Canadian Nuclear Laboratories | Laboratoires Nucléaires Canadiens

Port Hope Area Initiative Waste Management Project Annual Compliance Report for 2023 REV 0

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Revision 0

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EXECUTIVE SUMMARY

This Annual Compliance Report for the 2023 calendar year is produced to demonstrate that Canadian Nuclear Laboratories (CNL) has successfully met the requirements of the Nuclear Safety and Control Act, associated regulations, the *Port Hope Area Initiative Waste Management Project Licence WNSL-W1-2310.00/2032* (PHAI licence), and the *Port Hope Area Initiative Radioactive Waste Management Project Licence Conditions Handbook* (PHAI LCH). This report has been prepared in accordance with Licence Condition 3.1 of the PHAI LCH and Canadian Nuclear Safety Commission (CNSC) REGDOC -3.1.3, *Reporting Requirements for Waste Nuclear Substance Licensees, Class II Nuclear Facilities and Users of Prescribed Equipment, Nuclear Substances and Radiation Devices*.

CNL acknowledges that the Historic Waste Program Management Office and the PHAI projects are situated on the traditional and treaty lands of the Williams Treaties First Nations, specifically the Gunshot Treaty signed with the Mississauga First Nations of Alderville, Curve Lake, Hiawatha and Scugog Island.

These Mississauga Nations are also signatories to various 18th and 19th century treaties that covered lands in different parts of south-central Ontario. In 1923, the Mississauga First Nations and the Chippewa First Nations consisting of Rama, Beausoleil and Georgina Island signed the Williams Treaties and together, over 90 years later in June 2018, joined to ensure that their rights to and the relationship with these lands are respected through a renewed agreement with Canada and the Province of Ontario.

CNL operates on sites located on the traditional lands, waterways and ceded and unceded territories of Indigenous peoples. CNL recognizes and affirms all First Nations, Métis communities, and Inuit in this land we now know as Canada.

We acknowledge, respect and seek to better understand Indigenous history, rights and title on the lands where we work and develop projects.

At CNL we wish to honour and respect the importance of the relationship between Indigenous peoples and their lands, waters and territories. This unrestricted document provides CNL compliance monitoring and performance information for the Port Hope Area Initiative (PHAI) and is organized by CNSC's 14 Safety and Control Areas (SCA). This report provides site-specific information to supplement information in the *Annual Compliance Monitoring Report for Canadian Nuclear Laboratories* for 2023, which provides programmatic updates and performance of the 14 SCAs and CNL's Public Information and Disclosure program as applicable to all CNL sites.

The PHAI is a community-based project designed to develop and implement a safe, local, long-term management solution for historic low-level radioactive waste within the Port Hope and Clarington municipalities. The PHAI is defined by *An Agreement for the Cleanup and Long-Term Safe Management of Low-Level Radioactive Waste Situated in The Town of Port Hope, The Township of Hope and the Municipality of Clarington* (Legal Agreement), which took effect on 2001 March 29, between the Government of Canada and the municipalities of Port Hope and Clarington for the management of the low-level radioactive waste within each of the communities. CNL is responsible for the direction and execution of the PHAI in compliance with the Legal Agreement, licences, and Environmental Assessment decisions. CNL has overall responsibility for managing the PHAI on behalf of Atomic Energy of Canada Limited, a federal Crown corporation.

Overall Performance Highlights

Following a one-day hearing in 2022 November, the CNSC has renewed the licence for the PHAI (Summary Record of Decision - Port Hope Project Renewal), for a 10-year period beginning 2023 January 01. As part of the licence renewal, for effectiveness, a single licence consolidates four previous licences for PHAI activities, authorizing CNL to continue the safe cleanup and management of low-level radioactive waste in Port Hope, Ontario. The licence will also facilitate the ongoing monitoring and maintenance of the Port Granby Long-Term Waste Management Facility.

During the reporting period, CNL continued to manage the PHAI remediation activities in accordance with accepted procedures, as outlined in the PHAI LCH. The overall performance highlights at PHAI for 2023 are:

- All licensed activities continued to be carried out safely and securely.
- No members of the public received a radiation dose that exceeded any regulatory limit.
- No releases to the environment exceeded any regulatory limit.
- No worker at PHAI received a radiation dose in excess of any of the respective radiation dose limits for Nuclear Energy Workers, as defined by the Radiation Protection Regulations.

Engagement with Indigenous Communities and Organizations

Historically, the PHAI Public Information Program had included Indigenous communities and organizations as a target audience. In support of CNL's objective to advance reconciliation through meaningful actions and movement toward increased inclusion and participation, the *PHAI Phase 2 and 3 Program for Engagement with Indigenous Communities and Organizations*, was implemented in tandem with the public information program and aligned with CNL company-wide Indigenous relations efforts. A total of 44 engagements with Indigenous communities and organizations took place in 2023 including meetings, site tours and community visits.

Safety and Control Areas

The following is a summary of key 2023 initiatives and improvements at the PHAI which are further described in the relevant SCA sections of this report.

Management System

CNL has a well-established management system that defines the requirements to ensure that applicable work is conducted in accordance with requirements and best practices. Internal audits and self-assessments were conducted as required. ISO 9001:2015 certification was maintained. The management system was effectively implemented at the PHAI during the reporting period.

Human Performance Management

CNL has a well-established training program. It is in place to enhance human performance through the development and implementation of processes that ensure workers are sufficient in numbers in all relevant job areas, and have the necessary knowledge, skills, and tools in place to safely carry out their duties. The PHAI maintained a sufficient number of qualified workers to carry on the licensed activities safely. A range of mandatory and other job-specific training activities were carried out in the reporting period to ensure that all PHAI employees and contractors acquired mandated training (including refresher training) as appropriate for their duties to ensure the safe operation of the PHAI and to conduct work under the PHAI licence.

Operating Performance

CNL has a well-established conduct of operations program. CNL completed all required reporting as outlined in Section 3.1 of the PHAI LCH. There were ten events reported to CNSC in the reporting period, as outlined in the applicable SCA.

Safety Analysis

As per the PHAI LCH the Safety Analysis SCA is not applicable to the PHAI.

Physical Design

CNL has a well-established physical design program. Changes made to the physical facility, equipment, processes, procedures, or practices that could adversely affect the design basis are identified and assessed by key stakeholders through the Engineering Change Control program. In 2022 November, CNSC staff raised concerns with CNL's management oversight of changes and its adherence to the change control process. CNL acknowledged that the implementation of the change management process was an area needing improvement and initiated a Root Cause Analysis to identify and correct the programmatic issues. Program improvement continued through 2023 with continued updates to the Detailed Design Description Reports, submitted to CNSC staff in accordance with licence conditions.

Fitness for Service

The requirement to implement and maintain a fitness for service program became effective 2023 January 01 through the PHAI licence. CNL has a well-established Fitness for Service program. Program implementation at the PHAI facilities occurred through 2023. All equipment in the Port Hope and Port Granby Waste Water Treatment Plants was maintained in a ready-to-operate state.

Radiation Protection

CNL has a well-established Radiation Protection program. As Low As Reasonably Achievable (ALARA) initiatives and activities continued to be at the forefront of the PHAI Radiation Protection Program. Radiation Protection doses for workers remained ALARA and calculated doses to the public remain low. There were no exceedances of regulatory limits or action levels in the dose monitoring program. There were no reportable Radiation Protection events at the PHAI in the reporting period.

Conventional Health and Safety

CNL has a well-established conventional health and safety program to manage non-radiological workplace safety hazards and to protect personnel and equipment. All licensed activities continued to be carried out safely and securely. One reportable occupational health and safety event occurred in the reporting period. The reported event did not have any adverse effect on the safety and security of persons or the environment.

Environmental Protection

CNL has a well-established environmental and biophysical protection program that monitors radiological and hazardous substances to minimize risk to employees and the public. Environmental protection and mitigation continue to be effective; changes from the baseline are minimal and generally within the Environmental Assessment predictions. Operational monitoring and environmental assessment follow-up continued in the reporting period. One reportable environmental event occurred in the reporting period. The reported event did not have any adverse effect on the health, safety and security of persons or the environment.

Emergency Management and Fire Protection

CNL has well-established emergency management and fire protection programs that are in place to reduce the risk of fires and assist emergency staff in responding to events, and assist in the protection of employees, the local community, and the environment. All required annual fire response drills, were completed as per program and regulatory requirements. There were four reportable emergency events at the PHAI in the reporting period. The reported events did not have any adverse effect on the health, safety and security of persons or the environment.

Waste Management

The requirement to implement and maintain a Waste Management program became effective 2023 January 01 with the PHAI licence. CNL has a well-established waste management program. On-site management of waste occurred safely and without incident. Waste deliveries originating from various sites including Cameco, Waterfront Sites, Small-Scale Sites, the Harbour sediment, the Highland Drive landfill, and other waste sources such as on-site waste transfers, were made to the Port Hope Long-Term Waste Management Facility. Process residual waste was received at the Port Hope Long-Term Waste Management Facility from the Port Granby Waste Water Treatment Plant. There were no reportable waste management events in the reporting period.

Progress towards written Preliminary Decommissioning Plans for the Port Hope and Port Granby Long-Term Waste Management Facilities continued through 2023. Plans compliant with regulatory requirements will be submitted to CNSC in 2024.

Security

CNL has a well-established security program that is in place to implement and support the security requirements stipulated in the relevant regulations and the PHAI LCH. There was one reportable security event in the reporting period. The reported event did not have any adverse effect on the health, safety and security of persons or the environment.

Safeguards and Non-Proliferation

CNL has a well-established Nuclear Materials and Safeguards Management program. The program undertakes all required measures to ensure safeguards implementation in accordance International Atomic Energy Agency commitments. Inventory changes were documented and reported to the CNSC as required. There were no reportable safeguards events in the reporting period.

Packaging and Transport

CNL has a well-established Packaging and Transport program. The Transportation of Dangerous Goods Program continued to operate the safe off-site transport and shipment of dangerous goods by conforming to all applicable laws and regulations, including company policies and procedures. Shipments of dangerous goods continued to be received from off-site vendors at the PHAI site (consumable chemicals, diesel fuel, and propane). There were three reportable Transportation of Dangerous Goods events in the reporting period. The reported events did not have any adverse effect on the health, safety and security of persons or the environment.

Public Information Program

CNL has a well-established public information program that includes a public disclosure protocol regarding events and developments involving PHAI facilities or activities. Ten public disclosures related to the PHAI were made in the reporting period. Stakeholder and public engagement continued in 2023 in accordance with the public information program with a total of 26 presentations and 14 site tours of the PHAI sites.

Conclusion

CNL is committed to achieving high standards of operational safety and security. The information and data presented in this report support the conclusion that safe and secure performance was achieved, while enhancements were implemented to further improve results.

Table of Contents

Section **Page**

List of Figures

List of Tables

Land Acknowledgement

CNL's Historic Waste Program Management Office and the Port Hope Area Initiative projects are situated on the traditional and treaty lands of the Williams Treaties First Nations, specifically the Gunshot Treaty signed with the Mississauga First Nations of Alderville, Curve Lake, Hiawatha and Scugog Island.

These Mississauga Nations are also signatories to various 18^{th} and 19^{th} century treaties that covered lands in different parts of south-central Ontario. In 1923, the Mississauga First Nations and the Chippewa First Nations consisting of Rama, Beausoleil and Georgina Island signed the Williams Treaties and together, over 90 years later in June 2018, joined to ensure that their rights to and the relationship with these lands are respected through a renewed agreement with Canada and the Province of Ontario.

The area in which we are situated is also home to Indigenous Peoples from across the region and Canada. CNL is grateful to have the opportunity to work on these traditionally and culturally significant lands and waterways.

Introduction

Canadian Nuclear Laboratories (CNL) is Canada's premier nuclear science and technology organization, and a world leader in developing nuclear technology for peaceful and innovative applications. Using unique expertise, CNL is restoring and protecting the environment, advancing clean energy technology, and medical breakthroughs continue to improve the health of people around the world.

Atomic Energy of Canada Limited (AECL), a federal Crown corporation, has contracted CNL to manage and operate its sites and facilities across the country. CNL is also contracted to carry out AECL's mandate to enable nuclear science and technology and to protect the environment by fulfilling the government of Canada's radioactive waste and decommissioning responsibilities. Through its Historic Waste Program Management Office (HWP MO), CNL is implementing the Port Hope Area Initiative (PHAI) on behalf of AECL.

The PHAI represents the federal government's response to the community-requested solution for the cleanup and local, long-term, safe management of historic low-level radioactive waste (LLRW) in the municipalities of Port Hope and Clarington, Ontario. The waste is the result of the refining practices of the former Crown Corporation, Eldorado Nuclear Ltd., and its private sector predecessors. The original Eldorado refining operation and plant were established in the 1930s without consultation with Indigenous peoples of the area.

An Agreement for the Cleanup and Long-Term Safe Management of -Low-level Radioactive Waste Situated in The Town of Port Hope, The Township of Hope and the Municipality of Clarington the (Legal Agreement) [1], finalized in 2001 March, between the Government of Canada and the two municipalities, launched the PHAI by defining the framework and setting out the responsibilities for the Port Hope Project (PHP) and the Port Granby Project (PGP). The Legal Agreement [1] is periodically amended as needed to support changing circumstances.

Licence Information and Reporting Period

Name:	Canadian Nuclear Laboratories Ltd. - Port Hope Area Initiative Waste Management Project
Locations:	Municipality of Port Hope, Municipality of Clarington, and Regional Municipality of Durham

This Annual Compliance Report is produced to comply with the following:

- Licence Condition 3.1 of the *Port Hope Area Initiative Waste Management Project Waste Nuclear Substance Licence* (WNSL-W1-2310.00/2032), hereinafter referred to as the PHAI licence [2].
- The compliance verification criteria listed in the *PHAI Waste Management Project Licence Conditions Handbook* [3], hereinafter referred to as the PHAI LCH [3].
- Section 4 Annual Compliance Report of Canadian Nuclear Safety Commission (CNSC) REGDOC-3.1.3, *Reporting Requirements for Waste Nuclear Substance Licensees, Class II*

Nuclear Facilities and Users of Prescribed Equipment, Nuclear Substances and Radiation Devices [4].

Information included in this report is for the period of 2023 January 01 to 2023 December 31. This report provides site-specific information to supplement the information provided in the *Annual Compliance Monitoring Report for Canadian Nuclear Laboratories* (ACMR for CNL) [5], which provides corporate updates to the 14 Safety and Control Areas (SCA) as they are applied across all CNL.

The purpose of this report is to provide sufficient detail to demonstrate that CNL is meeting the requirements of the *Nuclear Safety and Control Act* [6], associated regulations and requirements as specified in the PHAI licence [2] and the PHAI LCH [3].

Changes to Organizational Structure

There were no changes to key positions or the organizational structure in the reporting period.

Facilities Included in this Report

Facilities included in this report are described as follows:

The Port Granby Long-Term Waste Management Site

The Port Granby Long-Term Waste Management Facility (PG LTWMF) and the Port Granby Waste Water Treatment Plant (PG WWTP) are located on the Northern Site at 4780 Lakeshore Road, in the Municipality of Clarington (Figure 1). The facility is 580 m north of Lakeshore Road, immediately northwest of the remediated former Port Granby Waste Management Facility (PG WMF). The site is bounded by Elliott Road to the west, Nichols Road on the east and the Canadian National Railway to the north.

The Southern Site is located at 4763 Lakeshore Road in the Municipality of Clarington, Ontario. The Southern Site consists of the remediated former PG WMF and occupies 18 hectares (ha) in Lot 3, Broken Front Concession “A” in the Municipality of Clarington, Regional Municipality of Durham, and Province of Ontario. The property is bounded by Lake Ontario to the south, by farmland owned by the Government of Canada to the east and west, and by Lakeshore Road to the north.

Figure 1: Port Granby Engineered Containment System and Waste Water Treatment Plant

The Port Hope Long-Term Waste Management Site

The Port Hope Long-Term Waste Management Facility (PH LTWMF) and the Port Hope Waste Water Treatment Plant (PH WWTP) are located at 2376 Baulch Road, Port Hope, Ontario (Figure 2).The site is south of Highway 401 between Brand Road and Baulch Road.

Figure 2: Port Hope Project Long-Term Waste Management Facility

Summary of Licensed Activities

The PHAI licence [2], authorizes CNL to possess, transfer, manage, and store nuclear substances, with some exceptions, which are required for, associated with, or arise from historic waste remediation operations in the Municipality of Port Hope, and the Municipality of Clarington, Regional Municipality of Durham, in the Province of Ontario.

The PHAI is defined by the Legal Agreement [1], which took effect on 2001 March 29, between the Government of Canada and the municipalities of Port Hope and Clarington for the management of LLRW as prescribed under the PHAI, and the Port Hope Long-Term Low-Level Radioactive Waste Management Project. Three phases of the PHAI have been defined as Phase 1: Planning and Preparation, Phase 2: Construction, Remediation and Closure, and Phase 3: Long-Term Monitoring and Maintenance.

The PHAI includes two distinct and separate projects:

The Port Granby Long-Term Low-Level Radioactive Waste Management Project

The Port Granby Long-Term Low-Level Radioactive Waste Management Project (PGP) involved the relocation of approximately 450,000 cubic metres of historic LLRW, located at a legacy waste management facility (WMF) site on the shoreline of Lake Ontario in Southeast Clarington, to a new, engineered containment system at the PG LTWMF constructed approximately 700 m north of Lake Ontario.

The PGP is in Phase 3:

- Phase 1 (complete):
    - Securing regulatory approvals.
    - Management of waste at the PG WMF currently owned by the Government of Canada and operated by CNL, on behalf of Atomic Energy of Canada Limited, a federal Crown corporation; Operation of this site was assumed from Cameco Corporation in 2012 March.
- Phase 2 (2011-2022) (completed in 2022):
    - Construction of the PG LTWMF.
    - Remediation of the PG WMF.
    - Transportation of LLRW from the PG WMF to the PG LTWMF for consolidation in a new, engineered containment system.
- Phase 3 (2023-2120):
    - Activities related to the post-closure operations of the PG LTWMF associated with long-term maintenance and monitoring.

The Port Hope Long-Term Low-Level Radioactive Waste Management Project

The Port Hope Long-Term Low-Level Radioactive Waste Management Project (PHP) comprises the long-term management of the LLRW removed from the former Welcome Waste Management Facility (WWMF), the construction of a new Port Hope Long-Term Waste Management Facility (PH LTWMF), the remediation of LLRW and specified industrial waste at various sites within the Municipality of Port Hope, and the safe transportation of the waste to PH LTWMF for long-term storage.

The PHP will:

- Remediate sites containing historic LLRW and other specified industrial waste located in the Municipality of Port Hope. These sites are described in the Legal Agreement [1].
- Consolidate and manage this waste in a new long-term waste management facility at the PH LTWMF, developed on lands comprised of and adjacent to the former WWMF. The contents of the former WWMF have been incorporated into the PH LTWMF.

The historic LLRW within the community currently exists within temporary storage and management facilities and miscellaneous remediation sites.

The PHP is in Phase 2:

- Phase 1 (complete):
  - Securing regulatory approvals.
  - The management of the waste in the WWMF, currently owned by the Government of Canada and operated by CNL on behalf of AECL, a federal Crown corporation.
- Phase 2 (2012-2030):
  - Development of a LTWMF on and adjacent to the present site of the WWMF.
  - Incorporation of the current inventory of waste from the WWMF into the new LTWMF.
  - Remediation of sites within the Municipality of Port Hope that are contaminated with historic LLRW.
- Phase 3 (2031-2120):
  - Activities related to the post-closure operations of the PH LTWMF associated with long-term care and maintenance.

Summary of New Licensed Activities

On 2022 November, the CNSC renewed the licence for the PHAI, for a 10-year period beginning 2023 January 01 authorizing CNL to continue the safe cleanup and management of low-level radioactive waste in Port Hope and Clarington Ontario [7]. The following licences were merged into one licence for effectiveness as part of the Record of Decision for the Application to Renew the Waste Nuclear Substance Licence for the PHP as a single licence for the PHAI.

- Port Hope Long-Term Low-Level Radioactive Waste Management Project licence (WNSL-W1-2310.02/2022) [8]
- Port Granby Long-Term Low-Level Radioactive Waste Management Project licence (WNSL-W1-2311.02/2022) [9]
- Pine Street Extension Temporary Storage Site licence (WNSL-W1-182.0/2022) [10]
- Port Hope Radioactive Waste Management Facility licence (WNSL-W1-344-1.8/ind.) [11]

Site Development

There were no significant modifications to the PHAI facilities, processes, equipment, procedures, programs, or organizational structure.

Financial Guarantees

The CNSC was previously provided a letter from the Honorable G. Rickford [12], advising that as an agent of His Majesty in Right of Canada, AECL's liabilities associated with the decommissioning of the Port Hope Area Initiative are ultimately liabilities of His Majesty in Right of Canada (note: AECL retains ownership of the lands, assets and liabilities associated with CNL's licences). This financial guarantee remains valid and in effect, as per the communication issued on 2020 August 25 [13].

1. Management System

The management system SCA covers the framework which establishes the processes and programs required to ensure that the organization achieves its safety objectives and continuously monitors its performance against these objectives, as well as fostering a healthy safety culture.

The PHAI's management system aligns with CSA N286-12, *Management System Requirements for Nuclear Facilities* [14].

1.1 Management System Program

The PHAI adheres to CNL's Management System Functional Support Area. Refer to Section 1 of the *ACMR for CNL* for details [5].

The *Historic Waste Program Quality Plan* (Quality Plan) [15] is consistent with the corporate *Management System Manual* (Management System) [16] and summarizes the processes and practices applicable to the PHAI licensed activities. These processes and practices comply with the quality management system defined in the CAN/CSA-ISO 9001:2015. CNL's third party registrar conducted the annual ISO 9001 audit which resulted in CNL successfully retaining its ISO 9001:2015 certificate (effective 2021 April 21).

Contractors conducting work for the PHAI project submit site specific quality plans for CNL's review and approval to ensure compliance with the *Quality Plan* [15]. Contractor compliance with project-specific quality plans is examined as part of CNL's compliance oversight program (Section 1.5).

There were no revisions to the *Quality Plan* [15] in the reporting period. For a list of management system document submissions applicable to multiple sites, refer to Section 1 of the *ACMR for CNL* [5].

1.2 Audits, Inspections and Self-Assessments

As per the requirements of the *Management System*, both SCAs and Facilities conduct various audits, inspections, and self-assessments to ensure that the management system is functioning according to expectations and that any policy, programmatic, or procedural deficiencies are identified, and appropriate actions taken to resolve them.

1.2.1 Audits

Refer to Section 1.2 of the *ACMR for CNL* [5] for a list of all CNL-wide Audits for the reporting period.

1.2.1.1 External Quality Audits

The external quality audits conducted at PHAI in the reporting period are summarized in Table 1. The annual HWP MO ISO 9001:2015 external audit was held by third party registrar Intertek for the surveillance year two. The audit identified no non-compliances and two opportunities for improvement for the PHAI. The two actions raised related to the two opportunities for improvement and were closed in 2023 March.

