	390	360	370	280	230	197	40	<25	<25	<25	<25	<25	<25	<25	51	100
Calcium	mg/L																			
Chloride	mg/L		1280	1300	1180	1030	950	970	820	840	840	1000	900	900	900	900	1000	900	900	800
Conductivity	µS/cm		12700	11600	11000	11300	10400	8890	7850	8080	7040	6880	6830	7000	6960	1400	8300	6420	7320	6840
Copper	mg/L	0.500																		
Cyanide	mg/L																			
Iron	mg/L	5.00																		
Magnesium	mg/L																			
Manganese	mg/L																			
Nitrate + Nitrite	mg/L																			
o-Phosphate	mg/L		3	4	4	2	3	3	3	2	<5	8	18	<5	<5	<5	<5	<5	<5	<5
pH		6.0 - 9.5	8	7.9	8	7.9	7.9	7.8	8.2	8.3	8.2	8	7.7	8.1	8.3	8.4	8.4	8.1	8	8.1
Phenols	mg/L																			
Potassium	mg/L																			
r-Silica	mg/L																			
Sodium	mg/L																			
Sulfate	mg/L																			
Tannin & Lignin	mg/L																			
Total Organic Carbon	mg/L																			
Turbidity	NTU																			
Zinc	mg/L	0.5																		
Calculated Parameters																				
Bicarbonate	mg/L																			
Carbonate	mg/L																			
Hydroxide	mg/L																			
Cation sum	meq/L																			
Anion sum	meq/L																			
% difference	mg/L																			
Theoretical Conductivity	µS/cm																			
Hardness	mg/L																			
Ion Sum	mg/L																			
Saturation pH																				
Langelier Index																				
BOD	mg/L	40	929	802	825	417	433	369	238	65	15	9	10	11	13	23	27	38	36	23
COD	mg/L																			
Color	TCU																			
Kjeldahl Nitrogen	mg/L		550	560	530	520	460	430	330	320	89	79	93	86	90	100	93	95	114	110
Total Phosphorus	mg/L																			
Total Dissolved Solids	mg/L																			
Total Suspended Solids	mg/L		84	117	99	67	81	121	112	156	156	5	14	<5	9	23	33	<5	17	20
Volatile Suspended Solids	mg/L																			

*Guidelines in accordance with Certificate of Approval (No. SL5-R2002)

SF Outlet Sand Filter Discharge - Trace Metals

Laboratory ID:			350323-1	351141-40	352640-1	352640-1	353204-3	353985-1	354842-1	355630-1	359715-38	366595-3	367630-1	368228-03	370052-1	370998-01	371694-1	372559-1	373149-32	374409-1
Client ID:			SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet
Sample Station:			SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet	SF-Outlet
Date: (YYYY/MM/DD)			4/15/2020	4/27/2020	5/4/2020	5/11/2020	5/20/2020	5/25/2020	6/1/2020	6/8/2020	7/13/2020	8/31/2020	9/9/2020	9/14/2020	9/29/2020	10/5/2020	10/13/2020	10/19/2020	10/26/2020	11/2/2020
	Units	Guidelines*	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results
Aluminium	µg/L																			
Antimony	µg/L																			
Arsenic	µg/L																			
Barium	µg/L																			
Beryllium	µg/L																			
Bismuth	µg/L																			
Boron	µg/L																			
Cadmium	µg/L																			
Calcium	µg/L																			
Chromium	µg/L	500	1140	1090	1060	1070	980	760	780	770	790	680	680	670	660	744	730	680	820	702
Cobalt	µg/L																			
Copper	µg/L	500	20	30	<10	50	20	<10	20	20	30	50	50	40	40	43	40	40	30	10
Iron	µg/L	5000	31800	29900	25400	27200	24400	20900	18800	22800	27400	22000	23400	21900	24400	22700	22900	20100	23400	19800
Lead	µg/L																			
Lithium	µg/L																			
Magnesium	µg/L																			
Manganese	µg/L																			
Mercury	µg/L																			
Molybdenum	µg/L																			
Nickel	µg/L	500	320	290	280	300	280	220	200	210	210	190	200	190	180	200	200	170	200	186
Potassium	µg/L																			
Rubidium	µg/L																			
Selenium	µg/L																			
Silver	µg/L																			
Sodium	µg/L																			
Strontium	µg/L																			
Tellurium	µg/L																			
Thallium	µg/L																			
Tin	µg/L																			
Uranium	µg/L																			
Vanadium	µg/L																			
Zinc	µg/L	500	410	360	310	310	250	200	200	180	140	80	110	100	100	112	140	120	100	130

*Guidelines in accordance with Certificate of Approval (No. SL5-R2002)

Appendix D – Operational Monitoring Results

MHL1 Manhole 1 Leachate General Chemistry

Laboratory ID:			343253-6	351141-37	359715-35	373149-30
Client ID:			MH-L1	MH-L1	MH-L1	MH-L1
Sample Station:			MH-L1	MH-L1	MH-L1	MH-L1
Date: (YYYY/MM/DD)			2020/01/23	2020/04/27	2020/07/13	2020/10/26
	Units	MDL¹	Results	Results	Results	Results
Alkalinity	mg/L	1	7500	4200	7200	5400
Ammonia	mg/L	0.05	780	430	770	580
Calcium	mg/L	0.05	392	353	323	304
Chloride	mg/L	0.5	1800	900	1500	1100
Conductivity	µS/cm	1	17800	12000	17900	12700
Copper	mg/L	0.001	0.03	0.02	0.05	0.03
Cyanide	mg/L	0.002				
Iron	mg/L	0.02	34.2	34	28.9	28.8
Magnesium	mg/L	0.01	596	456	632	582
Manganese	mg/L	0.001	13.3	11.6	9.09	9.3
Nitrate + Nitrite	mg/L	0.05	<25	<5	<25	<25
oPhosphate	mg/L	0.01	9	7	9	6
pH			7.6	7.4	7.6	7.4
Phenols	mg/L	0.001				
Potassium	mg/L	0.02	893	556	880	573
rSilica	mg/L	0.1	<50	30	<50	<50
Sodium	mg/L	0.05	1230	749	1270	785
Sulfate	mg/L	1	<500	1300	<500	<500
Tannin & Lignin	mg/L	0.5				
Total Organic Carbon	mg/L	0.5	4500	3200	3500	4200
Turbidity	NTU	0.1	>1000	>1000	>1000	>1000
Zinc	mg/L	0.001	0.4	0.25	0.24	0.17
Calculated Parameters						
Bicarbonate	mg/L		7470	4190	7170	5390
Carbonate	mg/L		28	9.89	26.8	12.7
Hydroxide	mg/L		0.020	0.013	0.020	0.013
Cation sum	meq/L		203	135	203	155
Anion sum	meq/L		201	137	187	139
% difference	mg/L		0.44	-0.7	4.11	5.39
Theoretical Conductivity	µS/cm		12600	9050	12100	9400
Hardness	mg/L		3430	2760	3410	3160
Ion Sum	mg/L		10500	7480	9980	7380
Saturation pH			5.4	5.8	5.6	5.7
Langelier Index			2.15	1.64	2.05	1.69
	mg/L					
BOD	mg/L	3	2230	2200	1180	990
COD	mg/L	10				
Color	TCU	5				
Kjeldahl Nitrogen	mg/L	0.25	960	610	820	550
Total Phosphorus	mg/L	0.002				
Total Dissolved Solids	mg/L	5				
Total Suspended Solids	mg/L	5	25	71	102	33
Volatile Suspended Solids	mg/L	5				

¹ Method Detection Limit

MHL1 Manhole 1 Leachate Trace Metals

Laboratory ID:			351141-37	359715-35	373149-30
Client ID:			MH-L1	MH-L1	MH-L1
Sample Station:			MH-L1	MH-L1	MH-L1
Date: (YYYY/MM/DD)			2020/04/27	2020/07/13	2020/10/26
	Units	MDL¹	Results	Results	Results
Aluminium	µg/L	1	14300	26400	22300
Antimony	µg/L	0.1	23	38	35
Arsenic	µg/L	1	160	290	210
Barium	µg/L	1	700	1170	920
Beryllium	µg/L	0.1	<1	< 1	< 1
Bismuth	µg/L	0.1	<10	< 10	< 10
Boron	µg/L	1	5490	10600	6310
Cadmium	µg/L	0.1	0.5	< 0.1	0.6
Calcium	µg/L	50	353000	323000	304000
Chromium	µg/L	1	800	1680	1220
Cobalt	µg/L	0.1	37	59	49
Copper	µg/L	1	20	50	30
Iron	µg/L	20	34000	28900	28800
Lead	µg/L	0.1	8	12	11
Lithium	µg/L	0.1	167	238	181
Magnesium	µg/L	10	456000	632000	582000
Manganese	µg/L	1	11600	9090	9300
Mercury	µg/L	0.05	0.12	0.27	0.31
Molybdenum	µg/L	0.1	26	49	36
Nickel	µg/L	1	220	400	300
Potassium	µg/L	20	556000	880000	573000
Rubidium	µg/L	0.1	478	743	494
Selenium	µg/L	1	<10	< 10	< 10
Silver	µg/L	0.1	2	2	1
Sodium	µg/L	50	749000	1270000	785000
Strontium	µg/L	1	1740	1930	1850
Tellurium	µg/L	0.1	<1	< 1	< 1
Thallium	µg/L	0.1	<1	< 1	< 1
Tin	µg/L	0.1	605	1590	1110
Uranium	µg/L	0.1	1	2	2
Vanadium	µg/L	1	260	570	420
Zinc	µg/L	1	250	240	170

¹ Method Detection Limit

MHL1 Manhole 1 Leachate Atlantic MUST

RPC Sample ID:			343253-6	351141-37	359715-35	373149-1
Client Sample ID:			MH-L1	MH-L1	MH-L1	MH-L1
Date Sampled:			23-Jan-20	27-Apr-20	13-Jul-20	26-Oct-20
Matrix:			water	water	water	water
Analytes	Units	RL				
Benzene	mg/L	0.001	0.004	0.005	0.005	<0.004
Toluene	mg/L	0.001	0.054	0.092	0.041	0.025
Ethylbenzene	mg/L	0.001	0.024	0.025	0.026	0.02
Xylenes	mg/L	0.001	0.074	0.075	0.076	0.061
VPH C6-C10 (Less BTEX)	mg/L	0.01	0.7	0.62	0.44	0.33
TPH >C10 - C16	mg/L	0.05	1.1	0.86	0.66	0.79
TPH >C16 - C21	mg/L	0.05	0.61	0.45	0.44	0.46
EPH >C21-C32	mg/L	0.1	1.6	1	0.9	0.9
Modified TPH Tier 1	mg/L	0.1	4	2.9	2.4	2.5
VPH Surrogate (IBB)	%		101	99	91	94
EPH Surrogate (IBB)	%		104	108	102	112
EPH Surrogate (C32)	%		87	112	102	114
Resemblance			UP	UP	UP	UP
Return to Baseline at C32			Yes	Yes	Yes	Yes

Cell #2 Outlet Leachate Treatment Pond - Cell #2 Outlet - General Chemistry

Laboratory ID:			343253-7	345760-1	248828-1	351141-38	353204-1	No sample	359715-36	366595-1	368228-01	373149-31	376476-1	378126-1	
Client ID:			Cell 2 @ Outlet	Cell 2 @ Outlet	Cell 2 @ Outlet	Cell 2 @ Outlet	Cell 2 @ Outlet	Cell 2 @ Outlet	Cell 2 @ Outlet	Cell 2 @ Outlet	Cell 2 @ Outlet	Cell 2 @ Outlet	Cell 2 @ Outlet	Cell 2 @ Outlet	Cell 2 @ Outlet
Sample Station:			Cell 2 @ Outlet	Cell 2 @ Outlet	Cell 2 @ Outlet	Cell 2 @ Outlet	Cell 2 @ Outlet	Cell 2 @ Outlet	Cell 2 @ Outlet	Cell 2 @ Outlet	Cell 2 @ Outlet	Cell 2 @ Outlet	Cell 2 @ Outlet	Cell 2 @ Outlet	Cell 2 @ Outlet
Date: (YYYY/MM/DD)			2020/01/23	2020/02/19	2020/03/24	2020/04/27	2020/05/19	2020/06	2020/07/13	2020/08/31	2020/09/14	2020/10/26	2020/11/19	2020/12/03	
	Units	MDL ¹	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	
Alkalinity	mg/L	1	5300			3700			1600			2400			
Ammonia	mg/L	0.05	540	520	670	350	350		<25	<25	<25	130	192	250	
Calcium	mg/L	0.05	282			175			242			265			
Chloride	mg/L	0.5	1400			910			1100			1100			
Conductivity	µS/cm	1	14200			9720			10300			9720			
Copper	mg/L	0.001	0.03			0.02			0.02			0.02			
Cyanide	mg/L	0.002													
Iron	mg/L	0.02	39.1			32.9			37.7			29.6			
Magnesium	mg/L	0.01	505			444			520			488			
Manganese	mg/L	0.001	8.09			3			4.45			6.52			
Nitrate + Nitrite	mg/L	0.05	<25			<5			450			360			
o-Phosphate	mg/L	0.01	<5			3			<5			<5			
pH		-	7.9	8	8.1	8.2	8.3		8	8.1	7.9	8	8.3	8.3	
Phenols	mg/L	0.001													
Potassium	mg/L	0.02	773			521			669			620			
r-Silica	mg/L	0.1	<50			20			<50			<50			
Sodium	mg/L	0.05	1040			722			921			865			
Sulfate	mg/L	1	<500			1400			<500			<500			
Tannin & Lignin	mg/L	0.5													
Total Organic Carbon	mg/L	0.5	3800			2100			2000			2800			
Turbidity	NTU	0.1	>1000			>1000			>1000			>1000			
Zinc	mg/L	0.001	0.52			0.22			0.18			0.15			
Calculated Parameters															
Bicarbonate	mg/L	-	5260			3640			1580			2380			
Carbonate	mg/L	-	39.3			54.3			14.9			22.3			
Hydroxide	mg/L	-	0.04			0.079			0.05			0.05			
Cation sum	meq/L	-	162			117			114			118			
Anion sum	meq/L	-	145			129			95.1			105			
% difference	mg/L	-	5.29			-4.9			9.12			5.97			
Theoretical Conductivity	µS/cm	-	9890			8370			7330			7670			
Hardness	mg/L	-	2780			2260			2740			2670			
Ion Sum	mg/L	-	7930			6910			6460			6590			
Saturation pH		-	5.8			6.1			6.3			6.1			
Langelier Index		-	2.14			2.08			1.66			1.88			
BOD	mg/L	3	1730	1390	1210	198	105		102	134	145	203	184	156	
COD	mg/L	10													
Color	TCU	5													
Kjeldahl Nitrogen	mg/L	0.25													
Total Phosphorus	mg/L	0.002													
Total Dissolved Solids	mg/L	5													
Total Suspended Solids	mg/L	5	65	96	130	117	298		118	157	159	131	147	137	
Volatile Suspended Solids	mg/L	5	48	78	122	64	200		100	120	116	104	140	124	

¹ Method Detection Limit

Cell #2 Outlet Leachate Treatment Pond - Cell #2 Outlet - Trace Metals

Laboratory ID:			351141-38	359715-36	373149-31
Client ID:			LTP-Cell#2	LTP-Cell#2	LTP-Cell#2
Sample Station:			LTP-Cell#2	LTP-Cell#2	LTP-Cell#2
Date: (YYYY/MM/DD)			2020/04/27	2020/07/13	2020/10/26
	Units	MDL¹	Results	Results	Results
Aluminium	µg/L	1	13900	14200	17400
Antimony	µg/L	0.1	24	29	33
Arsenic	µg/L	1	140	180	200
Barium	µg/L	1	370	460	700
Beryllium	µg/L	0.1	<1	< 1	< 1
Bismuth	µg/L	0.1	<10	< 10	< 10
Boron	µg/L	1	5230	7830	6660
Cadmium	µg/L	0.1	0.5	< 0.1	0.4
Calcium	µg/L	50	175000	242000	265000
Chromium	µg/L	1	820	1060	1190
Cobalt	µg/L	0.1	38	49	50
Copper	µg/L	1	20	20	20
Iron	µg/L	20	32900	37700	29600
Lead	µg/L	0.1	7	9	10
Lithium	µg/L	0.1	160	189	174
Magnesium	µg/L	10	444000	520000	488000
Manganese	µg/L	1	3000	4450	6520
Mercury	µg/L	0.05	0.1	0.07	0.11
Molybdenum	µg/L	0.1	26	33	37
Nickel	µg/L	1	230	260	280
Potassium	µg/L	20	521000	669000	620000
Rubidium	µg/L	0.1	449	566	513
Selenium	µg/L	1	<10	< 10	< 10
Silver	µg/L	0.1	<1	1	2
Sodium	µg/L	50	722000	921000	865000
Strontium	µg/L	1	1140	1420	1580
Tellurium	µg/L	0.1	<1	< 1	< 1
Thallium	µg/L	0.1	<1	< 1	< 1
Tin	µg/L	0.1	584	870	1100
Uranium	µg/L	0.1	1	2	2
Vanadium	µg/L	1	240	330	380
Zinc	µg/L	1	220	180	150

¹ Method Detection Limit

LHP Outlet Leachate Holding Pond Outlet - General Chemistry

Laboratory ID:			343253-8	345769-2	348828-2	351141-39	353204-2	356661-2	359715-37	366595-2	368228-02	373149-33	376476-2	378126-2
Client ID:			LHP-Outlet	LHP-Outlet	LHP-Outlet	LHP-Outlet	LHP-Outlet	LHP-Outlet	LHP-Outlet	LHP-Outlet	LHP-Outlet	LHP-Outlet	LHP-Outlet	LHP-Outlet
Sample Station:			LHP-Outlet	LHP-Outlet	LHP-Outlet	LHP-Outlet	LHP-Outlet	LHP-Outlet	LHP-Outlet	LHP-Outlet	LHP-Outlet	LHP-Outlet	LHP-Outlet	LHP-Outlet
Date: (YYYY/MM/DD)			2020/01/23	2020/02/19	2020/03/24	2020/04/27	2020/05/19	2020/06/15	2020/07/13	2020/08/31	2020/09/14	2020/10/26	2020/11/19	2020/12/03
	Units	MDL ¹	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results	Results
Alkalinity	mg/L	1	4600			4200			>1000			4300		
Ammonia	mg/L	0.05	410	420	500	400	360	138	<25	<25	<25	40	100	180
Calcium	mg/L	0.05	233			165			150			176		
Chloride	mg/L	0.5	1400			1310			900			800		
Conductivity	µS/cm	1	12600			12100			7400			7100		
Copper	mg/L	0.001	0.03			0.03			0.02			0.02		
Cyanide	mg/L	0.002												
Iron	mg/L	0.02	37.3			32			26.6			22.6		
Magnesium	mg/L	0.01	491			495			357			347		
Manganese	mg/L	0.001	5.15			6.15			3.21			3.59		
Nitrate + Nitrite	mg/L	0.05	<25			<5			220			260		
o-Phosphate	mg/L	0.01	<5	6	5	4	4	3	<5	<5	<5	<5	<5	<5
pH		-	7.8	7.8	8	7.9	8	8.2	8.4	8.6	8.6	8.2	8.2	8.1
Phenols	mg/L	0.001												
Potassium	mg/L	0.02	742			674			477			466		
r-Silica	mg/L	0.1	<50			20			<50			<50		
Sodium	mg/L	0.05	1010			970			687			661		
Sulfate	mg/L	1	<500			1500			<500			<500		
Tannin & Lignin	mg/L	0.5												
Total Organic Carbon	mg/L	0.5	3600			3000			1820			2000		
Turbidity	NTU	0.1	>1000			>1000			>1000			>1000		
Zinc	mg/L	0.001	0.56			0.3			0.15			0.11		
Calculated Parameters														
Bicarbonate	mg/L	-	4570			4170			-0.1			4240		
Carbonate	mg/L	-	27.1			31.1			-0.002			63.1		
Hydroxide	mg/L	-	0.032			0.04			0.126			0.079		
Cation sum	meq/L	-	146			139			80.5			82.2		
Anion sum	meq/L	-	131			152			41.1			127		
% difference	mg/L	-	5.41			-4.61			32.4			-21.4		
Theoretical Conductivity	µS/cm	-	9060			9780			4760			6870		
Hardness	mg/L	-	2600			2450			1840			1870		
Ion Sum	mg/L	-	7220			8220			3570			6300		
Saturation pH		-	5.9			6.1			---			6		
Langelier Index		-	1.9			1.81			---			2.15		
BOD	mg/L	3	1150	1150	1250	802	538	34	18	35	31	12	41	46
COD	mg/L	10												
Color	TCU	5												
Kjeldahl Nitrogen	mg/L	0.25	560	510	590	600	450	230	92	92	87	110	200	300
Total Phosphorus	mg/L	0.002												
Total Dissolved Solids	mg/L	5												
Total Suspended Solids	mg/L	5	57	136	129	81	58	77	70	49	31	13	27	56
Volatile Suspended Solids	mg/L	5												

¹ Method Detection Limit

LHP Outlet Leachate Holding Pond Outlet - Trace Metals

Laboratory ID:			351141-39	359715-37	373149-33
Client ID:			LHP-Outlet	LHP-Outlet	LHP-Outlet
Sample Station:			LHP-Outlet	LHP-Outlet	LHP-Outlet
Date: (YYYY/MM/DD)			2020/04/27	2020/07/13	2020/10/26
	Units	MDL¹	Results	Results	Results
Aluminium	µg/L	1	19600	10800	10900
Antimony	µg/L	0.1	28	20	22
Arsenic	µg/L	1	190	110	120
Barium	µg/L	1	600	420	520
Beryllium	µg/L	0.1	<1	< 1	< 1
Bismuth	µg/L	0.1	<10	< 10	< 10
Boron	µg/L	1	6670	5080	4890
Cadmium	µg/L	0.1	0.6	< 0.1	0.3
Calcium	µg/L	50	165000	150000	176000
Chromium	µg/L	1	1210	810	810
Cobalt	µg/L	0.1	57	46	41
Copper	µg/L	1	30	20	20
Iron	µg/L	20	32000	26600	22600
Lead	µg/L	0.1	11	10	9
Lithium	µg/L	0.1	177	121	91
Magnesium	µg/L	10	495000	357000	347000
Manganese	µg/L	1	6150	3210	3590
Mercury	µg/L	0.05	0.14	0.08	0.13
Molybdenum	µg/L	0.1	34	25	26
Nickel	µg/L	1	300	210	190
Potassium	µg/L	20	674000	477000	466000
Rubidium	µg/L	0.1	553	391	395
Selenium	µg/L	1	<10	< 10	< 10
Silver	µg/L	0.1	<1	< 1	1
Sodium	µg/L	50	970000	687000	661000
Strontium	µg/L	1	1320	1020	1070
Tellurium	µg/L	0.1	<1	< 1	< 1
Thallium	µg/L	0.1	<1	< 1	< 1
Tin	µg/L	0.1	868	564	663
Uranium	µg/L	0.1	2	1	2
Vanadium	µg/L	1	370	200	210
Zinc	µg/L	1	300	150	110

¹ Method Detection Limit

Vibrating Wire Piezometer Data VP 97-3; Serial Number 40403, 26 Meters, Bottom of Cell 1

Barometer Constants

Calibration Factor 0.04648 psi/Digit
 Temperature Correction Factor -0.01345 psi/C

Initial Readings (Factory Zero Readings)

Digits (f*f) 9796
 Temperature (C) 22.2
 Barometric Pressure (mbar) 1017.5

Vibrating Wire Piezometer Constants

Calibration Factor 0.002696 psi/Digit
 Temperature Correction -0.00243 psi/C

Initial Readings

Digits (f*f) 10111
 Temperature © 24.5
 Barometric Pressure (mbar) 994.8

Date	Digits (f*f)	Resistance (ohms)	Temperature (C)	Barometric Pressure (mbar)	Date	Digits (f*f)	Resistance (ohms)	Temperature (C)	Pressure Difference (psi)	Water Depth (m)
Jan-20	4821.8		-5.6	991.255606	Jan-20	10317.9		12.9	-0.478206509	-0.3370371
Feb-20	4667.1		7.3	983.640827	Feb-20	10375.5		13.2	-0.523780355	-0.3691573
Mar-20	no data				Mar-20	no data				
Apr-20	no data				Apr-20	no data				
May-20	no data				May-20	no data				
Jun-20	9813.5		42.0000	1006.7026	Jun-20	10333.9		12.5000	-0.7444	-0.5247
Jul-20	9870.3		12.8000	984.2282	Jul-20	10423.6		12.8000	-0.6610	-0.4659
Aug-20	9866.9		31.2000	983.3338	Aug-20	10373		12.9000	-0.5119	-0.3608
Sep-20	9908.1		19.3000	965.7837	Sep-20	10456.3		13.2000	-0.4826	-0.3401
Oct-20	9869.6		10.6000	984.8494	Oct-20	10366.1		13.3000	-0.5162	-0.3638
Nov-20	9892.5		0.2000	975.6039	Nov-20	10469		13.3000	-0.6595	-0.4648
Dec-20	9882.8		0.0000	980.1395	Dec-20	10479.4		13.8000	-0.7546	-0.5318

Vibrating Wire Piezometer Data VP 97-4 ; Serial Number 40404, 27 meters, Bottom of Cell 2

Barometer Constants

Calibration Factor 0.046482 psi/Digit
 Temperature Correction Factor -0.01345 psi/C

Initial Readings (Factory Zero Readings)

Digits (f*f) 9796
 Temperature (C) 22.2
 Barometric Pressure (mbar) 1017.5

Vibrating Wire Pizometer Constants

Calibration Factor 0.002823 psi/Digit
 Temperature Correction -0.00157 psi/C

Initial Readings

Digits (f*f) 9655
 Temperature © 24.7
 Barometric Pressure (mbar) 994.8

Date	Digits (f*f)	Resistance (ohms)	Temperature (C)	Barometric Pressure (mbar)	Date	Digits (f*f)	Resistance (ohms)	Temperature (C)	Pressure Difference(psi)	Water Depth (m)
Jan-20	4821.8		-5.6000	991.2556	Jan-20	9773.4		14.8000	-0.2673	-0.1884
Feb-20	4378	4440	16.2318	966.1045	Jan 11,02	9753	6540	8.0517	0.1657	0.1168
Mar-20	no data				Mar-20	no data				
Apr-20	no data				Apr-20	no data				
May-20	no data				May-20	no data				
Jun-20	9813.5		42.0000	1006.7026	Jun-20	9628.4		18.8000	-0.0883	-0.0622
Jul-20	9870.3		35.7000	981.1481	Jul-20	9954.9		14.6000	-0.6328	-0.4460
Aug-20	9866.9		31.2000	983.3338	Aug-20	9868.7		14.4000	-0.4208	-0.2966
Sep-20	9908.1		19.3000	965.7837	Sep-20	9946.4		14.2000	-0.3853	-0.2715
Oct-20	9869.6		10.6000	984.8494	Oct-20	9906.2		14.2000	-0.5483	-0.3865
Nov-20	9892.5		0.2000	975.6039	Nov-20	9989.5		14.3000	-0.6495	-0.4578
Dec-20	9882.8		0.0000	980.1395	Dec-20	4986.3		14.5000	13.4084	9.4502

Vibrating Wire Piezometer Data VP 97-5, Serial Number 40407, 81 meters, Bottom of Cell 2

Barometer Constants

Calibration Factor 0.046482 psi/Digit
 Temperature Correction Factor -0.01345 psi/C

Initial Readings (Factory Zero Readings)

Digits (f*f) 9796
 Temperature (C) 22.2
 Barometric Pressure (mbar) 1017.5

Vibrating Wire Piezometer Constants

Calibration Factor 0.002586 psi/Digit
 Temperature Correction 0.010477 psi/C

Initial Readings

Digits (f*f) 9563
 Temperature © 25.2
 Barometric Pressure (mbar) 994.8

Date	Digits (f*f)	Resistance (ohms)	Temperature (C)	Barometric Pressure (mbar)	Date	Digits (f*f)	Resistance (ohms)	Temperature (C)	Pressure Difference (psi)	Water Depth (m)
Jan-20	4821.8		-5.6000	991.2556	Jan-20	9516.5		18.8000	0.1046	0.0737
Feb-20	4667.1		7.3000	983.6408	Feb-20	9646.8		18.7000	-0.1230	-0.0867
Mar-20	no data				Mar-20	no data				
Apr-20	no data				Apr-20	no data				
May-20	no data				May-20	no data				
Jun-20	9813.5		42.0000	1006.7026	Jun-20	9907.2		15.0000	-1.1696	-0.8243
Jul-20	9870.3		35.7000	981.1481	Jul-20	9763.1		18.3000	-0.3917	-0.2761
Aug-20	9866.9		31.2000	983.3338	Aug-20	9674.6		18.0000	-0.1977	-0.1394
Sep-20	9908.1		19.3000	965.7837	Sep-20	9639.8		18.3000	0.1500	0.1057
Oct-20	9869.6		10.6000	984.8494	Oct-20	9616.6		18.6000	-0.0634	-0.0447
Nov-20	9892.5		0.2000	975.6039	Nov-20	9667.5		17.9000	-0.0683	-0.0481
Dec-20	9882.8		0.0000	980.1395	Dec-20	9681.4		17.7000	-0.1721	-0.1213

Vibrating Wire Piezometer Data; Serial Number 40408, 95 Meters (manhole), Top of Cell 2

Barometer Constants

Vibrating Wire Piezometer Constants

Calibration Factor 0.046482 psi/Digit
 Temperature Correction Factor -0.01345 psi/C

Calibration Factor 0.0027 psi/Digit
 Temperature Correction 0.002975 psi/C

Initial Readings (Factory Zero Readings)

Digits (f*f) 9796
 Temperature (C) 22.2
 Barometric Pressure (mbar) 1017.5

Initial Readings

Digits (f*f) 10362
 Temperature © 25.2
 Barometric Pressure (mbar) 994.8

Date	Digits (f*f)	Resistance (ohms)	Temperature (C)	Barometric Pressure (mbar)	Date	Digits (f*f)	Resistance (ohms)	Temperature (C)	Pressure Difference(psi)	Water Depth (m)
Jan-20	4786.7		-3.7	989.582719	Jan-20	10471.7		12.2	-0.259193556	-0.1826781
Feb-20	4619		12.3	981.22039	Feb-20	10501.3		12.3	-0.217528837	-0.153313
Mar-20	no data				Mar-20	no data				
Apr-20	no data				Apr-20	no data				
May-20	no data				May-20	no data				
Jun-20	9829.5		37.7000	999.8438	Jun-20	10578.3		12.3000	-0.6955	-0.4902
Jul-20	9890.3		28.9000	972.7663	Jul-20	10597.2		12.2000	-0.3541	-0.2496
Aug-20	9868		28.9000	983.1318	Aug-20	10553.8		12.0000	-0.3879	-0.2734
Sep-20	9906		19.1000	966.7868	Sep-20	10572.8		12.0000	-0.2021	-0.1425
Oct-20	9872.8		12.1000	983.1603	Oct-20	10550.2		12.1000	-0.3783	-0.2666
Nov-20	9900.8		3.2000	971.3424	Nov-20	10573.4		11.9000	-0.2701	-0.1904
Dec-20	9885.9		7.2000	977.7302	Dec-20	10584.1		11.8000	-0.3920	-0.2762

Vibrating Wire Piezometer Data VP 02-3, 26 meter; Serial Number 69314, Bottom of Cell 4

Barometer Constants

Calibration Factor 0.046482 psi/Digit
 Temperature Correction Factor -0.01345 psi/C

Initial Readings (Factory Zero Readings)

Digits (f*f) 9796
 Temperature (C) 22.2
 Barometric Pressure (mbar) 1017.5

Vibrating Wire Piezometer Constants

Calibration Factor 0.002558 psi/Digit
 Temperature Correction -0.006624 psi/C

Initial Readings

Digits (f*f) 9426
 Temperature © 24.3
 Barometric Pressure (mbar) 1003.5

Date	Digits (f*f)	Resistance (ohms)	Temperature (C)	Barometric Pressure (mbar)	Date	Digits (f*f)	Resistance (ohms)	Temperature (C)	Pressure Difference(psi)	Water Depth (m)
Jan-20	4821.8		-5.6000	991.2556	Jan-20	9495.7		16.4000	0.0516	0.0364
Feb-20	4667.1		7.3000	983.6408	Feb-20	9551.8		14.7000	0.0298	0.0210
Mar-20	no data				Mar-20	no data				
Apr-20	no data				Apr-20	no data				
May-20	no data				May-20	no data				
Jun-20	9813.5		42.0000	1006.7026	Jun-20	9514.8		16.0000	-0.2187	-0.1541
Jul-20	9870.3		35.7000	981.1481	Jul-20	9612.7		16.5000	-0.1018	-0.0717
Aug-20	9866.9		31.2000	983.3338	Aug-20	9579		15.9000	-0.0433	-0.0305
Sep-20	9908.1		19.3000	965.7837	Sep-20	9651.2		15.2000	0.0312	0.0220
Oct-20	9869.6		10.6000	984.8494	Oct-20	9557.1		15.2000	-0.0046	-0.0032
Nov-20	9892.5		0.2000	975.6039	Nov-20	9617.7		15.3000	-0.0262	-0.0185
Dec-20	9882.8		0.0000	980.1395	Dec-20	9588		15.1000	-0.0147	-0.0103

Vibrating Wire Piezometer Data VP 02-2, 80 meter; Serial Number 69313, Top of Cell 4

Barometer Constants

Calibration Factor 0.046482 psi/Digit
 Temperature Correction Factor -0.01345 psi/C

Initial Readings (Factory Zero Readings)

Digits (f*f) 9796
 Temperature (C) 22.2
 Barometric Pressure (mbar) 1017.5

Vibrating Wire Pizometer Constants

Calibration Factor 0.002547 psi/Digit
 Temperature Correction -0.007661 psi/C

Initial Readings

Digits (f*f) 9123
 Temperature © 24.5
 Barometric Pressure (mbar) 1003.5

Date	Digits (f*f)	Resistance (ohms)	Temperature (C)	Barometric Pressure (mbar)	Date	Digits (f*f)	Resistance (ohms)	Temperature (C)	Pressure Difference(psi)	Water Depth (m)
Jan-20	4786.7		-3.7000	989.5827	Jan-20	9216.8		17.6000	0.0158	0.0111
Feb-20	4619		12.3000	981.2204	Feb-20	9249.2		17.8000	0.0530	0.0374
Mar-20	no data				Mar-20	no data				
Apr-20	no data				Apr-20	no data				
May-20	no data				May-20	no data				
Jun-20	9829.5		37.7	999.84378	Jun-20	9218.7		17.5000	-0.1371	-0.0966
Jul-20	9890.3		28.9	972.766324	Jul-20	9312		17.3000	0.0195	0.0138
Aug-20	9868		28.9	983.13181	Aug-20	9274.6		17.3000	-0.0356	-0.0251
Sep-20	9906.6		19.1	966.507858	Sep-20	9249.1		11.5000	0.3149	0.2220
Oct-20	9872.8		12.1	983.160274	Oct-20	9242.1		17.5000	0.0453	0.0319
Nov-20	9900.8		3.2	971.342364	Nov-20	9309.3		17.2000	0.0478	0.0337
Dec-20	9885.9		7.2	977.730182	Dec-20	9295.4		16.8000	-0.0064	-0.0045

Vibrating Wire Piezometer Data; Serial Number 49786, 25 Meters, Bottom of Cell 3

Barometer Constants

Calibration Factor 0.046482 psi/Digit
 Temperature Correction Factor -0.01345 psi/C

Initial Readings (Factory Zero Readings)

Digits (f*f) 9796
 Temperature (C) 22.2
 Barometric Pressure (mbar) 1017.5

Vibrating Wire Pizometer Constants

Calibration Factor 0.0025 psi/Digit
 Temperature Correction -0.011763 psi/C

Initial Readings

Digits (f*f) 10456.7
 Temperature © 22.7
 Barometric Pressure (mbar) 1017

Date	Digits (f*f)	Resistance (ohms)	Temperature (C)	Barometric Pressure (mbar)	Date	Digits (f*f)	Resistance (ohms)	Temperature (C)	Pressure Difference(psi)	Water Depth (m)
Jan-20	4821.8		-5.6000	991.2556	Jan-20	10570		15.4000	0.1757	0.1239
Feb-20	4667.1		7.3000	983.6408	Feb-20	10647		14.8000	0.1010	0.0712
Mar-20	no data				Mar-20	no data				
Apr-20	no data				Apr-20	no data				
May-20	no data				May-20	no data				
Jun-20	9813.5		42.0000	1006.7026	Jun-20	10598		15.7000	-0.1218	-0.0859
Jul-20	9870.3		35.7000	981.1481	Jul-20	10707		14.7000	-0.0112	-0.0079
Aug-20	9866.9		31.2000	983.3338	Aug-20	10680		14.1000	0.0324	0.0229
Sep-20	9908.1		19.3000	965.7837	Sep-20	10743		13.9000	0.1301	0.0917
Oct-20	9869.6		10.6000	984.8494	Oct-20	10653		13.8000	0.0810	0.0571
Nov-20	9892.5		0.2000	975.6039	Nov-20	10731		14.4000	0.0133	0.0094
Dec-20	9882.8		0.0000	980.1395	Dec-20	10908		14.3000	-0.4943	-0.3484

Vibrating Wire Piezometer Data; Serial Number 50957, 80 meters, Bottom of Cell 3

Barometer Constants

Calibration Factor 0.046482 psi/Digit
 Temperature Correction Factor -0.01345 psi/C

Initial Readings (Factory Zero Readings)

Digits (f*f) 9796
 Temperature (C) 22.2
 Barometric Pressure (mbar) 1017.5

Vibrating Wire Piezometer Constants

Calibration Factor 0.002437 psi/Digit
 Temperature Correction -0.009102 psi/C

Initial Readings

Digits (f*f) 10821.6
 Temperature © 22.3
 Barometric Pressure (mbar) 1017

Date	Digits (f*f)	Resistance (ohms)	Temperature (C)	Barometric Pressure (mbar)	Date	Digits (f*f)	Resistance (ohms)	Temperature (C)	Pressure Difference (psi)	Water Depth (m)
Jan-20	4821.8		-5.6000	991.2556	Jan-20	10985.7		22.0000	-0.9409	-0.6631
Feb-20	4667.1		7.3000	983.6408	Feb-20	11041.1		22.2000	-0.9713	-0.6846
Mar-20	no data				Mar-20	no data				
Apr-20	no data				Apr-20	no data				
May-20	no data				May-20	no data				
Jun-20	9813.5		42.0000	1022.9713	Jun-20	11003.4		21.4000	-0.5215	-0.3675
Jul-20	9870.3		35.7000	1050.2204	Jul-20	11110.9		21.7000	-1.1814	-0.8326
Aug-20	9866.9		31.2000	1049.2452	Aug-20	11076.8		21.8000	-1.0851	-0.7647
Sep-20	9908.1		19.3000	1069.9964	Sep-20	11141.2		21.8000	-1.5430	-1.0875
Oct-20	9869.6		10.6000	1053.2710	Oct-20	11046.2		21.8000	-1.0689	-0.7533
Nov-20	9892.5		0.2000	1065.3141	Nov-20	11127.2		21.2000	-1.4355	-1.0117
Dec-20	9882.8		0.0000	1060.8323	Dec-20	11107.7		21.0000	-1.3211	-0.9311

Vibrating Wire Piezometer Data; Serial Number 50956, 80 Meters, Top of Cell 3

Barometer Constants

Calibration Factor 0.046482 psi/Digit
 Temperature Correction Factor -0.01345 psi/C

Initial Readings (Factory Zero Readings)

Digits (f*f) 9796
 Temperature (C) 22.2
 Barometric Pressure (mbar) 1017.5

Vibrating Wire Piezometer Constants

Calibration Factor 0.002319 psi/Digit
 Temperature Correction -0.009905 psi/C

Initial Readings

Digits (f*f) 10378.4
 Temperature © 22.6
 Barometric Pressure (mbar) 1017

Date	Digits (f*f)	Resistance (ohms)	Temperature (C)	Barometric Pressure (mbar)	Date	Digits (f*f)	Resistance (ohms)	Temperature (C)	Pressure Difference(psi)	Water Depth (m)
Jan-20	4786.7		-3.7000	989.5827	Jan-20	10514		16.6000	0.1426	0.1005
Feb-20	4619		12.3000	981.2204	Feb-20	10578		16.7000	0.1145	0.0807
Mar-20	no data				Mar-20	no data				
Apr-20	no data				Apr-20	no data				
May-20	no data				May-20	no data				
Jun-20	9829.5		37.7000	999.8438	Jun-20	10553.4		16.7000	-0.0986	-0.0695
Jul-20	9890.3		28.9000	972.7663	Jul-20	10678.9		16.2000	0.0081	0.0057
Aug-20	9868		28.9000	983.1318	Aug-20	10638.5		16.3000	-0.0495	-0.0349
Sep-20	9906.6		19.1000	966.5079	Sep-20	10675.3		16.3000	0.1062	0.0749
Oct-20	9872.8		12.1000	983.1603	Oct-20	10602.5		16.3000	0.0335	0.0236
Nov-20	9900.8		3.2000	971.3424	Nov-20	10681.2		16.0000	0.0254	0.0179
Dec-20	9885.9		7.2000	977.7302	Dec-20	10667.1		15.9000	-0.0336	-0.0237

Vibrating Wire Piezometer Data; Serial Number VW2345, 25 Meters, Top of Cell 5

Barometer Constants

Calibration Factor 0.046482 psi/Digit
 Temperature Correction Factor -0.01345 psi/C

Initial Readings (Factory Zero Readings)

Digits (f*f) 9796
 Temperature (C) 22.2
 Barometric Pressure (mbar) 1017.5

Vibrating Wire Piezometer Constants

Calibration Factor 0.002614 psi/Digit
 Temperature Correction -0.006332 psi/C

Initial Readings

Digits (f*f) 8952
 Temperature © 25.8
 Barometric Pressure (mbar) 1002.3

Date	Digits (f*f)	Resistance (ohms)	Temperature (C)	Barometric Pressure (mbar)	Date	Digits (f*f)	Resistance (ohms)	Temperature (C)	Pressure Difference(psi)	Water Depth (m)
Jan-20	4786.7		-3.7000	989.5827	Jan-20	9287.7		18.3000	-0.6456	-0.4550
Feb-20	4619		12.3000	981.2204	Feb-20	9346.4		18.5000	-0.6790	-0.4786
Mar-20	no data				Mar-20	no data				
Apr-20	no data				Apr-20	no data				
May-20	no data				May-20	no data				
Jun-20	9829.5		37.7000	999.8438	Jun-20	9318.1		18.1000	-0.8726	-0.6150
Jul-20	9890.3		28.9000	972.7663	Jul-20	9457.3		18.1000	-0.8437	-0.5947
Aug-20	9890.3		28.9000	972.7663	Aug-20	9379.2		18.1000	-0.6396	-0.4508
Sep-20	9906.6		19.1000	966.5079	Sep-20	270.4		25.5000	23.2147	16.3616
Oct-20	9872.8		12.1000	983.1603	Oct-20	97		18.4000	23.4714	16.5425
Nov-20	9900.8		3.2000	971.3424	Nov-20	9425.7		18.3000	-0.7418	-0.5228
Dec-20	9885.9		7.2000	977.7302	Dec-20	9400.7		18.0000	-0.7672	-0.5407

Vibrating Wire Piezometer Data; Serial Number VW 2346, Bottom of Cell 5

Barometer Constants

Calibration Factor 0.046482 psi/Digit
 Temperature Correction Factor -0.01345 psi/C

Initial Readings (Factory Zero Readings)

Digits (f*f) 9796
 Temperature (C) 22.2
 Barometric Pressure (mbar) 1017.5

Vibrating Wire Piezometer Constants

Calibration Factor 0.00276 psi/Digit
 Temperature Correction 0.000186 psi/C

Initial Readings

Digits (f*f) 9289
 Temperature © 25.5
 Barometric Pressure (mbar) 1002.3

Date	Digits (f*f)	Resistance (ohms)	Temperature (C)	Barometric Pressure (mbar)	Date	Digits (f*f)	Resistance (ohms)	Temperature (C)	Pressure Difference(psi)	Water Depth (m)
Jan-20	4821.8		-5.6000	991.2556	Jan-20	9503.4		15.4000	-0.4334	-0.3055
Feb-20	4667.1		7.3000	983.6408	Feb-20	9564.6		15.2000	-0.4919	-0.3467
Mar-20	no data				Mar-20	no data				
Apr-20	no data				Apr-20	no data				
May-20	no data				May-20	no data				
Jun-20	9813.5		42.0000	1006.7026	Jun-20	9537.3		15.2000	-0.7511	-0.5294
Jul-20	9870.3		35.7000	981.1481	Jul-20	9658.4		15.3000	-0.7147	-0.5037
Aug-20	9866.9		31.2000	983.3338	Aug-20	9596.5		15.4000	-0.5755	-0.4056
Sep-20	9908.1		19.3000	965.7837	Sep-20	9649.6		15.5000	-0.4675	-0.3295
Oct-20	9869.6		10.6000	984.8494	Oct-20	9569.3		15.2000	-0.5224	-0.3682
Nov-20	9892.5		0.2000	975.6039	Nov-20	9638.6		15.3000	-0.5796	-0.4085
Dec-20	9882.8		0.0000	980.1395	Dec-20	9616.3		15.4000	-0.5838	-0.4115

Vibrating Wire Piezometer Data; Serial Number VW 2344, Bottom of Cell 5

Barometer Constants

Calibration Factor 0.046482 psi/Digit
 Temperature Correction Factor -0.01345 psi/C

Initial Readings (Factory Zero Readings)

Digits (f*f) 9796
 Temperature (C) 22.2
 Barometric Pressure (mbar) 1017.5

Vibrating Wire Piezometer Constants

Calibration Factor 0.00261 psi/Digit
 Temperature Correction -0.004647 psi/C

Initial Readings

Digits (f*f) 9029
 Temperature © 25.9
 Barometric Pressure (mbar) 1002.3

Date	Digits (f*f)	Resistance (ohms)	Temperature (C)	Barometric Pressure (mbar)	Date	Digits (f*f)	Resistance (ohms)	Temperature (C)	Pressure Difference(psi)	Water Depth (m)
Jan-20	4821.8		-5.6000	991.2556	Jan-20	9395.2		23.5000	0.7867	0.5545
Feb-20	4667.1		7.3000	983.6408	Feb-20	9463.2		23.5000	0.7052	0.4970
Mar-20	no data				Mar-20	no data				
Apr-20	no data				Apr-20	no data				
May-20	no data				May-20	no data				
Jun-20	9813.5		42.0000	1006.7026	Jun-20	9432.2		23.2000	0.4587	0.3233
Jul-20	9870.3		35.7000	981.1481	Jul-20	9524.4		23.2000	0.5690	0.4011
Aug-20	9866.9		31.2000	983.3338	Aug-20	9488.9		23.2000	0.6376	0.4493
Sep-20	9908.1		19.3000	965.7837	Sep-20	9515.5		23.2000	0.8170	0.5758
Oct-20	9869.6		10.6000	984.8494	Oct-20	9464.1		23.1000	0.6857	0.4833
Nov-20	9892.5		0.2000	975.6039	Nov-20	9519		23.2000	0.6647	0.4685
Dec-20	9882.8		0.0000	980.1395	Dec-20	9501.1		22.8000	0.6501	0.4582

Vibrating Wire Piezometer Data; Serial Number VW 6984, Bottom of Cell 6

Bottom of cell 6

Barometer Constants

Calibration Factor 0.046482 kPa/Digit
 Temperature Correction Factor -0.01345 kPa/C

Initial Readings (Factory Zero Readings)

Digits (f*f) 9796
 Temperature (C) 22.2
 Barometric Pressure (mbar) 1017.5

Vibrating Wire Piezometer Constants

Calibration Factor 0.00293 psi/Digit
 Temperature Correction 0.0124 psi/C

Initial Readings

Digits (f*f) 9094
 Temperature © 22.9
 Barometric Pressure (mbar) 1018

Date	Digits (f*f)	Resistance (ohms)	Temperature (C)	Barometric Pressure (mbar)	Date	Digits (f*f)	Resistance (ohms)	Temperature	Pressure Difference(psi)	Water Depth (m)
Jan-20	4821.8		-5.6000	991.2556	Jan-20	9100.9		15.6000	0.359	0.2528
Feb-20	4667.1		7.3000	983.6408	Feb-20	9183.3		15.6000	0.228	0.1604
Mar-20	no data				Mar-20	no data				
Apr-20	no data				Apr-20	no data				
May-20	no data				May-20	no data				
Jun-20	9813.5		42.0000	1006.7026	Jun-20	9158.3		15.4000	-0.034	-0.0239
Jul-20	9870.3		35.7000	981.1481	Jul-20	9302.1		15.5000	-0.084	-0.0595
Aug-20	9866.9		31.2000	983.3338	Aug-20	9202.5		14.9000	0.175	0.1233
Sep-20	9908.1		19.3000	965.7837	Sep-20	9092.7		13.8000	0.750	0.5285
Oct-20	9869.6		10.6000	984.8494	Oct-20	9122.1		13.8000	0.387	0.2729
Nov-20	9892.5		0.2000	975.6039	Nov-20	8998.4		13.4000	0.883	0.6225
Dec-20	9882.8		0.0000	980.1395	Dec-20	8937.5		13.3000	0.996	0.7018

Vibrating Wire Piezometer Data; Serial Number VW 6985, Top of Cell 6

Barometer Constants

Calibration Factor 0.046482 kPa/Digit
 Temperature Correction Factor -0.01345 kPa/C

Initial Readings (Factory Zero Readings)