Table 1: External Quality Audits

Title	Type of Audit	No. of Non-Conformances Raised	No. of Actions Raised[a]	No. of Actions Completed
ISO 9001:2015 Surveillance (S2) Audit 2023 Jan 26-27 (HWP)	ISO 9001:2015 Quality Management System Surveillance Audit	0	2	2

Note:

a The actions raised may also include opportunities for improvement.

1.2.1.2 Internal Quality Audits

The internal audits completed by the Quality Audits and Processes branch in the reporting period are summarized in Table 2. ImpAct number Environmental Remediation Management (ERM)-23-2720 was raised to document the audit findings. Three opportunities for improvement were identified. A total of three remedial actions were raised in association with the findings. These actions are currently in progress with an expected completion date of 2024 April.

Table 2: Internal Quality Audits

Title	Audit Scope	No. of Non-Conformances Raised	No. of Corrective Actions Raised[a]	No. of Corrective Actions Completed
Quality Audit Report – HWP MO Audit	The scope included, but was not limited to, • Historic Waste Program Quality Plan (236-514200-QAP-001 Revision 2) • FY2022-2023 Annual Program of Work and Budget (145-502000-PLA-042 Revision 0, Section 1.2, and Section 1.3)	0	3	0

Note:

a The actions raised may also include opportunities for improvement.

1.2.2 Regulatory Inspections

Canadian Nuclear Safety Commission Inspections

There were six CNSC compliance inspections associated with the PHAI in the reporting period. The purpose of the inspections was to verify adherence with the *Nuclear Safety and Control Act*, associated regulations, conditions of the applicable licences and associated LCHs, and other related licensing basis documentation. The CNSC inspections conducted at the PHAI in the reporting period are summarized in Table 3.

Two compliance inspections took place from 2023 February 14 to 15 at the PG WWTP and PH WWTP. The inspections included the Radiation Protection, Environmental Protection, Fitness for Service and Conventional Health and Safety SCAs.

Two compliance inspections took place from 2023 April 27 to 28 of the PHP remediation activities at small scale sites and major sites. The inspections included the Radiation Protection, Environmental Protection, Conventional Health and Safety and Packaging and Transport SCAs.

One compliance inspection took place from 2023 August 09 to 10 of the PHP Harbour remediation site. The inspection included the Radiation Protection, Environmental Protection, and Conventional Health and Safety SCAs.

One compliance inspection took place from 2023 December 12 to 13 of the PHP Highland Drive Landfill remediation site. The inspection included the Radiation Protection and Environmental Protection SCAs.

The identified areas of non-compliance do not pose a risk to health and safety of the environment or persons.

Table 3: CNSC Inspections

Inspection No. CNL-PHAI-WMP	Area Inspected	No. of NNCs	No. of Recommendations[a]	No. of NNCs Closed [b]
2023-01	PG WWTP	0	0	0
2023-02	PH WWTP	1	3	1
2023-03	Small Scale Site Remediation Activities	2	1	2
2023-04	Major Site Remediation Activities	1	0	1
2023-05	Port Hope Harbour Remediation Activities	1	1	1
2023-06	Port Hope Highland Drive Landfill Remediation Activities	3	0	0

Note:

a. Recommendations are considered for future implementation as continuous improvement.
b. Closed as of 2024 March 01

NNC – Notice of Non-Compliance

International Atomic Energy Agency Inspections

The International Atomic Energy Agency (IAEA) conducts inspections at the PHAI to confirm that CNL is honouring their role in the international obligation to use nuclear material and technology only for peaceful purposes. The IAEA conducted two (2) inspections at the PHAI in the reporting period, as summarized in Table 4. There were no findings or recommendations associated with these inspections.

Table 4: International Atomic Energy Agency Inspections

Site (Facility/Location Code)	Activity						Total
	PIV	DIV	RII	IIV	UI	CA	
Port Hope LTWMF (CNWF)	1	1	0	0	0	0	2
Canada Location Outside Facility (CN-2)	0	0	0	0	0	0	0

Note:

PIV	Physical Inventory Verification	IIV	Interim Inventory Verification
DIV	Design Information Verification	UI	Unannounced Inspection
RII	Random Interim Inspection	CA	Complimentary Access

Inspections by Other Regulatory Bodies

There were no inspections by other regulatory bodies at the PHAI in the reporting period.

1.2.3 Self-Assessments

During the reporting period, three self-assessments conducted at PHAI covering various aspects of the Management System, including SCAs. These are summarized in Table 5.While two self-assessments targeted the transportation of dangerous goods program, the scope differed. The first self-assessment focused on PHAI documentation, while the second self-assessment focused on program implementation.

Table 5: List of Self-Assessments

ImpAct Title	SCA	Facility
ERM HWP Self-Assessments 2022/2023	Transportation of Dangerous Goods	PHAI
SRG Self-Assessments 2022/2023	Transportation of Dangerous Goods	PHAI
PHAI Fire Program Self-Assessment	Fire Protection	PHAI

Note:

- SRG – Stewardship Renewal Group

1.3 Problem Identification and Resolution

Supporting CNL's management system is a robust Problem Identification and Resolution Program for the management of incidents, events, opportunities for improvement and corrective actions. The Problem Identification and Resolution Program is a process for:

- Identifying, prioritizing, investigating, documenting, trending, tracking, preventing, and resolving problems
- Capturing opportunities for improvement and actions from Operating Experience
- Documenting non-conformities and verifying their disposition

The ActionWay software application provides the functionality to implement the Problem Identification and Resolution Program.

1.3.1 Trending of Events Related to Operational Activities

As events at the PHAI occur, they are recorded in the ActionWay software Improvement Action (ImpAct[1]) system. This information is regularly reviewed to identify any trends.

Formal event-based trend reports continue to be prepared on a routine basis to predict any adverse trends and identify improvements. Table 6 contains a list of the identified trend ImpAct records along with the title and number of actions raised to address identified causal factors.

Table 6: Trend ImpActs Raised

ImpAct No.	ImpAct Title	No. of Actions Raised
ERM-23-2363	HWP – HCP – MECP Reportable Spills - Trend	2
ERM-23-0733	HWP – PH HCP – Adverse Trend on Non-reportable Hydraulic oil spill	1

The use of the Problem Identification and Resolution Process continues to foster the internal reporting of lower significance level events (Level 4 and Level 3), thus affording the opportunity to implement continuous improvement initiatives through a robust Corrective Action Program. ImpActs raised at the PHAI over the past five years by Significance Level[2] are summarized in Table 7. The increase in the number of ImpActs at PHAI in 2022 and 2023 compared to previous years is attributed to an increased rigour for reporting Significance Level 3 and 4 events, which are considered minor problems. The increase is indicative of a positive reporting culture.

Table 7: Number of ImpActs Raised

[1] ImpAct – Abbreviation for Improvement and Action. It is an internal process used to identify events, problems, non-conformities, opportunities for improvements, and personnel injuries. The process also identifies and tracks actions to correct or remediate problems.

[2] Significance Level: Levels assigned to an event (SL1 being most significant, SL4 being least significant) based on the actual or potential result in safety, environmental, or business consequences.

Year	Level 0[a]	Level 1	Level 2	Level 3	Level 4	Total
2019	0	0	1	21	122	150
2020	3	0	0	5	81	89
2021	1	0	5	31	132	169[bc]
2022	4	0	6	41	199	250[b]
2023	2	0	6	84	252	344[b]

Note:

a Level 0 will be assigned if the ImpAct is deemed to be a non-problem and a recommendation to close the Impact will be given.

b Total does not include committee-based ImpActs.

c Total does not include an additional five ImpActs and one committee-based ImpAct that were raised for tracking initiatives that span PHAI projects.

1.4 Management Reviews

The PHAI site was included within the CNL Management System Review for fiscal year 2022/2023 to evaluate the effectiveness of the management system. The review did not identify any site specific actions. The 2022 April to 2023 December Management Review concluded that the CNL's management system is suitable to meet the necessary requirements, aligned with the strategic direction, and effective at supporting CNL to achieve our objectives.

1.5 Compliance Oversight

Activities performed by CNL and by PHAI consultants, contractors, and service providers are subject to CNL's compliance oversight program. An integrated approach to oversight is used, where one oversight process confirms the suitability, implementation, and effectiveness of processes applied to PHAI project activities. Compliance objectives for contractual obligations, licensing requirements, acts and regulations, environmental management and protection plans, compliance plans, and technical specifications are outlined in the *Historic Waste Program Management Office Field Oversight Activities* procedure [17].

During the reporting period, identified non-compliances and opportunities for improvement from CNL's compliance oversight activities continued to be dispositioned and implemented in accordance with program requirements [17].

2. Human Performance Management

The human performance management SCA covers activities that enable effective human performance, through the development and implementation of processes that ensure staff members are sufficient in numbers in all relevant job areas, and have the necessary knowledge, skills, and tools in place to safely carry out their duties.

The PHAI's human performance management program aligns with CNSC REGDOC-2.2.2, *Personnel Training* [18].

The PHAI maintained a sufficient number of qualified workers to carry on the licensed activities safely and in accordance with the *Nuclear Safety and Control Act* and associated regulations [6].

2.1 Human Performance Program

The PHAI adheres to CNL's Performance Assurance Functional Support Area. Refer to Section 2 of the *ACMR for CNL* for details [5].

All CNL employees receive mandatory Human Performance training. CNL's Human Performance and Training branch provides programs and support that help reduce human error and, as a result, the frequency and severity of unplanned events.

The effectiveness of the Human Performance program at the PHAI has been enhanced through the Focus on Four program. CNL has launched a refresher of the Event-Free tools that protect workers during work execution, with a focus on four of them. This includes Self-Check using Stop Think Act Review, Procedure Use and Adherence, Stop/Pause when Unsure, and Verification. PHAI staff customized the training materials for the work at PHAI, and has an instructor qualified to present. A pilot session was conducted with positive feedback and reviews. Integrated Work Control was partnered with these tools to provide a big picture for daily use.

2.2 Training Program

The PHAI adheres to the Corporate Training and Development Functional Support Area. Refer to Section 2 of the *ACMR for CNL* for details [5]. The *PHAI Training Plan* [19] defines the training processes applied to the work performed at the PHAI and promotes safe and effective workplaces through the cooperation of management, employees, contractors, and visitors. Contractors conducting work for the PHAI project submit site specific training plans for CNL's review and approval to ensure compliance with the *PHAI Training Plan* [19]. Contractor compliance with project-specific training plans is examined as part of CNL's compliance oversight program (Section 1.5). Compliance with the plan ensures that all project staff (including CNL employees and contractors) are qualified to perform their duties effectively and safely, using established processes and standards.

In accordance with the PHAI LCH [3], CNSC staff were notified [20] of the revision to the *PHAI Training Plan* [19] implemented in the reporting period. For a list of training program document notifications applicable to multiple CNL licences, refer to Section 1 of the *ACMR for CNL* [5].

2.2.1 Required Training

All workers assigned to the PHAI are required to attend a PHAI Awareness session to gain understanding of the project. Contractors are responsible to qualify staff to PHAI requirements as well as maintain their training. Records are inspected regularly by CNL staff during compliance oversight activities (Section 1.5) and audits.

The PHAI applies the Systematic Approach to Training for positions and roles identified on the *Application of the Systematic Approach to Training* controlled list [21] (controlled list). The Systematic Approach to Training enlists the Training Analysis method – Job/Task Analysis to identify training requirements to be documented in role-specific Training Plans. The positions and roles at the PHAI that are on the controlled list [21] include:

- Group 1 - Health Physicist
- Radiation Protection Surveyor
- Design Authority
- Dangerous Goods Handler
- Dangerous Goods Shipper
- Certified Industrial Hygienist

Identified positions at PHAI that do not meet the threshold criteria established in the *Process to Determine the Application of the Systematic Approach to Training at CNL* [22] for the *controlled list* [21] have their training requirements defined using *CNL's Learning and Development Standard* [23]. The standard enables a flexible approach to the identification, development, implementation, and maintenance of training programs.

Actions related to developing the Systematic Approach to Training programs for the above positions at the PHAI were completed in 2023 October. Continued progress was made in developing the Learning and Development based training programs.

All PHAI personnel, both employees and contractors, are adequately trained, with initial and continuing training requirements, to ensure safe operations and to conduct work under the PHAI licence [2]. Section 2 of the *ACMR for CNL* [5] details the 2023 CNL Employee and Manager/Supervisor required training and the Radiation Protection training activities. There were no PHAI employees affected by the lapses in Radiation Protection Group 3 and Group 2 training event, reported by CNL. Refer to Section 2 of the *ACMR for CNL* [5] for details.

Table 8 provides a list of federally/provincially legislated training courses that appear in PHAI position-specific training plans. Completion rate data against the 90% compliance benchmark [5] are not currently available due to delays in the assignment of required training in the Learning Management System. Refer to Section 2 of the *ACMR for CNL* [5] for information on the compensatory measures implemented while required training roles were being assigned in the Learning Management System.

CNL maintained training records of all workers (including contractors) conducting work in the facility under the PHAI LCH [3] during the reporting period.

Table 8: Federally/Provincially Legislated Training

Course Code	Course Title	2022 No. of Attendees	2023 No. of Attendees[a]
OSH-1001-ONLINE	Crane - Safe Indoor Hoist - Theory	0	0
OSH-3001-L	Crane Practical	0	0
OSH-1002-ONLINE	Lift Truck Operation Theory	10	0
OSH-3002-C	Lift Truck Practical - Counter Balance Practical	13	0
OSH-3002-H	Lift Truck Practical - Electric Pallet Jack	8	0
OSH-3002-D	Lift Truck Operation – Non-Electric Pallet Truck Practical	1	0
OSH-1003-ONLINE	Aerial Work Platform Theory	10	0
OSH-3003-B	Aerial Work Platform Practical - Articulating Boom 60 ft. (or less)	11	0
OSH-3003-D	Aerial Work Platform Practical - Scissor Lift	14	0
OSH-1004	Lock Out - Tag Out	3	7
OSH-3048-DP&PHAI	Lock Out/Tag Out Practical	2	16
OSH-1005-ONLINE	Working At Heights Theory	9	9
OSH-3005	Working at Heights Practical	8	15
OSH-1007	Asbestos Module 6E	0	4
OSH-9031-Online	Asbestos Awareness	5	4
OSH-1020	First Aid	2	2
OSH-1033-Online	Ladder Safety	0	4
OSH-1047-Online	Spotter Theory	6	3
OSH-3047	Spotter Practical	0	0
OSH-9076-ONLINE (REV 1)	Electric Shock (1.0)	6	4
OSH-9083	Utility Task Vehicle Rider	0	7
OSH-9104-Online	Trenching Safety Awareness	0	0
OSH-9118	Confined Space Entry	3	9
OSH-9119	Confined Space Entry Awareness	0	0
OSH-9120-Online	Crystalline Silica Awareness	0	0

Note:

a Where zero attendees are shown, no training was required and/or there were a sufficient number of qualified workers available to conduct the work planned.

2.2.2 Contractor Training

Before accessing the PHAI, contractors completed, at a minimum, the following training:

- Step up to Safety
- Radiation Protection Group 4
- PHAI Awareness

Training records for all contractors are verified before work commencement. In addition, records are verified regularly through CNL Compliance Oversight activities (Section 1.5).

2.2.3 Training Evaluations Summary

During the reporting period, there was one documented Observations of Trainer Evaluations and no Post-training Effectiveness Observation and Coaching evaluations. These evaluations are reviewed by Human Performance and Training staff and discussed as part of curriculum review committee meetings. Training program improvements are managed through applicable training change processes.

In addition, a Course Critique form is used to allow employees to provide feedback on any training courses they completed, whether instructor-led or computer-based training. During the reporting period, 110 employee responses were collected using this form.

To increase the number of evaluations performed by training program owners and managers with positions and roles developed using the systematic approach to training, an evaluation plan template was developed. This tool aids in planning when evaluations will be completed and helps to ensure that all courses/instructors within a function are periodically evaluated.

In addition, curriculum review committees serve as a method of training evaluation. During the reporting period, all required (eight) Curriculum Review Committee meetings were conducted quarterly and with the required membership for identified positions in the controlled list. The Curriculum Review Committee Terms of Reference mandate includes review of staff qualifications, field performance, system, equipment and staffing changes and training compliance. Updates and improvements are monitored in the ongoing action list from the meetings. Refer to Section 2.2 of the ACMR for CNL for 2023 [5] for more information.

3. Operating Performance

The operating performance SCA covers the implementation and maintenance of a program for reporting information to the CNSC, including compliance monitoring, operational performance, event reporting, and various types of notifications. The PHAI's reporting program aligns with CNSC REGDOC-3.1.3, *Reporting Requirements for Waste Nuclear Substance Licensees, Class II Nuclear Facilities and Users of Prescribed Equipment, Nuclear Substances and Radiation Devices* [4].

3.1 Operating Program

Although not formally part of the PHAI LCH [3], the PHAI adheres to CNL's Conduct of Operations Functional Support Area. It is included in this report for information. Refer to Section 3.1 and Section 11.2 of the *ACMR for CNL* for details [5].

3.1.1 Environmental Remediation Operations

Environmental remediation operations involve the removal of the primary Contaminants of Potential Concern (COPC) which are indicative of historic LLRW: arsenic, uranium, radium-226 and thorium-230, and safely transporting the LLRW to the PH LTWMF.

The following sub-sections provide a summary of the PHAI's licenced remediation activities during the reporting period.

3.1.1.1 Port Granby Long-Term Waste Management Facility

The PGP Phase 3 activities conducted during the reporting period relate to turnover, transition, maintenance, and monitoring. The activities listed below were conducted to ensure a smooth Phase 2 to Phase 3 turnover and transition from the contractor to CNL and to monitor and maintain the performance of the PG LTWMF.

CNL's authorization to proceed with turnover was granted on 2022 December 22 wherein care and control of the PGP Project sites was formally transferred to CNL. A small group of contractor staff were on-site during 2023. Following the authorization to proceed with turnover, CNL and the contractors worked collaboratively to coordinate the completion of Phase 2 project related documentation, to complete outstanding minor works, and to document and confirm turnover and transition related activities.

Minor outstanding works were completed by the contractor as part of the transition including municipal road works and maintenance, municipal road and on-site road signage installation, on-site road maintenance, restoration works, on-site pumping infrastructure maintenance, emergency backup infrastructure installation, closeout documentation provision, on-site security upgrades, and PG LTWMF maintenance.

3.1.1.2 Port Granby Waste Water Treatment Plant

During the reporting period, the PG WWTP daily operations and regular maintenance activities were operating in Phase 3 of the project. The facility was operational for 82% of the time (212 days out of a possibility of 260 days). Process interruptions were related only to maintenance activities, intermittent disruptions to the electrical power grid and low water levels in the equalization pond.

Water Collection and Treatment System

The wastewater collection system consists of ground water interceptors, a collection pond (East Storm Pond), and an equalization pond. Waste water from within the PG LTWMF (leachate, pump station 05 and 06) and East Gorge drainage recovery system (that is, pump station 03) is pumped to an equalization pond. The water then enters the plant, where it is treated using a two-stage process – membrane bioreactor pre-treatment (Stage 1), followed by reverse osmosis (Stage 2).

In Stage 1, membrane bioreactors are used to pre-filter the influent to remove fine solids and some biological material to supply high quality feed to the reverse osmosis membranes.

In Stage 2, the biologically treated water enters the reverse osmosis system where contaminants such as radium, uranium and arsenic are removed. The water is forced under high pressure through a membrane. The contaminants are rejected by the membrane, and the treated water flows through to the pH adjustment tank. A composite automatic water sampling unit collects samples at regular intervals before the treated water is discharged through a pipe extending 120 metres into Lake Ontario.

The rejected contaminants (reverse osmosis brine) are collected, then safely transported to the PH WWTP for further treatment.

Water Treatment and Monitoring

During the reporting period, influent and effluent samples were collected from the PG WWTP from fixed locations on weekly intervals. Grab samples were taken from a sample point on the pipeline feeding the treatment system and represented the treatment inflow. A total of 59,764 cubic metres of influent was treated by the PG WWTP in 2023. This represents a decrease of approximately 79% in volume from 2022 recorded volumes.

The PG WWTP was the sole source of effluent discharge from the former PG WMF in 2023. An automatic composite sampling unit collects samples at regular intervals before the water is discharged to Lake Ontario. Refer to Section 9.2.2.1 for details. A summary of these analyses and quantities of effluent for a five-year period is provided in Appendix A.1.

Waste Processing

During the reporting period, all of the residual brine product (2,899 cubic metres) was safely transported to the PH WWTP main collection pond for treatment at the PH WWTP. This represents a decrease of approximately 17% from recorded 2022 production. For waste transfers to off-site locations, refer to Section 11.1.1.

3.1.1.3 Port Hope Long-Term Waste Management Facility

During the reporting period, the PH LTWMF, located at the site of the former WWMF and adjacent lands was operating in Phase 2 of the project. Phase 2 project activities include construction of an engineered containment system and associated infrastructure and support facilities. During the reporting period, the activities and upgrades included the following:

- Initiated the upgrading of on-site infrastructure to support high-peak waste receiving:
    - Installation of an additional prefabricated monitoring facility that is fully insulated and heated.
    - Improvement work on the existing decontamination facility to repair damaged/torn fabric, insulate and install infrared heaters, install a centre divider wall to support truck washing and conditional release of haulage vehicles.
- Resumed the primary excavation of residual contaminated waste from the low-laying swamp area west of the engineered containment system, known as the ‘Forested Brush Area for Clearing.’
- Maintained the PH LTWMF in accordance with CNL established maintenance and operational procedures.
- Continued with the receipt and long-term storage of historic LLRW from various PHP remediation sites.
- Continued with placement of waste from PHP remediation sites into the PH LTWMF.
- Continued with monitoring of the design profile and shaping of cells 1, 3, and 2A. Capping is scheduled to commence in 2025.

3.1.1.4 Port Hope Waste Water Treatment Plant

During the reporting period, the PH WWTP was operating in Phase 2 of the project. The facility was operational for >98% of the time. Process interruptions were related to maintenance activities, intermittent disruptions to the electrical power grid, and operational restrictions of the PH LTWMF.

Water Collection and Treatment System

The wastewater collection system consists of interceptor ditches, a main collection pond and three settling ponds. The water treatment systems include a former water treatment building and the PH WWTP, and twin four-inch (100 mm) diameter discharge pipelines to Lake Ontario.

The purpose of the former water treatment building was to capture groundwater and surface water that contacted impacted materials deposited at the historic WWMF. The system was designed to reduce arsenic, radium-226 and uranium concentrations, and discharge the treated water to Lake Ontario. The former water treatment building was not operated during the reporting period.

The PH WWTP utilizes the same collection ditches and collection pond as the former water treatment building and employs inclined plate clarifiers, sand filtration, reverse osmosis, mechanical vapor recompression evaporators and slurry dryers to treat the collected surface water and groundwater. The system utilizes these technologies to remove over 99% of the arsenic, uranium, and other heavy metals in the influent water.