Digits (f*f) 9796
 Temperature (C) 22.2
 Barometric Pressure (mbar) 1017.5

Vibrating Wire Pizometer Constants

Calibration Factor 0.0027 psi/Digit
 Temperature Correction 0.00987 psi/C

Initial Readings

Digits (f*f) 8686
 Temperature © 23.4
 Barometric Pressure (mbar) 1018

Date	Digits (f*f)	Resistance (ohms)	Temperature (C)	Barometric Pressure (mbar)	Date	Digits (f*f)	Resistance (ohms)	Temperature (C)	Pressure Difference (psi)	Meters of water (m)
Jan-20	4786.7		-3.7000	989.5827	Jan-20	8859.7		22.4000	-0.0667	-0.0470
Feb-20	4619		12.3000	981.2204	Feb-20	8969		23.5000	-0.2297	-0.1619
Mar-20	no data				Mar-20	no data				
Apr-20	no data				Apr-20	no data				
May-20	no data				May-20	no data				
Jun-20	9829.5		37.7000	999.8438	Jun-20	8825.3		21.6000	-0.1305	-0.0920
Jul-20	9890.3		28.9000	972.7663	Jul-20	8985.4		21.4000	-0.1721	-0.1213
Aug-20	9868		28.9000	983.1318	Aug-20	8902.2		21.5000	-0.0968	-0.0682
Sep-20	9906.6		19.1000	966.5079	Sep-20	8912.8		23.2000	0.1325	0.0934
Oct-20	9872.8		12.1000	983.1603	Oct-20	8939.9		23.6000	-0.1782	-0.1256
Nov-20	9900.8		3.2000	971.3424	Nov-20	9003.4		21.9000	-0.1951	-0.1375
Dec-20	9885.9		7.2000	977.7302	Dec-20	8997.2		21.8000	-0.2720	-0.1917

Vibrating Wire Piezometer Data; Serial Number VW 6986, Bottom of Cell 6

Barometer Constants

Calibration Factor 0.046482 kPa/Digit
 Temperature Correction Factor -0.01345 kPa/C

Initial Readings (Factory Zero Readings)

Digits (f*f) 9796
 Temperature (C) 22.2
 Barometric Pressure (mbar) 1017.5

Vibrating Wire Pizometer Constants

Calibration Factor 0.00283 psi/Digit
 Temperature Correction 0.0102 psi/C

Initial Readings

Digits (f*f) 9001
 Temperature © 23.6
 Barometric Pressure (mbar) 1018

Date	Digits (f*f)	Resistance (ohms)	Temperature (C)	Barometric Pressure (mbar)	Date	Digits (f*f)	Resistance (ohms)	Temperature (C)	Pressure Difference(psi)	Water Depth (m)
Jan-20	4821.8		-5.6000	991.2556	Jan-20	9443.9		21.8000	-0.8846	-0.6235
Feb-20	4667.1		7.3000	983.6408	Feb-20	9594.7		21.9000	-1.1999	-0.8457
Mar-20	no data				Mar-20	no data				
Apr-20	no data				Apr-20	no data				
May-20	no data				May-20	no data				
Jun-20	9813.5		42.0000	1006.7026	Jun-20	9473.9		21.6000	-1.1957	-0.8427
Jul-20	9870.3		35.7000	981.1481	Jul-20	9643.1		21.5000	-1.3049	-0.9197
Aug-20	9866.9		31.2000	983.3338	Aug-20	9581.3		21.5000	-1.1618	-0.8188
Sep-20	9908.1		19.3000	965.7837	Sep-20	9570.4		21.5000	-0.8764	-0.6177
Oct-20	9869.6		10.6000	984.8494	Oct-20	9567.7		21.5000	-1.1452	-0.8072
Nov-20	9892.5		0.2000	975.6039	Nov-20	9610.9		21.5000	-1.1334	-0.7988
Dec-20	9882.8		0.0000	980.1395	Dec-20	9581.8		21.5000	-1.1168	-0.7871

Vibrating Wire Piezometer Data; Serial Number VW15021, 78m, Top of Cell 7

Barometer Constants

Calibration Factor 0.046482 kPa/Digit
 Temperature Correction Factor -0.01345 kPa/C

Initial Readings (Factory Zero Readings)

Digits (f*f) 9796
 Temperature (C) 22.2
 Barometric Pressure (mbar) 1017.5

Vibrating Wire Piezometer Constants

Calibration Factor -0.001467 psi/Digit
 Temperature Correction -0.006236 psi/C

Initial Readings

Digits (f*f) 6457
 Temperature © 23.8
 Barometric Pressure (mbar) 1012

Date	Digits (f*f)	Resistance (ohms)	Temperature (C)	Barometric Pressure (mbar)	Date	Digits (f*f)	Resistance (ohms)	Temperature (C)	Pressure Difference(psi)	Water Depth (m)
Jan-20	4786.7		-3.7000	989.5827	Jan-20	6205.4		20.0000	-0.0202	-0.0143
Feb-20	4619		12.3000	981.2204	Feb-20	5841.7		19.9000	-0.4319	-0.3044
Mar-20	no data				Mar-20	no data				
Apr-20	no data				Apr-20	no data				
May-20	no data				May-20	no data				
Jun-20	9829.5		37.7000	999.8438	Jun-20	5851.2		20.0000	-0.6887	-0.4854
Jul-20	9890.3		28.9000	972.7663	Jul-20	5758.9		19.5000	-0.4282	-0.3018
Aug-20	9868		28.9000	983.1318	Aug-20	5601.4		19.6000	-0.8103	-0.5711
Sep-20	9906.6		19.1000	966.5079	Sep-20	6189		19.9000	0.2910	0.2051
Oct-20	9872.8		12.1000	983.1603	Oct-20	5808.8		19.5000	-0.5058	-0.3565
Nov-20	9900.8		3.2000	971.3424	Nov-20	5689.1		19.6000	-0.5106	-0.3599
Dec-20	9885.9		7.2000	977.7302	Dec-20	5741		19.4000	-0.5259	-0.3706

Vibrating Wire Piezometer Data; Serial Number VW15022, 85m, Bottom of Cell 7

Barometer Constants

Calibration Factor 0.046482 kPa/Digit
 Temperature Correction Factor -0.01345 kPa/C

Vibrating Wire Piezometer Constants

Calibration Factor -0.001299 psi/Digit
 Temperature Correction -0.006405 psi/C

Initial Readings (Factory Zero Readings)

Digits (f*f) 9796
 Temperature (C) 22.2
 Barometric Pressure (mbar) 1017.5

Initial Readings

Digits (f*f) 6953
 Temperature © 23.4
 Barometric Pressure (mbar) 1012

Date	Digits (f*f)	Resistance (ohms)	Temperature (C)	Barometric Pressure (mbar)	Date	Digits (f*f)	Resistance (ohms)	Temperature (C)	Pressure Difference(psi)	Water Depth (m)
Jan-20	4821.8		-5.6000	991.2556	Jan-20	6785.8		24.2000	0.0786	0.0554
Feb-20	4667.1		7.3000	983.6408	Feb-20	6143.2		24.3000	-0.6464	-0.4556
Mar-20	no data				Mar-20	no data				
Apr-20	no data				Apr-20	no data				
May-20	no data				May-20	no data				
Jun-20	9813.5		42.0000	1006.7026	Jun-20	6174.6		24.2000	-0.9394	-0.6621
Jul-20	9870.3		35.7000	981.1481	Jul-20	6080.5		23.9000	-0.6891	-0.4857
Aug-20	9866.9		31.2000	983.3338	Aug-20	5709.1		23.9000	-1.2033	-0.8480
Sep-20	9908.1		19.3000	965.7837	Sep-20	6140.7		23.9000	-0.3881	-0.2735
Oct-20	9869.6		10.6000	984.8494	Oct-20	6130.6		23.9000	-0.6777	-0.4776
Nov-20	9892.5		0.2000	975.6039	Nov-20	5896.5		23.9000	-0.8477	-0.5975
Dec-20	9882.8		0.0000	980.1395	Dec-20	9493.8		23.6000	3.7613	2.6510

Vibrating Wire Piezometer Data; Serial Number VW15023 27m, Bottom of Cell 7

Barometer Constants

Calibration Factor 0.046482 kPa/Digit
 Temperature Correction Factor -0.01345 kPa/C

Initial Readings (Factory Zero Readings)

Digits (f*f) 9796
 Temperature (C) 22.2
 Barometric Pressure (mbar) 1017.5

Vibrating Wire Piezometer Constants

Calibration Factor -0.00149 psi/Digit
 Temperature Correction -0.005733 psi/C

Initial Readings

Digits (f*f) 7189
 Temperature © 23
 Barometric Pressure (mbar) 1012

Date	Digits (f*f)	Resistance (ohms)	Temperature (C)	Barometric Pressure (mbar)	Date	Digits (f*f)	Resistance (ohms)	Temperature (C)	Pressure Difference(psi)	Water Depth (m)
Jan-20	4821.8		-5.6000	991.2556	Jan-20	7080.7		15.8000	0.1808	0.1274
Feb-20	4667.1		7.3000	983.6408	Feb-20	6556.5		16.0000	-0.4910	-0.3460
Mar-20	no data				Mar-20	no data				
Apr-20	no data				Apr-20	no data				
May-20	no data				May-20	no data				
Jun-20	9813.5		42.0000	1006.7026	Jun-20	6581.1		15.8000	-0.7877	-0.5551
Jul-20	9870.3		35.7000	981.1481	Jul-20	6484.5		15.6000	-0.5598	-0.3945
Aug-20	9866.9		31.2000	983.3338	Aug-20	6361.6		15.4000	-0.7735	-0.5451
Sep-20	9908.1		19.3000	965.7837	Sep-20	6527.1		15.1000	-0.2706	-0.1907
Oct-20	9869.6		10.6000	984.8494	Oct-20	6539.2		15.1000	-0.5291	-0.3729
Nov-20	9892.5		0.2000	975.6039	Nov-20	6368.4		14.9000	-0.6484	-0.4570
Dec-20	9882.8		0.0000	980.1395	Dec-20	6450.8		14.7000	-0.5902	-0.4160

Vibrating Wire Piezometer Data; Serial Number VW22277 33m Bottom of Cell 8

Barometer Constants

Calibration Factor 0.046482 kPa/Digit
 Temperature Correction Factor -0.01345 kPa/C

Initial Readings (Factory Zero Readings)

Digits (f*f) 9796
 Temperature (C) 22.2
 Barometric Pressure (mbar) 1017.5

Vibrating Wire Piezometer Constants

Calibration Factor 0.00254 psi/Digit
 Temperature Correction 0.002492 psi/C

Initial Readings

Digits (f*f) 9273
 Temperature (C) 22.3
 Barometric Pressure (mbar) 1013.4

Date	Digits (f*f)	Resistance (ohms)	Temperature (C)	Barometric Pressure (mbar)	Date	Digits (f*f)	Resistance (ohms)	Temperature (C)	Pressure Difference (psi)	Meters of water (m)
Jan-20	4821.8		-5.6000	991.2556	Jan-20	9425.9		24.0000	-0.0629	-0.0444
Feb-20	4667.1		7.3000	983.6408	Feb-20	9578.3		24.0000	-0.3396	-0.2393
Mar-20	no data				Mar-20	no data				
Apr-20	no data				Apr-20	no data				
May-20	no data				May-20	no data				
Jun-20	9813.5		42.0000	1012.0288	Jun-20	9469.1		23.8000	-0.4745	-0.3344
Jul-20	9870.3		35.7000	984.7796	Jul-20	9516.8		23.4000	-0.2014	-0.1419
Aug-20	9866.9		31.2000	985.7548	Aug-20	9538.6		21.1000	-0.2766	-0.1950
Sep-20	9908.1		19.3000	965.0036	Sep-20	9445.9		22.6000	0.2635	0.1857
Oct-20	9869.6		10.6000	981.7290	Oct-20	9498.7		22.6000	-0.1132	-0.0798
Nov-20	9892.5		0.2000	969.6859	Nov-20	9575.2		22.5000	-0.1331	-0.0938
Dec-20	9882.8		0.0000	974.1677	Dec-20	9532.9		22.4000	-0.0909	-0.0640

Vibrating Wire Piezometer Data; Serial Number VW22278 68 m Bottom of Cell 8

Barometer Constants

Vibrating Wire Piezometer Constants

Calibration Factor 0.046482 kPa/Digit
 Temperature Correction Factor -0.01345 kPa/C

Calibration Factor 0.002363 psi/Digit
 Temperature Correction -0.001238 psi/C

Initial Readings (Factory Zero Readings)

Digits (f*f) 9796
 Temperature (C) 22.2
 Barometric Pressure (mbar) 1017.5

Initial Readings

Digits (f*f) 9317
 Temperature © 22.1
 Barometric Pressure (mbar) 1013.4

Date	Digits (f*f)	Resistance (ohms)	Temperature (C)	Barometric Pressure (mbar)	Date	Digits (f*f)	Resistance (ohms)	Temperature (C)	Pressure Difference (psi)	Meters of water (m)
Jan-20	4821.8		-5.6000	991.2556	Jan-20	9560.5		24.1000	-0.2567	-0.1809
Feb-20	4667.1		7.3000	983.6408	Feb-20	9696.9		24.2000	-0.4687	-0.3303
Mar-20	no data				Mar-20	no data				
Apr-20	no data				Apr-20	no data				
May-20	no data				May-20	no data				
Jun-20	9813.5		42.0000	1006.7026	Jun-20	9580.4		25.0000	-0.5289	-0.3727
Jul-20	9870.3		35.7000	981.1481	Jul-20	9610.9		25.0000	-0.2303	-0.1623
Aug-20	9866.9		31.2000	983.3338	Aug-20	9704.4		25.1000	-0.4831	-0.3405
Sep-20	9908.1		19.3000	965.7837	Sep-20	9702.9		25.2000	-0.2251	-0.1586
Oct-20	9869.6		10.6000	984.8494	Oct-20	9669.7		25.2000	-0.4232	-0.2982
Nov-20	9892.5		0.2000	975.6039	Nov-20	9686		25.5000	-0.3280	-0.2311
Dec-20	9882.8		0.0000	980.1395	Dec-20	9650.2		25.5000	-0.3092	-0.2179

Vibrating Wire Piezometer Data; Serial Number VW22279 84 m Top of Cell 8

Barometer Constants

Calibration Factor 0.046482 kPa/Digit
 Temperature Correction Factor -0.01345 kPa/C

Initial Readings (Factory Zero Readings)

Digits (f*f) 9796
 Temperature (C) 22.2
 Barometric Pressure (mbar) 1017.5

Vibrating Wire Piezometer Constants

Calibration Factor 0.002616 psi/Digit
 Temperature Correction 0.002759 psi/C

Initial Readings

Digits (f*f) 9236
 Temperature © 22
 Barometric Pressure (mbar) 1013.4

Date	Digits (f*f)	Resistance (ohms)	Temperature (C)	Barometric Pressure (mbar)	Date	Digits (f*f)	Resistance (ohms)	Temperature (C)	Pressure Difference (psi)	Meters of water (m)
Jan-20	4786.7		-3.7000	989.5827	Jan-20	9447.6		24.6000	-0.2009	-0.1416
Feb-20	4619		12.3000	981.2204	Feb-20	9577.4		24.5000	-0.4195	-0.2956
Mar-20	no data				Mar-20	no data				
Apr-20	no data				Apr-20	no data				
May-20	no data				May-20	no data				
Jun-20	9829.5		37.7000	999.8438	Jun-20	9478.6		25.2000	-0.4292	-0.3025
Jul-20	9890.3		28.9000	972.7663	Jul-20	9584.7		24.8000	-0.3151	-0.2221
Aug-20	9868		28.9000	983.1318	Aug-20	9589.6		23.7000	-0.4813	-0.3392
Sep-20	9906.6		19.1000	966.5079	Sep-20	9582.3		23.8000	-0.2208	-0.1556
Oct-20	9872.8		12.1000	983.1603	Oct-20	9516.7		23.6000	-0.2913	-0.2053
Nov-20	9900.8		3.2000	971.3424	Nov-20	9589.1		23.5000	-0.3096	-0.2182
Dec-20	9885.9		7.2000	977.7302	Dec-20	9562.1		23.5000	-0.3316	-0.2337

Vibrating Wire Piezometer Data; Serial Number VW50389 80 m Top of Cell 9

Barometer Constants

Calibration Factor -0.005483 kPa/Digit
 Temperature Correction Factor -0.01967 kPa/C

Initial Readings (Factory Zero Readings)

Digits (f*f) 5148
 Temperature (C) 20.4
 Barometric Pressure (mbar) 1016.8

Vibrating Wire Pizometer Constants

Calibration Factor 0.017204 psi/Digit psi/Digit
 Temperature Correction -0.01282 psi/C psi/C

Initial Readings

Digits (f*f) 9324
 Temperature © 21.8
 Barometric Pressure (mbar) 1019.8

Date	Digits	Resistance	Temperature	Barometric		Date	Digits	Resistance	Temperature	Pressure	Meters of water
Jan-20	4786.7		-3.7000	989.5827		Jan-20	9475.8		15.5000	-0.2998	-0.2113
Feb-20	4619		12.3000	981.2204		Feb-21	9506.9		15.8000	-0.2590	-0.1826
Mar-20	no data					Mar-20	no data				
Apr-20	no data					Apr-20	no data				
May-20	no data					May-20	no data				
Jun-20	9829.5		37.7000	999.8438		Jun-20	9469.2		16.9000	-0.4275	-0.3013
Jul-20	9890.3		28.9000	972.7663		Jul-20	9530.1		17.1000	-0.1935	-0.1364
Aug-20	9868		28.9000	983.1318		Aug-20	9495.1		17.6000	-0.2509	-0.1769
Sep-20	9906.6		19.1000	966.5079		Sep-20	9526.9		17.9000	-0.0922	-0.0650
Oct-20	9872.8		12.1000	983.1603		Oct-20	9523.7		18.0000	-0.3251	-0.2291
Nov-20	9900.8		3.2000	971.3424		Nov-20	9572		18.6000	-0.2784	-0.1962
Dec-20	9885.9		7.2000	977.7302		Dec-20	9547.1		18.8000	-0.3053	-0.2152

Vibrating Wire Piezometer Data; Serial Number VW50388 80 m Bottom of Cell 9

Barometer Constants

Calibration Factor 0.046482 kPa/Digit
 Temperature Correction Factor -0.01345 kPa/C

Initial Readings (Factory Zero Readings)

Digits (f*f) 9796
 Temperature (C) 22.2
 Barometric Pressure (mbar) 1017.5

Vibrating Wire Piezometer Constants

Calibration Factor 0.0026649 psi/Digit
 Temperature Correction 0.010435 psi/C

Initial Readings

Digits (f*f) 9138
 Temperature © 21.5
 Barometric Pressure (mbar) 1019.8

Depth	Digits (f*f)	Resistance (ohms)	Temperature (C)	Barometric Pressure (mbar)	Date	Digits (f*f)	Resistance (ohms)	Temperature (C)	Pressure Difference (psi)	Meters of water
Jan-20	4821.8		-5.6000	991.2556	Jan-20	9203		13.1000	0.3824	0.2695
Feb-20	4667.1		7.3000	983.6408	Feb-20	9209		12.9000	0.4761	0.3356
Mar-20	no data				Mar-20	no data				
Apr-20	no data				Apr-20	no data				
May-20	no data				May-20	no data				
Jun-20	9813.5		42.0000	1006.7026	Jun-20	9143		12.4000	0.3152	0.2222
Jul-20	9870.3		35.7000	981.1481	Jul-20	9295		14.3000	0.2911	0.2052
Aug-20	9866.9		31.2000	983.3338	Aug-20	9253		16.7000	0.3772	0.2659
Sep-20	9908.1		19.3000	965.7837	Sep-20	9351		13.9000	0.3687	0.2599
Oct-20	9869.6		10.6000	984.8494	Oct-20	9283		14.2000	0.2709	0.1910
Nov-20	9892.1		3.2000	975.3863	Nov-20	9293		13.2000	0.3769	0.2656
Dec-20	9882.8		0.0000	980.1395	Dec-20	9288		6.7000	0.3039	0.2142

Vibrating Wire Piezometer Data; Serial Number VW50390 135m Bottom of Cell 9

Barometer Constants

Calibration Factor 0.046482 kPa/Digit
 Temperature Correction Factor -0.01345 kPa/C

Initial Readings (Factory Zero Readings)

Digits (f*f) 9796
 Temperature (C) 22.2
 Barometric Pressure (mbar) 1017.5

Vibrating Wire Piezometer Constants

Calibration Factor 0.003019 psi/Digit
 Temperature Correction 0.013427 psi/C

Initial Readings

Digits (f*f) 9337
 Temperature © 21.7
 Barometric Pressure (mbar) 1019.8

Date	Digits (f*f)	Resistance (ohms)	Temperature (C)	Barometric Pressure (mbar)	Date	Digits (f*f)	Resistance (ohms)	Temperature (C)	Pressure Difference (psi)	Meters of water
Jan-20	4821.8		-5.6000	991.2556	Jan-20	9381.3		8.6000	-0.0959	-0.0676
Feb-20	4667.1		7.3000	983.6408	Feb-20	9423.9		9.1000	-0.0955	-0.0673
Mar-20	no data				Mar-20	no data				
Apr-20	no data				Apr-20	no data				
May-20	no data				May-20	no data				
Jun-20	9813.5		42.0000	1006.7026	Jun-20	9320.4		12.4000	-0.1501	-0.1058
Jul-20	9870.3		35.7000	981.1481	Jul-20	9421		9.5000	-0.0507	-0.0357
Aug-20	9866.9		31.2000	983.3338	Aug-20	9405.1		9.8000	-0.0399	-0.0282
Sep-20	9908.1		19.3000	965.7837	Sep-20	9449.5		10.3000	0.0998	0.0704
Oct-20	9869.6		10.6000	984.8494	Oct-20	9402.7		10.3000	-0.0543	-0.0382
Nov-20	9892.5		3.2000	975.2004	Nov-20	9436		10.6000	-0.0006	-0.0004
Dec-20	9882.8		0.0000	980.1395	Dec-20	9419		10.7000	-0.0275	-0.0194

Appendix E Household Hazardous Waste (HHW) Inventory

HAZARDOUS WASTE COLLECTION 2020

Row Labels	Sum of Vehicles (ea)	Sum of Batteries (Small) (Kg)	Sum of Batteries (Auto) (Ea)	Sum of Fluorescents (CFL's) (Ea)	Sum of Fluorescents (Tubes) (Ea)	Sum of *A* Corrosive Liquids (Acidic) (L)	Sum of *B* Corrosive Liquids (Caustic) (L)	Sum of *E* Oxydizing Liquids (L)	Sum of *F* Pesticide Liquids (L)	Sum of ** Aerosols (Total) (L)	Sum of *D* Flammable Liquids (Total) (L)	Sum of Propane *Cylinders* (L)	Sum of Propane *BBQ* (Ea)	Sum of Waste Paint Materials (L)	Sum of Used Oils *BULK* (L)	Sum of Used Glycol *BULK* (L)	Sum of Waste Misc. (L)
Clair Mobile NB1309	47	19	14	35	1	1	20	30	1	150	300	20		1140	250		
01-Sep	47	19	14	35	1	1	20	30	1	150	300	20		1140	250		
Edmundston Mobile NB1420	546	532	56	294	310	150	240	160	160	1030	3320	290	44	7740	1800	80	
12-Sep	316	266	35	126	157	80	140	80	80	640	1575	210	32	4300	1200	80	
24-Oct	230	266	21	168	153	70	100	80	80	390	1745	80	12	3440	600		
Grand Falls Mobile NB1311	261	228	33	117	118	325	305	25	280	460	1682	120	9	3440	950		
05-Sep	161	152	24	85	85	305	295	20	240	340	1000	100	8	2150	600		
17-Oct	100	76	9	32	33	20	10	5	40	120	682	20	1	1290	350		
Lac Baker Mobile NB1331	59	152	12	21	13	1	5	10	5	140	400	20	6	1290	400		
01-Oct	59	152	12	21	13	1	5	10	5	140	400	20	6	1290	400		
St Francois NB001329	71	40	28		40	4	10	80	40	100	558	120	9	1604	500		
06-Oct	71	40	28		40	4	10	80	40	100	558	120	9	1604	500		
St-Leonard Mobile NB1445	83	57	11	25	56	10	20	80	40	100	550	30	7	1290	400		
03-Sep	83	57	11	25	56	10	20	80	40	100	550	30	7	1290	400		
St-Quentin Mobile NB2424	82	400	17	35	48	9	14	10	12	80	833	30	6	977	862	300	
08-Oct	35	19	10	15	16	5	10	10	10	40	283	10	2	537	512	300	
10-Sep	47	381	7	20	32	4	4		2	40	550	20	4	440	350		
Grand Total	1149	1428	171	527	586	500	614	395	538	2060	7643	630	81	17481	5162	380	

Material Summary

All Transactions 01/01/2020 - 12/31/2020 Material DOM (WASTE)

<u>Material</u>	<u>Description</u>	<u>Loads</u>	<u>Net Wt.</u>	<u>Units</u>	<u>Charges</u>
DOM (WASTE)	DOMESTIC WASTE MAINE	530	11491228 kg	0.00	999,737.01
	Grand Total:	<u>530</u>	<u>11491228 kg</u>	<u>0.00</u>	<u>999,737.01</u>

Appendix F Imported Construction and Demolition (C & D) Debris Database

Material Summary

All Transactions 01/01/2020 - 12/31/2020 Material PDW MAINE

<u>Material</u>	<u>Description</u>	<u>Loads</u>	<u>Net Wt.</u>	<u>Units</u>	<u>Charges</u>
				kg	
				kg	

Grand Total:

0 Connes



Appendix G – Asbestos Disposal Record

Material Summary

All Transactions 01/01/2020 - 12/31/2020 Material ASBESTOS

<u>Material</u>	<u>Description</u>	<u>Loads</u>	<u>Net Wt.</u>	<u>Units</u>	<u>Charges</u>
ASBESTOS	ASBESTOS	11	123828 kg	275.55	19,741.60
	Grand Total:	<u>11</u>	<u>123828 kg</u>	<u>275.55</u>	<u>19,741.60</u>



APPENDIX F

Site Photos



Photo 1: View of active landfill area (July, 2021).



Photo 2: View of active landfill area (July, 2021).



Photo 3: View of landfill access road from Chem. Clément-Roy (Google Earth).



APPENDIX G

Supporting Documents

DATA REPORT 7147: Northwest Regional Service Commission, NB

Prepared 11 January 2022
by J. Pender, Data Manager

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- 1.2 Restrictions
- 1.3 Additional Information

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2.0 Rare and Endangered Species

- 2.1 Flora
 - 2.2 Fauna
- Map 2: Flora and Fauna

3.0 Special Areas

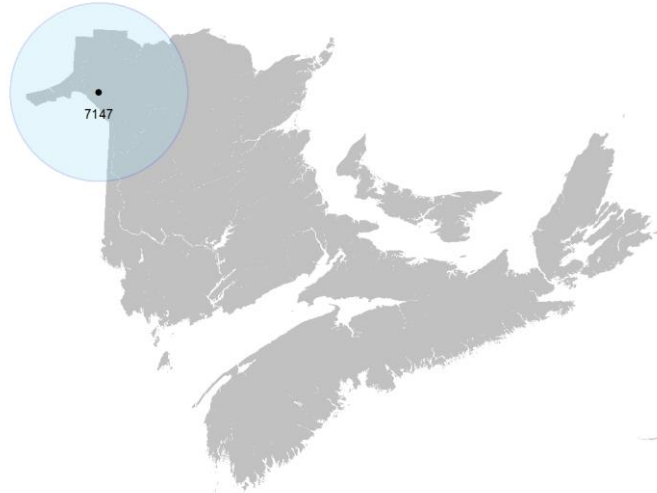
- 3.1 Managed Areas
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4.0 Rare Species Lists

- 4.1 Fauna
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5.0 Rare Species within 100 km

- 5.1 Source Bibliography



Map 1. A 100 km buffer around the study area

1.0 PREFACE

The Atlantic Canada Conservation Data Centre (AC CDC; www.accdc.com) is part of a network of NatureServe data centres and heritage programs serving 50 states in the U.S.A, 10 provinces and 1 territory in Canada, plus several Central and South American countries. The NatureServe network is more than 30 years old and shares a common conservation data methodology. The AC CDC was founded in 1997, and maintains data for the jurisdictions of New Brunswick, Nova Scotia, Prince Edward Island, and Newfoundland and Labrador. Although a non-governmental agency, the AC CDC is supported by 6 federal agencies and 4 provincial governments, as well as through outside grants and data processing fees.

Upon request and for a fee, the AC CDC queries its database and produces customized reports of the rare and endangered flora and fauna known to occur in or near a specified study area. As a supplement to that data, the AC CDC includes locations of managed areas with some level of protection, and known sites of ecological interest or sensitivity.

1.1 DATA LIST

Included datasets:

Filename

NorthwestRgnNB_7147ob.xls
NorthwestRgnNB_7147ob100km.xls
NorthwestRgnNB_7147msa.xls

Contents

Rare or legally-protected Flora and Fauna in your study area
A list of Rare and legally protected Flora and Fauna within 100 km of your study area
Managed and Biologically Significant Areas in your study area

1.2 RESTRICTIONS

The AC CDC makes a strong effort to verify the accuracy of all the data that it manages, but it shall not be held responsible for any inaccuracies in data that it provides. By accepting AC CDC data, recipients assent to the following limits of use:

- a) Data is restricted to use by trained personnel who are sensitive to landowner interests and to potential threats to rare and/or endangered flora and fauna posed by the information provided.
- b) Data is restricted to use by the specified Data User; any third party requiring data must make its own data request.
- c) The AC CDC requires Data Users to cease using and delete data 12 months after receipt, and to make a new request for updated data if necessary at that time.
- d) AC CDC data responses are restricted to the data in our Data System at the time of the data request.
- e) Each record has an estimate of locational uncertainty, which must be referenced in order to understand the record's relevance to a particular location. Please see attached Data Dictionary for details.
- f) AC CDC data responses are not to be construed as exhaustive inventories of taxa in an area.
- g) The absence of a taxon cannot be inferred by its absence in an AC CDC data response.

1.3 ADDITIONAL INFORMATION

The accompanying Data Dictionary provides metadata for the data provided.

Please direct any additional questions about AC CDC data to the following individuals:

Plants, Lichens, Ranking Methods, All other Inquiries

Sean Blaney
Senior Scientist / Executive Director
(506) 364-2658
sean.blaney@accdc.ca

Animals (Fauna)

John Klymko
Zoologist
(506) 364-2660
john.klymko@accdc.ca

Plant Communities

Caitlin Porter
Botanist / Community Ecologist
(902) 719-4815
caitlin.porter@accdc.ca

Data Management, GIS

James Churchill
Conservation Data Analyst / Field Biologist
(902) 679-6146
james.churchill@accdc.ca

Billing

Jean Breau
Financial Manager / Executive Assistant
(506) 364-2657
jean.breau@accdc.ca

Questions on the biology of Federal Species at Risk can be directed to AC CDC: (506) 364-2658, with questions on Species at Risk regulations to: Samara Eaton, Canadian Wildlife Service (NB and PE): (506) 364-5060 or Julie McKnight, Canadian Wildlife Service (NS): (902) 426-4196.

For provincial information about rare taxa and protected areas, or information about game animals, deer yards, old growth forests, archeological sites, fish habitat etc., in New Brunswick, please contact Hubert Askanas, Energy and Resource Development: (506) 453-5873.

For provincial information about rare taxa and protected areas, or information about game animals, deer yards, old growth forests, archeological sites, fish habitat etc., in Nova Scotia, please contact Donna Hurlburt, NS DLF: (902) 679-6886. To determine if location-sensitive species (section 4.3) occur near your study site please contact a NS DLF Regional Biologist:

Western: Emma Vost
(902) 670-8187
Emma.Vost@novascotia.ca

Western: Sarah Spencer
(902) 541-0081
Sarah.Spencer@novascotia.ca

Central: Shavonne Meyer
(902) 893-0816
Shavonne.Meyer@novascotia.ca

Central: Kimberly George
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Kimberly.George@novascotia.ca

Eastern: Harrison Moore
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Eastern: Maureen Cameron-MacMillan
(902) 295-2554
Maureen.Cameron-MacMillan@novascotia.ca

Eastern: Elizabeth Walsh
(902) 563-3370
Elizabeth.Walsh@novascotia.ca

For provincial information about rare taxa and protected areas, or information about game animals, fish habitat etc., in Prince Edward Island, please contact Garry Gregory, PEI Dept. of Communities, Land and Environment: (902) 569-7595.

2.0 RARE AND ENDANGERED SPECIES

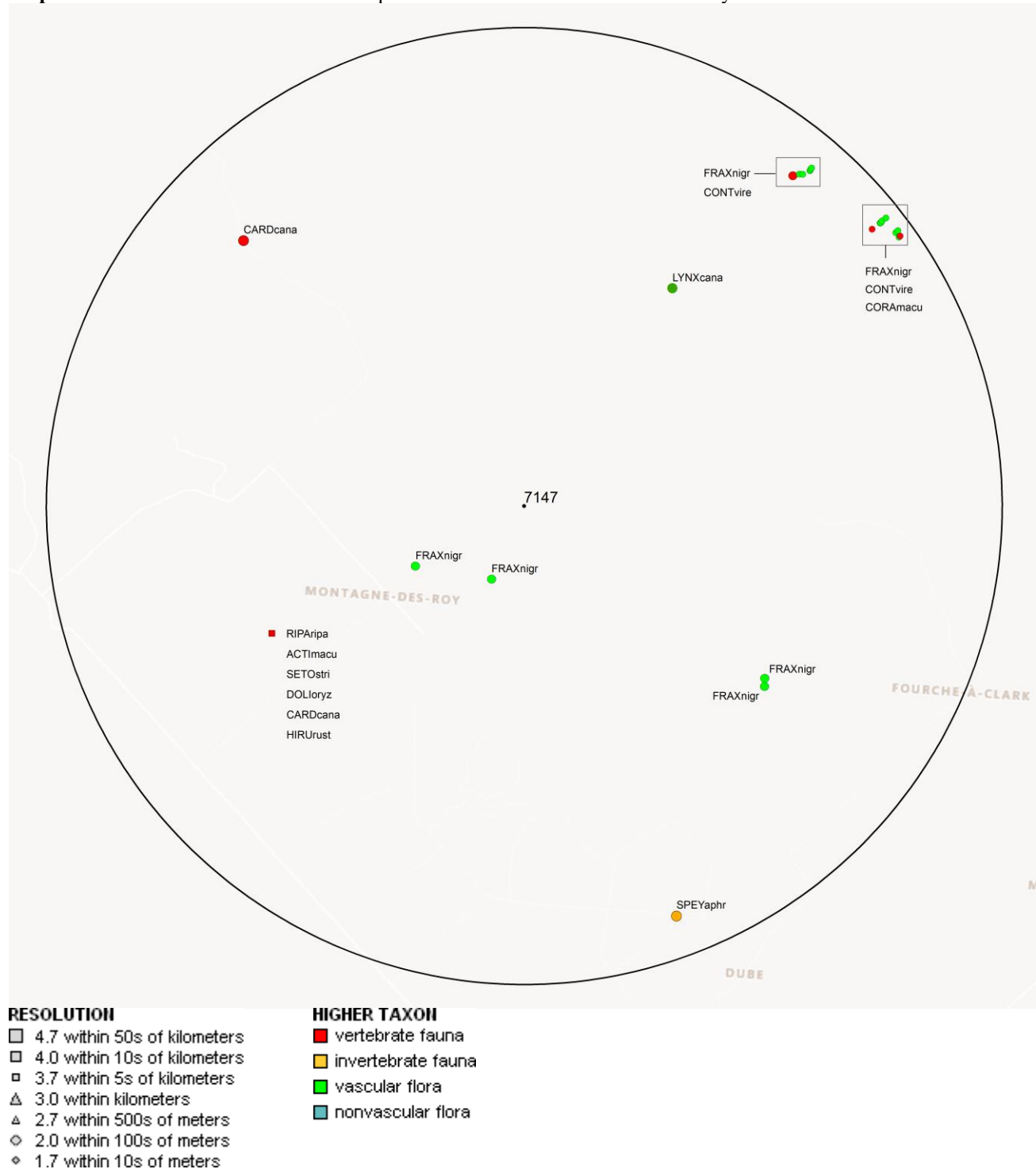
2.1 FLORA

The study area contains 16 records of 2 vascular, no records of nonvascular flora (Map 2 and attached: *ob.xls).

2.2 FAUNA

The study area contains 15 records of 8 vertebrate, 1 record of 1 invertebrate fauna (Map 2 and attached data files - see 1.1 Data List). Please see section 4.3 to determine if 'location-sensitive' species occur near your study site.

Map 2: Known observations of rare and/or protected flora and fauna within the study area.



3.0 SPECIAL AREAS

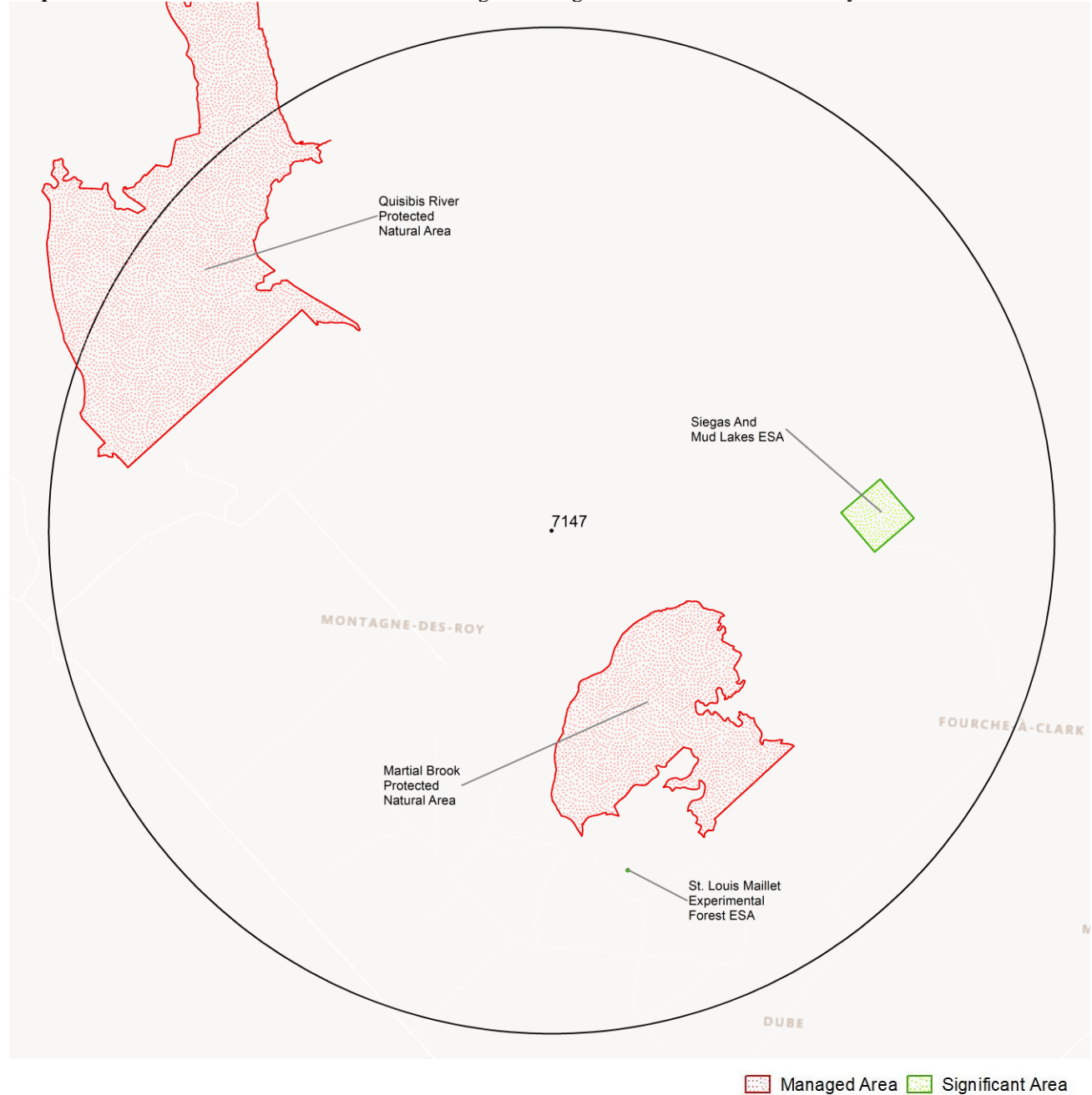
3.1 MANAGED AREAS

The GIS scan identified 2 managed areas in the vicinity of the study area (Map 3 and attached file: *msa.xls).

3.2 SIGNIFICANT AREAS

The GIS scan identified 2 biologically significant sites in the vicinity of the study area (Map 3 and attached file: *msa.xls).

Map 3: Boundaries and/or locations of known Managed and Significant Areas within the study area.



4.0 RARE SPECIES LISTS

Rare and/or endangered taxa (excluding “location-sensitive” species, section 4.3) within the study area listed in order of concern, beginning with legally listed taxa, with the number of observations per taxon and the distance in kilometers from study area centroid to the closest observation (\pm the precision, in km, of the record). [P] = vascular plant, [N] = nonvascular plant, [A] = vertebrate animal, [I] = invertebrate animal, [C] = community. Note: records are from attached files *ob.xls/*ob.shp only.

4.1 FLORA

	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
P	<i>Fraxinus nigra</i>	Black Ash	Threatened			S4S5	15	0.8 \pm 0.0
P	<i>Corallorhiza maculata</i>	Spotted Coralroot				S3S4	1	4.8 \pm 0.0

4.2 FAUNA

	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)
A	<i>Riparia riparia</i>	Bank Swallow	Threatened	Threatened		S2S3B,S2S3M	1	3.0 \pm 7.0
A	<i>Dolichonyx oryzivorus</i>	Bobolink	Threatened	Threatened	Threatened	S3B,S3M	1	3.0 \pm 7.0
A	<i>Hirundo rustica</i>	Barn Swallow	Special Concern	Threatened	Threatened	S2B,S2M	3	3.0 \pm 7.0
A	<i>Cardellina canadensis</i>	Canada Warbler	Special Concern	Threatened	Threatened	S3B,S3M	3	3.0 \pm 7.0
A	<i>Contopus virens</i>	Eastern Wood-Pewee	Special Concern	Special Concern	Special Concern	S4B,S4M	3	4.5 \pm 0.0
A	<i>Lynx canadensis</i>	Canadian Lynx	Not At Risk		Endangered	S3	2	2.8 \pm 100.0
A	<i>Actitis macularia</i>	Spotted Sandpiper				S3S4B,S5M	1	3.0 \pm 7.0
A	<i>Setophaga striata</i>	Blackpoll Warbler				S3S4B,S5M	1	3.0 \pm 7.0
I	<i>Speyeria aphrodite</i>	Aphrodite Fritillary				S3	1	4.6 \pm 0.0

4.3 LOCATION SENSITIVE SPECIES

The Department of Natural Resources in each Maritimes province considers a number of species “location sensitive”. Concern about exploitation of location-sensitive species precludes inclusion of precise coordinates in this report. Those intersecting your study area are indicated below with “YES”.

New Brunswick

Scientific Name	Common Name	SARA	Prov Legal Prot	Known within the Study Site?
<i>Chrysemys picta picta</i>	Eastern Painted Turtle	Special Concern		No
<i>Chelydra serpentina</i>	Snapping Turtle	Special Concern	Special Concern	No
<i>Glyptemys insculpta</i>	Wood Turtle	Threatened	Threatened	No
<i>Haliaeetus leucocephalus</i>	Bald Eagle		Endangered	No
<i>Falco peregrinus pop. 1</i>	Peregrine Falcon - anatum/tundrius pop.	Special Concern	Endangered	No
<i>Cicindela marginipennis</i>	Cobblestone Tiger Beetle	Endangered	Endangered	No
<i>Coenonympha nipisiquit</i>	Maritime Ringlet	Endangered	Endangered	No
<i>Bat hibernaculum or bat species occurrence</i>		[Endangered] ¹	[Endangered] ¹	No

¹ *Myotis lucifugus* (Little Brown Myotis), *Myotis septentrionalis* (Long-eared Myotis), and *Perimyotis subflavus* (Tri-colored Bat or Eastern Pipistrelle) are all Endangered under the Federal Species at Risk Act and the NB Species at Risk Act.

4.4 SOURCE BIBLIOGRAPHY

The recipient of these data shall acknowledge the AC CDC and the data sources listed below in any documents, reports, publications or presentations, in which this dataset makes a significant contribution.

# recs	CITATION
15	Stantec. 2014. Energy East Pipeline Corridor Species Occurrence Data. Stantec Inc., 4934 records.
6	Lepage, D. 2014. Maritime Breeding Bird Atlas Database. Bird Studies Canada, Sackville NB, 407,838 recs.
4	Erskine, A.J. 1992. Maritime Breeding Bird Atlas Database. NS Museum & Nimbus Publ., Halifax, 82,125 recs.
4	Sabine, M. 2016. Black Ash records from the NB DNR Forest Development Survey. New Brunswick Department of Natural Resources.
2	Canadian Wildlife Service. 2019. Canadian Protected and Conserved Areas Database (CPCAD). December 2019. ECCC. https://www.canada.ca/en/environment-climate-change/services/national-wildlife-areas/protected-conserved-areas-database.html .
2	Sollows, M.C., 2008. NBM Science Collections databases: mammals. New Brunswick Museum, Saint John NB, download Jan. 2008, 4983 recs.
2	Tims, J. & Craig, N. 1995. Environmentally Significant Areas in New Brunswick (NBESA). NB Dept of Environment & Nature Trust of New Brunswick Inc, 6042 recs. https://doi.org/10.1037/arc0000014 .
1	Klymko, J. 2018. Maritimes Butterfly Atlas database. Atlantic Canada Conservation Data Centre.

5.0 RARE SPECIES WITHIN 100 KM

A 100 km buffer around the study area contains 7250 records of 95 vertebrate and 313 records of 33 invertebrate fauna; 8700 records of 261 vascular, 562 records of 144 nonvascular flora (attached: *ob100km.xls).

Taxa within 100 km of the study site that are rare and/or endangered in the province in which the study site occurs (including “location-sensitive” species). All ranks correspond to the province in which the study site falls, even for out-of-province records. Taxa are listed in order of concern, beginning with legally listed taxa, with the number of observations per taxon and the distance in kilometers from study area centroid to the closest observation (\pm the precision, in km, of the record).