Final effluent is held in a storage tank where it is monitored for conductivity and pH adjusted prior to release. A composite automatic water sampling unit collects samples at regular intervals before the water is discharged to Lake Ontario. The treated water is then discharged through a pipe extending three kilometers underground to Lake Ontario via the same twin four-inch (100 mm) diameter pipelines that were used from the former water treatment building.

Water Treatment and Monitoring

Influent and effluent samples were collected from the PH WWTP from fixed locations on weekly intervals during the reporting period. Grab samples were taken from a sample point on the pipeline feeding the treatment system and represented the treatment inflow. A total of 303,700 cubic metres of influent was collected by the PH WWTP in 2023. This represents an increase of approximately 7% from 2022 recorded volumes.

A composite automatic water sampling unit collects samples at regular intervals before the treated water is discharged to Lake Ontario. Refer to Section 9.2.2.2 for details. A summary of these analyses and quantities of effluent for a five-year period is provided in Appendix A.2.

Operations of Residuals Management Systems

Regular operations of the residual management systems occurred in conjunction with normal water treatment activities during the reporting period. The residuals management equipment includes the clarifiers, evaporators, slurry dryers, and belt press systems. Both sludge and slurry processing streams continue to be optimized.

Waste Processing

The production and handling of residual wastes that were generated from the water treatment process was initiated upon final commissioning of the waste handling equipment (2017 December). Further testing and optimization of these and associated processes took place once commissioning activities were complete. Processing of the solids generated from operations began in 2018 April and has continued on a full-time basis since then. A total of approximately 4,829 tonnes of residual waste solids have been produced and transferred to the PH LTWMF to date.

Residual Solids Treatment and Disposal

During the reporting period, the two solid waste streams operated as designed. As noted above, several key optimizations were made to improve the efficiency and throughput of these processes. The evaporators treat concentrate produced by the reverse osmosis systems and are designed to reduce the overall volume of this waste through the production of condensate. The condensate is combined with permeate generated from the reverse osmosis units and discharged to Lake Ontario. The evaporated concentrate (slurry) is fed to mechanical dryers for further dewatering. The dried slurry is transferred into bulk storage totes as a flowable solid. The totes are then transferred to the PH LTWMF for long term management.

Dissolved solids in the influent liquid waste stream are chemically precipitated and collected as sludge in the clarifier vessels. These solids are stabilized using polymer compounds and held in batches before dewatering in the belt filter press. The filtration step removes excess water from the sludge before deposition into bulk storage totes which are then transferred to the PH LTWMF for long term management. The decanted water is discharged back to the clarifiers or to the main collection pond for recirculating treatment.

A combined total of 985 tonnes of residual solid wastes were generated by the PH WWTP in 2023. This represents a decrease of approximately 12% from recorded 2022 production.

3.1.1.5 Major Sites

The PHAI sites where LLRW is previously known to have existed based on historical file review are classified as Major Sites. In addition, there are several Known Sites, which have been identified through earlier radiological investigations that are also included in this section.

Alexander Street Ravine

The site consists of approximately 4,100 cubic metres of LLRW deposited into the steep ravine by Eldorado Nuclear Limited. The site consists of a wooded ravine with steep forested slopes. It is bounded to the south by the Canadian Pacific rail embankment, to the north by forested lands, to the west by a golf course, and to the east by residential properties.

Due to various environmental constraints, Special Circumstances have been applied to a large portion of the original Alexander Street Ravine site and to the residentially-owned woodlot packages. The Special Circumstance Decision Package for the largest portion of the ravine property (privately owned) has been finalized and the property owner has approved the decision. There will be a targeted remediation performed on the municipality owned parcels targeting remediation of approximately 2,150 cubic metres of LLRW. The design work for the targeted remediation is completed and remediation is scheduled to begin in 2024.

Canadian National/Canadian Pacific Viaducts Area

The site consisted of approximately 21,000 cubic metres of LLRW, including a mound alongside John St. Remediation and restoration of this site was completed in 2023.

Lions Park

The site consists of approximately 2,500 cubic metres of LLRW. During 2023, approximately 45% of this LLRW was removed and transported to the PH LTWMF. The remainder of LLRW is expected be removed in 2024.

Port Hope Harbour and Centre Pier

The Port Hope Harbour consists of approximately 83,000 cubic metres of LLRW and the Center Pier consists of approximately 82,600 cubic metres, resulting in a total of 165,600 cubic metres of LLRW. The Port Hope Harbour site is the most complex site of the PHAI. Contamination in the harbour exists as a sediment layer overlying the till and bedrock surface through the approach channel and turning basin. The sediment thickness varies, extending to as much as four (4) metres deep. The Center Pier waste is comingled LLRW and industrial waste.

During the reporting period, mechanical dredging was used as the removal mechanism for bulk sediment removal. The Portable Water Treatment System, located on the Center Pier is operational and will continue to support the site for any water treatment needs.

Replacement and reinforcement of the harbour walls continued throughout 2023 with a focus on the pier west wall, Queen’s wharf, and turning basin west wall. A portion of the pier east wall has also been remediated. The excavation of the Center Pier is well underway, with approximately 70% of the excavation and backfill scope completed.

Strachan Street

The site consists of approximately 3,500 cubic metres of LLRW deposited by Eldorado Nuclear Limited. Restoration of the Strachan Street site was completed in 2023.

Waterworks West (West Beach)

The site consists of approximately 6,500 cubic metres of LLRW deposited by Eldorado Nuclear Limited. Removal of LLRW commenced in 2023 April. Remediation around the creek running through the middle of the site was delayed due to a change in policy at Fisheries and Oceans Canada that resulted in their rescinding the previous authorization to perform work around this creek and requiring a new permit to be obtained. There is ongoing discussion with the Ministry of Natural Resources and Forestry, Fisheries and Oceans Canada, Curve Lake, and Hiawatha First Nations in developing a restoration plan for the site as required by the new Fisheries and Oceans Canada authorization. Remediation will continue through 2024 with restoration expected to be completed by the fall of 2024.

Highland Drive Area

The Highland Drive Landfill Area is comprised of three (3) separate and unique sites: Highland Drive Landfill Site, the Highland Drive South Ravine, and the Pine Street Consolidation Site. The Highland Drive Landfill consists of 51,900 cubic metres of LLRW co-mingled or overlain by municipal solid waste.

The remediation work in the Highland Drive Landfill site is unique in that it involves the removal of LLRW in a former municipal solid waste landfill. A site-specific remedial verification approach was developed and accepted by CNSC staff. The contractor commenced waste haulage from the landfill area in 2023 January. This project will continue until the fall of 2024.

The Highland Drive South Ravine consists of 5,400 cubic metres of LLRW in pond sediment and the north slope of the ravine. Design for the Highland Drive South Ravine was awarded in 2023 March, and remediation started in the winter of 2023. The Permeable Reactive Barrier that forms a part of this site's scope is to be completed in 2024, with final works occurring on site in summer 2025.

The Pine Street Consolidation Site consisted of 47,000 cubic metres of LLRW consolidated in a mound during the initial cleanup of Port Hope properties in the late 1970s to early 1980s. Remediation and restoration was completed in 2022. In 2023, CNL continued to maintain, monitor, and inspect the Pine Street Consolidation Site.

3.1.1.6 Small-Scale Sites

The PHAI Small-Scale Sites project involves the investigation of Urban Area (formerly Ward 1) properties and a select number of Rural Area (formerly Ward 2) properties in Port Hope for the presence of the four signature contaminants of potential concern which are indicative of historic LLRW: arsenic, uranium, radium-226 and thorium-230. Small-Scale Sites consist primarily of privately owned (residential and business) and municipal properties, including road allowances.

Characterization, also known as the initial survey, is used to confirm the presence of LLRW on a given site and determines how the site is subsequently managed. Characterization field activities include interior radon gas detector deployment, and a preliminary above surface gamma survey followed by an intrusive subsurface investigation. The intrusive subsurface investigation involves borehole drilling, soil sampling and possibly sampling of building or other types of material; gamma radiation measurements of boreholes and soil cores; and x-ray fluorescence measurements of soil boring samples for uranium and arsenic. Selected soil samples undergo independent, accredited analytical laboratory testing. Where historic LLRW is suspected to be present, further analysis for 17 secondary contaminants of potential concern is undertaken. If the presence of LLRW is confirmed then the site proceeds to delineation followed by design, remediation, including the safe transportation of the waste to the PH LTWMF for storage, and restoration activities.

Properties continued to be evaluated for evidence of radon gas exceedances. Where exceedances were found to be a result of LLRW contamination on the property, mitigation systems were evaluated for installation.

Characterization of External Properties

Of the 5,143 properties with external lots, 97% have been characterized. Of the characterized exterior properties, 23% have been identified with LLRW. Of the remaining exterior properties not characterized, most of these sites have access challenges including refusal from the property owner to participate, or have not provided access to their property (such as railway lands).

Characterization of Internal Properties

Of the 4,448 properties with interior spaces, 98% have been characterized. Of the characterized properties with interiors, 5% have been identified with LLRW or potential LLRW. Of the remaining interiors that have not been characterized, 40% are in-progress and the remaining are on hold due to property owner access challenges.

Characterization of Roads

Of the 478 municipal road allowance sites, 42% have been characterized. Of the characterized road allowance sites, 69% have been identified with LLRW. Of the remaining road allowance sites that have not been characterized, characterization activities are in-progress and expected to be completed in 2025.

Remediation and Restoration

Site remediation requires detailed planning prior to field execution to ensure compliance with the PHAI licence [2], federal and provincial regulatory requirements, municipal permits and requirements, technical codes and standards, and specific contractual obligations with property owners. Pre-construction planning is structured into a series of steps including pre-mobilization, mobilization, site preparation, excavation, remediation verification, back-filling, restoration, stakeholder property walk-down inspections, issue of Certificate of Substantial Performance and warranty period. Some sites have added complexities such as a high-water table or historical buildings with challenging structural integrity. Soil remediation activities can involve detailed geotechnical assessments, engineered shoring, precision excavations, specialized equipment, and detailed water management strategies. The range of restoration scopes are broad and can require the complete demolition of a home and/or occupant relocation. Construction planning is typically performed on a group of contiguous properties and roads to limit property owner disruptions.

During the reporting period, excavations of exterior historic LLRW and backfilling to existing grades was completed at 5% of the exterior properties and roads. Interior remediation was completed at 9.5% of the interior properties.

3.1.1.7 Temporary Storage Sites

The Pine Street North Extension Temporary Storage Site consists of two asphalt storage pads and a Quonset storage building. The site remains in use for emergency and after-hours temporary storage of impacted soils, building debris contaminated with LLRW, roll-off storage bins containing residual amounts of impacted soils and equipment utilized during off-site remedial activities.

During the reporting period, there were no major upgrades or developments to the site.

3.2 Reporting Requirements

The PHAI maintains a program for reporting information to the CNSC in accordance with the PHAI LCH [3] and REGDOC-3.1.3 [4]. This includes compliance monitoring, operational performance, event reporting, and various types of notifications. During the reporting period, CNL prepared and submitted the written reports required by the PHAI LCH [3].

The PHAI adheres to CNL's Compliance Functional Support Area. For a list of reporting program document notifications applicable to multiple CNL licences, refer to Section 1 of the *ACMR for CNL* [5].

3.2.1 Reportable Events to the CNSC

During the reporting period, there were ten events that occurred at the PHAI that were deemed reportable to the CNSC. Reportable events are listed in Table 9.

Table 9: Reportable Events to the CNSC

ImpAct No.	Title	SCA	Facility/Site
ERM-23-0460	HWP – Port Hope Transportation of Dangerous Goods Shipment Misclassification Identified	Packaging and Transport	Small Scale Sites
ERM-23-0949	Port Hope Viaducts Site Lost Time Accident (Injured Ankle)	Conventional Health and Safety	Major Sites (Viaducts)
ERM-23-1756	PH WWTP Copper Action Level Exceedance	Environmental Protection	PH WWTP
ERM-23-1951	HWP – False Fire Alarm Triggered During Smoke Detector Cleaning	Emergency Management and Fire Protection	Small Scale Sites
ERM-23-2235	HWP – PH Major Sites – HDLF – Perimeter Security Fence Vandalism	Security	Major Sites (Highland Drive Landfill)
ERM-23-2652	HWP – SSS Task Order 3 – Stand Behind Skid Steer Small Fire	Emergency Management and Fire Protection	Small Scale Sites
ERM-23-2751	HWP – PH LTWMF – EMS Called for Existing Heart Condition	Emergency Management and Fire Protection	PH LTWMF
HSSE-23-2951	PHAI – Fire Protection Program Self-Assessment	Emergency Management and Fire Protection	N/A
ERM-23-3435	HWP – PH LTWMF – Material Falls Off Haul Truck onto Zone 2 Unloading Platform	Packaging and Transport	PH Harbour and PH LTWMF
ERM-23-3920	PHAI Contractor – TDG Inaccurate Shipment	Packaging and Transport	PHP

3.2.2 Reportable Events to Other Regulators

During the reporting period, there was one Hazardous Occurrence Investigation Report made to Employment and Social Development Canada (refer to Section 8 Conventional Health and Safety for further details).

The following events were reported to the Ontario Ministry of Environment, Conservation and Parks (MECP) Spills Action Centre:

- ERM-23-1387 – Port Hope Harbour Centre Pier – MECP Reportable Biodegradable Hydraulic Oil Spill
- ERM-23-1469 – Port Hope Harbour Biodegradable Hydraulic Oil Spill
- ERM-23-1551 – Port Hope Harbour Portable Water Treatment System Exceedance of Total Aluminum
- ERM-23-2076 – Port Hope Harbour Biodegradable Hydraulic Oil Spill
- ERM-23-2111 – Port Hope Harbour Biodegradable Hydraulic Oil Spill
- ERM-23-2224 – Port Hope Harbour Biodegradable Hydraulic Oil Spill
- ERM-23-2359 – Port Hope Harbour Biodegradable Hydraulic Oil Spill

There was one report made to the Department of Fisheries and Oceans for various species of fish deaths in the Port Hope inner harbour, observed in 2023 August (ERM-23-2432). Additional regulators were notified of the event, including Environment and Climate Change Canada, the MECP, and the CNSC.

4. Safety Analysis

As per the PHAI licence [2] the Safety Analysis SCA is not applicable to the PHAI.

5. Physical Design

The physical design SCA relates to activities that affect the ability of systems, structures, and components to meet and maintain their design basis, given new information arising over time and taking changes in the external environment into account.

5.1 Design Program

The PHAI adheres to CNL's Design Authority and Design Engineering Functional Support Area. The Design Engineering Functional Support Area maintains and controls the design basis for all design activities, and it ensures that design is planned, executed, verified, and documented according to applicable codes, standards, and regulatory and design customer requirements. Refer to Section 5.1 of the *ACMR for CNL* for details [5].

The PHAI employs the CNL suite of design planning, development, and review procedures to the design works produced internally, and the *Oversight of Engineering Agencies* procedure [24] to design works produced by others, which form the majority of designs related to the PHAI.

In 2022 and 2023, an extent of condition analysis was conducted on each of the Detailed Design Description Reports listed in the PHAI LCH [3]. Based on the results of the extent of condition assessments, a new set of design basis documents are in development to address identified discrepancies and consolidate eight (8) documents into three (3). In accordance with the PHAI LCH [3], CNSC staff were notified of the following new Design Basis Documents and proposed that they replace the documents listed in the PHAI LCH [3] as compliance verification criteria:

- *Port Hope Long Term Waste Management Facility Design Basis* [25]
- *Port Granby Long Term Waste Management Facility Design Basis* [26]

The *Port Hope Project Remediation Sites Design Basis* document is committed for submission to CNSC staff in 2024.

For a list of design program document notifications applicable to multiple CNL licences, refer to Section 1 of the *ACMR for CNL* [5].

5.1.1 Changes to Design or Equipment

The Configuration Management Functional Support Area provides the framework to maintain and control the physical configuration of structures, systems, and components at CNL. Configuration Management applies to all design, operations, decommissioning, and maintenance activities at CNL sites. Configuration Management applies to all non-nuclear and nuclear documents, policies, programs, and procedures that contain information or instructions that could impact the following:

- Design (both regulatory and owner prescribed) and licensing basis
- Any plant physical configuration
- Any configuration item or information

Configuration Management allows for maintaining and controlling the configuration of nuclear facilities within approved safety margins and regulatory requirements when changes or non-identical replacement parts are required. Configuration Management ensures that changes are assessed, approved, designed, implemented, commissioned, and placed into service within the safety envelope at all CNL sites in accordance with the design requirements.

The PHAI utilizes CNL's Engineering Change Control program, supplemented by *HWP MO Application of Engineering Change Control and Oversight* [27].

During the reporting period, change management process improvements continued in regards to implementation. A root cause analysis was completed in the spring of 2023 to identify and correct previously identified programmatic issues. The root cause analysis identified five corrective actions and eight remedial actions to be taken by CNL. As of 2024 March 26, four of the five corrective actions and seven of the eight remedial actions are closed. The two remaining open actions are on schedule to close in 2024. Revision 2 of the *Application of Engineering Change Control and Oversight* [27] (effective 2023 August 31) was made to provide specific guidance on effectively applying the graded approach to ensure that the appropriate change process is selected.

During the reporting period, one activity was assessed according to the engineering change control process as listed in Table 10.

Table 10: Engineering Change Control Assessments for 2023

Category of Change	Description of Change
Full Change Request	Engineering Assessment of the 4 x 4 Columns at 196 Toronto Rd. Office

6. Fitness for Service

The fitness for service SCA covers activities that affect the physical condition of structures, systems, and components to ensure that they remain effective over time. This includes programs that ensure all equipment is available to perform its intended function when called up to do so.

6.1 Fitness for Service Program

The PHAI adheres to CNL's Fitness for Service Functional Support Area through its Maintenance and Work Management, Equipment Reliability and Preventative Maintenance Programs. Refer to Section 6.1 of the *ACMR for CNL* for details [5].

6.1.1 Planned Maintenance, Testing and Inspections

The maintenance program for the PH and PG WWTPs follow the guidelines in CNL's company-wide Fitness for Service program [28]. Company-wide requirements are used in conjunction with the computerized maintenance management system called PMXpert for which six additional procedures were developed and implemented for the PHAI. PMXpert facilitates scheduling of preventive maintenance work orders at various intervals to maintain equipment service as recommended by the original equipment manufacturers. Corrective maintenance work orders are used when equipment needs repair or replacement.

The maintenance department at both the PH and PG WWTP's generate weekly key performance indicator reports as a means of tracking the performance of each respective maintenance program. Closed preventive maintenance work orders are measured against open preventive maintenance work orders to ensure that pre-determined benchmark percentages are maintained or exceeded. These reports are distributed to all WWTP staff members and records are maintained.

Predictive maintenance is performed annually throughout the PG and PH WWTP's. This includes vibration analysis and infrared thermography of mechanical and electrical equipment by both a sub-contracted agency and in-house subject matter experts. High voltage assets have predictive maintenance work orders and inspections performed annually by a sub-contracted agency to ensure fitness for service. Reports are generated by all parties and corrective maintenance work orders are generated based on the findings in the reports.

Oil samples are taken on regularly scheduled intervals from critical equipment, these samples are analyzed and reports issued by the contracted agency. Corrective maintenance work orders are generated based on the reports and all records are maintained.

6.1.1 Equipment Fitness for Service/Equipment Performance

All equipment in the PH and PG WWTP's, whether in use or not, is maintained in a ready-to-operate state. All preventive maintenance work orders are completed as scheduled regardless of operational status. There are no systems, structures or components that cannot be operated when called upon.

6.1.2 Condition of Structures

The PG and PH WWTPs remain early in their lifecycle and, as such, show little to no signs of structural or superficial degradation.

The hydrochloric acid storage and dosing system at the PG WWTP was fully removed and rebuilt in accordance with the Engineering Change Control program. Improvements to storage and ventilation of the chemical and the replacement of the ceiling and roof directly above the chemical room were completed.

7. Radiation Protection

The radiation protection (RP) SCA covers the implementation of the radiation protection program, in accordance with the *Radiation Protection Regulations* [29].

7.1 Radiation Protection Program

The PHAI adheres to CNL's RP Functional Support Area. Refer to Section 7 of the *ACMR for CNL* for details [5]. The *Port Hope Area Initiative Radiation Protection Plan* (PHAI RP Plan) [30] defines the radiation protection measures applicable to PHAI projects and is consistent with CNL's *Radiation Protection Program Requirements* [31]. The purpose of these radiation protection measures is to ensure that the execution of PHAI projects complies with relevant regulations pursuant to the *Nuclear Safety and Control Act* [6]. The program addresses the radiation hazards associated with the PHAI and ensures that surface and airborne contamination, and radiation doses to employees are monitored and controlled.

Contractors conducting work for the PHAI project submit site specific radiation protection plans for CNL's review and approval to ensure compliance with the *PHAI RP Plan* [30]. Contractor compliance with project-specific radiation protection plans is examined as part of CNL's compliance oversight program (Section 1.5).

There were no revisions to the *PHAI RP Plan* [30] in the reporting period. For a list of radiation protection program document notifications applicable to multiple CNL licences, refer to Section 1 of the *ACMR for CNL* [5]. For a summary of any radiation protection program reviews, improvements, and revisions, refer to Section 7 of the *ACMR for CNL* [5].

7.1.1 ALARA Initiatives and Activities

CNL's radiation protection program includes, as in integral part, an As Low As Reasonably Achievable (ALARA) program. This ALARA program is the quality management system designed to ensure the provision of radiation protection is optimized for activities involving sources of radiation exposure so that the magnitude of individual and collective doses and the likelihood of incurring exposures resulting from activities are kept as low as reasonably achievable, economic, and social factors taken into account. The integrity of the ALARA program is managed through routine monitoring and reviews of dose records to confirm that no adverse trends or exceedance have occurred.

ALARA initiatives and activities are practiced in every facet of the PHAI activities and is specifically addressed through the implementation of the PHAI environmental monitoring program's monthly and quarterly deployment of PHAI environmental radon monitors and Thermoluminescent Dosimeters (TLD).

7.1.2 Contamination Control

External radiation hazards exist in the form of low-energy gamma radiation. During the reporting period, CNL conducted routine radiation dose rate surveys at the PG and PH WWTPs and LTWMFs. CNL routinely reviewed the results of radiation dose rate surveys conducted at remediation sites by contractor staff. The dose rate surveys conducted in the reporting period demonstrate that dose rates are not exceeding the radiological safety zone limits, as defined in the *PHAI RP Plan* [30].

Internal radiation hazards exist in the form of loose radioactive material, known as contamination, which may enter the body by inhalation, ingestion, or absorption. As a result, routine monitoring across the project is completed to confirm that current activities have been executed while minimizing the spread of radioactive contamination.