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	<i>Myotis lucifugus</i>	Little Brown Myotis	Endangered	Endangered	Endangered	S1	1	82.5 \pm 1.0	NB
A	<i>Myotis septentrionalis</i>	Northern Long-eared Myotis	Endangered	Endangered	Endangered	S1	2	61.5 \pm 1.0	NB
A	<i>Salmo salar pop. 7</i>	Atlantic Salmon - Outer Bay of Fundy pop.	Endangered		Endangered	SNR	2	70.8 \pm 0.0	NB
A	<i>Rangifer tarandus pop. 2</i>	Woodland Caribou (Atlantic-Gasp -rsie pop.)	Endangered	Endangered	Extirpated	SX	1	67.3 \pm 1.0	NB
A	<i>Emydoidea blandingii</i>	Blanding's Turtle - Nova Scotia pop.	Endangered	Endangered			1	68.6 \pm 1.0	NB
A	<i>Sturnella magna</i>	Eastern Meadowlark	Threatened	Threatened	Threatened	S1B,S1M	9	11.4 \pm 7.0	NB
A	<i>Ixobrychus exilis</i>	Least Bittern	Threatened	Threatened	Threatened	S1S2B,S1S2M	4	11.8 \pm 7.0	NB
A	<i>Hylocichla mustelina</i>	Wood Thrush	Threatened	Threatened	Threatened	S1S2B,S1S2M	131	10.0 \pm 0.0	NB
A	<i>Asio flammeus</i>	Short-eared Owl	Threatened	Special Concern	Special Concern	S2B,S2M	14	11.8 \pm 7.0	NB
A	<i>Antrostomus vociferus</i>	Eastern Whip-Poor-Will	Threatened	Threatened	Threatened	S2B,S2M	7	47.6 \pm 7.0	NB
A	<i>Catharus bicknelli</i>	Bicknell's Thrush	Threatened	Threatened	Threatened	S2B,S2M	473	20.0 \pm 7.0	NB
A	<i>Glyptemys insculpta</i>	Wood Turtle	Threatened	Threatened	Threatened	S2S3	52	12.7 \pm 0.0	NB
A	<i>Chaetura pelagica</i>	Chimney Swift	Threatened	Threatened	Threatened	S2S3B,S2M	139	7.6 \pm 7.0	NB
A	<i>Riparia riparia</i>	Bank Swallow	Threatened	Threatened	Threatened	S2S3B,S2S3M	184	3.0 \pm 7.0	NB
A	<i>Dolichonyx oryzivorus</i>	Bobolink	Threatened	Threatened	Threatened	S3B,S3M	219	3.0 \pm 7.0	NB
A	<i>Anguilla rostrata</i>	American Eel	Threatened		Threatened	S4	1	86.7 \pm 0.0	NB
A	<i>Tringa flavipes</i>	Lesser Yellowlegs	Threatened		Threatened	S4M	15	14.0 \pm 0.0	NB
A	<i>Hirundo rustica</i>	Barn Swallow	Special Concern	Threatened	Threatened	S2B,S2M	360	3.0 \pm 7.0	NB
A	<i>Bucephala islandica (Eastern pop.)</i>	Barrow's Goldeneye - Eastern pop.	Special Concern	Special Concern	Special Concern	S2M,S2N	2	24.7 \pm 5.0	NB
A	<i>Salmo salar pop. 12</i>	Atlantic Salmon - Gaspé - Southern Gulf of St Lawrence pop.	Special Concern		Special Concern	S2S3	107	52.8 \pm 0.0	NB
A	<i>Chelydra serpentina</i>	Snapping Turtle	Special Concern	Special Concern	Special Concern	S3	1	75.5 \pm 0.0	NB
A	<i>Euphagus carolinus</i>	Rusty Blackbird	Special Concern	Special Concern	Special Concern	S3B,S3M	168	6.0 \pm 0.0	NB
A	<i>Contopus cooperi</i>	Olive-sided Flycatcher	Special Concern	Threatened	Threatened	S3B,S3M	550	7.6 \pm 7.0	NB
A	<i>Cardellina canadensis</i>	Canada Warbler	Special Concern	Threatened	Threatened	S3B,S3M	666	3.0 \pm 7.0	NB
A	<i>Coccothraustes vespertinus</i>	Evening Grosbeak	Special Concern	Special Concern		S3B,S3S4N,SUM	275	7.6 \pm 7.0	NB
A	<i>Chordeiles minor</i>	Common Nighthawk	Special Concern	Threatened	Threatened	S3B,S4M	155	7.3 \pm 0.0	NB
A	<i>Phalaropus lobatus</i>	Red-necked Phalarope	Special Concern	Special Concern		S3M	2	23.1 \pm 0.0	NB
A	<i>Contopus virens</i>	Eastern Wood-Pewee	Special Concern	Special Concern	Special Concern	S4B,S4M	315	4.5 \pm 0.0	NB
A	<i>Podiceps auritus</i>	Horned Grebe	Special Concern	Special Concern	Special Concern	S4N,S4M	1	49.5 \pm 2.0	NB
A	<i>Bubo scandiacus</i>	Snowy Owl	Not At Risk			S1N,S2S3M	2	20.7 \pm 1.0	NB
A	<i>Accipiter cooperii</i>	Cooper's Hawk	Not At Risk			S1S2B,S1S2M	11	22.6 \pm 7.0	NB
A	<i>Fulica americana</i>	American Coot	Not At Risk			S1S2B,S1S2M	2	41.4 \pm 0.0	NB
A	<i>Aegolius funereus</i>	Boreal Owl	Not At Risk			S1S2B,SUM	1	97.6 \pm 7.0	NB
A	<i>Sorex dispar</i>	Long-tailed Shrew	Not At Risk			S2	15	82.5 \pm 1.0	NB
A	<i>Buteo lineatus</i>	Red-shouldered Hawk	Not At Risk			S2B,S2M	12	30.5 \pm 1.0	NB
A	<i>Chlidonias niger</i>	Black Tern	Not At Risk			S2B,S2M	3	41.8 \pm 0.0	NB
A	<i>Lynx canadensis</i>	Canadian Lynx	Not At Risk		Endangered	S3	115	2.8 \pm 100.0	NB
A	<i>Sterna hirundo</i>	Common Tern	Not At Risk			S3B,SUM	37	17.0 \pm 0.0	NB
A	<i>Podiceps grisegena</i>	Red-necked Grebe	Not At Risk			S3M,S2N	1	49.5 \pm 0.0	NB
A	<i>Haliaeetus leucocephalus</i>	Bald Eagle	Not At Risk		Endangered	S4	141	7.0 \pm 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
A	<i>Puma concolor pop. 1</i>	Eastern Cougar	Data Deficient		Endangered	SNA	10	46.7 ± 1.0	NB
A	<i>Thryothorus ludovicianus</i>	Carolina Wren				S1	4	22.6 ± 7.0	NB
A	<i>Tringa melanoleuca</i>	Greater Yellowlegs				S1?B,S5M	28	14.0 ± 0.0	NB
A	<i>Progne subis</i>	Purple Martin				S1B,S1M	20	64.1 ± 7.0	NB
A	<i>Oxyura jamaicensis</i>	Ruddy Duck				S1B,S2S3M	4	21.7 ± 0.0	NB
A	<i>Aythya affinis</i>	Lesser Scaup				S1B,S4M	1	39.5 ± 0.0	NB
A	<i>Eremophila alpestris</i>	Horned Lark				S1B,S4N,S5M	35	22.8 ± 7.0	NB
A	<i>Chroicocephalus ridibundus</i>	Black-headed Gull				S1N,S2M	1	49.1 ± 0.0	NB
A	<i>Butorides virescens</i>	Green Heron				S1S2B,S1S2M	12	11.8 ± 7.0	NB
A	<i>Nycticorax nycticorax</i>	Black-crowned Night-heron				S1S2B,S1S2M	18	11.8 ± 7.0	NB
A	<i>Empidonax traillii</i>	Willow Flycatcher				S1S2B,S1S2M	4	36.4 ± 7.0	NB
A	<i>Troglodytes aedon</i>	House Wren				S1S2B,S1S2M	5	22.6 ± 7.0	NB
A	<i>Calidris bairdii</i>	Baird's Sandpiper				S1S2M	2	20.0 ± 0.0	NB
A	<i>Microtus chrotorrhinus</i>	Rock Vole				S2?	28	72.3 ± 1.0	NB
A	<i>Mimus polyglottos</i>	Northern Mockingbird				S2B,S2M	31	11.8 ± 7.0	NB
A	<i>Toxostoma rufum</i>	Brown Thrasher				S2B,S2M	65	11.8 ± 7.0	NB
A	<i>Poocetes gramineus</i>	Vesper Sparrow				S2B,S2M	21	22.6 ± 7.0	NB
A	<i>Pinicola enucleator</i>	Pine Grosbeak				S2B,S4S5N,S4S5M	80	11.3 ± 7.0	NB
A	<i>Tringa solitaria</i>	Solitary Sandpiper				S2B,S5M	22	12.5 ± 0.0	NB
A	<i>Phalacrocorax carbo</i>	Great Cormorant				S2N,S2M	1	96.0 ± 1.0	NB
A	<i>Asio otus</i>	Long-eared Owl				S2S3	15	13.0 ± 0.0	NB
A	<i>Picoides dorsalis</i>	American Three-toed Woodpecker				S2S3	28	7.6 ± 7.0	NB
A	<i>Spatula clypeata</i>	Northern Shoveler				S2S3B,S2S3M	19	11.8 ± 7.0	NB
A	<i>Myiarchus crinitus</i>	Great Crested Flycatcher				S2S3B,S2S3M	31	17.6 ± 0.0	NB
A	<i>Petrochelidon pyrrhonota</i>	Cliff Swallow				S2S3B,S2S3M	142	7.6 ± 7.0	NB
A	<i>Pluvialis dominica</i>	American Golden-Plover				S2S3M	3	20.0 ± 0.0	NB
A	<i>Loxia curvirostra</i>	Red Crossbill				S3	34	22.6 ± 7.0	NB
A	<i>Spinus pinus</i>	Pine Siskin				S3	158	7.6 ± 7.0	NB
A	<i>Prosopium cylindraceum</i>	Round Whitefish				S3	8	47.3 ± 10.0	NB
A	<i>Salvelinus namaycush</i>	Lake Trout				S3	9	37.9 ± 10.0	NB
A	<i>Eptesicus fuscus</i>	Big Brown Bat				S3	1	57.1 ± 0.0	NB
A	<i>Cathartes aura</i>	Turkey Vulture				S3B,S3M	34	18.9 ± 0.0	NB
A	<i>Rallus limicola</i>	Virginia Rail				S3B,S3M	9	7.6 ± 7.0	NB
A	<i>Charadrius vociferus</i>	Killdeer				S3B,S3M	283	7.6 ± 7.0	NB
A	<i>Coccyzus erythrophthalmus</i>	Black-billed Cuckoo				S3B,S3M	13	17.3 ± 0.0	NB
A	<i>Vireo gilvus</i>	Warbling Vireo				S3B,S3M	60	11.8 ± 7.0	NB
A	<i>Piranga olivacea</i>	Scarlet Tanager				S3B,S3M	162	7.2 ± 0.0	NB
A	<i>Passerina cyanea</i>	Indigo Bunting				S3B,S3M	15	37.3 ± 0.0	NB
A	<i>Molothrus ater</i>	Brown-headed Cowbird				S3B,S3M	79	7.6 ± 7.0	NB
A	<i>Icterus galbula</i>	Baltimore Oriole				S3B,S3M	59	11.8 ± 7.0	NB
A	<i>Somateria mollissima</i>	Common Eider				S3B,S4M,S3N	2	46.5 ± 0.0	NB
A	<i>Setophaga tigrina</i>	Cape May Warbler				S3B,S4S5M	149	7.6 ± 7.0	NB
A	<i>Anas acuta</i>	Northern Pintail				S3B,S5M	6	11.8 ± 7.0	NB
A	<i>Mergus serrator</i>	Red-breasted Merganser				S3B,S5M,S4S5N	24	33.7 ± 7.0	NB
A	<i>Arenaria interpres</i>	Ruddy Turnstone				S3M	1	20.0 ± 0.0	NB
A	<i>Bucephala albeola</i>	Bufflehead				S3M,S2N	2	49.5 ± 1.0	NB
A	<i>Calidris maritima</i>	Purple Sandpiper				S3M,S3N	1	96.0 ± 1.0	NB
A	<i>Tyrannus tyrannus</i>	Eastern Kingbird				S3S4B,S3S4M	204	5.8 ± 0.0	NB
A	<i>Actitis macularius</i>	Spotted Sandpiper				S3S4B,S5M	370	3.0 ± 7.0	NB
A	<i>Gallinago delicata</i>	Wilson's Snipe				S3S4B,S5M	250	7.1 ± 0.0	NB
A	<i>Larus delawarensis</i>	Ring-billed Gull				S3S4B,S5M	79	15.4 ± 0.0	NB
A	<i>Setophaga striata</i>	Blackpoll Warbler				S3S4B,S5M	391	3.0 ± 7.0	NB
A	<i>Calidris pusilla</i>	Semipalmated Sandpiper				S3S4M	10	14.0 ± 0.0	NB
A	<i>Calidris melanotos</i>	Pectoral Sandpiper				S3S4M	7	20.0 ± 0.0	NB
A	<i>Calidris alba</i>	Sanderling				S3S4M,S1N	3	20.0 ± 0.0	NB
I	<i>Danaus plexippus</i>	Monarch	Endangered	Special Concern	Special Concern	S3B,S3M	12	16.4 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
	<i>Ophiogomphus howei</i>	Pygmy Snaketail	Special Concern	Special Concern	Special Concern	S2	3	40.1 ± 0.0	NB
	<i>Bombus terricola</i>	Yellow-banded Bumblebee	Special Concern	Special Concern		S3?	54	9.5 ± 0.0	NB
	<i>Coccinella transversoguttata richardsoni</i>	Transverse Lady Beetle	Special Concern			SH	3	39.7 ± 1.0	NB
	<i>Erora laeta</i>	Early Hairstreak				S1	9	9.1 ± 0.0	NB
	<i>Leucorrhinia patricia</i>	Canada Whiteface				S1	7	60.3 ± 1.0	NB
	<i>Plebejus saepiolus</i>	Greenish Blue				S1S2	25	24.7 ± 0.0	NB
	<i>Ophiogomphus colubrinus</i>	Boreal Snaketail				S1S2	2	50.6 ± 0.0	NB
	<i>Aeshna juncea</i>	Rush Darner				S2	8	60.3 ± 1.0	NB
	<i>Coenagrion interrogatum</i>	Subarctic Bluet				S2	7	49.7 ± 0.0	NB
	<i>Callophrys henrici</i>	Henry's Elfin				S2S3	2	22.6 ± 0.0	NB
	<i>Hesperia sassacus</i>	Indian Skipper				S3	1	32.6 ± 7.0	NB
	<i>Papilio brevicauda gaspeensis</i>	Short-tailed Swallowtail				S3	7	34.5 ± 0.0	NB
	<i>Satyrium acadica</i>	Acadian Hairstreak				S3	7	22.6 ± 7.0	NB
	<i>Callophrys polios</i>	Hoary Elfin				S3	4	19.6 ± 0.0	NB
	<i>Speyeria aphrodite</i>	Aphrodite Fritillary				S3	14	4.6 ± 0.0	NB
	<i>Boloria eunomia</i>	Bog Fritillary				S3	13	5.8 ± 3.0	NB
	<i>Boloria bellona</i>	Meadow Fritillary				S3	5	13.8 ± 2.0	NB
	<i>Boloria chariclea</i>	Arctic Fritillary				S3	3	91.0 ± 0.0	NB
	<i>Polygonia satyrus</i>	Satyr Comma				S3	19	10.7 ± 0.0	NB
	<i>Polygonia gracilis</i>	Hoary Comma				S3	19	13.8 ± 2.0	NB
	<i>Nymphalis l-album</i>	Compton Tortoiseshell				S3	17	14.5 ± 2.0	NB
	<i>Gomphus vastus</i>	Cobra Clubtail				S3	2	14.0 ± 0.0	NB
	<i>Gomphus abbreviatus</i>	Spine-crowned Clubtail				S3	6	40.1 ± 0.0	NB
	<i>Somatochlora albicincta</i>	Ringed Emerald				S3	22	60.3 ± 1.0	NB
	<i>Somatochlora cingulata</i>	Lake Emerald				S3	14	44.3 ± 1.0	NB
	<i>Somatochlora forcipata</i>	Forcipate Emerald				S3	6	48.9 ± 0.0	NB
	<i>Lestes eurinus</i>	Amber-Winged Spreadwing				S3	1	60.3 ± 1.0	NB
	<i>Stylurus scudderi</i>	Zebra Clubtail				S3	5	35.4 ± 0.0	NB
	<i>Alasmidonta undulata</i>	Triangle Floater				S3	4	33.4 ± 1.0	NB
	<i>Pantala hymenaea</i>	Spot-Winged Glider				S3B,S3M	1	68.0 ± 1.0	NB
	<i>Satyrium liparops</i>	Striped Hairstreak				S3S4	10	26.4 ± 2.0	NB
	<i>Cupido comyntas</i>	Eastern Tailed Blue				S3S4	1	26.4 ± 2.0	NB
N	<i>Fuscopannaria leucosticta</i>	White-rimmed Shingle Lichen	Threatened			S2	2	78.8 ± 0.0	NB
N	<i>Aphanorrhagma serratum</i>	a Moss				S1	1	67.4 ± 0.0	NB
N	<i>Arctoa fulvella</i>	a Moss				S1	2	82.5 ± 1.0	NB
N	<i>Campylophyllum halleri</i>	Haller's Fine Wet Moss				S1	2	39.8 ± 1.0	NB
N	<i>Drepanocladus capillifolius</i>	Hair Hook Moss				S1	1	57.3 ± 1.0	NB
N	<i>Grimmia donniana</i>	Donn's Grimmia Moss				S1	4	82.5 ± 1.0	NB
N	<i>Grimmia incurva</i>	Black Grimmia				S1	4	82.5 ± 1.0	NB
N	<i>Grimmia unicolor</i>	a Moss				S1	1	63.6 ± 1.0	NB
N	<i>Hypnum recurvatum</i>	Recurved Plait Moss				S1	3	39.8 ± 1.0	NB
N	<i>Kiaeria starkei</i>	Starke's Fork Moss				S1	1	82.5 ± 1.0	NB
N	<i>Placynthium asperellum</i>	Lilliput Ink Lichen				S1	1	57.9 ± 0.0	NB
N	<i>Enchylium tenax</i>	Soil Tarpaper Lichen				S1	5	67.3 ± 0.0	NB
N	<i>Psora pseudorussellii</i>	Bordered Scale Lichen				S1	1	77.7 ± 0.0	NB
N	<i>Cetraria ericetorum ssp. ericetorum</i>	a Lichen				S1	2	82.8 ± 20.0	NB
N	<i>Ptychostomum pallens</i>	Pale Bryum				S1?	3	38.7 ± 0.0	NB
N	<i>Catoscopium nigrum</i>	Black Golf Club Moss				S1?	5	39.8 ± 1.0	NB
N	<i>Cinclidium stygium</i>	Sooty Cupola Moss				S1?	2	73.8 ± 0.0	NB
N	<i>Dicranum bonjeanii</i>	Bonjean's Broom Moss				S1?	2	40.4 ± 1.0	NB
N	<i>Entodon brevisetus</i>	a Moss				S1?	1	93.5 ± 1.0	NB
N	<i>Paludella squarrosa</i>	Tufted Fen Moss				S1?	1	73.8 ± 0.0	NB
N	<i>Rhytidium rugosum</i>	Wrinkle-leaved Moss				S1?	3	64.3 ± 0.0	NB
N	<i>Seligeria recurvata</i>	a Moss				S1?	5	39.8 ± 1.0	NB
N	<i>Splachnum sphaericum</i>	Round-fruited Dung Moss				S1?	1	91.5 ± 1.0	NB
N	<i>Timmia megapolitana</i>	Metropolitan Timmia Moss				S1?	3	50.4 ± 1.0	NB
N	<i>Rhizomnium pseudopunctatum</i>	Felted Leafy Moss				S1?	1	79.0 ± 1.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
N	<i>Euopsis granatina</i>	Lesser Rockbud Lichen				S1?	1	68.8 ± 0.0	NB
N	<i>Spilonema revertens</i>	Rock Hairball Lichen				S1?	1	68.8 ± 0.0	NB
N	<i>Peltigera venosa</i>	Fan Pelt Lichen				S1?	5	60.1 ± 0.0	NB
N	<i>Mesoptychia heterocolpos</i>	Whip Notchwort				S1S2	2	89.7 ± 0.0	NB
N	<i>Eocalypogeia schusteriana</i>	Schuster's Pouchwort				S1S2	3	61.2 ± 1.0	NB
N	<i>Calliergon richardsonii</i>	Richardson's Spear Moss				S1S2	4	59.8 ± 1.0	NB
N	<i>Pseudocampyllum radicale</i>	Long-stalked Fine Wet Moss				S1S2	2	61.1 ± 100.0	NB
N	<i>Distichium inclinatum</i>	Inclined Iris Moss				S1S2	1	98.8 ± 1.0	NB
N	<i>Fissidens taxifolius</i>	Yew-leaved Pocket Moss				S1S2	1	67.3 ± 0.0	NB
N	<i>Grimmia longirostris</i>	a Moss				S1S2	1	39.8 ± 1.0	NB
N	<i>Hygrohypnum bestii</i>	Best's Brook Moss				S1S2	1	39.8 ± 10.0	NB
N	<i>Oncophorus virens</i>	Green Spur Moss				S1S2	3	39.8 ± 1.0	NB
N	<i>Platydictya confervoides</i>	a Moss				S1S2	5	39.8 ± 1.0	NB
N	<i>Seligeria brevifolia</i>	a Moss				S1S2	2	72.3 ± 1.0	NB
N	<i>Timmia austriaca</i>	Austrian Timmia Moss				S1S2	3	47.2 ± 1.0	NB
N	<i>Timmia norvegica</i> var. <i>excurrens</i>	a moss				S1S2	2	93.5 ± 0.0	NB
N	<i>Tomentypnum falcifolium</i>	Sickle-leaved Golden Moss				S1S2	2	56.2 ± 1.0	NB
N	<i>Hamatocaulis vernicosus</i>	a Moss				S1S2	3	73.8 ± 0.0	NB
N	<i>Haplocladium microphyllum</i>	Tiny-leaved Haplocladium Moss				S1S2	7	52.0 ± 1.0	NB
N	<i>Umbilicaria vellea</i>	Grizzled Rocktripe Lichen				S1S2	2	64.3 ± 0.0	NB
N	<i>Cystocoleus ebeneus</i>	Rockgossamer Lichen				S1S2	1	68.9 ± 0.0	NB
N	<i>Anaptychia crinalis</i>	Hanging Fringed Lichen				S1S2	1	58.3 ± 0.0	NB
N	<i>Frullania selwyniana</i>	Selwyn's Scalewort				S1S3	1	58.3 ± 0.0	NB
N	<i>Obtusifolium obtusum</i>	Obtuse Notchwort				S1S3	1	76.4 ± 0.0	NB
N	<i>Tritomaria scitula</i>	Mountain Notchwort				S1S3	1	57.0 ± 1.0	NB
N	<i>Anomodon viticulosus</i>	a Moss				S2	3	72.5 ± 0.0	NB
N	<i>Cirriphyllum piliferum</i>	Hair-pointed Moss				S2	2	39.8 ± 1.0	NB
N	<i>Cynodontium strumiferum</i>	Strumose Dogtooth Moss				S2	1	79.3 ± 0.0	NB
N	<i>Didymodon ferrugineus</i>	Rusty Beard Moss				S2	1	39.8 ± 1.0	NB
N	<i>Ditrichum flexicaule</i>	Flexible Cow-hair Moss				S2	11	39.6 ± 1.0	NB
N	<i>Fontinalis hypnoides</i>	a moss				S2	2	46.7 ± 15.0	NB
N	<i>Anomodon tristis</i>	a Moss				S2	1	57.9 ± 0.0	NB
N	<i>Hypnum pratense</i>	Meadow Plait Moss				S2	2	61.2 ± 1.0	NB
N	<i>Isopterygiopsis pulchella</i>	Neat Silk Moss				S2	1	70.3 ± 2.0	NB
N	<i>Meesia triquetra</i>	Three-ranked Cold Moss				S2	1	62.4 ± 100.0	NB
N	<i>Orthotrichum speciosum</i>	Showy Bristle Moss				S2	2	71.7 ± 0.0	NB
N	<i>Physcomitrium immersum</i>	a Moss				S2	2	39.8 ± 1.0	NB
N	<i>Platydictya jungermannioides</i>	False Willow Moss				S2	1	97.1 ± 1.0	NB
N	<i>Pohlia elongata</i>	Long-necked Nodding Moss				S2	1	70.3 ± 2.0	NB
N	<i>Pohlia sphagnicola</i>	a moss				S2	1	88.8 ± 1.0	NB
N	<i>Seligeria calcarea</i>	Chalk Brittle Moss				S2	1	57.2 ± 0.0	NB
N	<i>Sphagnum centrale</i>	Central Peat Moss				S2	1	74.1 ± 0.0	NB
N	<i>Tayloria serrata</i>	Serrate Trumpet Moss				S2	1	79.4 ± 0.0	NB
N	<i>Tortula mucronifolia</i>	Mucronate Screw Moss				S2	5	39.8 ± 1.0	NB
N	<i>Zygodon viridissimus</i> var. <i>rupestris</i>	a moss				S2	2	61.6 ± 0.0	NB
N	<i>Anomobryum julaceum</i>	Slender Silver Moss				S2	1	39.8 ± 1.0	NB
N	<i>Peltigera lepidophora</i>	Scaly Pelt Lichen				S2	10	57.9 ± 0.0	NB
N	<i>Barbilophozia lycopodioides</i>	Greater Pawwort				S2?	1	69.9 ± 1.0	NB
N	<i>Anomodon minor</i>	Blunt-leaved Anomodon Moss				S2?	2	51.8 ± 0.0	NB
N	<i>Ptychostomum pallescens</i>	Tall Clustered Bryum				S2?	1	39.8 ± 1.0	NB
N	<i>Dicranum spurium</i>	Spurred Broom Moss				S2?	1	68.7 ± 0.0	NB
N	<i>Hygrohypnum montanum</i>	a Moss				S2?	2	80.7 ± 0.0	NB
N	<i>Schistostega pennata</i>	Luminous Moss				S2?	1	40.0 ± 1.0	NB
N	<i>Seligeria campylopoda</i>	a Moss				S2?	4	39.8 ± 1.0	NB
N	<i>Seligeria diversifolia</i>	a Moss				S2?	2	56.6 ± 1.0	NB
N	<i>Trichodon cylindricus</i>	Cylindric Hairy-teeth Moss				S2?	3	64.7 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
N	<i>Plagiomnium rostratum</i>	Long-beaked Leafy Moss				S2?	4	63.4 ± 1.0	NB
N	<i>Ramalina labiosorediata</i>	Chalky Ramalina Lichen				S2?	2	64.3 ± 0.0	NB
N	<i>Collema leptaleum</i>	Crumpled Bat's Wing Lichen				S2?	6	57.7 ± 0.0	NB
N	<i>Imshaugia placodioides</i>	Eyed Starburst Lichen				S2?	1	55.9 ± 0.0	NB
N	<i>Hypogymnia bitteri</i>	Powdered Tube Lichen				S2?	2	58.1 ± 0.0	NB
N	<i>Ptychostomum cernuum</i>	Swamp Bryum				S2S3	3	39.8 ± 1.0	NB
N	<i>Ptychostomum weigelii</i>	Weigel's Bryum Moss				S2S3	1	56.3 ± 3.0	NB
N	<i>Calliergonella cuspidata</i>	Common Large Wetland Moss				S2S3	2	74.1 ± 0.0	NB
N	<i>Drepanocladus polygamus</i>	Polygamous Hook Moss				S2S3	3	39.6 ± 1.0	NB
N	<i>Didymodon rigidulus</i>	Rigid Screw Moss				S2S3	6	39.6 ± 1.0	NB
N	<i>Fissidens bushii</i>	Bush's Pocket Moss				S2S3	1	99.0 ± 0.0	NB
N	<i>Orthotrichum elegans</i>	Showy Bristle Moss				S2S3	5	7.4 ± 5.0	NB
N	<i>Pohlia prolifera</i>	Cottony Nodding Moss				S2S3	1	70.3 ± 2.0	NB
N	<i>Saelania glaucescens</i>	Blue Dew Moss				S2S3	4	46.7 ± 15.0	NB
N	<i>Scorpidium scorpioides</i>	Hooked Scorpion Moss				S2S3	3	73.8 ± 0.0	NB
N	<i>Sphagnum subfulvum</i>	a Peatmoss				S2S3	1	79.2 ± 0.0	NB
N	<i>Taxiphyllum deplanatum</i>	Imbricate Yew-leaved Moss				S2S3	1	7.4 ± 5.0	NB
N	<i>Plagiomnium drummondii</i>	Drummond's Leafy Moss				S2S3	2	21.0 ± 3.0	NB
N	<i>Cyrtomnium hymenophylloides</i>	Short-pointed Lantern Moss				S2S3	2	56.6 ± 0.0	NB
N	<i>Dendriscoaulon umhausense</i>	a lichen				S2S3	2	82.2 ± 0.0	NB
N	<i>Parmeliopsis ambigua</i>	Green Starburst Lichen				S2S3	1	58.1 ± 0.0	NB
N	<i>Tortella fragilis</i>	Fragile Twisted Moss				S3	5	39.8 ± 1.0	NB
N	<i>Hymenostylium recurvirostre</i>	Hymenostylium Moss				S3	11	39.8 ± 1.0	NB
N	<i>Collema nigrescens</i>	Blistered Tarpaper Lichen				S3	7	57.7 ± 0.0	NB
N	<i>Solorina saccata</i>	Woodland Owl Lichen				S3	32	55.4 ± 0.0	NB
N	<i>Ahtiana aurescens</i>	Eastern Candlewax Lichen				S3	3	58.7 ± 0.0	NB
N	<i>Cladonia strepsilis</i>	Olive Cladonia Lichen				S3	1	70.2 ± 0.0	NB
N	<i>Scytinium lichenoides</i>	Tattered Jellyskin Lichen				S3	9	63.7 ± 0.0	NB
N	<i>Nephroma resupinatum</i>	a lichen				S3	35	13.8 ± 0.0	NB
N	<i>Leptogium laceroides</i>	Short-bearded Jellyskin Lichen				S3	3	56.1 ± 0.0	NB
N	<i>Peltigera membranacea</i>	Membranous Pelt Lichen				S3	4	37.6 ± 0.0	NB
N	<i>Ptychostomum inclinatum</i>	Blunt-tooth Thread Moss				S3?	1	56.3 ± 0.0	NB
N	<i>Scytinium subtile</i>	Appressed Jellyskin Lichen				S3?	2	60.2 ± 0.0	NB
N	<i>Anomodon rugelii</i>	Rugel's Anomodon Moss				S3S4	6	39.6 ± 1.0	NB
N	<i>Barbula convoluta</i>	Lesser Bird's-claw Beard Moss				S3S4	4	39.6 ± 1.0	NB
N	<i>Calliergon giganteum</i>	Giant Spear Moss				S3S4	1	49.6 ± 3.0	NB
N	<i>Dicranella cerviculata</i>	a Moss				S3S4	2	33.0 ± 1.0	NB
N	<i>Dicranella varia</i>	a Moss				S3S4	9	30.7 ± 3.0	NB
N	<i>Encalypta ciliata</i>	Fringed Extinguisher Moss				S3S4	3	7.4 ± 5.0	NB
N	<i>Fissidens bryoides</i>	Lesser Pocket Moss				S3S4	4	46.7 ± 15.0	NB
N	<i>Elodium blandowii</i>	Blandow's Bog Moss				S3S4	2	56.6 ± 0.0	NB
N	<i>Heterocladium dimorphum</i>	Dimorphous Tangle Moss				S3S4	2	46.7 ± 15.0	NB
N	<i>Isopterygiopsis muelleriana</i>	a Moss				S3S4	4	46.7 ± 15.0	NB
N	<i>Myurella julacea</i>	Small Mouse-tail Moss				S3S4	11	39.8 ± 1.0	NB
N	<i>Pogonatum dentatum</i>	Mountain Hair Moss				S3S4	2	33.0 ± 1.0	NB
N	<i>Splachnum rubrum</i>	Red Collar Moss				S3S4	1	62.7 ± 2.0	NB
N	<i>Tomentypnum nitens</i>	Golden Fuzzy Fen Moss				S3S4	4	60.1 ± 3.0	NB
N	<i>Weissia controversa</i>	Green-Cushioned Weissia				S3S4	5	39.6 ± 1.0	NB
N	<i>Abietinella abietina</i>	Wiry Fern Moss				S3S4	14	39.6 ± 1.0	NB
N	<i>Trichostomum tenuirostre</i>	Acid-Soil Moss				S3S4	2	46.7 ± 15.0	NB
N	<i>Scorpidium revolvens</i>	Limprichtia Moss				S3S4	2	73.8 ± 0.0	NB
N	<i>Rauvella scita</i>	Smaller Fern Moss				S3S4	2	61.5 ± 0.0	NB
N	<i>Pannaria rubiginosa</i>	Brown-eyed Shingle Lichen				S3S4	10	57.7 ± 0.0	NB
N	<i>Pseudocyphellaria holarctica</i>	Yellow Specklebelly Lichen				S3S4	10	46.2 ± 0.0	NB
N	<i>Scytinium teretiusculum</i>	Curly Jellyskin Lichen				S3S4	2	83.6 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
N	<i>Vahlia leucophaea</i>	Shelter Shingle Lichen				S3S4	6	64.3 ± 0.0	NB
N	<i>Nephroma parile</i>	Powdery Kidney Lichen				S3S4	8	37.0 ± 0.0	NB
N	<i>Protopannaria pezizoides</i>	Brown-gray Moss-shingle Lichen				S3S4	11	68.7 ± 0.0	NB
N	<i>Fuscopannaria soledata</i>	a Lichen				S3S4	1	58.1 ± 0.0	NB
N	<i>Pannaria conoplea</i>	Mealy-rimmed Shingle Lichen				S3S4	10	45.1 ± 0.0	NB
N	<i>Anaptychia palmulata</i>	Shaggy Fringed Lichen				S3S4	2	99.0 ± 0.0	NB
N	<i>Cladonia amaurocraea</i>	Quill Lichen				S3S4	1	63.5 ± 0.0	NB
N	<i>Dermatocarpon luridum</i>	Brookside Stippleback Lichen				S3S4	72	17.2 ± 0.0	NB
P	<i>Juglans cinerea</i>	Butternut	Endangered	Endangered	Endangered	S1	173	37.5 ± 2.0	NB
P	<i>Pedicularis furbishiae</i>	Furbish Lousewort	Endangered	Endangered	Endangered	S1	55	36.4 ± 0.0	NB
P	<i>Fraxinus nigra</i>	Black Ash	Threatened			S4S5	713	0.8 ± 0.0	NB
P	<i>Symphyotrichum anticostense</i>	Anticosti Aster	Special Concern	Special Concern	Endangered	S2S3	278	39.8 ± 5.0	NB
P	<i>Pterospora andromedea</i>	Woodland Pinedrops			Endangered	S1	18	75.2 ± 0.0	NB
P	<i>Cryptotaenia canadensis</i>	Canada Honewort				S1	6	50.7 ± 1.0	NB
P	<i>Sanicula trifoliata</i>	Large-Fruited Sanicle				S1	3	87.7 ± 0.0	NB
P	<i>Antennaria parlinii ssp. fallax</i>	Parlin's Pussytoes				S1	1	77.1 ± 0.0	NB
P	<i>Arnica lonchophylla</i>	Northern Arnica				S1	11	56.0 ± 5.0	NB
P	<i>Hieracium robinsonii</i>	Robinson's Hawkweed				S1	2	39.8 ± 1.0	NB
P	<i>Canadanthus modestus</i>	Great Northern Aster				S1	44	30.5 ± 0.0	NB
P	<i>Betula glandulosa</i>	Glandular Birch				S1	5	83.0 ± 0.0	NB
P	<i>Andersonglossum boreale</i>	Northern Wild Comfrey				S1	6	63.7 ± 1.0	NB
P	<i>Hackelia deflexa ssp. americana</i>	American Stickseed				S1	1	90.9 ± 10.0	NB
P	<i>Cardamine concatenata</i>	Cut-leaved Toothwort				S1	4	72.1 ± 0.0	NB
P	<i>Draba arabisans</i>	Rock Whitlow-Grass				S1	2	79.5 ± 50.0	NB
P	<i>Draba cana</i>	Lance-leaved Draba				S1	1	63.1 ± 1.0	NB
P	<i>Draba glabella</i>	Rock Whitlow-Grass				S1	1	83.4 ± 50.0	NB
P	<i>Boechera grahamii</i>	Graham's Rockcress				S1	2	76.9 ± 1.0	NB
P	<i>Moehringia macrophylla</i>	Large-Leaved Sandwort				S1	2	68.0 ± 0.0	NB
P	<i>Chenopodium simplex</i>	Maple-leaved Goosefoot				S1	1	63.7 ± 0.0	NB
P	<i>Blitum capitatum</i>	Strawberry-Blite				S1	7	19.7 ± 10.0	NB
P	<i>Drosera anglica</i>	English Sundew				S1	5	60.4 ± 0.0	NB
P	<i>Drosera linearis</i>	Slender-Leaved Sundew				S1	4	74.0 ± 0.0	NB
P	<i>Vaccinium uliginosum</i>	Alpine Bilberry				S1	1	83.0 ± 0.0	NB
P	<i>Hylodesmum glutinosum</i>	Large Tick-trefoil				S1	1	87.1 ± 0.0	NB
P	<i>Oxytropis deflexa var. foliolosa</i>	Nodding Locoweed				S1	8	67.5 ± 0.0	NB
P	<i>Gentiana rubricaulis</i>	Purple-stemmed Gentian				S1	1	72.5 ± 0.0	NB
P	<i>Pinguicula vulgaris ssp. vulgaris</i>	Common Butterwort				S1	1	85.4 ± 0.0	NB
P	<i>Pinguicula vulgaris</i>	Common Butterwort				S1	33	81.9 ± 1.0	NB
P	<i>Coptidium lapponicum</i>	Lapland Buttercup				S1	28	14.7 ± 0.0	NB
P	<i>Amelanchier fernaldii</i>	Fernald's Serviceberry				S1	1	83.4 ± 0.0	NB
P	<i>Rubus flagellaris</i>	Northern Dewberry				S1	7	12.4 ± 1.0	NB
P	<i>Galium brevipes</i>	Limestone Swamp Bedstraw				S1	1	34.7 ± 0.0	NB
P	<i>Agalinis purpurea var. parviflora</i>	Small-flowered Purple False Foxglove				S1	3	27.1 ± 0.0	NB
P	<i>Valeriana dioica ssp. sylvatica</i>	Northern Valerian				S1	2	56.4 ± 0.0	NB
P	<i>Viola canadensis</i>	Canada Violet				S1	1	58.1 ± 0.0	NB
P	<i>Carex blanda</i>	Eastern Woodland Sedge				S1	1	26.0 ± 2.0	NB
P	<i>Carex cephaloidea</i>	Thin-leaved Sedge				S1	14	51.0 ± 0.0	NB
P	<i>Carex merritt-feraldii</i>	Merritt Fernald's Sedge				S1	1	28.4 ± 0.0	NB
P	<i>Carex media</i>	Intermediate Sedge				S1	28	29.4 ± 1.0	NB
P	<i>Carex scirpoidea</i>	Scirpuslike Sedge				S1	2	65.1 ± 1.0	NB
P	<i>Carex sterilis</i>	Sterile Sedge				S1	3	59.5 ± 0.0	NB
P	<i>Carex grisea</i>	Inflated Narrow-leaved Sedge				S1	2	51.2 ± 0.0	NB
P	<i>Carex saxatilis</i>	Russet Sedge				S1	6	95.8 ± 0.0	NB

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P	<i>Carex bigelowii</i>	Bigelow's Sedge				S1	6	82.8 ± 0.0	NB
P	<i>Rhynchospora capillacea</i>	Slender Beakrush				S1	5	35.6 ± 0.0	NB
P	<i>Juncus stygius ssp. americanus</i>	Moor Rush				S1	1	24.6 ± 10.0	NB
P	<i>Juncus subtilis</i>	Creeping Rush				S1	1	57.3 ± 0.0	NB
P	<i>Allium canadense</i>	Canada Garlic				S1	10	47.0 ± 0.0	NB
P	<i>Malaxis monophyllos var. brachypoda</i>	North American White Adder's-mouth				S1	1	48.0 ± 1.0	NB
P	<i>Platanthera flava var. herbiola</i>	Pale Green Orchid				S1	1	97.5 ± 0.0	NB
P	<i>Platanthera macrophylla</i>	Large Round-Leaved Orchid				S1	1	73.7 ± 1.0	NB
P	<i>Elymus hystrix</i>	Spreading Wild Rye				S1	13	91.9 ± 0.0	NB
P	<i>Festuca subverticillata</i>	Nodding Fescue				S1	25	44.3 ± 10.0	NB
P	<i>Potamogeton friesii</i>	Fries' Pondweed				S1	5	50.4 ± 0.0	NB
P	<i>Potamogeton strictifolius</i>	Straight-leaved Pondweed				S1	2	63.4 ± 100.0	NB
P	<i>Dryopteris clintoniana</i>	Clinton's Wood Fern				S1	11	24.6 ± 10.0	NB
P	<i>Dryopteris filix-mas ssp. brittonii</i>	Britton's Male Fern				S1	2	99.9 ± 0.0	NB
P	<i>Gymnocarpium continentale</i>	Nahanni Oak Fern				S1	10	28.8 ± 0.0	NB
P	<i>Gymnocarpium robertianum</i>	Limestone Oak Fern				S1	14	51.6 ± 0.0	NB
P	<i>Huperzia selago</i>	Northern Firmoss				S1	8	15.3 ± 0.0	NB
P	<i>Botrychium lunaria</i>	Common Moonwort				S1	7	41.9 ± 0.0	NB
P	<i>Galium trifidum ssp. subbiflorum</i>	Three-petaled Bedstraw				S1?	6	55.2 ± 0.0	NB
P	<i>Sisyrinchium mucronatum</i>	Michaux's Blue-eyed-grass				S1?	7	68.8 ± 0.0	NB
P	<i>Poa interior</i>	Inland Bluegrass				S1?	2	55.4 ± 0.0	NB
P	<i>Micranthes virginiensis</i>	Early Saxifrage				S1S2	5	23.9 ± 0.0	NB
P	<i>Carex crawei</i>	Crawe's Sedge				S1S2	22	64.7 ± 0.0	NB
P	<i>Selaginella rupestris</i>	Rock Spikemoss				S1S2	4	56.0 ± 0.0	NB
P	<i>Cuscuta cephalanthi</i>	Buttonbush Dodder				S1S3	10	63.3 ± 0.0	NB
P	<i>Osmorhiza depauperata</i>	Blunt Sweet Cicely				S2	7	25.7 ± 5.0	NB
P	<i>Osmorhiza longistylis</i>	Smooth Sweet Cicely				S2	9	51.0 ± 0.0	NB
P	<i>Sanicula odorata</i>	Clustered Sanicle				S2	10	50.5 ± 1.0	NB
P	<i>Solidago racemosa</i>	Racemose Goldenrod				S2	42	38.0 ± 0.0	NB
P	<i>Impatiens pallida</i>	Pale Jewelweed				S2	24	50.6 ± 0.0	NB
P	<i>Betula minor</i>	Dwarf White Birch				S2	24	45.6 ± 1.0	NB
P	<i>Boechera stricta</i>	Drummond's Rockcress				S2	6	40.0 ± 0.0	NB
P	<i>Stellaria longifolia</i>	Long-leaved Starwort				S2	1	47.1 ± 1.0	NB
P	<i>Hypericum x dissimulatum</i>	Disguised St. John's-wort				S2	1	83.0 ± 1.0	NB
P	<i>Triosteum aurantiacum</i>	Orange-fruited Tinker's Weed				S2	3	63.3 ± 0.0	NB
P	<i>Shepherdia canadensis</i>	Soapberry				S2	40	37.9 ± 0.0	NB
P	<i>Astragalus eucosmus</i>	Elegant Milk-vetch				S2	23	48.3 ± 0.0	NB
P	<i>Oxytropis campestris var. johannensis</i>	Field Locoweed				S2	104	25.3 ± 1.0	NB
P	<i>Quercus macrocarpa</i>	Bur Oak				S2	2	55.6 ± 0.0	NB
P	<i>Nuphar x rubrodisca</i>	Red-disk Yellow Pond-lily				S2	5	74.7 ± 5.0	NB
P	<i>Aphyllon uniflorum</i>	One-flowered Broomrape				S2	2	61.8 ± 0.0	NB
P	<i>Polygaloides paucifolia</i>	Fringed Milkwort				S2	1	28.4 ± 0.0	NB
P	<i>Polygala senega</i>	Seneca Snakeroot				S2	26	49.1 ± 50.0	NB
P	<i>Persicaria amphibia var. emersa</i>	Long-root Smartweed				S2	4	46.0 ± 0.0	NB
P	<i>Anemone multifida</i>	Cut-leaved Anemone				S2	121	23.9 ± 0.0	NB
P	<i>Anemone parviflora</i>	Small-flowered Anemone				S2	24	75.2 ± 1.0	NB
P	<i>Hepatica americana</i>	Round-lobed Hepatica				S2	2	87.6 ± 0.0	NB
P	<i>Crataegus scabrida</i>	Rough Hawthorn				S2	1	99.3 ± 1.0	NB
P	<i>Rosa acicularis ssp. sayi</i>	Prickly Rose				S2	25	72.7 ± 0.0	NB
P	<i>Galium kamtschaticum</i>	Northern Wild Licorice				S2	12	52.9 ± 0.0	NB
P	<i>Salix candida</i>	Sage Willow				S2	27	25.1 ± 50.0	NB
P	<i>Castilleja septentrionalis</i>	Northeastern Paintbrush				S2	33	27.7 ± 5.0	NB
P	<i>Scrophularia lanceolata</i>	Lance-leaved Figwort				S2	7	68.1 ± 0.0	NB
P	<i>Dirca palustris</i>	Eastern Leatherwood				S2	29	13.6 ± 0.0	NB
P	<i>Phryma leptostachya</i>	American Lopseed				S2	21	51.0 ± 0.0	NB
P	<i>Verbena urticifolia</i>	White Vervain				S2	3	68.1 ± 1.0	NB

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P	<i>Viola novae-angliae</i>	New England Violet				S2	36	17.4 ± 0.0	NB
P	<i>Symplocarpus foetidus</i>	Eastern Skunk Cabbage				S2	4	43.1 ± 0.0	NB
P	<i>Carex concinna</i>	Beautiful Sedge				S2	70	30.5 ± 0.0	NB
P	<i>Carex granularis</i>	Limestone Meadow Sedge				S2	38	47.0 ± 0.0	NB
P	<i>Carex gynocrates</i>	Northern Bog Sedge				S2	18	19.0 ± 10.0	NB
P	<i>Carex hirtifolia</i>	Pubescent Sedge				S2	3	43.2 ± 0.0	NB
P	<i>Carex livida</i>	Livid Sedge				S2	31	24.6 ± 5.0	NB
P	<i>Carex plantaginea</i>	Plantain-Leaved Sedge				S2	25	48.8 ± 0.0	NB
P	<i>Carex prairea</i>	Prairie Sedge				S2	19	28.2 ± 0.0	NB
P	<i>Carex rostrata</i>	Narrow-leaved Beaked Sedge				S2	10	11.7 ± 0.0	NB
P	<i>Carex sprengelii</i>	Longbeak Sedge				S2	32	38.3 ± 0.0	NB
P	<i>Carex tenuiflora</i>	Sparse-Flowered Sedge				S2	12	24.6 ± 5.0	NB
P	<i>Carex albicans</i> var. <i>emmonsii</i>	White-tinged Sedge				S2	2	24.6 ± 5.0	NB
P	<i>Elodea nuttallii</i>	Nuttall's Waterweed				S2	47	13.8 ± 0.0	NB
P	<i>Galearis rotundifolia</i>	Small Round-leaved Orchid				S2	32	24.6 ± 5.0	NB
P	<i>Calypso bulbosa</i> var. <i>americana</i>	Calypso				S2	17	35.7 ± 0.0	NB
P	<i>Coeloglossum viride</i>	Long-bracted Frog Orchid				S2	5	48.0 ± 1.0	NB
P	<i>Cypripedium parviflorum</i> var. <i>makasin</i>	Small Yellow Lady's-Slipper				S2	33	24.6 ± 10.0	NB
P	<i>Galearis spectabilis</i>	Showy Orchis				S2	23	51.0 ± 0.0	NB
P	<i>Goodyera oblongifolia</i>	Menzies' Rattlesnake-plantain				S2	19	34.0 ± 0.0	NB
P	<i>Spiranthes lucida</i>	Shining Ladies'-Tresses				S2	10	31.8 ± 0.0	NB
P	<i>Dichanthelium linearifolium</i>	Narrow-leaved Panic Grass				S2	3	48.2 ± 0.0	NB
P	<i>Elymus canadensis</i>	Canada Wild Rye				S2	2	24.6 ± 5.0	NB
P	<i>Poa glauca</i>	Glaucous Blue Grass				S2	22	48.1 ± 0.0	NB
P	<i>Schizachyrium scoparium</i>	Little Bluestem				S2	76	23.8 ± 0.0	NB
P	<i>Potamogeton vaseyi</i>	Vasey's Pondweed				S2	2	17.8 ± 0.0	NB
P	<i>Asplenium trichomanes</i>	Maidenhair Spleenwort				S2	4	29.8 ± 0.0	NB
P	<i>Woodsia alpina</i>	Alpine Cliff Fern				S2	51	47.0 ± 0.0	NB
P	<i>Diphasiastrum sitchense</i>	Sitka Ground-cedar				S2	17	18.5 ± 0.0	NB
P	<i>Botrychium minganense</i>	Mingan Moonwort				S2	28	30.8 ± 0.0	NB
P	<i>Selaginella selaginoides</i>	Low Spikemoss				S2	28	19.0 ± 5.0	NB
P	<i>Symphotrichum novi-belgii</i> var. <i>crenifolium</i>	New York Aster				S2?	1	56.6 ± 1.0	NB
P	<i>Humulus lupulus</i> var. <i>lupuloides</i>	Common Hop				S2?	1	72.8 ± 0.0	NB
P	<i>Galium obtusum</i>	Blunt-leaved Bedstraw				S2?	1	57.3 ± 1.0	NB
P	<i>Salix myricoides</i>	Bayberry Willow				S2?	62	14.9 ± 0.0	NB
P	<i>Platanthera huronensis</i>	Fragrant Green Orchid				S2?	7	32.0 ± 0.0	NB
P	<i>Solidago altissima</i>	Tall Goldenrod				S2S3	87	48.8 ± 0.0	NB
P	<i>Callitriche hermaphroditica</i>	Northern Water-starwort				S2S3	18	28.6 ± 0.0	NB
P	<i>Lonicera oblongifolia</i>	Swamp Fly Honeysuckle				S2S3	76	6.7 ± 0.0	NB
P	<i>Epilobium coloratum</i>	Purple-veined Willowherb				S2S3	9	17.5 ± 5.0	NB
P	<i>Rumex pallidus</i>	Seabeach Dock				S2S3	1	60.2 ± 0.0	NB
P	<i>Rumex occidentalis</i>	Western Dock				S2S3	47	23.6 ± 0.0	NB
P	<i>Amelanchier gaspensis</i>	Gasp - Serviceberry				S2S3	4	42.7 ± 0.0	NB
P	<i>Rubus pensilvanicus</i>	Pennsylvania Blackberry				S2S3	1	73.7 ± 1.0	NB
P	<i>Galium labradoricum</i>	Labrador Bedstraw				S2S3	47	28.2 ± 0.0	NB
P	<i>Valeriana uliginosa</i>	Swamp Valerian				S2S3	75	6.9 ± 0.0	NB
P	<i>Carex adusta</i>	Lesser Brown Sedge				S2S3	7	28.0 ± 0.0	NB
P	<i>Scirpus atrovirens</i>	Dark-green Bulrush				S2S3	94	14.3 ± 12.0	NB
P	<i>Juncus brachycephalus</i>	Small-Head Rush				S2S3	82	19.6 ± 0.0	NB
P	<i>Corallorhiza maculata</i> var. <i>maculata</i>	Spotted Coralroot				S2S3	15	34.2 ± 0.0	NB
P	<i>Neottia auriculata</i>	Auricled Twayblade				S2S3	11	48.0 ± 1.0	NB
P	<i>Spiranthes cernua</i>	Nodding Ladies'-Tresses				S2S3	13	5.2 ± 0.0	NB
P	<i>Eragrostis pectinacea</i>	Tufted Love Grass				S2S3	2	60.1 ± 0.0	NB
P	<i>Stuckenia filiformis</i>	Thread-leaved Pondweed				S2S3	26	50.6 ± 0.0	NB
P	<i>Potamogeton praelongus</i>	White-stemmed Pondweed				S2S3	23	49.1 ± 0.0	NB
P	<i>Ophioglossum pusillum</i>	Northern Adder's-tongue				S2S3	31	18.6 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	<i>Arnica lanceolata</i>	Lance-leaved Arnica				S3	79	29.2 ± 0.0	NB
P	<i>Artemisia campestris ssp. caudata</i>	Tall Wormwood				S3	20	31.7 ± 0.0	NB
P	<i>Artemisia campestris</i>	Field Wormwood				S3	12	31.8 ± 0.0	NB
P	<i>Erigeron hyssopifolius</i>	Hyssop-leaved Fleabane				S3	193	30.5 ± 0.0	NB
P	<i>Nabalus racemosus</i>	Glaucous Rattlesnakeroot				S3	53	26.5 ± 5.0	NB
P	<i>Tanacetum bipinnatum ssp. huronense</i>	Lake Huron Tansy				S3	155	17.4 ± 0.0	NB
P	<i>Symphotrichum boreale</i>	Boreal Aster				S3	18	22.8 ± 5.0	NB
P	<i>Betula pumila</i>	Bog Birch				S3	2	60.6 ± 0.0	NB
P	<i>Turritis glabra</i>	Tower Mustard				S3	23	14.1 ± 0.0	NB
P	<i>Arabis pycnocarpa</i>	Cream-flowered Rockcress				S3	24	23.9 ± 0.0	NB
P	<i>Cardamine maxima</i>	Large Toothwort				S3	1	91.4 ± 0.0	NB
P	<i>Subularia aquatica ssp. americana</i>	American Water Awlwort				S3	3	63.2 ± 0.0	NB
P	<i>Astragalus alpinus</i>	Alpine Milk-vetch				S3	3	76.8 ± 0.0	NB
P	<i>Astragalus alpinus var. brunetianus</i>	Alpine Milk-Vetch				S3	152	17.4 ± 0.0	NB
P	<i>Hedysarum americanum</i>	Alpine Hedysarum				S3	269	26.5 ± 5.0	NB
P	<i>Gentianella amarella ssp. acuta</i>	Northern Gentian				S3	21	13.4 ± 0.0	NB
P	<i>Geranium bicknellii</i>	Bicknell's Crane's-bill				S3	1	70.1 ± 0.0	NB
P	<i>Myriophyllum farwellii</i>	Farwell's Water Milfoil				S3	1	57.2 ± 0.0	NB
P	<i>Stachys hispida</i>	Smooth Hedge-Nettle				S3	83	14.0 ± 0.0	NB
P	<i>Nuphar microphylla</i>	Small Yellow Pond-lily				S3	14	14.1 ± 0.0	NB
P	<i>Epilobium hornemannii</i>	Hornemann's Willowherb				S3	34	12.5 ± 5.0	NB
P	<i>Epilobium strictum</i>	Downy Willowherb				S3	6	75.3 ± 0.0	NB
P	<i>Persicaria punctata</i>	Dotted Smartweed				S3	1	96.2 ± 0.0	NB
P	<i>Fallopia scandens</i>	Climbing False Buckwheat				S3	6	32.1 ± 0.0	NB
P	<i>Littorella americana</i>	American Shoreweed				S3	4	52.4 ± 0.0	NB
P	<i>Primula mistassinica</i>	Mistassini Primrose				S3	60	31.8 ± 0.0	NB
P	<i>Pyrola minor</i>	Lesser Pyrola				S3	30	7.5 ± 0.0	NB
P	<i>Clematis occidentalis</i>	Purple Clematis				S3	11	41.4 ± 0.0	NB
P	<i>Ranunculus gmelinii</i>	Gmelin's Water Buttercup				S3	3	81.8 ± 0.0	NB
P	<i>Thalictrum confine</i>	Northern Meadow-rue				S3	28	37.2 ± 0.0	NB
P	<i>Rubus occidentalis</i>	Black Raspberry				S3	6	14.2 ± 1.0	NB
P	<i>Galium boreale</i>	Northern Bedstraw				S3	16	62.1 ± 0.0	NB
P	<i>Salix pedicellaris</i>	Bog Willow				S3	41	49.0 ± 0.0	NB
P	<i>Salix interior</i>	Sandbar Willow				S3	127	17.3 ± 5.0	NB
P	<i>Comandra umbellata</i>	Bastard's Toadflax				S3	1	79.4 ± 0.0	NB
P	<i>Parnassia glauca</i>	Fen Grass-of-Parnassus				S3	297	31.8 ± 0.0	NB
P	<i>Pilea pumila</i>	Dwarf Clearweed				S3	1	94.6 ± 0.0	NB
P	<i>Viola adunca</i>	Hooked Violet				S3	4	51.0 ± 1.0	NB
P	<i>Viola adunca var. adunca</i>	Hooked Violet				S3	1	72.7 ± 0.0	NB
P	<i>Viola nephrophylla</i>	Northern Bog Violet				S3	250	16.9 ± 10.0	NB
P	<i>Carex arcta</i>	Northern Clustered Sedge				S3	29	24.6 ± 10.0	NB
P	<i>Carex capillaris</i>	Hairlike Sedge				S3	281	18.8 ± 0.0	NB
P	<i>Carex chordorrhiza</i>	Creeping Sedge				S3	25	40.9 ± 0.0	NB
P	<i>Carex conoidea</i>	Field Sedge				S3	20	31.7 ± 0.0	NB
P	<i>Carex eburnea</i>	Bristle-leaved Sedge				S3	145	21.3 ± 0.0	NB
P	<i>Carex exilis</i>	Coastal Sedge				S3	25	60.5 ± 0.0	NB
P	<i>Carex garberi</i>	Garber's Sedge				S3	54	30.2 ± 0.0	NB
P	<i>Carex haydenii</i>	Hayden's Sedge				S3	73	13.9 ± 0.0	NB
P	<i>Carex michauxiana</i>	Michaux's Sedge				S3	3	37.2 ± 1.0	NB
P	<i>Carex ormostachya</i>	Necklace Spike Sedge				S3	12	30.5 ± 0.0	NB
P	<i>Carex rosea</i>	Rosy Sedge				S3	15	17.2 ± 8.0	NB
P	<i>Carex tenera</i>	Tender Sedge				S3	12	22.3 ± 0.0	NB
P	<i>Carex tuckermanii</i>	Tuckerman's Sedge				S3	36	18.1 ± 0.0	NB
P	<i>Carex vaginata</i>	Sheathed Sedge				S3	47	19.0 ± 10.0	NB
P	<i>Carex wiegandii</i>	Wiegand's Sedge				S3	6	22.8 ± 5.0	NB
P	<i>Carex atratifomis</i>	Scabrous Black Sedge				S3	261	17.2 ± 8.0	NB
P	<i>Cyperus dentatus</i>	Toothed Flatsedge				S3	2	62.2 ± 0.0	NB
P	<i>Cyperus esculentus var. leptostachyus</i>	Perennial Yellow Nutsedge				S3	29	14.1 ± 0.0	NB