Table 11 summarizes the contamination events that occurred at the PHAI during the past five-years. During the reporting period, the PHAI experienced six worker contamination events. The number of skin and personal clothing contamination events reflects a breakdown of the six worker contamination events. Of the six events, four included both skin and personal clothing contamination, one included skin contamination only, and one included personal clothing contamination only. The six worker contamination events resulted in five skin contamination events and five personal clothing contamination events as indicated in Table 11. There was one surface contamination exceedance within radiological safety zone limits. No exceedances of CNSC regulatory dose limits or radiation dose action levels were observed as a result of the contamination events.

Table 11: Contamination Events

Year	Skin and Clothing Contamination				Workplace Contamination	
	Skin[a]	Personal Clothing[b]	Radiological Work Clothing[c]	Total	Surface[e]	Vehicle /Materials[f]
2019	0	3	0	3	0	0
2020	0	1	1	2	4	0
2021	1	3	0	4	1	0
2022	0	1	0	1	0	0
2023	5	5	0	6[d]	1	0

Note:

a Contamination found is greater than 4 Bq/cm^2 beta-gamma or 0.1 Bq/cm^2 alpha.
b Contamination detected above background on personal clothing.
c Contamination detected is greater than 850 Bq/cm^2 beta/gamma or greater than 30 Bq/cm^2 alpha.
d Total number of skin and clothing contamination events (four events included both skin and personal clothing contamination).
e Fixed/loose contamination in excess of limits specified for the applicable radiological zone.
f Removable surface contamination detected above background.

The contamination events noted in Table 11 occurred during planned routine work and regular operations. In 2023, an increase in the total number of worker contamination events was observed due to an increase in the total number of workers and an increase in radiological work activities at PHAI sites. The six worker contamination events occurred at three different work sites. No skin dose (0.00 mSv) resulted from any of the skin and clothing contamination events.

One workplace surface contamination event resulted in a maximum surface contamination of 12 Bq/cm^2 beta/gamma. The workplace surface contamination event occurred at the PH LTWMF in a radiological safety zone 2.

7.2 Dosimetry

Radiation dose refers to the energy deposited or absorbed in materials through which it passes. Accordingly, dosimetry is the measurement, calculation and assessment of that radiation dose absorbed by the human body. This applies both internally, due to ingested, inhaled or absorbed radioactive substances, or externally due to irradiation by sources of radiation.

Results are compared to action levels and regulatory dose limits. Action levels are a specific dose of radiation that, if reached, may indicate a loss of control of part of the radiation protection program, and triggers a requirement for specific action to be taken. Action levels are site-specific parameters that are typically set near the upper bounds of normal operating performance and below regulatory dose limits. Regulatory dose limits are defined in the *Radiation Protection Regulations* [29].

All PHAI workers who have a reasonable probability of receiving an occupational effective dose in connection with a nuclear substance or nuclear facility in excess of 1 mSv per calendar year are designated as a Nuclear Energy Worker (NEW) [30].

7.2.1 Interpretation of Reported Dose Quantities

The PHAI uses the Chalk River Laboratories Licensed Dosimetry Service Provider for external and internal dosimetry for CNL staff, contingent workers, and some sub-contractors. The PHAI contractors responsible for operating various PHAI sites utilize a CNSC Licensed Dosimetry Service Provider for their staff and sub-contractors. Dose to CNL workers is not measured independently; only the total dose per person is recorded, irrespective of the sites at which the person works (such as licensed activities at both Port Hope and Port Granby).

CNL site and facility staff and the PHAI Contractors who work in, or frequently enter Controlled Areas are assigned CNSC licensed dosimeters to monitor for external deep and shallow dose radiation exposures. CNL dosimetry operates on a quarterly monitoring period. All external dosimetry is read on a routine basis. Visitors and non-NEWs are typically provided Electronic Personal Dosimeters to monitor dose and to ensure trigger limits and dose control points identified within the *PHAI RP Plan* [30] are not exceeded.

The internal dosimetry program is primarily provided to the CNL Operations and RP staff who work in close proximity with radiological hazards as assessed by the RP program. The bioassay is tested for the presence of uranium through in-vivo submissions. All results for uranium bioassay reported were well below CNL’s Bioassay Recommendation Level of Minor, which indicates little to no potential for an uptake of radioactivity.

CNL's personnel radon exposure program for PHAI sites monitors employees, contingent workers, and sub-contractors and PHAI contractors due to the increased work required to support Phase 2 construction. Phase 2 construction workers were assigned track-etch type Personal Radon detectors and doses are calculated and recorded if the monthly or quarterly average exceeds the trigger level of 150 Bq/m^3. Ten exceedances of the trigger level were identified in the reporting period. A dose estimation was completed for each trigger level exceedance which resulted in an individual maximum estimated dose of 0.79 mSv. The estimated doses from radon exposure are included in Table 12.

The PHAI continues to ensure that doses to workers are kept ALARA by strict compliance to its Dosimetry program as stipulated in the *PHAI RP Plan* [30].

7.2.2 Radiation Doses to Personnel

The dose data in all tables in this section represents doses delivered at PHAI for all monitored persons, which includes employees (including those in temporary employment such as students), contractors, sub-contractors, and visitors. Doses have not been broken down by individual sites, as workers routinely move between sites without changing dosimeters, making it difficult to accurately determine how much dose can be attributed to a worker at a single facility.

The maximum individual effective dose during the current five-year dosimetry period (from 2021 January 01 to 2025 December 31) is 1.08 mSv, received by a CNL contractor employee.

In 2023, there were 845 non-NEWs that had their effective dose assessed.

Table 12: Distribution of Effective Dose for 2023

Monitored Person Type		Dose Range (mSv)							Total No. of Persons	Individual Dose (mSv)			Collective Dose (person·mSv)
		0	0.01-0.50	0.51-1.00	1.01-5.00	5.01-10.00	10.01-20.00	>20.00					
		No. of Persons								Max	Ø Avg[a]	Avg All[b]	
NEW	Employee	125	114	0	0	0	0	0	239	0.34	0.07	0.03	7.62
NEW	Contractor	1183	132	2	0	0	0	0	1317	0.79	0.11	0.01	14.27
NEW	Visitor[c]	404	1	0	0	0	0	0	405	0.10	0.10	0.00	0.10
Non-NEW	Employee	3	0	0	0	0	0	0	3	0.00	-	0.00	0.00
Non-NEW	Contractor	13	1	0	0	0	0	0	14	0.04	0.04	0.00	0.04
Non-NEW	Visitor[d]	828	0	0	0	0	0	0	828	0.00	-	0.00	0.00
Totals (All Monitored Persons)		2556	248	2	0	0	0	0	2806	0.79	0.09	0.01	22.03

Note:

a Average of all measured doses that exclude the zero dose value, rounded to two decimal places.
b Average of all measured doses that include the zero dose value, rounded to two decimal places.
c Visitor NEWs are persons who were historically employee and/or contractor NEWs but have returned to the site as visitor while retaining their historical NEW status or frequented often enough to warrant NEW status as per *PHAI RP Plan* [30].
d Visitor dosages are measured by personal electronic dosimeters.

Table 13: Distribution of Equivalent Dose to the Skin for 2023

Monitored Person Type		Dose Range (mSv) 0	0.01-0.50	0.51-1.00	1.01-5.00	5.01-10.00	10.01-20.00	>20.00	Total No. of Persons	Individual Dose (mSv) Max	Ø Avg[a]	Avg All[b]	Collective Dose (person·mSv)
		No. of Persons											
NEW	Employee	125	113	1	0	0	0	0	239	0.64	0.07	0.03	8.28
NEW	Contractor	1223	94	0	0	0	0	0	1317	0.34	0.10	0.01	9.45
NEW	Visitor[c]	-	-	-	-	-	-	-	-	-	-	-	-
Non-NEW	Employee	3	0	0	0	0	0	0	3	0.00	-	0.00	0.00
Non-NEW	Contractor	13	1	0	0	0	0	0	14	0.04	0.04	0.00	0.04
Non-NEW	Visitor[c]	1	0	0	0	0	0	0	1	0.00	-	0.00	0.00
Totals (All Monitored Persons)		1365	208	1	0	0	0	0	1574	0.64	0.09	0.01	17.77

Note:

a Average of all measured doses that exclude the zero dose value, rounded to two decimal places.

b Average of all measured doses that include the zero dose value, rounded to two decimal places.

c Visitors on contractor sites are not monitored for their equivalent dose to the skin. Visitors issued a TLD by CNL are monitored for their equivalent dose to the skin.

Table 14: Summary of Dose Components Received for 2023 [a]

Monitored Person Type		External Penetrating Dose					External Surface Dose					Extremity Dose				
		Total No. Persons	Collective (p·mSv)	Max	Ø Avg[b]	Avg All[c]	Total No. Persons	Collective (p·mSv)	Max	Ø Avg[b]	Avg All[c]	Total No. Persons	Collective (p·mSv)	Max	Ø Avg[b]	Avg All[c]
NEWs	Employee	239	7.62	0.34	0.07	0.03	239	8.28	0.64	0.07	0.03			-	-	-
	Contractor	1317	14.27	0.79	0.11	0.01	1317	9.45	0.34	0.10	0.01	14	20.14	4.36	1.44	1.44
	Visitor[de]	405	0.10	0.10	0.10	0.00	-	-	-	-	-	-	-	-	-	-
Non-NEWs	Employee	3	0.00	0.00	-	0.00	3	0.00	0.00	-	0.00	-	-	-	-	-
	Contractor	14	0.04	0.04	0.04	0.00	14	0.04	0.04	0.04	0.00	-	-	-	-	-
	Visitor[e]	828	0.00	0.00	0.00	0.00	1	0.00	0.00	-	0.00	-	-	-	-	-
Totals (All Monitored Persons)		2806	22.03	0.79	0.09	0.01	1574	17.77	0.64	0.09	0.01	14	20.14	4.36	1.44	1.44

Note:

a All quantities are measured in mSv unless otherwise noted.
b Average of all measured doses that exclude the zero dose value, rounded to two decimal places.
c Average of all measured doses that include the zero dose value, rounded to two decimal places.
d Visitor NEWs are persons who were historically employee and/or contractor NEWs but have returned to the site as visitor while retaining their historical NEW status or frequented often enough to warrant NEW status as per *PHAI RP Plan* [30].
e Visitors on contractor sites are not monitored for their equivalent dose to the skin. Visitors issued a TLD by CNL are monitored for their equivalent dose to the skin.

7.2.2.1 Discussion of Dose Data

All effective radiation doses were measured to be less than the assigned dose control point (1 mSv) for all individuals on the project and well below all action levels for the PHAI. No anomalies were observed in the data above.

7.2.2.2 Radiation Dose Changes or Trends

As the project continues, Phase 2 radiation doses are expected to remain stable from the previous calendar year. The maximum annual total effective dose equivalent for all workgroups for the last five-years is listed in Table 15. The 2023 maximum individual effective dose to all workers (employees, contractors, and students) was approximately 0.79 mSv. These results are expected given no significant change in the scope of work. The maximum individual dose for all worker categories remains far below the regulatory dose limit of 50 mSv per year [29].

Table 15: Effective Dose Trend – Last Five-Years

Year	Maximum Individual Dose for All Worker Categories (mSv)
2019	0.79
2020	0.27
2021	0.43
2022	0.59
2023	0.79

7.2.3 Program Exceedances

There were no exceedances of action levels or regulatory dose limits in the dose monitoring program for the 2023 calendar year.

7.2.4 Radiation Dose to Members of the Public

The total effective radiation dose equivalent limit to members of the public are specified in the *Radiation Protection Regulations* [29] as 1 mSv (1,000 µSv) per calendar year. It is a calculated value, in units of mSv, which takes into account the absorbed dose to all organs of the body, the relative hard level of the radiation, and the sensitivities of each organ to radiation.

Public dose specific to the locations around the PG LTWMF and PH LTWMF is calculated from the maximum radon and TLD measurements taken along the facility fence lines, with a conservative occupancy period of 60 hours per year. As such, the provided public doses do not apply to any other area in Port Granby or Port Hope. Note that liquid effluent releases are not included in the calculation of public dose, as the effluent is not used for drinking.

Results from the 2023 monitoring program confirm a public dose less than 2% of the annual dose limit for members of the public. Table 16 and Table 17 provides the public dose for a five-year period for the PGP and the PHP respectively.

Table 16: Port Granby Project Radiation Dose to Members of the Public

Year	Annual Public Dose (mSv)	% Public Dose Limit (1 mSv)
2019	0.04	4.0
2020	0.02	2.0
2021	0.04	4.1
2022	0.03	3.3
2023	0.01	1.0

In 2023, the dose for the PGP is less than 1% of the dose limit for a member of the public.

Table 17: Port Hope Project Radiation Dose to Members of the Public

Year	Annual Public Dose (mSv)	% Public Dose Limit (1 mSv)
2019	0.04	3.5
2020	0.03	3.3
2021	0.02	2.3
2022	0.03	2.8
2023	0.02	2.0

In 2023, the dose for the PHP is less than 2% of the dose limit for a member of the public.

8. Conventional Health and Safety

The conventional health and safety SCA covers the implementation of a program to manage the non-radiological workplace safety hazards and to protect personnel and equipment.

8.1 Conventional Health and Safety Program

The PHAI adheres to the CNL's Occupational Safety and Health (OSH) Functional Support Area. Refer to Section 8 of the *ACMR for CNL* for details [5]. The *Port Hope Area Initiative Occupational Safety and Health Plan* (PHAI OSH Plan) [32] has been developed to define the OSH program applicable to PHAI projects and is consistent with CNL's corporate OSH program.

Contractors conducting work for the PHAI project submit site specific health and safety plans for CNL's review and approval to ensure compliance with the *PHAI OSH Plan* [32]. Contractor compliance with project-specific health and safety plans is examined as part of CNL's compliance oversight program (Section 1.5).

In 2023, the CNSC was notified [33] of a revision to the *PHAI OSH Plan* [32] made in 2022. The delayed notification to CNSC staff was the result of administrative error. For a list of conventional health and safety program document notifications applicable to multiple CNL licences, refer to Section 1 of the *ACMR for CNL* [5]. For a summary of any conventional health and safety program reviews, improvements, and revisions, refer to Section 8 of the *ACMR for CNL* [5].

The HWP MO's OSH program priorities for 2023 included:

- Improvements to staff access to Occupational, Health and Safety related notices and information through creation of a dedicated SharePoint site. The online information portal was updated with cold stress related information and notifications.
- Improvements to field oversight observation and documentation practices enabling staff to input field observations using a mobile device and creating a dashboard with all field oversight compliance monitoring information.
- Improvements to the monthly fall protection equipment inventory and inspection practices at the WWTPs with a comprehensive review of their process and ensuring appropriate equipment tags, preventive maintenance, and inspection tracking practices are in place.
- Enhancements to improve focus on field traffic control measures across Port Hope in response to increased project and public vehicular volume.
- Additional live Employee Family Assistance Program mental health services sessions were offered. In December, HWP MO staff were provided access to a mental health professional on a weekly basis in Port Hope.
- Contractor safety forums were held with several guest speakers including subject matter experts on gloves and hand protection, claims management, and mental health.

Additional topics included the Ministry of Labour, heavy equipment competency, use of naloxone, and dedicated workshops on enhancing safety culture.

- Upgrades to the personal protective equipment and clothing logistics process, including the availability of supplies in a new location.
- Wellness video presentations and one-on-one sessions with a psychologist for CNL staff.
- Enhancements in monitoring and safety messaging following the Canadian wildfire situation.

8.1.1 Site Safety and Health Committee

The Site Safety and Health Committee (SSHC) provides a forum for CNL and its employees to work together to ensure a safe and healthy working environment is provided and maintained for its employees. The HWP SSHC is dedicated to the oversight, promotion, and improvement of the health and safety of all employees of the HWP and engages both employees and management in the development of solutions on health and safety concerns in the workplace. The HWP SSHC is comprised of no less than nine and no more than fifteen members, including two co-chairpersons, and a recording secretary. One of the co-chairpersons represents employees and the other represents management. Members (and their alternates) are selected from the employee base. At least half of the HWP SSHC members are employees that do not exercise managerial functions. During the reporting period, the HWP SSHC had nine regularly scheduled meetings and one special meeting.

In 2023, the committee underwent some transition of membership roles. The Employee Co-Chair role, and the Committee Secretary role were transitioned to existing members.

The SSHC Safety and Wellness Suggestion Boxes were effective and gave an outlet for anonymous comments and requests. The SSHC continued with the employee awareness campaigns which have been an effective means of communicating seasonal Health and Safety concerns to employees over the past few years. Two new employee representatives joined the committee, which prompted a training session conducted by the Industrial Hygienist for the new representatives and as a refresher for several senior employee representatives.

No investigations were carried out in 2023 and there were no unresolved issues at the end of the year.

8.1.2 Inspections

Workplace inspections are completed to systematically observe practices and conditions pertaining to all work activities and locations. This process encompasses recording the observations, classifying the hazard level, developing remedial actions, and follow-up on actions. Inspection findings are shared as appropriate.

The HWP SSHC schedules inspections throughout the year and must ensure that all parts of the workplace are inspected at least once annually. A minimum of one HWP SSHC member completes each inspection in conjunction with the responsible Manager, or designate, for the work area.

During the reporting period:

- The SSHC conducted 14 inspections.
- HWP's Health and Safety oversight staff completed 5668 field inspections and walk downs resulting in 4777 total observations of which 85% were positive compliance. The remaining opportunities for improvement were documented, tracked, and communicated to project teams for follow-up. Of all the non-compliance observations 96% were immediately corrected. The remaining observations were minor and have since been resolved or continue as items for periodic review.

8.1.3 Hazardous Occurrence Investigation Reports and Lost-Time Injuries

Under the *Canada Occupational Health and Safety Regulations* [34], there are different types of hazardous occurrences, including:

- Minor Injury: any employment injury or an occupational disease for which medical treatment is provided and excludes a disabling injury.
- Disabling Injury: any employment injury or an occupational disease that results in either time loss, or modified duties. Disabling injuries can be either temporary (sprained wrist), or permanent (severed limb), depending on whether or not the employee is expected to make a full recovery.
- Loss of Consciousness: from an electric shock or a toxic or oxygen deficient atmosphere. Rescue / revival or other emergency procedures: any incident that requires emergency procedures to be implemented, such as a hazardous substance spill, bomb threat or violence prevention procedure.

Annual reports are provided to the Minister Employment and Social Development Canada as required by regulation.

During the reporting period, there was one hazardous occurrence at the PHAI reported to Employment and Social Development Canada. On 2023 July 26, a maintenance worker was removing a chamber lid using a lifting hook and the worker reported feeling a strain in their lower back while in the process of lifting the chamber lid out of place. This event resulted in modified duties.

A five-year summary of injury rate data is provided in Table 18.

Table 18: Summary of Injury Rate Data

	2019	2020	2021	2022	2023
PHAI CNL Staff					
Person Hours Worked	340,000	421,875	408,630	407,956	502,175
Lost-Time Injuries	1	0	2	0	0
Working Days Lost	33	0	12	0	0
Frequency[a]	0.68	0	1.03	0	0
Severity[b]	22.57	0	6.17	0	0
PHAI Contractors[c]					
Lost Time Injuries	0	0	0	1	1
Working Days Lost	0	0	0	46	1

Note:

a. Frequency rate equals # of Lost-Time Injuries x 200 000 hrs of exposure divided by person hours worked (based on 100 Full Time workers).
b. Severity rate equals # of Working Days Lost x 200 000 hrs of exposure divided by person hours worked (based on 100 Full Time workers).
c. The Number of Person Hours worked are not divulged by contractors. As such, Frequency and Severity rates cannot be calculated.

The working days lost resulted from an incident on 2023 March 30 (ERM-23-0949). A CNL sub-contractor worker was walking along a level ground (gravel) designated walkway when they slipped and fell on an ice patch created by the overnight freeze. The fall resulted in an ankle fracture. Refer to Section 3.2 for a summary of all reportable events.

9. Environmental Protection

The environmental protection SCA covers programs that monitor and control all releases of nuclear and hazardous substances into the environment, as well as their effects on the environment as a result of licensed activities.

The release of hazardous substances is regulated by the CNSC, Environment and Climate Change Canada, and the MECP through various acts and regulations.

The PHAI's environmental protection program aligns with CNSC REGDOC-2.9.1, *Environmental Protection: Environmental Principles, Assessments and Protection Measures* [35].

9.1 Environmental Protection Program

The PHAI adheres to CNL's Environmental Protection Functional Support Area. Refer to Section 9 of the *ACMR for CNL* for details [5]. The following documents define the methodologies and protocols followed in performing the environmental monitoring specific to the PHAI:

- *Environmental and Biophysical Monitoring Plan, Port Granby Project* [36]
- *Port Hope Project Environmental Protection Plan* [37]
- *Environmental and Biophysical Monitoring Plan, Port Hope Project* [38]
- *PHP Dust Management and Requirements Plan* [39]

Contractors conducting work for the PHAI project submit site specific environmental protection plans for CNL's review and approval to ensure compliance with applicable *Environmental Management and Protection Plans*. Contractor compliance with project-specific environmental protection plans is examined as part of CNL's oversight program (Section 1.5).

The CNSC was notified in [40] and [41] of revisions to the *Port Hope Project Environmental Protection Plan* [37] and the *Port Granby Project Environmental and Biophysical Monitoring Plan* [36]. For a list of environmental protection program document notifications applicable to multiple CNL licences, refer to Section 1 of the *ACMR for CNL* [5]. For a summary of any environmental protection program reviews, improvements and revisions, refer to Section 9 of the *ACMR for CNL* [5].

The four signature COPCs that are indicative of historic LLRW are arsenic, uranium, radium-226 and thorium-230. Additional primary COPCs include thorium-232, antimony, cobalt, copper, nickel, and lead. Secondary COPS include barium, beryllium, boron, cadmium, mercury, molybdenum, selenium, silver, vanadium and zinc. Not all parameters are analyzed at each site. The list of parameters sampled is based on the composition of the waste deposited and the historical conditions present at each site.

9.2 Environmental Compliance Monitoring

Small concentrations of hazardous substances are released to the environment as a result of the water treatment operations at the PH WWTP and PG WWTP. The release of hazardous substances is regulated by the CNSC, Environment and Climate Change Canada, and the MECP through various acts and regulations.

The PG and PH WWTPs were designed to meet the ongoing treatment requirements for the contaminants of potential concern associated with the site LTWMF. Liquid effluent from the PG WWTP and PH WWTP is monitored to verify compliance with the limits for the contaminants, defined in the *PGP Environmental and Biophysical Monitoring Plan* [36], and the *Port Hope Project Environmental and Biophysical Monitoring Plan* [38] respectively. Monitored parameters shall not exceed the specified release limits. In addition, CNL has established and CNSC has accepted action levels for the monitored parameters. An action level is intended to provide early warning of a potential loss of control of part of a licensee's environmental protection program and triggers a requirement for specific action to be taken. Action levels are facility-specific parameters that are typically set near the upper bounds of normal operating performance and below regulatory limits. Exceeding an action level is not a regulatory non-compliance and does not necessarily imply a negative outcome; however, action level exceedances are CNSC reportable events.

In 2023, new action levels and release limits for the monitoring of additional parameters at the PH WWTP, because of the transfer of liquid waste from the PG WWTP to the PH WWTP for processing, were accepted by the CNSC [42]. The additional parameters included cadmium, cobalt, phosphorus and vanadium.

Action levels are periodically reviewed and adjusted to ensure that they remain an effective indicator of the system performance. During the reporting period, a routine review of action levels following CSA Group Standard N288.8-17 [43] was completed for the PG WWTP and PH WWTP and submitted to CNSC staff [44]. The proposed changes to the action levels for some parameters were reviewed and accepted by CNSC staff [45], triggering revisions to each site's respective *Environmental and Biophysical Monitoring Plans* [36] and [38].

9.2.1 Monitoring Points, Schedules and Parameters

Composite samples are collected weekly at both the PG WWTP and PH WWTP to collect data on the final effluent discharge. The sampling point at each plant is located at the final effluent tank. An auto-sampler collects a sample aliquot at a minimum frequency of every 15 minutes.

The samples are submitted to a third-party commercial laboratory certified to determine concentrations of the parameters listed in Table 19. Due to the unique characterization of influent at each site, parameters differ between the WWTPs.

Table 19: Waste Water Treatment Plant Effluent Monitoring Parameters

PH WWTP Parameters	PG WWTP Parameters
Total Aluminum (Al)	Total Arsenic (As)
Total Arsenic (As)	Total Cadmium (Cd)
Total Cadmium (Cd)	Total Cobalt (Co)
Total Cobalt (Co)	Total Copper (Cu)
Total Copper (Cu)	Total Molybdenum (Mo)
Total Lead (Pb)	Total Phosphorus (P)
Total Phosphorus (P)	Total Selenium (Se)
Total Uranium (U)	Total Thallium (Tl)
Total Vanadium (V)	Total Uranium (U)
Total Zinc (Zn)	Total Vanadium (V)
Radium-226 (Ra-226)	Radium-226 (Ra-226)
pH	pH
Total Suspended Solids (TSS)	Total Suspended Solids (TSS)
Acute Toxicity	Total Ammonia (NH_3)
-	Nitrite (NO_2)
-	Nitrate (NO_3)
-	Acute Toxicity

Additionally, effluent cannot be acutely toxic as determined by monthly testing of the effluent [7]. Toxicity sampling is taken from the same composite sample as the chemical parameters for analysis.

Results are compared to action levels and release limits defined in [36] and [38].

9.2.2 Monitoring and Testing Methods

All compliance samples were submitted to a third-party commercial laboratory for analysis. The laboratory is certified by the Canadian Association for Laboratory Accreditation Inc.

Toxicity samples were sent to two commercial laboratories for toxicity analysis via Environment and Climate Change Canada approved reference methods, namely:

- *Reference Method for Determining Acute Lethality of Effluents to Daphnia magna, Environment Canada* EPS 1/RM/14 (Second Edition, December 2000, with February 2016 amendments
- *Reference Method for Determining Acute Lethality of Liquid Effluents to Rainbow Trout, Environment Canada* EPS 1/RM/13 (Second Edition, December 2000, with May 2007 and February 2016 amendments

9.2.2.1 Port Granby Waste Water Treatment Plant Effluent Monitoring Results

For PG WWTP processing effectiveness and comparison purposes, a weekly grab sample of influent is collected. A summary of influent concentrations is provided in Appendix A.1, Table 33 for information.

A total of 25,917 cubic metres of effluent was discharged by the PG WWTP in 2023. This represents a decrease of approximately 31% from 2022 volumes. The decrease in effluent volume was driven by several factors including reverse osmosis brine being transported to the PH WWTP and moving from a surface water treatment regime to a focused ground water and leachate treatment regime. The total volume of water discharged annually for a period of five years is provided in Appendix A.1, Table 34 for information.

A summary of the PG WWTP liquid effluent concentrations and acute toxicity effluent monitoring results are provided in Appendix A.1, Table 35. For the purposes of comparing year over year effluent monitoring results for the past five-years, histogram charts are provided in Appendix A.1, Figure 3, Figure 4, Figure 5, and Figure 6. Note that radium-226, total suspended solids, and total phosphorus, cadmium, selenium, and thallium results were not included, since the analytical results are rarely reported above the parameter laboratory method detection limits.

A review of the data from Figures 3 to 6 yields the following observations:

- During the period of 2019 to 2023, the final effluent results reported by the PG WWTP were generally stable.
- Arsenic results tend to fluctuate over time, depending on total dissolved solids content of the influent water. Reported arsenic concentrations in the final effluent discharge increased slightly during 2023.
- Total ammonia, nitrate, and nitrite concentrations have decreased to near zero during 2023.

During the reporting period, there were no instances where effluent was found to be toxic.

9.2.2.2 Port Hope Waste Water Treatment Plant Effluent Monitoring Results

For plant processing effectiveness and comparison purposes, a weekly grab sample of influent is collected. A summary of influent average and maximum concentrations is provided in Appendix A.2, Table 36 for information.

A total of 131,889 cubic metres of effluent was discharged by the PH WWTP in 2023. This represents an increase of approximately 29% from 2022 recorded volumes. The total volume of water discharged annually for a period of five years is provided in Appendix A.2, Table 37 for information.

A summary of the PH WWTP liquid effluent concentrations and acute toxicity effluent monitoring results are provided in Appendix A.2, Table 38. For the purposes of comparing year over year effluent monitoring results for the past five-years, histogram charts are presented in

Appendix A.2, Figure 7, Figure 8, Figure 9, and Figure 10. Note that radium-226 results were not graphed, since reported analytical results above the method detection limit (0.005 Bq/L) are rarely reported. Cadmium, cobalt, phosphorus, and vanadium were not graphed since monitoring of these parameters began in 2023 May, and the limited data does not provide an effective trend analysis.

A review of the data from Figures 7 to 10 yields the following observations:

- Since PH WWTP operations began in 2017, reported final effluent discharge analytical results for licensed parameters trended downwards, and during the period of 2019 to 2021 were generally stable.
- Efforts in 2023 were focused on residual solids management. This effort resulted in overall influent water total dissolved solids concentration decreasing from a high of 14g/L early in 2023, to approximately 1 g/L by the end of 2023. This resulted in a decreasing trend of final effluent concentrations throughout 2023.

During the reporting period, there were no instances where effluent was found to be toxic.

9.2.3 Quality Assurance and Quality Control

To confirm the accuracy and precision of laboratory analyses, a quality control regime is followed. For the purposes of the environmental compliance, both duplicate and blank sampling is conducted:

- Duplicate samples are collected at a minimum frequency of once per month.
- Duplicate final effluent toxicity samples are collected each month. To prevent laboratory bias, the duplicate toxicity sample is sent to a different certified laboratory.
- Blank samples are collected at a minimum frequency of once every two months.

Sample nomenclature on Quality Assurance/Quality Control samples is blind in nature, ensuring that the analytical laboratory cannot determine the source of the sample.

Blank samples are created using laboratory grade deionized water or commercially available distilled water.

Beginning 2020 January, CNL changed the third-party commercial laboratory providing the analytical results. The current commercial laboratory generally has lower method detection limits for licensed parameters than the previous commercial laboratory. This can be readily observed for some parameters in the histograms presented in Appendix A.1 and A.2.

9.2.4 Regulatory Limit Exceedances and Environmental Contamination Incidents

All reportable events and proactive notifications, including spills to the environment, are summarized in Section 3.2.

During the reporting period, there was one event related to regulatory limits:

- On 2023 May 23, there was an exceedance of the Action Levels for copper and zinc from the PH WWTP.

During routine final effluent sampling, confirmatory laboratory analysis indicated elevated results for copper and zinc above their action levels. Upon discovery, the PH WWTP was reverted to internal recirculation, and effluent discharge was ceased. Several investigations were completed to determine the probable cause for the action level exceedances. The probable cause was determined to be the metallic components (cast iron, brass and bronze) that comprise the discharge and recirculation pumps and associated flow control components. Some degradation of these materials was occurring due to the deionized nature of the final effluent, contributing metallic elements into the final effluent stream. Additional infrastructure installed within the final effluent tank may also have contributed to the cross-contamination. Of the five corrective actions identified, four are completed. The remaining action is targeted for completion by 2024 July.

The reported event did not have an adverse effect on the health, safety and security of persons or the environment.

9.3 Operational Environmental Monitoring

The purpose of the operational environmental monitoring program is to ensure that the performance of the engineering components are operating as designed. The methodologies and protocols followed in performing the operational environmental monitoring are described in the *PGP Environmental and Biophysical Monitoring Plan* [36] and *Port Hope Project Environmental and Biophysical Monitoring Plan* [38].

The monitoring activities reported in this section were led by CNL, including the collection of field data. Laboratory analytical services were provided by an accredited laboratory under contract to CNL. The laboratories are accredited to the ISO 17025:2017 standard.

9.3.1 Operational Groundwater Monitoring

Operational groundwater wells are monitored to detect any migration of contaminants from the LTWMFs via the groundwater pathway and to further monitor the nature, extent, direction, or rate of change of such migration.

9.3.1.1 Port Granby Long-Term Waste Management Facility

During 2022, groundwater wells were installed at the PG LTWMF for Phase 3 monitoring. Implemented in 2023, groundwater wells were monitored on a quarterly basis. Groundwater monitoring is conducted as part of the Environmental Assessment (EA) follow-up program. The sampling results and discussion are provided in Section 9.4.3.1.

9.3.1.2 Port Hope Long-Term Waste Management Facility

Groundwater wells are sampled semi-annually (spring and fall) at nine (9) of the 22 locations as depicted in Appendix B.1, Figure 11. Additional groundwater monitoring is conducted as part of the EA follow-up program. The additional sampling results and discussion are provided in Section 9.4.3.1.

The results of the groundwater sampling are compared to the following:

- The water quality criteria for potable groundwater conditions listed in Table A2.5 of the *Port Hope Long-Term Low-Level Radioactive Waste Management Project* (PHP Screening Report) [46]. This is a conservative approach as groundwater is not potable on site. Continuation in the use of this criteria ensures consistency in reporting with previous years.
- Ontario's groundwater standards, specifically Table 3 Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition [47].

A summary of the results is provided in Appendix B.1, Table 39. The operational monitoring wells are monitored for arsenic, uranium and Ra-226 as well as for water levels. The analytical results are compared to averages from previous years to identify trends. In 2023, operational monitoring results were consistent with historical data (2019-2022).

Groundwater levels were measured quarterly in 2023. The average groundwater levels in monitoring wells are generally comparable to previous years.

Sentinel Wells

Groundwater samples are collected from the sentinel wells semi-annually (spring and fall) for the in-place management of arsenic under Cell 1 and Cell 2A/B. The results are compared to averages from previous years to identify trends [38], and to the CNL trigger level of 50 µg/L. The trigger level concentration for arsenic is established at 50% of the PWQO [50]. The trigger level is in place as the primary down gradient receptor of groundwater leaving the site is the tributary to Brand Creek (located west of the PH LTWMF).

The sampling results are provided in Appendix B.1, Table 40. In 2023, no groundwater results from the sentinel well monitoring exceeded the arsenic trigger level of 50 µg/L, and the levels remain consistent with the reporting from previous years.

9.3.2 Port Granby Project Groundwater Seepage Monitoring (Bluff)

Surface water 'seep' samples from the south bluffs at the former PG WMF are collected quarterly from three (3) locations along the Lake Ontario bluffs, as depicted in Appendix B.1, Figure 12.

The results of the bluff seepage sampling are compared to the following:

- The *Environmental Assessment Study Report for the Port Granby Project* [48]. According to the baseline predictions the bluff seepage to Lake Ontario is occurring at a rate of 51,100 m^3 per year. The seepage contains uranium (baseline concentration of 0.79 mg/L (790 µg/L)), arsenic (baseline concentration of 0.64 mg/L (640 µg/L)) and radium-226 (baseline concentration of 0.55 Bq/L).

- The *Port Granby Project Aquatic Environment Environmental Effects Assessment Report* [49]. Baseline concentrations for arsenic and uranium exceeded their respective interim Ontario's Provincial Water Quality Objectives (PWQO) values [50]. However, they did not exceed the lowest chronic values for the contribution of contaminants to Lake Ontario. These concentrations are expected to decrease after remediation is complete.
- The *Aquatic Environment Baseline Characterization Study for the Port Granby Project* [51]. The projected plume of arsenic and uranium associated with bluff seepage will cover a very small area (< 750 m^2), with most of the plume predicted to have contaminant concentrations equivalent to approximately 1% of the original concentration observed in the bluff seepage samples. The total contaminant plume to Lake Ontario remains very small. The seepage water quality is expected to improve now that the remediation of the PG WMF is complete and as natural attenuation occurs over time.

Results are provided in Appendix A.1, Table 41 to Table 43. Samples were not collected at two (2) locations due to elevated lake water levels (PG-S-1) and unsafe access conditions (PG-S-3). In 2023, elevated levels of arsenic and uranium were observed in the seepage water that were above the PWQO and/or the Canadian Council of the Ministers of the Environment (CCME) *Canadian Water Quality Guidelines for the Protection of Aquatic Life* (CWQG) [52]. Concentrations of some contaminants are slightly increased at PG-S-2 when compared to 2022 concentrations, but overall, concentrations have been decreasing since 2019.

9.3.3 Port Granby Project Sediment Monitoring

Sediment is sampled along the Lake Ontario shoreline near the areas of bluff seepage as depicted in Appendix B.3, Figure 13. The results are compared to the relevant parameters of Ontario's *Provincial Sediment Quality Guidelines* (PSQG) [53] and the CCME *Canadian Sediment Quality Guidelines for the Protection of Aquatic Life* [54], with consideration for the *Aquatic Environment Baseline Characterization Study for the PGP* [51].

Sediment in the near shore zones along the bluffs are susceptible to change after every storm event. The natural stratigraphy of the Port Granby bluffs makes them vulnerable to erosion from external factors (such as wave action) and internal factors (such as high pore water pressure). This natural vulnerability may lead to the brief deposition of near shore sediments with elevated levels of metals and radionuclides in Lake Ontario. The transient nature of near shore sediments in Lake Ontario may contribute to alternating exceedances and non-exceedances of metals compared to the PSQG [53]. Sediment quality is expected to improve over time as remediation of the PG site is complete.

Results are provided in Appendix B.3, Table 44 and Table 45. Samples were not collected at one (1) location (PG-BS-6) due to unsafe access conditions. In 2023, arsenic exceeded Ontario's PSQG [53] and the CCME *Canadian Sediment Quality Guidelines for the Protection of Aquatic Life* [54] at sampling location PG-BS-7. Arsenic exceeded the PSQG Lowest Effect Level and CCME Interim Sediment Quality Guidelines in the 2023 June sample and the PSQG Severe Effect

Level and CCME Probable Effect Level in the 2023 December sample. The 2023 results are consistent with previous years.

9.3.4 Port Granby Project Storm Water Management Pond Monitoring

The storm water management system consists of a series of storm water draining swales that direct non-impacted surface storm water (drainage water) runoff to the north and south storm water management ponds. The storm water management ponds provide water quality improvement and flow attenuation by means of engineered outlets. Discharge of the storm water occurs via draining swales to the north and south tributary, which discharge into Port Granby Creek.

Surface water is sampled monthly at two (2) storm water management ponds at the PG LTWMF, as depicted in Appendix B.4, Figure 14.

The results are compared to the PWQO [50] and the CWQG [52], with consideration for the *Screening Report for Port Granby Long-Term Low-Level Radioactive Waste Management Project* (PGP Screening Report) [55].

Results are provided in Appendix B.4, Table 46 and Table 47. In 2023, monitoring results were consistent with previous years. Three (3) exceedances of criteria were observed in 2023. In the north storm water pond (PG-PS1), arsenic exceeded the CWQG [52] in July and September. In the south storm water pond (PG-PS2), uranium exceeded the PWQO [50] in April. The elevated arsenic and uranium were not observed in the Port Granby Watershed, as discussed in Section 9.4.4.1.

9.3.5 Port Hope Project Residential Wells

The residential well sampling program is for voluntary primary residents of properties within Ward 1 of the Municipality of Port Hope, situated near the PH LTWMF.

During the reporting period, 16 residential properties participated in the annual program. Participating residents were provided with an analytical bottle set and instructions which follow best practices for sampling. The water collected is not preserved or field filtered for the safety of the residents who collect the sample. The samples are submitted to a third-party laboratory under chain of custody by CNL.

Samples were analysed for arsenic, radium-226, uranium and nitrate concentrations as well as for pH. Residents were notified in writing with the results. Nitrates exceeded the *Ontario Drinking Water Quality Standards* [56] at one property. The exceedance is attributed to the agricultural processes taking place in the general vicinity of the PH LTWMF. The exceedance of nitrates has been noted historically at this property and before remedial activities occurred at the PH LTWMF.

9.4 Environmental Effects Monitoring

The purpose of an environmental effects monitoring program, known as the EA follow-up program, is to verify the accuracy of the EA predictions for the project, and determine the effectiveness of measures taken to mitigate any potential adverse environmental effects. The specific objectives of the EA follow-up program are outlined in the *PGP Screening Report* [55] and the *PHP Screening Report* [46].

The EA follow-up program is structured using a framework of six sub-programs. These programs collectively incorporate all the individual activities required for tracking the follow-up actions prescribed in the *PGP Screening Report* [55] and the *PHP Screening Report* [46]. These programs include the following biophysical elements:

- Atmospheric Environment: Includes monitoring for air quality, noise, radon, and radiological effects.
- Geology and Groundwater Environment: Includes monitoring of soil quality, groundwater quality and groundwater flow.
- Aquatic Environment: Includes monitoring of sediment quality and surface water quality.

The details of the program are established in [36] and [38].

The information provided in this section was collected during the 2023 reporting period. An update of all the EA commitments for the biophysical effects follow-up monitoring are summarized for the PGP and the PHP in Appendix C, Table 48 and Table 49 respectively.

9.4.1 Methodology

The monitoring activities reported in this section were led by CNL, including the collection of the field data. The methodologies used and protocols followed in performing the environmental monitoring are described in [36] and [38]. Analytical services were provided by an external laboratory accredited to ISO 17025:2017.

9.4.2 Atmospheric Environmental Monitoring

The prescribed EA follow-up monitoring activities in the atmospheric environment include elements associated with air quality (radiological and non-radiological parameters), odour and noise monitoring.

Air quality refers to the chemical and physical characteristics of the air shed. Air quality monitoring is intended to identify concentrations of suspended particulate that may have been caused by project activities.

9.4.2.1 Air Quality - Total Suspended Particulate and Particulate Matter

CNL monitors both air quality at work sites and in the near vicinity to ensure that mitigation measures to reduce dust and radon at work sites and at the PH LTWMF are effective. Air quality monitoring addresses concentrations of two types of suspended particulate that could potentially be related to project activities:

- Total Suspended Particulate (TSP) comprising particle sizes < 44 µm in diameter.
- Particulate Matter 2.5 µm ($PM_{2.5}$) comprising particulate matter with particle sizes < 2.5 µm in diameter.

Results are compared to limits defined in the *PHAI Dust Management and Requirements Plan* [39]. The same criteria for TSP are found in Ontario's *Ambient Air Quality Criteria* (AAQC) [57]. In 2012, the CCME adopted the Air Quality Management System as a new comprehensive approach to managing air issues [58]. *Canadian Ambient Air Quality Standards for Fine Particulate Matter* ($PM_{2.5}$) are included, which replace the Canada-wide standards developed in 2000. A 2020 value of 27 µg/m^3 is used for $PM_{2.5}$.

In addition, results are compared to relevant predictions made in the *PHP Screening Report* [46]. It was predicted that the 24-hour AAQC [57] will be exceeded on occasion for arsenic and cobalt at off-site locations. It was predicted that $PM_{2.5}$ will exceed the 24-hour AAQC [57] at some off-site locations.

Additional Analysis (Metals and Radionuclides)

Additional analysis is conducted on the samples containing the highest net weight of TSP collected each week at the high-volume (Hi-Vol) monitoring stations. These samples are analyzed to determine the concentration of metals and radionuclides in the suspended dust.

The results of the additional analysis are compared to relevant predictions made in the *PHP Screening Report* [46]. It was predicted that the 24-hour AAQC [57] will be exceeded on occasion for arsenic and cobalt at off-site locations. It was predicted that the levels of radionuclides would be below Health Canada Reference values. The predicted values were based on modelled PM_{10} concentrations. Comparing particulate radioactivity on TSP filters to the modelled predictions is applying a conservative approach.

Results of the 2023 monitoring are summarized by location in the following sub-sections.

PH LTWMF

Hi-Vol air samplers are operated for a 24-hour period with the sampling media (filters) changed daily, at four (4) locations as depicted in C.1, Figure 15. Note that at the Northwest Welcome location, low-volume (MiniVol) air samplers for TSP and $PM_{2.5}$ were deployed from 2023 April 06 to 2023 August 29 due to electrical issues that prevented the use of the Hi-Vol air sampler. In this case, concentrations of particulate in the filters were assumed to be $PM_{2.5}$, which provides a conservative approach.

A summary of the results for TSP and $PM_{2.5}$ is provided in Appendix C.1, Table 50 to Table 58.

Total Suspended Particulate

In 2023, the Overriding Limit of 120 µg/m^3 for TSP [39] was exceeded. The observed exceedances were attributed to the poor air quality between 2023 June to September due to wildfires in northern Ontario.

Particulate matter ($PM_{2.5}$)

The $PM_{2.5}$ results (98th percentile averaged over three years (2021, 2022 and 2023)) are compared to 27 µg/m^3 as a proactive approach to current industry guidelines. The $PM_{2.5}$ values were above the value of 27 µg/m^3 at the 192 Toronto Road, Welcome South and Weather Station monitoring locations for the PH LTWMF. The exceedances of the 98th percentile were attributed to wildfires in northern Ontario and poor air quality between 2023 June to September.

Additional Analysis (Metals and Radionuclides)

The results of the additional analysis are provided in Appendix C.1, Table 55 to Table 58. In 2023, there were no exceedances of the AAQC [57]. Radium-226 and thorium-232 exceeded the predicted values for some of the filters in 2023; however, they remained well below the Health Canada reference values. Note that the exceedances of the predicted values are related to laboratory detection limits (that is, uncalculated laboratory results were less than the limit of detection for radium-226 and thorium-232).

In 2023, there were exceedances of the *PHP Screening Report* [46] predicted values for uranium on some of the filters. The increasing trend in uranium in TSP from 2020 is due to a laboratory contract change that occurred in 2020 January resulting in an increase in the overall detection limit. Also, during 2023, poor air quality in Ontario due to wildfires from June to September contributed to the exceedances. As a result, there were a few detectable concentrations of uranium observed. Uranium concentrations remained well below the Health Canada reference values.

Highland Drive Landfill and Vicinity Sites

Hi-Vol air samplers are operated for a 24-hour period with the sampling media (filters) changed daily, at three (3) locations as depicted in Appendix C.1, Figure 16. In 2023, MiniVol samplers were deployed at two (2) locations (Cavan Candies and Jack Burger) due to ongoing electrical issues with the Hi-Vol air samplers. In this case, concentrations of particulate in the MiniVol filters were assumed to be $PM_{2.5}$, which provides a conservative approach.