Taxonomic Group	Scientific Name	Common Name	COSEWIC	SARA	Prov Legal Prot	Prov Rarity Rank	# recs	Distance (km)	Prov
P	<i>Eleocharis intermedia</i>	Matted Spikerush				S3	39	22.5 ± 0.0	NB
P	<i>Eleocharis quinqueflora</i>	Few-flowered Spikerush				S3	65	14.9 ± 0.0	NB
P	<i>Rhynchospora capitellata</i>	Small-headed Beakrush				S3	10	32.0 ± 0.0	NB
P	<i>Rhynchospora fusca</i>	Brown Beakrush				S3	3	96.1 ± 0.0	NB
P	<i>Trichophorum clintonii</i>	Clinton's Clubrush				S3	47	31.8 ± 0.0	NB
P	<i>Lemna trisulca</i>	Star Duckweed				S3	1	14.1 ± 0.0	NB
P	<i>Triantha glutinosa</i>	Sticky False-Asphodel				S3	186	27.2 ± 5.0	NB
P	<i>Cypripedium reginae</i>	Showy Lady's-Slipper				S3	38	6.9 ± 0.0	NB
P	<i>Liparis loeselii</i>	Loesel's Twayblade				S3	12	6.5 ± 0.0	NB
P	<i>Platanthera blephariglottis</i>	White Fringed Orchid				S3	19	5.9 ± 0.0	NB
P	<i>Platanthera grandiflora</i>	Large Purple Fringed Orchid				S3	1	57.4 ± 0.0	NB
P	<i>Bromus latiglumis</i>	Broad-Glumed Brome				S3	105	18.6 ± 0.0	NB
P	<i>Muhlenbergia richardsonis</i>	Mat Muhly				S3	136	17.4 ± 0.0	NB
P	<i>Potamogeton obtusifolius</i>	Blunt-leaved Pondweed				S3	12	49.0 ± 10.0	NB
P	<i>Potamogeton richardsonii</i>	Richardson's Pondweed				S3	50	14.0 ± 0.0	NB
P	<i>Adiantum pedatum</i>	Northern Maidenhair Fern				S3	94	48.7 ± 0.0	NB
P	<i>Cryptogramma stelleri</i>	Steller's Rockbrake				S3	70	30.2 ± 5.0	NB
P	<i>Asplenium viride</i>	Green Spleenwort				S3	54	17.4 ± 0.0	NB
P	<i>Dryopteris fragrans</i>	Fragrant Wood Fern				S3	47	36.4 ± 0.0	NB
P	<i>Dryopteris goldiana</i>	Goldie's Woodfern				S3	105	25.2 ± 0.0	NB
P	<i>Woodsia glabella</i>	Smooth Cliff Fern				S3	33	47.0 ± 0.0	NB
P	<i>Equisetum palustre</i>	Marsh Horsetail				S3	44	13.5 ± 0.0	NB
P	<i>Isoetes tuckermanii</i> ssp. <i>tuckermanii</i>	Tuckerman's Quillwort				S3	1	89.5 ± 1.0	NB
P	<i>Diphasiastrum x sabinifolium</i>	Savin-leaved Ground-cedar				S3	16	31.3 ± 10.0	NB
P	<i>Huperzia appressa</i>	Mountain Firmoss				S3	1	96.8 ± 0.0	NB
P	<i>Sceptridium dissectum</i>	Dissected Moonwort				S3	2	68.0 ± 10.0	NB
P	<i>Botrychium lanceolatum</i> ssp. <i>angustisegmentum</i>	Narrow Triangle Moonwort				S3	9	21.0 ± 0.0	NB
P	<i>Botrychium simplex</i>	Least Moonwort				S3	39	15.8 ± 0.0	NB
P	<i>Polypodium appalachianum</i>	Appalachian Polypody				S3	9	32.0 ± 0.0	NB
P	<i>Crataegus submollis</i>	Quebec Hawthorn				S3?	1	67.9 ± 1.0	NB
P	<i>Mertensia maritima</i>	Sea Lungwort				S3S4	1	74.0 ± 50.0	NB
P	<i>Lobelia kalmii</i>	Brook Lobelia				S3S4	233	14.1 ± 0.0	NB
P	<i>Myriophyllum sibiricum</i>	Siberian Water Milfoil				S3S4	45	31.2 ± 1.0	NB
P	<i>Stachys pilosa</i>	Hairy Hedge-Nettle				S3S4	105	12.4 ± 0.0	NB
P	<i>Stachys pilosa</i> var. <i>pilosa</i>	Marsh Hedge-Nettle				S3S4	1	13.8 ± 1.0	NB
P	<i>Drymocallis arguta</i>	Tall Wood Beauty				S3S4	110	16.9 ± 10.0	NB
P	<i>Geocaldon lividum</i>	Northern Comandra				S3S4	8	27.8 ± 0.0	NB
P	<i>Cladium mariscoides</i>	Smooth Twigrush				S3S4	3	71.7 ± 0.0	NB
P	<i>Eriophorum russeolum</i>	Russet Cottongrass				S3S4	1	73.9 ± 10.0	NB
P	<i>Spirodela polyrhiza</i>	Great Duckweed				S3S4	6	13.6 ± 0.0	NB
P	<i>Corallorhiza maculata</i>	Spotted Coralroot				S3S4	18	4.8 ± 0.0	NB
P	<i>Calamagrostis stricta</i>	Slim-stemmed Reed Grass				S3S4	14	14.9 ± 0.0	NB
P	<i>Calamagrostis stricta</i> ssp. <i>stricta</i>	Slim-stemmed Reed Grass				S3S4	4	49.1 ± 0.0	NB
P	<i>Potamogeton oakesianus</i>	Oakes' Pondweed				S3S4	1	68.4 ± 1.0	NB
P	<i>Phleum alpinum</i>	Alpine Timothy				SH	3	70.2 ± 0.0	NB
P	<i>Botrychium lineare</i>	Narrow-leaved Moonwort				SH	1	49.6 ± 5.0	NB

5.1 SOURCE BIBLIOGRAPHY (100 km)

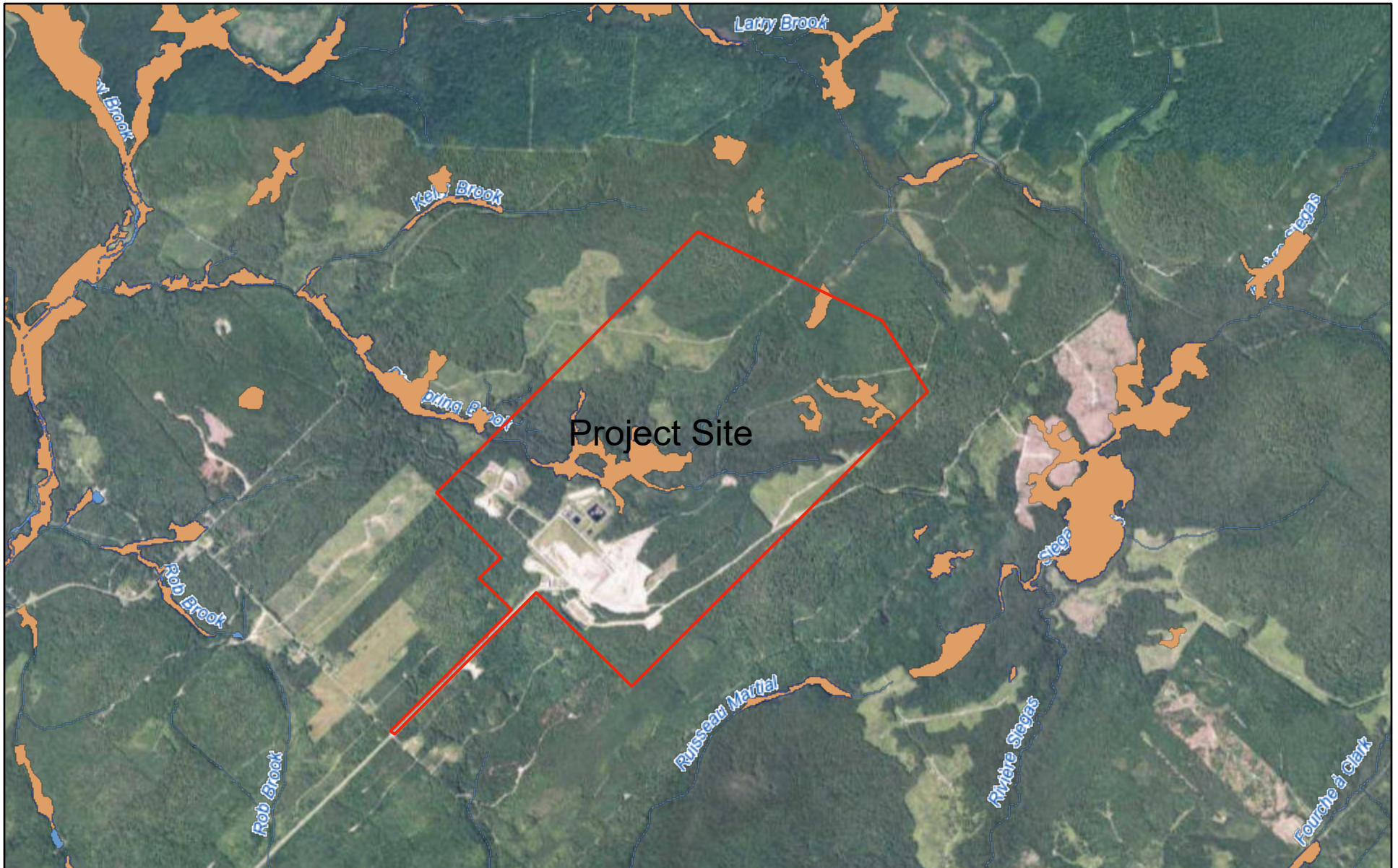
The recipient of these data shall acknowledge the AC CDC and the data sources listed below in any documents, reports, publications or presentations, in which this dataset makes a significant contribution.

# recs	CITATION
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4	Anon. 2017. Export of Maritimes Butterfly records. Global Biodiversity Information Facility (GBIF).
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4	Cowie, Faye. 2007. Surveyed Lakes in New Brunswick. Canadian Rivers Institute, 781 recs.
4	Doucet, D.A. 2008. Fieldwork 2008: Odonata. ACCDC Staff, 625 recs.
4	Downes, C. 1998-2000. Breeding Bird Survey Data. Canadian Wildlife Service, Ottawa, 111 recs.
4	Fournier, R. 2010. Rare plant observation records in Baker Brook and Grew Island areas. Pers. comm., 4 recs.
4	Webster, R.P. 1999. Insects of the Stillwater Watershed, A Preliminary Study. , 11 recs.
3	iNaturalist. 2018. iNaturalist Data Export 2018. iNaturalist.org and iNaturalist.ca, Web site: 11700 recs.
3	Klymko, J.J.D. 2012. Insect fieldwork & submissions, 2011. Atlantic Canada Conservation Data Centre. Sackville NB, 760 recs.
3	Madden, A. 1998. Wood Turtle records in northern NB. New Brunswick Dept of Natural Resources & Energy, Campbellton, Pers. comm. to S.H. Gerriets. 16 recs.
3	Richardson, Leif. 2018. Maritimes <i>Bombus</i> records from various sources. Richardson, Leif.
3	Sollows, M.C., 2009. NBM Science Collections databases: molluscs. New Brunswick Museum, Saint John NB, download Jan. 2009, 6951 recs (2957 in Atlantic Canada).
3	Turgeon, M.N. 2009. Showy Lady-slipper & Round-leaved Orchis observed at Loon Lake, Madawaska Co., NB. Pers. comm. to D.M. Mazerolle, 3 recs.
2	Blaney, C.S. Miscellaneous specimens received by ACCDC (botany). Various persons. 2001-08.

# recs	CITATION
2	Consortium of North American Lichen Herbaria. 2018. <i>Cetraria ericetorum</i> records from CNALH. CNALH, 3.
2	Haughian, S.R. 2018. Description of <i>Fuscopannaria leucosticta</i> field work in 2017. New Brunswick Museum, 314 recs.
2	iNaturalist. 2020. iNaturalist butterfly records selected for the Maritimes Butterfly Atlas. iNaturalist.
2	Majka, C. 2009. Université de Moncton Insect Collection: Carabidae, Cerambycidae, Coccinellidae. Université de Moncton, 540 recs.
2	Newell, R.E. 2000. E.C. Smith Herbarium Database. Acadia University, Wolfville NS, 7139 recs.
2	Pike, E., Tingley, S. & Christie, D.S. 2000. Nature NB Listserve. University of New Brunswick, listserv.unb.ca/archives/naturenb. 68 recs.
2	Sabine, M. 2016. Black Ash records from NB DNR permanent forest sampling Plots. New Brunswick Department of Natural Resources, 39 recs.
2	Simpson, D. Collection sites for Black Ash seed lots preserved at the National Tree Seed Centre in Fredericton NB. National Tree Seed Centre, Canadian Forest Service. 2016.
2	Sollows, M.C. 2008. NBM Science Collections databases: herpetiles. New Brunswick Museum, Saint John NB, download Jan. 2008, 8636 recs.
2	Webster, R.P. Atlantic Forestry Centre Insect Collection, Maritimes butterfly records. Natural Resources Canada. 2014.
2	Webster, R.P. Database of R.P. Webster butterfly collection. 2017.
1	Bishop, G. 2012. Field data from September 2012 <i>Anticosti Aster</i> collection trip. , 135 rec.
1	Calhoun, J.C. Butterfly records databased at the McGuire Center for Lepidoptera and Biodiversity. Calhoun, J.C. 2020.
1	Chaput, G. 2002. Atlantic Salmon: Maritime Provinces Overview for 2001. Dept of Fisheries & Oceans, Atlantic Region, Science Stock Status Report D3-14. 39 recs.
1	e-Butterfly. 2018. Selected Maritimes butterfly records from 2016 and 2017. Maxim Larrivee, Sambo Zhang (ed.) e-butterfly.org.
1	Goltz, J.P. 2001. Botany Ramblings April 29-June 30, 2001. N.B. Naturalist, 28 (2): 51-2. 8 recs.
1	Goltz, J.P. 2002. Botany Ramblings: 1 July to 30 September, 2002. N.B. Naturalist, 29 (3):84-92. 7 recs.
1	Hinds, H.R. 2000. Flora of New Brunswick (2nd Ed.). University New Brunswick, 694 pp.
1	Klymko, J.J.D.; Robinson, S.L. 2014. 2013 field data. Atlantic Canada Conservation Data Centre.
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1	Sabine, D.L. 2005. 2001 Freshwater Mussel Surveys. New Brunswick Dept of Natural Resources & Energy, 590 recs.
1	Speers, L. 2001. Butterflies of Canada database. Agriculture & Agri-Food Canada, Biological Resources Program, Ottawa, 190 recs.
1	Webster, R.P. & Edsall, J. 2007. 2005 New Brunswick Rare Butterfly Survey. Environmental Trust Fund, unpublished report, 232 recs.
1	Webster, R.P. 2001. R.P. Webster Collection. R. P. Webster, 39 recs.
1	Wilhelm, S.I. et al. 2019. Colonial Waterbird Database. Canadian Wildlife Service.

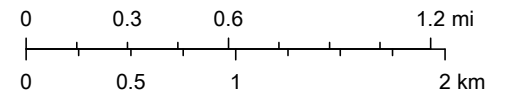
GeoNB Mapping



1/24/2022, 10:20:54 AM

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|--------------|-------------|------------------|---------------------|
| Override 1 | Wetlands | Fen | Shrub Wetland |
| 2 | Aquatic Bed | Freshwater Marsh | Water Courses |
| Water Bodies | Bog | Forested Wetland | Year of Photography |

1:36,112



Department of Environment & Local Government/Ministère de

GeoNB

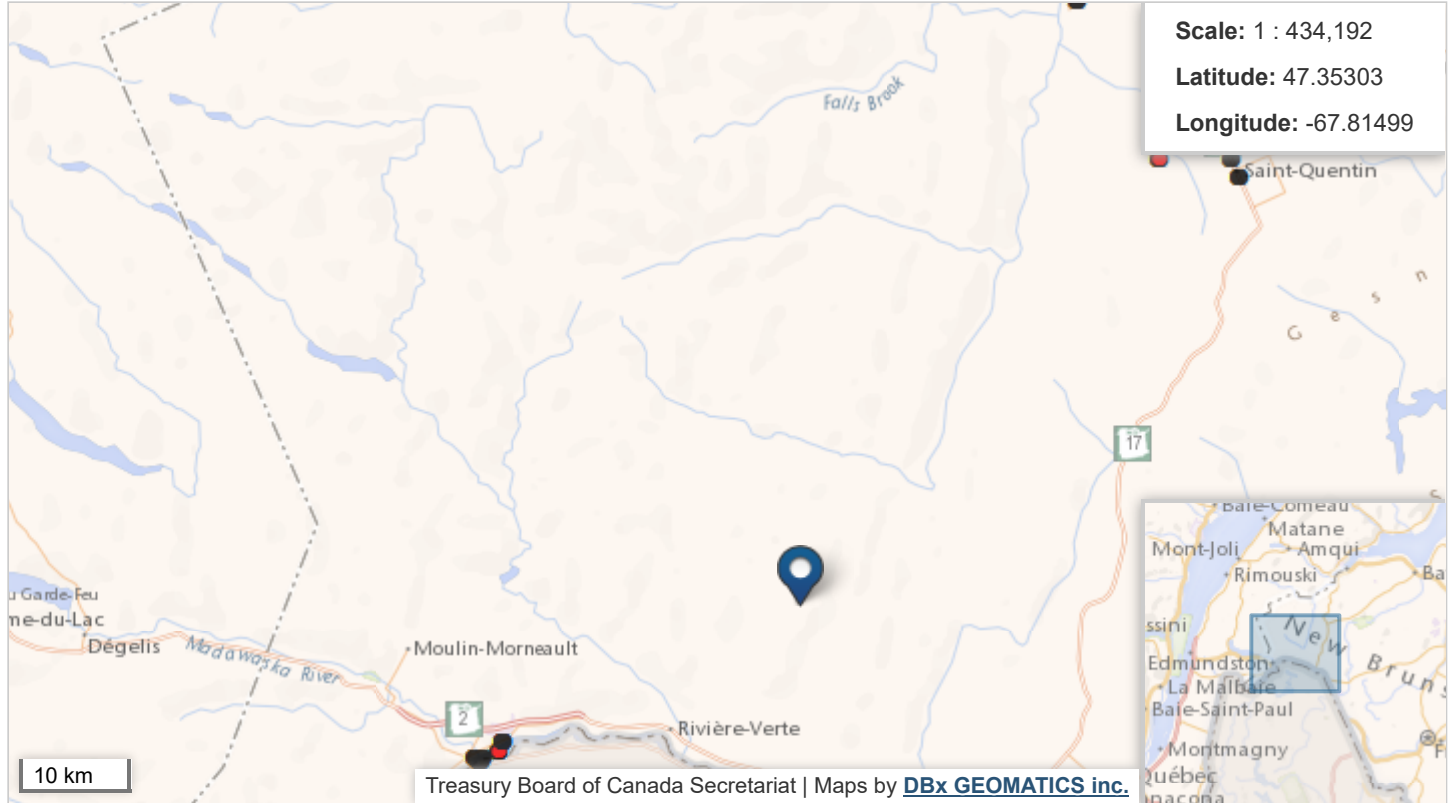
This map is a graphical representation which approximates the size, configuration and location of features. This map is not intended to be used for legal descriptions or to calculate exact dimensions or area.