A summary of the results for TSP and $PM_{2.5}$ is provided in Appendix C.1, Table 59 to Table 63.

Total Suspended Particulate

In 2023, the Overriding Limit of 120 µg/m^3 for TSP [39] was exceeded at the Highland Drive Landfill site. The observed exceedances were attributed to the poor air quality between 2023 June to September due to wildfires in northern Ontario.

Particulate matter ($PM_{2.5}$)

The $PM_{2.5}$ results (98th percentile averaged over three years (2021, 2022 and 2023)) are compared to 27 µg/m^3 as a proactive approach to current industry guidelines. The $PM_{2.5}$ values were above the value of 27 µg/m^3 at the Cavan Candies, Jack Burger and High School monitoring locations around the Highland Drive site. The exceedances of the 98th percentile were attributed to wildfires in northern Ontario and poor air quality between 2023 June to September.

Additional Analysis (Metals and Radionuclides)

The results of the additional analysis are provided in Appendix C.1, Table 64 to Table 66.

In 2023, there were no exceedances of arsenic or cobalt. There were no exceedances of the AAQC [57] in 2023. Radium-226 and thorium-232 exceeded the predicted values for some of the filters in 2023; however, they remained well below the Health Canada reference values. Note that the exceedances of the predicted values are related to laboratory detection limits (that is uncalculated laboratory results were less than the limit of detection for radium-226 and thorium-232).

In 2023, there were exceedances of the *PHP Screening Report* [46] predicted values for uranium on some of the filters. The increasing trend in uranium for TSP from 2020 is due to a laboratory contract change that occurred in 2020 January resulting in an increase in the overall detection limit. Also, during 2023, poor air quality in Ontario due to wildfires from 2023 June to September contributed to the exceedances. As a result, there were a few detectable concentrations of uranium observed. Uranium concentrations remained well below the Health Canada reference values.

Lions Park Recreational Centre

MiniVol air samplers were operated for a 24-hour period with the sampling media (filters) changed daily, at one (1) location as depicted in Appendix C.1, Figure 16. Monitoring in 2023 took place between April and December to align with the remediation activities. The MiniVol samplers were deployed at the Lions Park Recreational Centre sample locations due to ongoing electrical issues that prevented the use of Hi-Vol air samplers.

A summary of the results for TSP and PM_{2}.5 is provided in Appendix C.1, Table 67.

Total Suspended Particulate

In 2023, the Overriding Limit of 120 µg/m^3 for TSP [39] was exceeded at the Lions Park Recreational Centre site. The observed exceedances were attributed to the poor air quality between 2023 June to September due to wildfires in northern Ontario.

Particulate matter ($PM_{2.5}$)

In 2023, the value of 27 µg/m^3 for the 98th percentile for $PM_{2.5}$ was exceeded at the Lions Park Recreational Centre site. The $PM_{2.5}$ results (98th percentile) were averaged over one year due to a limited data set. The observed exceedance was attributed to the poor air quality between 2023 June to September due to wildfires in northern Ontario.

9.4.2.2 Air Quality - Independent Dust Monitoring

In accordance with the *PHAI Dust Management Requirements and Plan* [39], an independent dust monitoring program is executed by a third party. The third-party monitoring is conducted in addition to that conducted by the prime contractor and CNL, to ensure that perceived organizational conflicts regarding dust monitoring results and work activities are avoided. Continuous monitoring occurs during work hours, and results are reported in 15-minute intervals.

The independent dust monitoring contractor uses real-time dust monitors to measure TSP at the work site perimeter. The *PHAI Dust Management Requirements and Plan* [39] identifies the CNL action level for a TSP monitor reading at the work site perimeter to be > 120 µg/m^3 averaged over 15 minutes. An exceedance of a dust action level triggers an immediate response by CNL and the prime contractor to initiate corrective action(s) to reduce dust levels, however, it is not an action level as defined by the CNSC and is not a reportable event.

Monitoring by the independent dust monitoring contractor is completed at the PH LTWMF and Highland Drive Landfill.

Results for the reporting period are discussed by location in the following sub-sections.

PH LTWMF

Real-time dust monitoring results from the independent dust monitoring program for the PH LTWMF is available at PHAI.ca. The weekly reports include daily real-time dust measurements and a site map illustrating the locations of the independent real-time dust monitors.

In 2023, there were no instances when the 15-minute average exceeded the action level of 120 µg/m^3 attributable to on-site sources.

Highland Drive Landfill

In 2023, there were no instances when the 15-minute average exceeded the action level of 120 µg/m^3 attributable to on-site sources.

9.4.2.3 Air Quality - Volatile Organic Compound Monitoring

Volatile organic compound samples are collected weekly at the Chemetron Lagoon, Highland Drive Landfill, and at the Port Hope Harbour during dredging activities. Summa canisters are placed at two (2) locations, upwind and downwind of the activities. Note that dredging activities are not continuous.

The sampling results are compared to Ontario's AAQC [57] 24-hour average. The results are provided in Appendix C.1, Table 68 to Table 73.

In 2023, four (4) exceedances of the Ontario AAQC [57] 24-hour average were observed. The first exceedance was observed in 2023 March at the Port Hope Harbour (upwind and downwind locations). The second exceedance was observed in 2023 July at the Chemetron Lagoon site (upwind and downwind locations). The third exceedance was observed in 2023 August at the Port Hope Harbour (downwind location). The fourth exceedance was observed in 2023 August at the Highland Drive Landfill (upwind and downwind locations). No on-site source(s) for the exceedances were observed.

9.4.2.4 Air Quality - Ambient Radon and Radon Progeny

In accordance with the *PHAI RP Plan* [30], CNL monitors air for radon and radon progeny to ensure that measures to reduce radon at the LTWMF facilities and remediation sites are effective. Radon detectors known as alpha track (or equivalent) are used for sampling radon in accordance with [36] and [38].

The *PHAI RP Plan* [30] establishes an internal trigger level of 150 Bq/m^3 averaged over the time the radon monitor was deployed.

PG LTWMF

Radon is monitored monthly or quarterly at the following locations, as depicted in Appendix C.1, Figure 18:

- PG LTWMF (4 locations)
- PG South (3 locations)
- PG Community (3 locations)
- PG Engineered Containment System (8 locations)

Phase 3 monitoring will occur for the next one to two years. Additional monitoring locations were added directly around the PG engineered containment system. Following this monitoring period, a review of results will determine a reduced frequency or termination of monitoring for the remainder of Phase 3.

A summary of radon monitoring results, including background values, are provided in Appendix C.1, Table 74. In 2023, the maximum radon concentration in the PG Community was 33 Bq/m^3 which is below the environmental trigger level for radon 150 Bq/m^3.

PHP

Radon is monitored monthly or quarterly at the following locations:

- PH LTWMF (5 locations), as depicted in Appendix C.1, Figure 19
- PH Community (Within a 2 km radius of PH LTWMF) (4 locations), as depicted in Appendix C.1, Figure 19
- Locations where remedial activity lasts longer than one month:

   - Port Hope Centre Pier and Harbour (5 locations)
   - Highland Drive Landfill (4 locations)
   - Waterworks West (West Beach) (4 locations)

Radon was monitored in the first quarter of 2023, and was ceased due to the removal of LLRW, at the following locations:

- Pine Street Extension Consolidation Site South (3 locations)
- Strachan Street Consolidation Site (3 locations)

A summary of the radon monitoring results, including background values, are provided for the PHP in Appendix C.1, Table 75. In 2023, the maximum radon concentration in the PH Community was 67 Bq/m^3 which is below the environmental trigger level for radon 150 Bq/m^3.

Pine Street Extension Temporary Storage Site

Radon monitoring activities were conducted quarterly at four (4) locations at the Pine Street Extension Temporary Storage Site as described in the *Port Hope Licensed Sites Environmental Monitoring Program Specifications* document [59]. Four (4) background locations are also monitored. The results are compared to the trigger level of 150 Bq/m^3 as defined in the *Environmental Parameters Investigative and Corrective Measures Thresholds for Environmental Monitoring of WNSL-W1-182 Licensed Activities* document [60].

The sampling results are provided in Appendix C.1, Table 76. During the 2023 sampling period, no individual quarterly measurements exceeded the radon in air trigger level of 150 Bq/m^3, at any of the Pine Street Extension Temporary Storage Site or Port Hope background locations. The 2023 average radon concentration at the Pine Street Extension Temporary Storage site was 28.4 Bq/m^3. The observed radon concentrations pose no risk to employees, the public or the environment.

9.4.2.5 Odour Monitoring

Odour sampling occurs at upwind and downwind residential receptor locations in the vicinity of the Highland Drive Landfill and Port Hope Harbour remediation sites.

The higher the dilution-to-threshold (D/T) ratio, the stronger the odours. In general, odour annoyance resulting in complaints can be expected when ambient odour concentrations reach a level 5 times the threshold value (5 D/T). Based on the general understanding that odour annoyance for the most offensive odours begins at about 5 D/T, this is applied as the threshold level above which mitigation measures are triggered or assessed for effectiveness [36].

Results for the reporting period are discussed by location in the following sub-sections.

Highland Drive Landfill

In 2023, odour samples were collected twice daily during waste removal at the Highland Drive Landfill. Note that waste removal is not continuous. There were no instances when the threshold value of 5 D/T was reached during waste removal at the Highland Drive Landfill off-site receptors.

Port Hope Harbour

In 2023, odour samples were collected twice daily during the sediment dredging and dewatering activities at the Port Hope Harbour. Note that these activities were not continuous. There were no instances when the threshold value of 5 D/T was reached during sediment dredging and dewatering activities at the Port Hope Harbour off-site receptors.

9.4.2.6 Noise Monitoring

Noise is generally defined as unwanted sound. Noise monitoring is conducted by measurement of sound levels at the remediation sites to confirm compliance with appropriate by-laws and regulations (*World Health Organization's Guideline for Community Noise* (WHO Guideline for Community Noise) [61]. Qualitative criteria for noise impacts are also used to assess measured increases above the background sound levels. The results are compared to predictions made in the *PHP Screening Report* [46].

Results for the reporting period are discussed by location in the following sub-sections.

PH LTWMF

Sound level data is collected quarterly at several locations as depicted in Appendix C.1, Figure 20. For residents adjacent to the PH LTWMF during construction and development, the noise levels were predicted to increase by approximately 12 decibels (dBA) [46]. In addition, results are compared to baseline data that was collected in 2015 when the level of activity around the site was comparatively low.

The results of the noise monitoring campaigns, averaged logarithmically over three working days, are provided in Appendix C.1, Table 77. The 2023 results are similar to 2022. In 2023, a slight increase of 2 to 3 dBA was observed. All values were below the *WHO Guideline for Community Noise* [61] level of 70 dB over a 24-hour period.

Northern, Central and Southern Transportation Routes

Spot sound level data is collected at 1-hour intervals morning and evening seasonally, during peak transportation activities on the PHP transportation routes. The monitoring locations are depicted in Appendix C.1, Figure 21. Sound levels from increased truck traffic on the designated transportation routes were predicted to increase by approximately 1 to 2 dBA [46]. In addition, results are compared to the revised baseline data that was collected in 2018 before the transportation routes were being used by CNL.

The results of the noise monitoring campaigns, averaged logarithmically over three working days, are provided in Appendix C.1, Table 78. The 2023 monitoring results for the southern and northern transportation routes showed little to no increase from the 2018 baseline monitoring data. The central transportation route showed an increase in the 2023 monitoring period when compared to the 2018 baseline data. All values were below the *WHO Guideline for Community Noise* [61] level of 70 dB over a 24-hour period.

Highland Drive Landfill and Vicinity Sites

Sound level data is collected at three (3) locations around the Highland Drive and vicinity sites as depicted in Appendix C.1, Figure 22. Sound levels were predicted to increase by approximately 5 to 10 dBA.[46].

The results of the noise monitoring campaign averaged logarithmically over three working days, are provided in Appendix C.1, Table 79. In comparing 2023 results to the 2020 baseline results, the following observations were made:

- A decrease of 5 dBA was observed at location HD-N-0001
- An increase of 4 dBA was observed at location HD-N-0002
- A decrease of 2 dBA was observed at location HD-N-0003

All values were below the *WHO Guideline for Community Noise* [60] level of 70 dB over a 24-hour period.

9.4.3 Geology and Groundwater Monitoring

The prescribed monitoring activities in the geology and groundwater environment include elements associated with groundwater flow and quality, drainage water quality, and soil quality.

9.4.3.1 Groundwater (Flow and Quality) Monitoring

Groundwater flow and quality monitoring is performed quarterly at the PG LTWMF [36] and twice per year at both the PH LTWMF and the Highland Drive site [38]. The monitoring results are compared against:

- The applicable water quality criteria for potable groundwater conditions listed in the *PGP Screening Report* [55] and the *PHP Screening Report* [46]. Onsite water is not potable. This conservative approach is taken to ensure consistency with reporting from previous years.
- Ontario's groundwater standards, specifically Table 3 - Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition (Ontario's Table 3 Standard) [47].

Monitoring of the groundwater conditions continue through Phases 2 and 3 of the project, and improvements to groundwater quality are expected to occur as the site is remediated. Once remediated, the groundwater in the vicinity and downgradient of the landfill will naturally attenuate.

Results for the reporting period are discussed by location in the following sub-sections.

PG LTWMF

During the reporting period, groundwater wells were sampled quarterly at 65 locations, in conjunction with the measurement of groundwater static levels, as depicted in Appendix C.2, Figure 23.

Results are provided in Appendix C.2, Table 80 to Table 134.

In 2023, five (5) exceedances of the criteria identified in the *PGP Screening Report* [55] were observed at five (5) locations as follows:

- At location PG-MW3A-02, which is the site's most northerly well, an exceedance of the criteria for barium was observed. This observation is consistent with monitoring data collected in previous years. As groundwater in the region generally flows south towards Lake Ontario, these exceedances are likely originating from an alternative source; exceedances were not observed at any of CNL's other monitoring wells or surface water monitoring in Port Granby Creek or Lake Ontario Watershed (9.4.4.1).
- At location PG-BH214-22, which is located in the centre of the former PG WMF, an exceedance of the criteria for arsenic was observed. The values are consistent with the bluff seepage sampling results (9.3.2).
- At locations PG-MW6C-22 and PG-MW10A-22, which are located at the edge of the shoreline bluffs, exceedances of the criteria for uranium was observed. The values are consistent with the bluff seepage sampling results (9.3.2).
- At location PG-MW15D-22, an exceedance of the criteria for arsenic was observed. CNL continues to investigate the source of the elevated arsenic.

In 2023, groundwater levels were measured quarterly. Average groundwater levels are comparable to previous years.

PH LTWMF

During the reporting period, groundwater wells were sampled semi-annually at 22 locations, as depicted in Appendix B.1, Figure 11. Results are provided in Appendix C.2, Table 135 to Table 156. Additional groundwater monitoring is conducted as part of the Operational Environmental Monitoring program. The additional sampling results and discussion are provided in Section 9.3.1.2.

In 2023, samples collected from location WC-MW3A-11R exceeded the criteria for barium in both monitoring campaigns. Exceedances for barium have been observed in previous years and were present before construction of the PH LTWMF. As monitoring of groundwater conditions continues through Phases 2 and 3 of the project, improvements to groundwater quality are expected to occur as the portions of the legacy site are remediated, and through natural attenuation.

Groundwater levels are measured quarterly. In 2023, average groundwater levels are comparable to previous years.

Highland Drive Landfill

Remediation activities were initiated at the Highland Drive Landfill site in late 2022. During the reporting period, groundwater wells were sampled semi-annually at 22 of the 41 locations depicted in Appendix C.2, Figure 24. The disparity in the number of sampling locations is due to the following factors:

- Some groundwater wells were abandoned and decommissioned to allow for remediation of the Highland Drive Landfill site.
- Some groundwater wells were damaged and could not be sampled.
- Some groundwater wells had elevated radon levels.

Effects on groundwater quality are expected to be minimal and slow to develop. The data collected during Phase 2 can be considered to complement the baseline water quality data. The data will be used to establish a typical range of groundwater parameter concentrations for each monitoring well, in order to verify the effectiveness of the remedial efforts.

Results are provided in Appendix C.2, Table 157 to Table 176.

In 2023, uranium exceedances were noted at ten (10) locations. Arsenic exceeded at two (2) locations. Exceedances of uranium and arsenic are the result of the effects of the LLRW wastes comingled with the municipal solid wastes at the Highland Drive Landfill site. In Phase 3, an installation of a permeable reactive barrier downgradient of the Highland Drive Landfill in the Highland Drive South Ravine will also assist with the remediation of the contaminants in the groundwater.

Groundwater levels are measured quarterly. In 2023, of the 22 wells available for monitoring, 12 had calculated water levels; reference groundwater elevation data was not available for 10 wells.

9.4.3.2 Soil Monitoring

Soil sampling is conducted annually to determine if there has been an increase in contaminant concentrations as a result of windblown dust deposition. Soil sampling activities involve the collection of surface soil samples from off-site perimeter locations around the PG LTWMF, the PH LTWMF, and the Highland Drive remediation site and analyzed for metals and radionuclides.

The soil samples consist of a composite sample that is composed of a minimum of five (5) individual samples. The samples are retrieved from within a 10 m radius of the target sampling location from a 0-5 cm depth, after removal of the grass layer. They are homogenized and used to create the composite sample for each of the required sampling locations.

The results are compared to previous years and predictions made in:

- The *PGP Screening Report* [55]. No likely residual adverse effects to soil quality were predicted, with the exception of thorium-230. Thorium-230 was expected to increase 38% in concentration over baseline.

- The *PHP Screening Report* [46]. Maximum concentrations of arsenic and cobalt at the perimeter of the PH LTWMF were predicted to be 4.7 µg/g and 6.67 µg/g, respectively. During construction of the PH LTWMF, mean concentrations of thorium-230 were predicted to be 97.7 Bq/kg (0.0977 Bq/g), and maximum concentrations to be 41.9 Bq/kg (0.1419 Bq/g).

Results for the reporting period are discussed by location in the following sub-sections.

PG LTWMF

Soil samples are collected annually at five (5) locations as depicted in Appendix B.4, Figure 14. The results are provided in Appendix C.2, Table 177 to Table 181. In 2023, soil located around the PG LTWMF site were sampled and analyzed for metals and radionuclides. Soil concentrations in 2023 have remained consistent with baseline data and monitoring data from previous years.

PH LTWMF

Soil samples are collected annually at five (5) locations as depicted in Appendix C.2, Figure 25. The results are provided in Appendix C.2, Table 182 to Table 186. In 2023, the concentration of arsenic exceeded the predicted concentration at one (1) location (PH-WWMF-SS-05). The concentrations of arsenic were below predicted at the remaining four (4) sampling locations. Values above the predicted concentrations have been observed in previous years at PH-WWMF-SS-05. Thorium-230 concentrations in 2023 are above the predicted mean and maximum values at some locations due to the laboratory detection limits.

Highland Drive Landfill

Soil samples are collected annually at two (2) locations as depicted in Appendix C.2, Figure 26. The results are provided in Appendix C.2, Table 187 and Table 188. In 2023, results are similar to data collected in previous years, including the baseline data.

9.4.4 Aquatic Environmental Monitoring

The Aquatic Environmental Monitoring Program includes sampling surface water to verify the accuracy of the predictions made during the EA. The expected long term environmental effect from the PHAI is improved surface water quality. Improvements are expected due to the decrease in the contaminated water that currently infiltrates from the underlying groundwater, and eventually discharges to the surface water. In addition, a considerable reduction in contaminant loading from the discharged leachate from the PG LTWMF and the PH LTWMF is considered a long-term beneficial environmental effect of the PHAI. Slight increases are expected during Phase 2.

Results for the reporting period are discussed by location in the following sub-sections.

9.4.4.1 Port Granby Long Term Waste Management Facility Watershed

Surface water samples are collected quarterly at the locations depicted in Appendix B.4, Figure 14. Results are compared to the PWQO [50] and CWQG [52] (where available) and to predictions made in the *PGP Screening Report* [55].

Port Granby Creek Surface Water Quality

The water flowing in Port Granby Creek is sampled at two (2) locations: upstream and downstream of the PG LTWMF. The *PGP Screening Report* [55] predicted no measurable change to Port Granby Creek surface water quality as a result of the project.

The results are provided in Appendix C.3, Table 189 and Table 190. In 2023, no changes in water quality were observed.

Port Granby Creek Storm Event Sampling

In 2023, Port Granby Creek was monitored during one storm event in June. The results are provided in Appendix C.3, Table 191. The contaminant concentrations were observed to peak as TSS increased. TSS concentrations at the peak of the storm event were 350 mg/L, compared to 20 mg/L as the storm event sampling commenced. As TSS levels increased, cobalt and vanadium were observed to exceed the PWQO [50]. Historically, cobalt and vanadium have exceeded the PWQO [50] in both the upstream and downstream monitoring locations.

Lake Ontario Surface Water Quality

The surface water of Lake Ontario is sampled on a quarterly basis (if safely accessible) at three (3) locations: as depicted in Appendix B.4, Figure 14, to verify that the water quality in the vicinity of the diffuser discharge and the associated mixing zone is not affected by operations of the PG LTWMF. The surface water is sampled is conducted at the diffuser (location PG-LO-D), and approximately 20 m east and west of the diffuser (locations PG LO-E and PG-LO-W respectively). The *PGP Screening Report* [55] predicted that there will be a long-term improvement and reduced contaminant loading to Lake Ontario as a result of the project.

In 2023, samples were not collected for the winter season due to unsafe boating conditions on Lake Ontario. The results are provided in Appendix C.3, Table 192, Table 193 and Table 194. In 2023, there no exceedances were observed. Results have remained consistent with mixing zone monitoring data, illustrating that water quality at the diffuser is not affected by current operations.

Port Granby Long Term Waste Management Facility Drainage Water

Drainage water is sampled semi-annually at one (1) location, as depicted in Appendix B.4, Figure 14. The results are compared to the PWQO [50] and the CWQG [52], and predictions made in the PGP Screening Report [55]. The *PGP Screening Report* [55] predicted no measurable changes in quality or quantity of drainage water as a result of the project.

The results are provided in Appendix C.3, Table 195. In 2023, no exceedances were observed. Results were consistent with monitoring data over the last few years and the predictions made in the *PGP Screening Report* [55].

9.4.4.2 Port Hope Long Term Waste Management Facility Watershed

Surface water samples are collected quarterly at seven (7) locations as depicted in Appendix C.3, Figure 27. Results are compared to the PWQO [50] and CWQG [52] (where available) and predictions made in the *PHP Screening Report* [46]. It was predicted that the removal of contaminated material from the remediation sites will result in improvements to down-gradient surface water quality.

Brand Creek Surface Water Quality

The results are provided in Appendix C.3, Table 196 to Table 199. In 2023, two (2) exceedances of the PWQO [50] were observed for uranium and cobalt in the January and April samples at the Brand Creek tributary (location BC-T). This tributary is fed mainly by Clark’s Ditch, which receives surface water runoff from the PH LTWMF. Exceedances for uranium and arsenic have been observed in previous years, as well as during the baseline assessment. The water quality of this tributary is expected to improve over time as remediation progresses. All other results are consistent with the pre-construction baseline monitoring data from 2016, suggesting that the construction of the PH LTWMF is not having an adverse effect on Brand Creek water quality.

Brand Creek Storm Event Monitoring

In 2023, Brand Creek was monitored during one (1) storm event in February. The results are provided in Appendix C.3, Table 200. The contaminant concentrations were observed to peak as TSS increased. TSS concentrations at the peak of the storm event were 606 mg/L, compared to 23 mg/L as the storm event sampling commenced. As TSS levels increased, cobalt, vanadium and zinc were observed to exceed the PWQO [50].

Lake Ontario Surface Water Quality

The surface water of Lake Ontario is sampled on a quarterly basis (if safely accessible) at three (3) locations: the diffuser (location BC-LO-D), and approximately 20 m east and 20 m west of the diffuser (location BC-LO-E and BC-LO-W respectively). Surface waste sampling is conducted to verify that the water quality in the vicinity of the diffuser discharge and the associated mixing zone is not affected by operations of the PH LTWMF. The *PHP Screening Report* [46] predicted that there will be a long-term improvement and reduced contaminant loading to Lake Ontario as a result of the project.

The results are provided in Appendix C.3, Table 201 to Table 203. In 2023, there were no observed exceedances of PWQOs [50] or CWQGs [52]. The results were generally consistent with monitoring data over the last few years, suggesting that current operations have not had an adverse effect on water quality. The results from location BC-LO-D, relative to the mixing zone samples (BC-LO-E and BC-LO-W) were also comparable, suggesting that water quality at the diffuser is not affected by current operations.

Port Hope Long Term Waste Management Facility Drainage Water

The drainage water (storm water and leachate) from the PH LTWMF engineered containment system is collected in the on-site treatment ponds semi-annually at four (4) locations, as depicted in Appendix C.3, Figure 28.

The results are provided in Appendix C.3, Table 204 to Table 206. A data table is not provided for location WC-SW4-02. It was not sampled in 2023 and the previous four years due to an insufficient volume of water. Historically, this location has intermittent drainage water present, and samples cannot always be collected. In 2023, exceedances of PWQOs [50] or CWQGs [52] for arsenic, copper, lead, uranium, aluminum, boron and zinc were observed at two (2) locations (WC-SW3-02 and WC-SW5-02). An exceedance of uranium was observed at one (1) location (WC-SW6-02). The 2023 results are consistent with the baseline assessment. Changes in drainage water quality and volume were expected to occur after remediation work commenced. Drainage water at the PH LTWMF is treated before it is released to the environment.

9.4.4.3 Port Hope Project Highland Drive Landfill Watershed

Brewery Creek Surface Water Quality

Surface water samples are collected quarterly at two (2) locations, one upstream (GRT-3) and one downstream (GRT-3B), as depicted in Appendix C.3, Figure 29.

The results are provided in Appendix C.3, Table 207 and Table 208. In 2023, no exceedances of the PWQOs [50] or CWQGs [52] were observed.

Highland Drive South Creek Surface Water Quality

Highland Drive South Creek is subject to the influences of the Highland Drive Landfill as it is located downgradient. As discussed in the *Port Hope Project Environmental Assessment Study Report* (PHP EA Study Report) [62], the evaluation of water quality changes in Highland Drive South Creek are based on expected changes in loadings from groundwater and would not increase during site remediation. The concentrations of key contaminants (uranium and arsenic) are expected to decrease by between 78% and 88% in the longer term.

The water flowing in Highland Drive South Creek is sampled quarterly at two (2) locations (one upstream (HC-U) and one downstream (HC-D)), as depicted in Appendix C.3, Figure 30.

The results are provided in Appendix C.3, Table 209 and Table 210. In 2023, pre-construction monitoring took place. In 2023, exceedances of the PWQO [50] or CWQG [52] were observed for arsenic, boron, and uranium at both the upstream and downstream locations in all four sampling campaigns. Results are consistent with the results from the baseline sampling in 2013.

Highland Drive South Creek Storm Event Monitoring

In 2023, Highland Drive South Creek water quality was monitored during one (1) storm event in June. One (1) sample per hour for six hours was collected for a total of six (6) samples. The results are provided in Appendix C.3, Table 211.

The contaminant concentrations were observed to peak as TSS increased. TSS concentrations at the peak of the storm event were 7 mg/L, compared to 2 mg/L as the storm event sampling commenced. As TSS levels increased, arsenic, boron and uranium were observed to exceed the PWQOs [50] and/or CWQGs [52]. Concentrations subsequently reduced as TSS levels declined. COPC concentrations associated with the source of contamination are predicted to decline in surface water once the remediation of the Highland Drive Landfill is complete.

9.4.4.4 Alexander Street Ravine Watershed

Alexander Creek Surface Water Monitoring

Surface water samples are collected quarterly at two (2) locations (upstream (AC-1) and downstream (AC-3)) as depicted in Appendix C.3, Figure 31.

The results are provided in Appendix C.3, Table 212, and Table 213. In 2023, pre-construction monitoring took place. The results were less than the PWQO [50] and CWQG [52] with the exception of uranium at the downstream location (AC-3), and lead, copper, vanadium and zinc at the upstream location (AC-1). The uranium exceedances were observed in all four sampling campaigns in 2023. Uranium has historically exceeded in Alexander Creek, likely due to the influence of buried deposits of LLRW within the Alexander Street Ravine. These localized areas of contamination are scheduled for remediation in 2024.

9.4.4.5 Port Hope Harbour

In 2023 August a fish mortality event took place within the inner Port Hope Harbour. Based on the results of CNL's investigation, CNL concluded that the fish mortality event was not related to the remediation activities or associated restoration works in the Port Hope Harbour. This event was reported to required regulatory agencies as discussed in Section 3.2.2.

The Lake Ontario surface water is sampled quarterly at three (3) locations in the Port Hope Harbour as depicted in Appendix C.3, Figure 32. During the periodic dredging operations at the Port Hope Harbour, surface water is sampled weekly at two (2) locations, as depicted in Appendix C.3, Figure 33.

The results are compared to previous years and predictions made in the *PHP Screening Report* [46]. The following predictions were made:

- Concentrations of uranium are predicted to increase in the area between the harbour and the Ganaraska River.
- Once contaminated sediment is removed from the harbour, water quality is predicted to improve [62].

- Predictions from the *PHP EA Study Report* [62] used theoretical/predicted data inputs to a model. Actual conditions related to daily inputs of water to the inner harbour during dredging have resulted in a different set of conditions, requiring that the proposed EA mitigation measures be modified. CNL engaged Responsible Authorities to ensure a path forward for the protection of Lake Ontario and the Ganaraska River. This has resulted in the creation of a robust monitoring program to ensure the protection of the aquatic environment while dredging activities continue at the Port Hope Harbour.

Lake Ontario Surface Water Quality

The results are provided in Appendix C.3, Table 214 to Table 216. In 2023, concentrations of arsenic, uranium, lead, cobalt, and copper were observed to exceed the PWQO [50] and CWQG [52] at one (1) location (PHH-2). There were no exceedances of the PWQO [50] and/or CWQG [52] at locations PHH-1 or PHH-4, demonstrating that there were no impacts to Lake Ontario or Ganaraska River surface water quality.

Lake Ontario Surface Water Quality during Dredging Activities

The results are provided in Appendix C.3, Table 217 and Table 218. In 2023, concentrations of arsenic, uranium, cobalt, and lead were observed to exceed the PWQO [50] and CWQG [52] at one (1) location (PHH-2a). There were no exceedances of the PWQO [50] and/or CWQG [52] at location PHH-1a, demonstrating that there were no impacts to Lake Ontario or Ganaraska River surface water quality.

Lake Ontario Turbidity Monitoring

During the periodic dredging activities in the Port Hope Harbour, turbidity monitoring is conducted daily, including in-water and near-water works, in the Port Hope Harbour at four (4) locations as outlined in the *Port Hope Harbour Turbidity Monitoring Plan* [63] (one location upstream in the Ganaraska River, two locations south of the Wave Attenuator and one location near the entrance channel in Lake Ontario).

In 2023, the prime contractor provided a summary of the results to CNL on a monthly basis for review. No turbidity exceedances were observed in 2023 that were attributed to CNL activities.

9.4.4.6 Temporary Storage Site Monitoring

Pine Street Extension Temporary Storage Site Surface Water Monitoring

The Pine Street Extension Temporary Storage Site catch basins are designed to catch surface water run-off from the internal drainage ditches, and to allow sediments to settle before water discharges to the internal drainage swales and into the storm water management pond. Surface water samples are collected quarterly from the three (3) catch basins at Pad 2, and the storm water management pond east of Pad 2, as depicted in Appendix C.3, Figure 34.

Surface water monitoring activities were conducted as described in the *Port Hope Licensed Sites Environmental Monitoring Program Specifications* document [59]. The results are compared to the trigger levels defined in the *Environmental Parameters Investigative and Corrective Measures Thresholds for Environmental Monitoring of WNSL-W1-182 Licensed Activities* document [60].

The sampling results are provided in Appendix C.3, Table 219. In 2023, no exceedances of trigger levels were observed.

10. Emergency Management and Fire Protection

The emergency management and fire protection SCA covers emergency plans and emergency preparedness programs that exist for emergencies and for non-routine conditions.

10.1 Emergency Preparedness Program

The PHAI adheres to CNL's Emergency Preparedness Functional Support Area. Refer to Section 10.1 of the *ACMR for CNL* for details [5]. The *Port Hope Area Initiative Emergency Plan* (PHAI Emergency Plan) [64] describes the planning and operational requirements for the response to an emergency directly or indirectly affecting the PHAI. The *PHAI Emergency Plan* is consistent with CNL's Corporate Emergency Preparedness Program which ensures that all components of emergency preparedness and response are effectively maintained. Contractors conducting work for the PHAI project submit emergency preparedness plans to CNL for review and approval to ensure compliance with the *PHAI Emergency Plan* [64]. Contractor compliance with project-specific emergency preparedness plans is examined as part of CNL's compliance oversight program (Section 1.5).

There were no revisions to the *PHAI Emergency Plan* [64] in the reporting period. For a list of emergency preparedness program document notifications applicable to multiple CNL licences, refer to Section 1 of the *ACMR for CNL* [5].

10.1.1 Drills and Exercises

In the reporting period, the comprehensive PHAI five-year drill and exercise plan continued to be implemented. This plan outlines the drills that are to be conducted, and an approximate timeline for those drills. All drills were completed as per regulatory and programmatic requirements.

10.1.2 Training

In the reporting period, the following training related to Emergency Management was conducted:

- Emergency Steward and Officer-in-Charge training for staff at all PHAI facilities
- Officer-in-Charge training for WWTP personnel
- Coordinated sessions with Port Hope Police Service to train staff on dealing with conflict and potentially hostile situations

10.1.3 External Collaborations

In the reporting period, there was repeated engagement with Clarington, Durham, Port Hope, and Northumberland Region first responders.

Port Granby Long-Term Waste Management Facility

Routine communications regarding site activities were conducted to support the transition to a new Chief for the Clarington Fire Department. Durham Regional Police and Durham Paramedic Services were also engaged in joint sessions with various responders.

Port Hope Project

Port Hope Fire Department and Emergency Services were engaged on remediation site activities and the operation of the PH WWTP. Port Hope Police and Northumberland Paramedic Service were also engaged in joint sessions with various responders.

10.1.4 Unplanned Emergency Events

In the reporting period, there were no PHAI incidents that required activation of the CRL Emergency Operations Centre. There were three unplanned emergency events reported to CNSC:

- On 2023 June 23, the fire alarm was activated at a CNL field office at 39 Hayward St. and emergency personnel were dispatched. This was determined to be a false alarm, occurring during routine smoke detector cleaning.
- On 2023 August 29, a small flame was observed within the engine compartment of a compact stand behind skid steer at a small-scale site. The flame was extinguished using nearby fire extinguishers.
- On 2023 September 06, emergency medical services responded to a site call at the PH LTWMF and attended to a worker’s worsening pre-existing medical condition.

The reported events did not have any adverse effect on the health, safety and security of persons or the environment. Refer to Section 3.2 for a summary of all reportable events.

10.2 Fire Protection Program

The PHAI adheres to CNL’s Fire Protection Functional Support Area. Refer to Section 10.2 of the *ACMR for CNL* for details [5]. The *Port Hope Area Initiative Fire Protection Program* [65] includes a combination of site level fire plans, fire notification and protection systems, inspections and training on hazard identification, control, emergency response and fire extinguisher training.

There were no revisions to the *PHAI Fire Protection Plan* [65] in the reporting period. For a list of fire protection program document notifications applicable to multiple CNL licences, refer to Section 1 of the *ACMR for CNL* [5].

During the reporting period, a self-assessment of the PHAI fire protection program was completed to verify that it meets the requirements of the *National Fire Code of Canada* [66] and the *National Building Code of Canada* [67]. Deficiencies were observed that were reported to CNSC staff. One (1) corrective action was closed by 2024 January 22. The reported observations did not have any adverse effect on the health, safety and security of persons or the environment. Refer to Section 3.2 for a summary of all reportable events.

10.2.1 Fire Response Drills

During the reporting period, all required annual fire response drills were completed. Drill responses identified requirements for updated notification processes, improved training, and awareness on response procedures for newly assigned Emergency Stewards.

10.2.2 External Collaborations

During the reporting period, tours were conducted with Clarington Emergency and Fire Services and Port Hope Fire and Emergency Services.

10.2.3 Third Party Audits and Inspections

During the reporting period, all required routine CNL fire protection program inspections were completed at the PHAI. The inspections were completed using standard inspection forms and processes. Third-party fire system specialists conducted annual inspections and follow-up maintenance on the PG WWTP and PH WWTP.

10.2.4 Fire Hazard Analysis

There were no Fire Hazards Analysis completed for the PHAI in 2023.

11. Waste Management

The waste management SCA covers internal waste-related programs that form part of the facility's operations up to the point where the waste is removed from the facility to a separate waste management facility. This also covers the planning for decommissioning.

The requirement to implement and maintain a Waste Management program became effective 2023 January 01 [3]. CNL has a well-established waste management program. Waste deliveries originating from various PHAI sites including Cameco, waterfront sites, small-scale sites, the harbour sediment, the Highland Drive landfill, and other waste sources such as on-site waste transfers, were made to the PH LTWMF. Process residual waste was received at the PH LTWMF from the PG WWTP.

During the reporting period, progress was made towards the development of a Preliminary Safety Case for the PG LTWMF. Progress towards written Preliminary Decommissioning Plans for the PH LTWMF and PG LTWMF continued through 2023, as discussed in Section 11.2.

11.1 Waste Management Program

The PHAI adheres to CNL's Waste Management Functional Support Area. Refer to Section 11.1 of the *ACMR for CNL* for details [5].

The waste management program aligns with the following:

- CNSC REGDOC-2.11.1, *Waste Management, Volume I: Management of Radioactive Waste* [68]
- CSA N292.0, *General principles for the management of radioactive waste and irradiated fuel* [69]
- CSA N292.3, *Management of low- and intermediate-level radioactive waste* [70]

In accordance with the company-wide program, the PHAI follows general Waste Management Plans, as well as project-specific documentation to ensure that waste activities are performed in a safe and environmentally responsible manner which meets or exceeds applicable regulations and standards and minimizes current and future environmental impacts and liabilities.

The PHAI general Waste Management Plans are:

- *Port Granby Waste Management Plan* [71]
- *Management of Historic Artefact Recovery Program* [72]
- *PHAI – Management of Historic LLRW* [73]
- *Cameco Decommissioning Waste Management Plan* [74]

There were no revisions to the *Port Hope Long-Term Waste Management Facility Waste Acceptance Criteria* [75] in the reporting period. For a list of waste management program document notifications applicable to multiple CNL licences, refer to Section 1 of the *ACMR for CNL* [5].

As part of routine waste management program surveillance process, the PHAI project waste management practices and documentation were assessed to verify that they align with the CNL waste management process and governing requirements. The results of the assessment have been documented and follow-up actions have been initiated through CNL's Impact process.

11.1.1 Port Granby Long-Term Waste Management Facility Operations

Four major types of process wastes were historically placed at the PG WMF: limed raffinate, calcium fluoride, ammonium nitrate and magnesium fluoride. Of note, all the PG WMF waste types, and affected onsite soils have been transferred to the PG LTWMF for long-term management as part of the PGP.

11.1.1.1 Waste Inventory

The PG LTWMF engineered containment system contains an inventory of 1,315,059 metric tonnes, and an estimated total activity of 1.60E+14 Bq, as summarized in Table 20. The activity stems from the uranium and uranium progeny found in the waste. There was no new waste placed in the PG LTWMF during the 2023 calendar year.

Table 20: Port Granby Long-Term Waste Management Facility Stored Waste Inventory

Waste Type	Source	Total Estimated Quantity (Metric tonnes)	Total Estimated Radioactivity (Bq) [Calculated]	Primary Radionuclides
Radioactive	Historic Waste from PG WMF, Marginally Contaminated Soils and Mix of LLRW and Marginally Contaminated Soils	1,314,446	1.60E+14	Uranium and Uranium Progeny
Radioactive	Process residuals from WWTP (LLRW)	613	1.13E+10	Uranium and Uranium Progeny
Radioactive	Total Waste Placed at the PG LTWMF	1,315,059	1.60E+14	Uranium and Uranium Progeny
Note: · The PG LTWMF was capped and closed in 2023. The quantity of waste stored remains unchanged from 2022.				

11.1.1.2 Waste Transfers

As part of the routine water treatment process, residuals and associated materials that are removed from the water effluent are either transferred to the PH WWTP for further processing or packaged and sent to the PH LTWMF facility for long-term management. Waste material sent from the PG WWTP during the reporting period is summarized in Table 21.

Table 21: Waste Transfers from the Port Granby Waste Water Treatment Plant – 2023

Waste Type	Waste Description	Weight	Total Estimated Radioactivity (Bq) [Calculated]	Primary Radionuclides	Destination
Radioactive	Reverse Osmosis Concentrate	2,899 tonnes	7.83E+08	Uranium and Uranium Progeny	PH WWTP
Radioactive	Process Residuals – Solids from the PG WWTP and PG site demobilisation waste.	5 tonnes	1.10E+04	Uranium and Uranium Progeny	PH LTMWF
Hazardous Waste	PG LTWMF - Other Specified Inorganics	731 Kg	0	N/A	Aevitas

11.1.2 Port Hope Long-Term Waste Management Facility Operations

The PH LTWMF has a capacity of approximately 2 million cubic metres comprised of LLRW and non-radioactive industrial waste (including contingencies and daily clean soil cover materials).

The engineered containment system at the PH LTWMF has been designed to isolate the historic LLRW that is received from the remediation sites by securely encasing it on the top, bottom, and sides with thick, multiple layers of natural and specially manufactured materials. These layers form components of the cover and baseliner that, independently, are robust enough to prevent contaminants from entering the environment.

Systems are being installed within and around the engineered containment system that will monitor it for hundreds of years. Inspections and monitoring of the collection system for contaminated water (leachate) will confirm the effectiveness of the cover system. Sensors in both the cover and the baseliner will monitor performance, while groundwater quality will be monitored through ongoing testing of specially designed wells surrounding the base.

The waste is generated in accordance with the remediation project plans and is transported from the remediation sites and the PG WWTP to the PH LTWMF via tandem or triaxle dump trucks. Other non-radiological waste such as clean construction debris, hazardous waste (such as fuel spill product, residual chemicals), and general and lunchroom garbage is diverted away from the PH LTWMF, and is delivered to off-site facilities for management, recycling, and/or disposal. The waste deemed acceptable for receipt at the PH LTWMF [75], is received and placed in the engineered containment system in accordance with standard operating procedures.

11.1.2.1 Waste Inventory

The PH LTWMF engineered containment system contains an inventory of 1,850,700 metric tonnes, and an estimated total activity of 2.59E+14 Bq, as summarized in Table 22.

Table 22: Port Hope Long-Term Waste Management Facility Estimated Stored Waste Inventory

Waste Type	Source	Total Estimated Quantity (Metric tonnes)[a]	Total Estimated Radioactivity (Bq) [Calculated][b]	Primary Radionuclides
Radioactive	PH WWTP[c]	5,200	7.09E+10	Uranium and Uranium Progeny
Radioactive	PH LTWMF – On-Site Waste Placement (Welcome Site, Pond Expansion, Forested Area, Auto Debris from former site)	875,200	1.67E+14	Uranium and Uranium Progeny
Radioactive	Cameco Waste	48,400	4.33E+13	Uranium and Uranium Progeny
Radioactive	Small-Scale Sites (Package 1, 2, 3, 3.1, 3.2, 4, 5, 5.1, Task Order2, Task Order 3, Interiors)	138,400	2.59E+11	Uranium and Uranium Progeny
Radioactive	Temporary Storage Sites (Centre Pier, Pine St Extension, Sewage Treatment Plant, Storage Cell)	78,700	2.34E+11	Uranium and Uranium Progeny
Radioactive	Harbour Centre Pier	240,600	4.42E+13	Uranium and Uranium Progeny
Radioactive	Highland Drive Landfill	166,500	1.93E+12	Uranium and Uranium Progeny
Radioactive	Pine Street Extension	77,900	6.81E+11	Uranium and Uranium Progeny
Radioactive	Waterfront Sites (Viaducts, Waterworks East, Waterworks West, Strachan St, Mill St.)	192,100	3.81E+11	Uranium and Uranium Progeny
Radioactive	Construction Monitoring Program	5,100	1.53E+10	Uranium and Uranium Progeny
Radioactive	Port Granby LTWMF	1,800	1.11E+10	Uranium and Uranium Progeny
Radioactive	Hydrovac Waste	774[d]	N/A	Uranium and Uranium Progeny

Waste Type	Source	Total Estimated Quantity (Metric tonnes)[a]	Total Estimated Radioactivity (Bq) [Calculated][b]	Primary Radionuclides
Industrial Waste	Chemetron Lagoon	1,000	0	Industrial Waste
Industrial Waste	Lion's Park Site	19,800	7.20E+11	Industrial Waste with minor Uranium/Uranium Progeny
Total Waste Placed at the PH LTWMF		**1,850,700**[c]	**2.59E+14**	**Uranium and Uranium Progeny**

Note:

a Rounded to 100 metric tonnes.
b Total activity data up to 2023 December 31.
c Includes inventory contribution from offsite waste water, and PG reverse osmosis concentrate/brine.
d The hydrovac trucks are not weighed due to physical limitations. This number represents the number of trucks accepted at the PH LTWMF. The radioactivity is not calculated but is minimal given the limitation imposed on the hydrovac trucks to only transport exempt waste (as per the Transportation of Dangerous Goods). Furthermore, the waste is of liquid consistency, and drains to the WWTP for processing. All processed waste from the WWTP is placed in the LTWMF and accounted separately.