Treasury Board of Canada Secretariat

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DFRP/FCSI - Map Navigator

Area: Edmundston--Woodstock, United States of America **Content:** 0 Federal Property, 0 Federal Building, 23 Federal Contaminated Sites



Layers

- ★ Federal Properties
- ★ Federal Buildings
- ● ● Federal Contaminated Sites
- Economic Region
- Census Divisions
- Census Subdivisions
- Metropolitan Areas
- Federal Electoral Districts
- Treaty Areas

¹ This layer is visible only when the map scale is smaller than 1:3,000,000.

² ● Suspected ● Active ● Closed

Google base maps are only available when the map scale is smaller than 1:60,000.

IMPORTANT NOTE: The tables below are currently not synchronized with the map content.
Please click on the following button if you want to update the tables content:

[UPDATE TABLES](#)

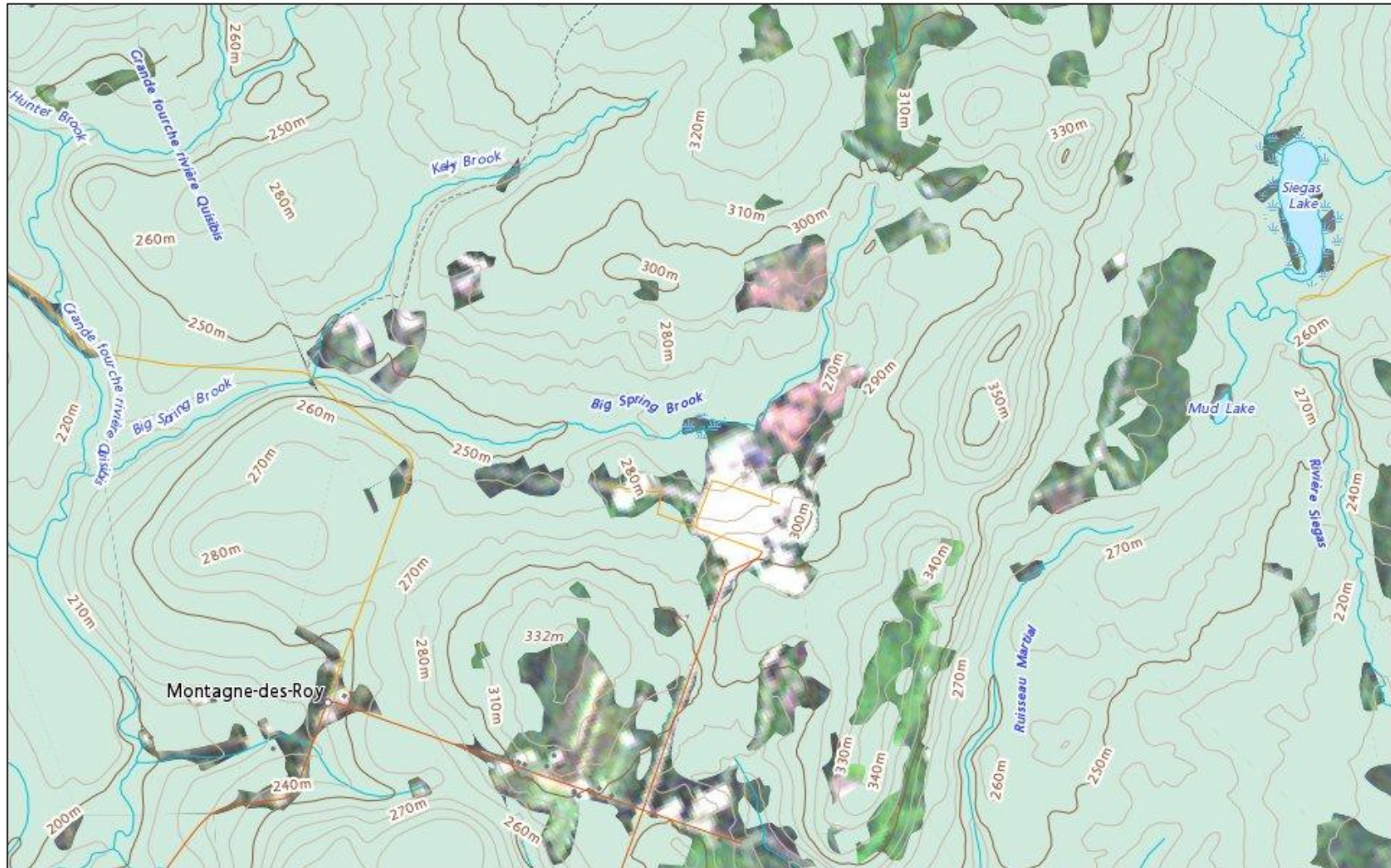
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Federal Buildings (0)

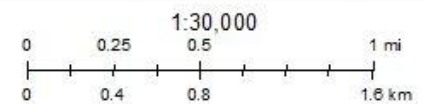
Federal Contaminated Sites (0)

No record found.

Toporama



April 4, 2022



Natural Resources
Canada

Ressources naturelles
Canada

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Canada



APPENDIX H

Viewscape Modelling



Plotted: Apr 4, 2022 09:02 AM - By: ANDREW DEMERCHANT - File: n:\projects\1007001\100760_002\drafting\sections\100760002-04_sections.dwg

NOTE: 2018 aerial photo from GeoNB.

DRAWN BY AGSD	CHECKED BY MS
CALCULATIONS BY	CHECKED BY

DATE
APRIL, 2022

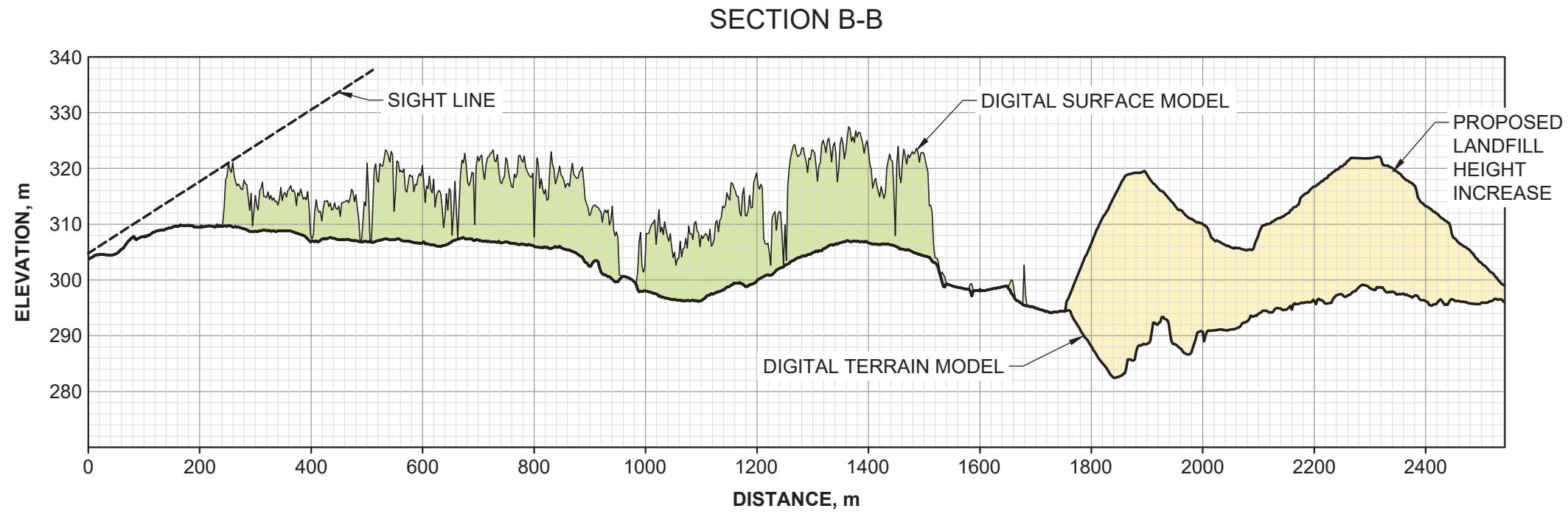
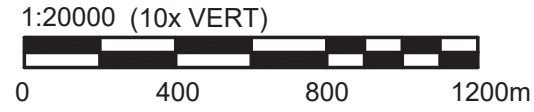
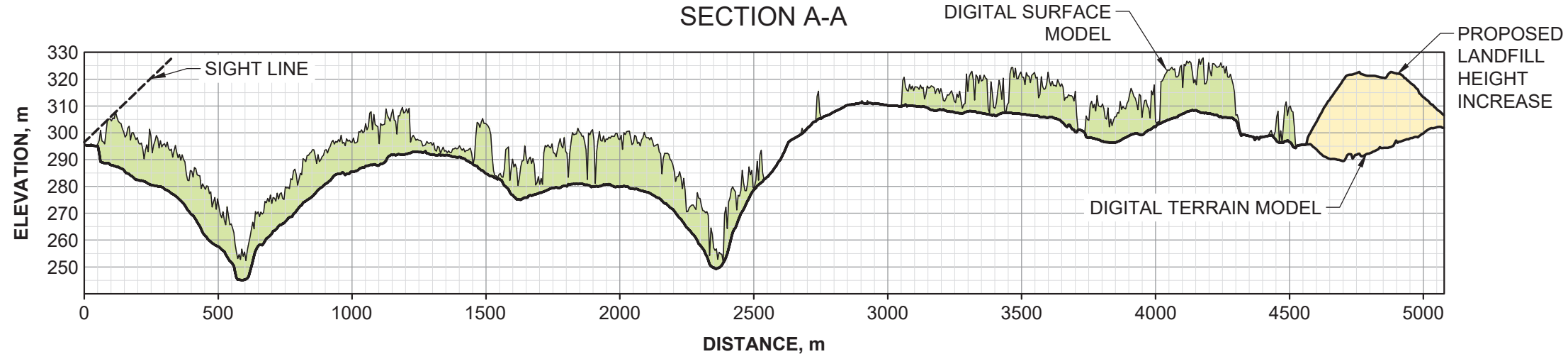
PROJECT
WASTE CONTAINMENT CELL HEIGHT INCREASE PROJECT


DRAWING
PLAN SHOWING VIEWPLANE SECTION LOCATIONS

SCALE
1:20000
0 400 800 1200m

FILE NO. 100760002-04 DRAWING FIGURE 1





LEGEND
 OBSTRUCTION

NOTE: Digital surface and terrain models from HRDEM (NRCAN and GeoNB) and are shown in CGVD2013.

DRAWN BY AGSD	CHECKED BY MS
CALCULATIONS BY	CHECKED BY

DATE
APRIL, 2022

PROJECT
WASTE CONTAINMENT CELL HEIGHT INCREASE PROJECT

DRAWING
VIEWPLANE SECTIONS

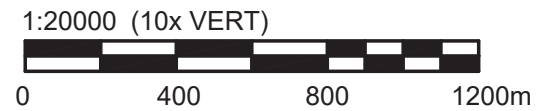
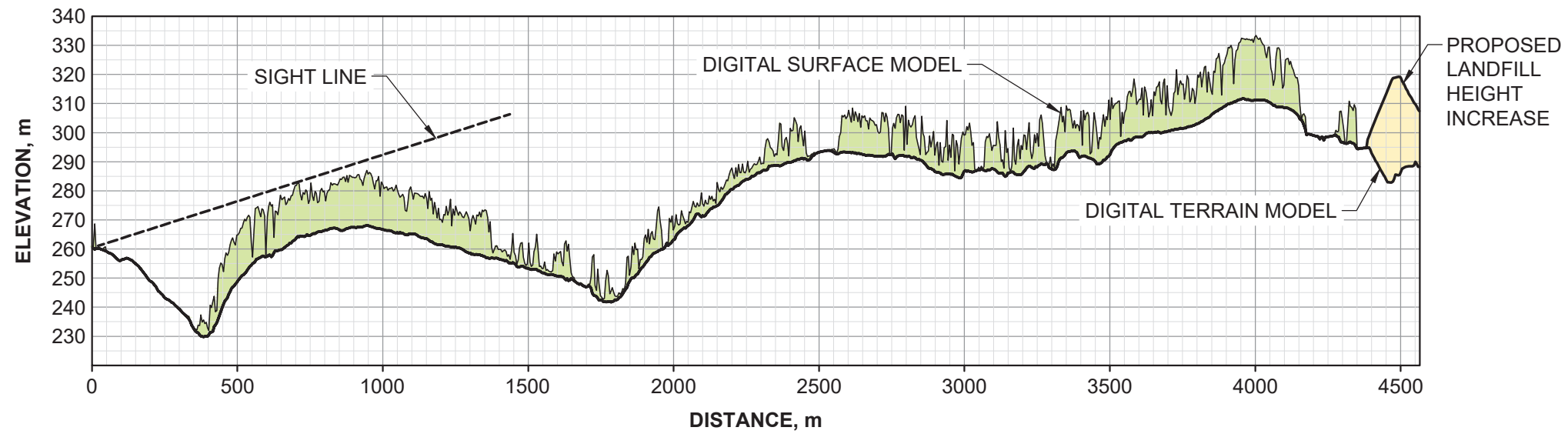
SCALE
AS NOTED

FILE NO. 100760002-04	DRAWING FIGURE 2
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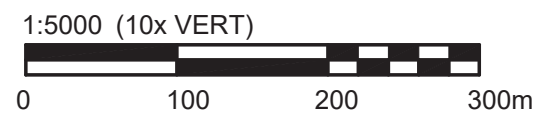
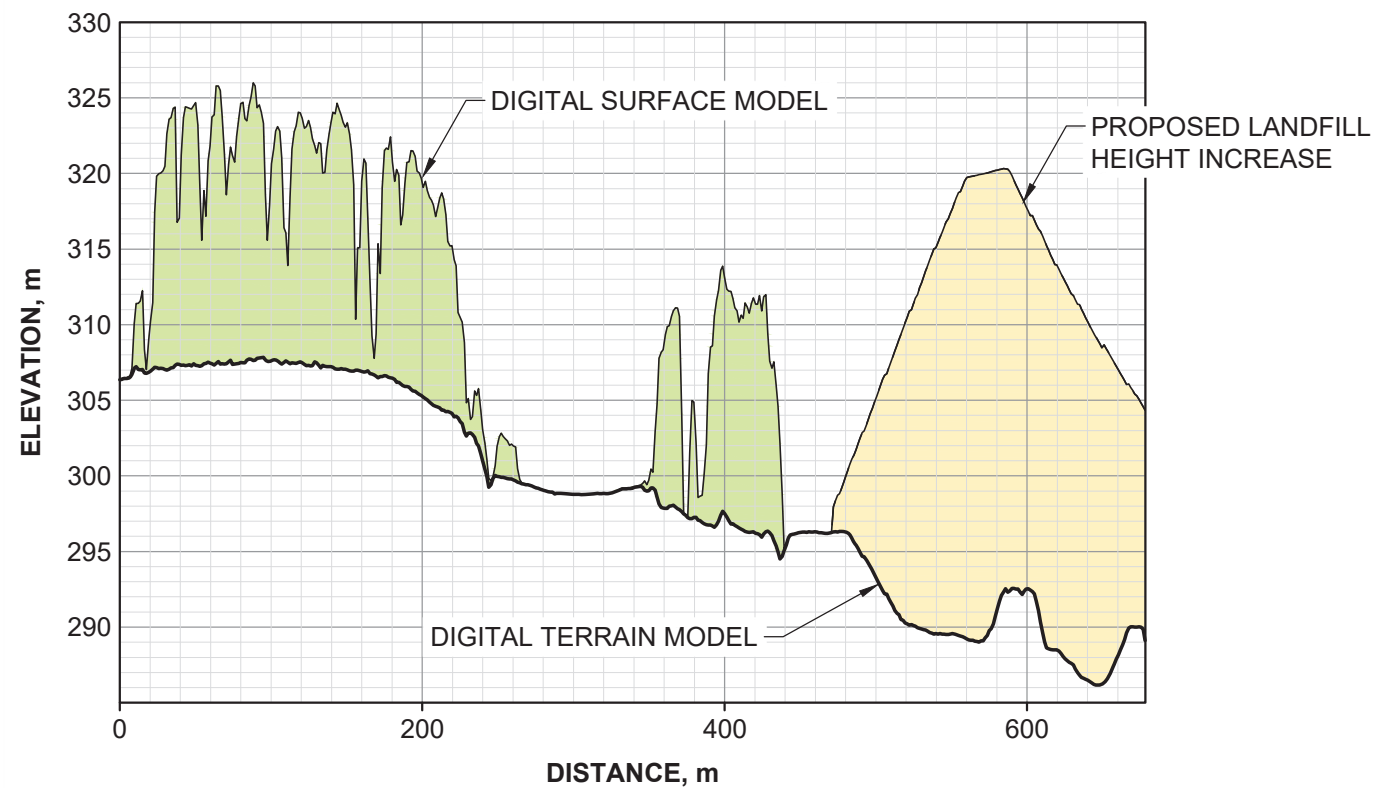


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SECTION C-C



SECTION D-D



LEGEND

OBSTRUCTION

NOTE: Digital surface and terrain models from HRDEM (NRCAN and GeoNB) and are shown in CGVD2013.

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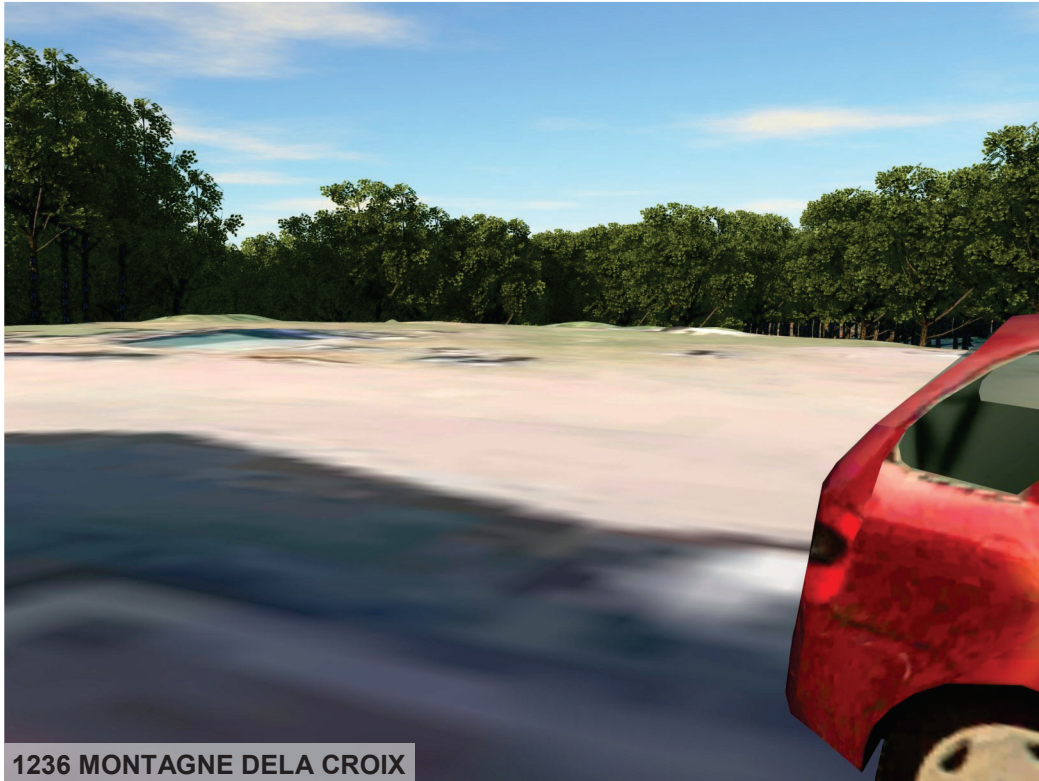
PROJECT
WASTE CONTAINMENT CELL HEIGHT INCREASE PROJECT

DRAWING
VIEWPLANE SECTIONS

SCALE
AS NOTED

FILE NO. 100760002-04	DRAWING FIGURE 3
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1236 MONTAGNE DELA CROIX



1454 MTN DE LA CROIX

PROJECT

WASTE CONTAINMENT CELL
HEIGHT INCREASE PROJECT

DRAWING

FUTURE PROJECTED
VIEWSCAPES (1 of 3)

DRAWN BY

AGSD

DATE

APRIL, 2022

FILE NO.

100760002-05.pub

DRAWING NO.

FIGURE H-1

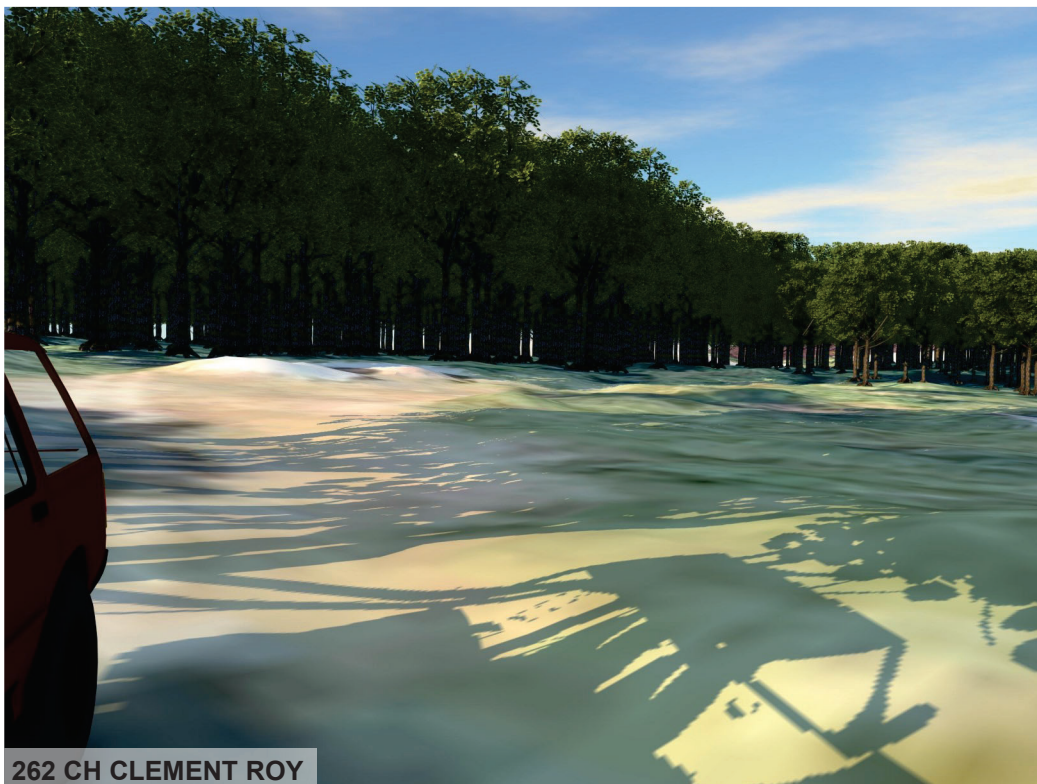


GEMTEC

CONSULTING ENGINEERS
AND SCIENTISTS



191 CH CLEMENT ROY



262 CH CLEMENT ROY

PROJECT

WASTE CONTAINMENT CELL
HEIGHT INCREASE PROJECT

DRAWING

FUTURE PROJECTED
VIEWSCAPES (2 of 3)

DRAWN BY

AGSD

DATE

APRIL, 2022

FILE NO.

100760002-05.pub

DRAWING NO.

FIGURE H-2




GEMTEC

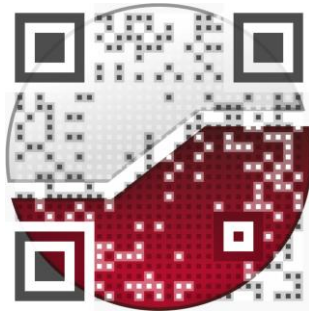
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AND SCIENTISTS



SCALE HOUSE

PROJECT		DRAWING		 GEMTEC CONSULTING ENGINEERS AND SCIENTISTS
WASTE CONTAINMENT CELL HEIGHT INCREASE PROJECT		FUTURE PROJECTED VIEWSCAPES (3 of 3)		
DRAWN BY	DATE	FILE NO.	DRAWING NO.	
AGSD	MAR, 2022	100760002-05.pub	FIGURE H-3	

experience • knowledge • integrity



civil	civil
geotechnical	géotechnique
environmental	environnement
structural	structures
field services	surveillance de chantier
materials testing	service de laboratoire des matériaux

expérience • connaissance • intégrité