11.1.2.2 Waste Transfers

Waste material transferred from the PH WWTP, PH LTWMF and PHAI project sites during the reporting period are summarized in Table 23.

Table 23: Waste Transfers from the Port Hope Area Initiative Sites

Waste Type	Origin Facility	Waste Description	Weight/Volume	Total Estimated Radioactivity (Bq) [Calculated]	Primary Radionuclides	Destination
Hazardous	PH LTMWF	Light Fuel	615 L	0	N/A	Safety-Kleen
Hazardous	PH WWTP	Acid Waste - Heavy Metals	820 L	0	N/A	GFL Environmental
Hazardous	PH WWTP	Organic Laboratory Chemicals	20 L	0	N/A	GFL Environmental
Hazardous	PH WWTP	Other Polymeric Wastes	510 L	0	N/A	GFL Environmental
Hazardous	PH WWTP	Waste Oils and Lubricants	810 L	0	N/A	GFL Environmental
Hazardous	Viaducts – 90 Queen St.	Acid Waste - Heavy Metals	1000 L	0	N/A	GFL Environmental
Hazardous	Viaducts – 90 Queen St.	Alkaline Wastes - Other Metals	40 L	0	N/A	GFL Environmental
Hazardous	Viaducts – 90 Queen St.	Inorganic Laboratory Chemicals	20 L	0	N/A	GFL Environmental
Hazardous	Viaducts – 90 Queen St.	Light Fuels	1000 L	0	N/A	GFL Environmental
Hazardous	Chemetron Lagoon	Acid Waste - Heavy Metals	30 L	0	N/A	Safety-Kleen
Hazardous	Chemetron Lagoon	Alkaline Wastes - Other Metals	200 L	0	N/A	Safety-Kleen
Hazardous	Chemetron Lagoon	Oil Skimmings and Sludges	219,500 L	0	N/A	Aevitas

Waste Type	Origin Facility	Waste Description	Weight/Volume	Total Estimated Radioactivity (Bq) [Calculated]	Primary Radionuclides	Destination
Hazardous	Chemetron Lagoon	Other Inorganic Acid Wastes	100 L	0	N/A	Safety-Kleen
Hazardous	Chemetron Lagoon	Other Specified Inorganics	122,950 kg	0	N/A	TUQ4
Hazardous	Chemetron Lagoon	PCBs	7,839,280 kg	0	N/A	TUQ4

11.2 Decommissioning Plan

The CNSC defines decommissioning as the administrative and technical actions taken to allow the removal of some or all of the regulatory controls from a facility, location, or site where nuclear substances are managed, used, possessed, or stored.

The PHAI adheres to CNL's Cleanup Functional Support Area. Refer to Part I Section 11.2 in the *ACMR for CNL* for details [5]. The PHAI follows the requirements set out in Cleanup Function Program Description Document [76].

The waste decommissioning planning program aligns with:

- CNSC REGDOC-2.11.2, *Decommissioning* [77]
- CSA N294, *Decommissioning of facilities containing nuclear substance*s [78]

For a list of decommissioning program document notifications applicable to multiple CNL licences, refer to Section 1 of the *ACMR for CNL* [5].

11.2.1 Preliminary Decommissioning Planning

A Preliminary Decommissioning Plan for the PGP was developed and submitted to CNSC staff in 2023. Table 24 lists the published preliminary decommissioning plans for the PHAI. A revised plan is targeted for submission to CNSC staff by 2024 June 30. CNL has committed to preparing a preliminary decommissioning plan for the PHP. The plan is in active draft and is targeted for submission to CNSC staff by 2024 June 30.

Table 24: Summary of Preliminary Decommissioning Plans

Site	Document Status	Document Reference	Submission Date	Additional Information
PGP	Revision 2 Draft	Port Granby Project – Preliminary Decommissioning Plan [79]	Revision 1 – 2023 March 23 Revision 2 – 2024 June 30	Revision 1 was submitted to CNSC staff. A revised document is committed for submission to CNSC staff by 2024 June 30.
PHP	Revision 0 Draft	N/A	2024 June 30	Revision 0 of the document is committed for submission to CNSC staff by 2024 June 30.

12. Security

The security SCA covers the programs required to implement and support the security requirements stipulated in the regulations, in the PHAI licence [2], in orders, or in expectations for the facility or activity, as applicable.

12.1 Security Program

The PHAI adheres to CNL's Security Functional Support Area. Refer to Section 12 of the *ACMR for CNL* for details [5]. The *Port Hope Area Initiative Security Plan* (PHAI Security Plan) [80] establishes the security arrangements that are required for PHAI project sites. It addresses the responsibilities, linkages with local law enforcement, functions, and elements of the security plan such as training, drills, exercises, and various physical security components. The purpose of the *PHAI Security Plan* [80] is to ensure the physical protection of the PHAI assets and safeguarding of the public and personnel. The *PHAI Security Plan* [80] is based on applicable legislation, regulations and the PHAI licence [2], and is consistent with CNL's corporate security policies and programs.

Contractors conducting work as part of the PHAI project submit security plans to CNL for review and approval to ensure compliance with the *PHAI Security Plan* [80]. Contractor compliance with project-specific security plans is examined as part of CNL's compliance oversight program (Section 1.5).

During the reporting period, the PHAI implemented a graded personnel security assessment program. In addition, an updated threat risk assessment was conducted for PHAI facilities.

There were no revisions to the *PHAI Security Plan* [80] in the reporting period. For a list of security program document notifications applicable to multiple CNL licences, refer to Section 1 of the *ACMR for CNL* [5].

12.1.1 Security Events

In the reporting period, there was one security event that was reported to CNSC:

- On 2023 July 18, perimeter fencing at the Highland Drive Landfill was vandalized.

The reported event did not have any adverse effect on the health, safety and security of persons or the environment. Refer to Section 3.2 for a summary of all reportable events.

13. Safeguards and Non-Proliferation

The safeguards and non-proliferation SCA covers the programs and activities required for the successful implementation of the obligations arising from the Canada and IAEA safeguards agreements as well as all other measures arising from the *Treaty on the Non-Proliferation of Nuclear Weapons* [81].

The PHAI's safeguards program aligns with CNSC REGDOC-2.13.1, *Safeguards and Nuclear Material Accountancy* [82].

13.1 Safeguards Program

The PHAI adheres to CNL's Nuclear Materials and Safeguards Management Functional Support Area. Refer to Section 13 of the *ACMR for CNL* for details [5].

There are no safeguards program documents specific to the PHAI. For a list of safeguards program document notifications applicable to multiple CNL licences, refer to Section 1 of the *ACMR for CNL* [5].

13.1.1 International Atomic Energy Agency Activities

The IAEA conducted several types of activities as part of the safeguards approach for CNL, including, but not limited to, IAEA safeguards seals changes, human surveillance, implementation and/or maintenance of IAEA safeguards monitoring equipment, and technical visits. A list of IAEA inspections conducted at the PHAI can be found in Section 1.2.2.

On 2023 July 13, the Practical Arrangements for the implementation of safeguards at the PH LTWMF was finalized by IAEA signature.

14. Packaging and Transport

The packaging and transport SCA include programs that cover the safe packaging and transport of nuclear substances to and from the licensed facility.

14.1 Packaging and Transport Program

The PHAI adheres to CNL's Transportation of Dangerous (TDG) Goods Functional Support Area, which includes the requirements of the Packaging and Transport SCA. Refer to Section 14 of the *ACMR for CNL* for details [5].

The *Port Hope Area Initiative Transportation of Dangerous Goods Plan* (PHAI TDG Plan) [83] applies to any activities involving the transportation of dangerous goods to, or from CNL sites. The TDG program provides an operational framework for the safe off-site transport of dangerous goods by conforming to all applicable laws and regulations, as well as CNL policies and procedures. Contractors conducting work for the PHAI project submit site specific transportation of dangerous goods plans for CNL's review and approval to ensure compliance with the *PHAI TDG Plan* [83]. Contractor compliance with project-specific health and safety plans is examined as part of CNL's compliance oversight program (Section 1.5).

There were no revisions to the *PHAI TDG Plan* [83] in the reporting period. For a list of packaging and transport program document notifications applicable to multiple CNL licences, refer to Section 1 of the *ACMR for CNL* [5].

14.1.1 Shipments

During the reporting period, shipments of dangerous goods were conducted from the PHAI sites to offsite facilities, and shipments of dangerous goods were received from offsite vendors (such as consumable chemicals, diesel fuel, and propane).

Ongoing oversight (Section 1.5) of contractors is performed to ensure adherence to the project specific work plan. Recommended incremental improvements to the means and methods to meet the transportation of dangerous goods requirements are provided when deemed necessary

In the reporting period, there were three events related to the TDG program reported to CNSC:

- On 2023 January 24, a TDG Class 7 shipment was found to have been potentially misclassified.
- On 2023 November 06, LLRW was transported on the exterior surface of a conveyance as it was travelling on the designated transportation route.
- On 2023 December 13, a shipment was received at the 192 Toronto Rd. storage location with inaccurate documentation and labelling.

The reported events did not have any adverse effect on the health, safety and security of persons or the environment. Refer to Section 3.2 for a summary of all reportable events.

15. Other Matters of Regulatory Interest

15.1 Public Information and Disclosure Program

The primary goal of the public information program, as it relates to the licensed activities, is to ensure that information related to the health, safety and security of persons and the environment, and other issues associated with the lifecycle of nuclear facilities are effectively communicated to the public. As a component, where the public has indicated an interest in knowing, the program shall include a commitment to and protocol for ongoing, timely communication of information related to the licensed facility during the licence period.

The *PHAI Phase 2 and 3 Public Information Program* [85] sets out the protocol for ongoing, timely and accurate public communication about the activities of the PHAI for both the Phase 2 activities of the PHP and the Phase 3 long-term monitoring and maintenance of the PGP. The program is reviewed and updated as necessary to ensure it continues to provide appropriate direction.

The public information program supports the CNL overall mission to lead the cleanup and long-term storage and monitoring of historic low-level radioactive waste in Port Hope and Port Granby in an environmentally responsible and cost-effective manner. As the program also supports the *Waste Nuclear Substance Licence Canadian Nuclear Laboratories Ltd. Port Hope Area Initiative Waste Management Project* WNSL-W2-2310.00/2032 [2], issued to CNL by the CNSC, this document is guided by CNSC regulatory document REGDOC-3.2.1 *Public Information and Disclosure* [84], and adheres to the CNL Corporate Public Information Program. Refer to Section 15 of the *Annual Compliance Monitoring Report for Canadian Nuclear Laboratories* for details [5].

The CNSC was notified in 2023 December of a revision to the *Port Hope Area Initiative Phase 2 and Phase 3 Public Information Program* [85].

15.1.1 Outreach and Stakeholder Engagement

The objectives of the PHAI public information program are supported in part by general tactics, products and activities conducted for each of the PHP and PGP on request, as needed or ongoing, as appropriate.

A list of project-related stakeholder and public engagements undertaken in 2023 is included in Table 25.

Table 25: Public Engagements for 2023

Date	Location	Activity
January 09	Clarington	Annual Port Granby Project Update - Municipality of Clarington General Government Committee
January 24	Port Hope	Municipality of Port Hope council presentation
January 30	Port Hope	Northumberland Hills Association of Realtors PHAI Task Force
February 14	Port Hope	Port Hope and District Chamber of Commerce monthly project update
February 28	Port Hope	PHAI Update - Northumberland Hills Association of Realtors
March 01	Port Hope	Port Hope and District Chamber of Commerce Annual General Meeting
March 01	PHAI.ca	PGP Public Attitude Survey results published
March 08	Port Granby	Port Granby newsletter in mailboxes
March 21	Port Hope	Municipality of Port Hope council quarterly update
March 21	Virtual	Municipality of Clarington municipal coordination meeting
March 30	Port Hope	PHAI Public Info Session hosted by Port Hope and District Chamber of Commerce
April 11	Virtual	Port Hope and District Chamber of Commerce monthly project update
April 12	Port Hope	Property Information Session - 39 East Side properties
April 20	Port Hope	Public Information Session: Alexander Street Ravine
April 27	Port Hope	Property Information Session - Catherine, Harris, Elizabeth, Hay
May 09	Virtual	Port Hope and District Chamber of Commerce monthly project update
May 11	British Columbia	Bettering Environmental Stewardship and Technology Conference - PHAI Overview
May 23	Virtual	Municipality of Clarington bi-monthly municipal coordination meeting
May 31	Port Hope	Amendment application: Save the Trees group meeting
June 01	Port Hope	PHAI update postcard delivery: Port Hope businesses
June 12	Virtual	PHAI update video – community project update
June 13	Virtual	Port Hope and District Chamber of Commerce monthly update
June 13	Niagara Falls	Waste Management Community of Practice for Low-Level Waste Management: PHAI Overview
June 14	Port Hope	Municipality of Port Hope staff tour - PH LTWMF
June 15	Port Hope	Agreement Monitoring Group
June 19	Port Hope	PHP newsletter in mailboxes
June 22	Port Hope	Northumberland and Clarington Emergency Responders meeting
June 29	Advertising	Amendment application newspaper ad
July 04	Port Hope	Municipality of Port Hope council quarterly update

Date	Location	Activity
July 11	United Kingdom	Nuclear Decommissioning Authority Technical Information Exchange Meeting on International Best Practice in Stakeholder Engagement
July 12	Port Hope	Public Drop-in session: Port Hope Library
July 17	Port Hope	Meeting with Haliburton, Kawartha, Pine Ridge Health Unit
July 19	Port Hope Library	Drop-in Session: Special Circumstances Waterworks West and Centre Pier
July 26	Port Hope	United States Department of Energy visit
July 26	Port Hope Library	Public Drop-in session: Port Hope Library
August 01	Port Hope	External Discussion Group: Amendment application messaging
August 9	Virtual	Port Hope and District Chamber of Commerce monthly update
August 17	Port Hope	External Discussion Group: Amendment application messaging
August 23	Port Hope Library	Public Drop-in session: Port Hope Library
August 31	Port Hope	Nuclear Waste Management, Decommissioning and Environmental Restoration conference delegates' tour
September 06	Port Hope	MP Philip Lawrence - Project Update
September 07	Port Hope	Ontario Power Generation Decommissioning and Waste Management staff visit
September 08	Port Hope	Discussion Group: tree groups
September 10	Port Hope	Run, Salmon Run Festival Information Booth
September 11	Port Hope	Port Hope Rotary Club
September 12	Port Hope	Ministry of Environment, Conservation and Parks Deputy Minister tour
September 14	Peterborough	Central Lakes Association of Realtors presentation
September 14	Port Hope	Agreement Monitoring Group meeting - PHP
September 15	Port Hope	Port Hope Fall Fair (three days)
September 19	Port Hope	Port Hope and District Chamber of Commerce monthly update
September 19	Port Hope	Public Information Session: Highland Drive South Ravine
September 19	Port Hope	Municipality of Port Hope council quarterly update meeting
September 22	Clarington	Durham Nuclear Health Committee: Annual PGP update
September 26	Virtual	Municipality of Clarington bi-monthly municipal coordination meeting
September 27	Port Hope	Public Information Session: Amendment application (PH Library)
September 28	Virtual	Amendment application 101: video launch
October 17	Port Hope	Port Hope and District Chamber of Commerce monthly update
October 21	Port Hope	Loyalist College Industry Day
October 25	Port Hope	Neighbourhood Information Session: Alexander Street Ravine
October 25	Port Hope	Port Hope and District Chamber of Commerce - PHP Project Sites Tour

Date	Location	Activity
November 06	Vienna, Austria	IAEA International Conference on the Safety of Radioactive Waste Management, Decommissioning, Environmental Protection and Remediation: *Ensuring Safety and Enabling Sustainability presentation on Indigenous Relations*
November 11	Port Hope	CNL wreath placement at Municipality of Port Hope cenotaph
November 15	Port Hope	Neighbourhood Information Session: Coal Gasification Plant
November 21	Port Hope	PH and District Chamber of Commerce monthly update
November 22	Port Granby	Municipality of Port Hope /Municipality of Clarington tour of Port Granby Nature Reserve lands
December 04	Clarington	Municipality of Clarington Annual Update presentation
December 12	Port Hope	PH and District Chamber of Commerce monthly update
December 14	Port Hope	CNL/Municipality of Port Hope Communications Working Group meeting
December 19	Port Hope	Municipality of Port Hope Committee of the Whole Quarterly Update presentation

Note:

- Amendment application refers to CNL application to Canadian Nuclear Safety Commission to amend the PHAI licence with a change to the PHAI Cleanup Criteria (see Section 15.1.6.7).

15.1.2 Public Disclosures

CNL is committed to providing open and transparent public disclosure, guided by the *PHAI Phase 2 and Phase 3 Public Information Program* [85], in alignment with CNSC regulatory document REGDOC-3.2.1 *Public Information and Disclosure* [84] about unplanned project activities and non-routine Events. All public disclosures were posted on PHAI.ca.

A list of the ten public disclosures for the reporting period is included in Table 26.

Table 26: Public Disclosures for 2023

Date	Subject
February 03	Mislabelled shipment of waste received at long-term waste management facility
May 02	Water collection tank overflow contained on site
May 18	Biodegradable hydraulic oil spill at Port Hope Harbour
May 30	Biodegradable hydraulic oil spill at Port Hope Harbour
June 22	Water treatment plant effluent sampling exceedance
July 07	Biodegradable hydraulic oil spill at Port Hope Harbour
July 12	Biodegradable hydraulic oil spill at Port Hope Harbour
July 20	Biodegradable hydraulic oil spill at Port Hope Harbour

Date	Subject
July 28	Biodegradable hydraulic oil spill at Port Hope Harbour
December 19	Overclassified waste shipped to long-term waste management facility

15.1.3 Public Engagement

CNL shares information on the PHP and PGP with the host communities through a variety of tactics.

15.1.3.1 CNL Project Information Office

The Port Hope office is open Monday to Friday 8:30 a.m. to 4:30 p.m. to provide information and respond to inquiries. After-hours telephone access is available outside of business hours with CNL staff on call for prompt response to calls of an urgent nature or next business day follow-up for non-urgent calls.

15.1.3.2 Online Communications

Through digital media – website and social media channels - PHAI.ca, Facebook, X, Instagram, and LinkedIn, CNL provides information on the PHP and PGP including descriptions of current and upcoming work, environmental monitoring reports, project newsletters and information on CNSC licences, Public Disclosures and the Complaint Resolution Program and the Property Value Protection Program.

15.1.3.3 Social Media

Staff responds to questions or comments posted by members of the public on PHAI social media accounts and monitors dialogue of relevance to the PHAI on other social media accounts. Timely corrections to inaccurate information about the PHAI and responses as appropriate are posted.

In 2023, the PHAI social media plan was updated to encourage public interaction with CNL Port Hope online, while continuing to inform the public and Port Hope residents with project activities and updates. New elements included expanding online interaction with community groups and sharing community information. An increase in visual materials was also a main focus with the use of maps, aerial images, and video to highlight work and respond to questions. The result was a 10 per cent increase in engagement on Facebook and LinkedIn and a 20 per cent increase on Instagram.

15.1.3.4 Website

In 2023, all communications materials including fact sheets, newsletters and PHAI.ca were refreshed to update the look and feel in alignment with the CNL brand.

In support of engagement on the CNL application to the Canadian Nuclear Safety Commission to amend the PHAI licence with a change to the PHAI Cleanup Criteria (Section 15.1.6.7) CNL developed a full complement of materials including a presentation, fact sheets and information video.

A link on the front page of PHAI.ca provides direct access to information on the topic with a dedicated page with links to the materials, additional resources, and information on how to participate in the process.

15.1.3.5 Presentations and Site Tours

Presentations and site tours facilitate understanding and appreciation for the complexity and importance of PHAI projects. They also provide information on current and planned project activities and programs. Presentations and tours illustrate the scope of project planning and implementation including environmental protection, compliance with occupational health and safety requirements and conformance with EA and licensing obligations practices.

This outreach helps strengthen connections with science, education, and industry communities; promote and support science, technology, engineering, and math education; and share information with other groups/communities undertaking similar initiatives.

In 2023, CNL staff provided presentations and tours for members of the local business and real estate communities, the local, national, and international nuclear industry and environmental remediation audiences.

15.1.3.6 Host Community Communications

CNL staff liaises regularly with elected officials and staff of the host municipalities. As part of an agreed-upon framework for dialogue to keep municipalities abreast of PHAI plans and progress, CNL provides regular project and communications updates to municipal councils, committees, and staff through a variety of media, as well as topical presentations upon request.

CNL provided regular updates to both the Port Hope and Port Granby communities through quarterly meetings of the Agreement Monitoring Group, regular council presentations, newsletters, advertising, and resident notifications.

In Port Granby, CNL staff provided an annual project update to the Durham Nuclear Health Committee.

In 2023 September, CNL staff provided a PHP update to Philip Lawrence - MP, Northumberland-Peterborough South.

15.1.3.7 Community Notifications

Community notifications provide information about near-term PHAI-related activity and/or notable changes to schedule or nature of work to residents and businesses and others located near planned work. They may also serve as advance notification of longer-term project plans or disclosure of unplanned project events.

In 2023, CNL issued several notifications about upcoming work and short-term road closures – each is posted on PHAI.ca and circulated on social media. CNL also produced and hand-delivered a project update card geared to local businesses who may receive inquiries about the project from residents and visitors.

As a direct result of the closure of the local newspaper, CNL increased its efforts to hand deliver notifications where appropriate. This is an example of how the communications efforts adapts as needed.

15.1.3.8 Special Events

Participation in external events provides a broader public with information about PHAI activities and health and safety measures in place to protect people and the environment. It is also an opportunity for CNL staff to act as project ambassadors and broaden awareness and understanding of the projects.

In 2023, CNL participated once again in the annual Run, Salmon, Run Festival and returned to the Port Hope Fall Fair.

15.1.3.9 Public Information Sessions

CNL holds public information sessions to share updates and details on PHAI work and related monitoring, mitigation and health and safety measures in place to protect people and the environment.

These sessions, open to anyone who wishes to participate, allow CNL to provide updates on planned or changed project activity and programs, discuss neighborhood-specific issues related to PHAI work and receive feedback from public.

Sessions include opportunity for two-way dialogue through question-and-answer opportunities with CNL and contractors subject matter experts and are open to any member of the public, stakeholders, and the media.

CNL partnered with the Port Hope and District Chamber of Commerce in 2023 March to provide a community information session on the PHP. A session was held in April to focus on upcoming work on the Alexander Street Ravine.

Throughout the summer, CNL offered evening drop-in information sessions at the Port Hope Public Library in downtown Port Hope. Sessions focused on the CNL application to the Canadian Nuclear Safety Commission to amend the PHAI licence with a change to the PHAI Cleanup Criteria and current project plans including planned work on the Port Hope Harbour and Alexander Street Ravine sites.

The sessions provided direct access to CNL staff in a central location for ease of access.

15.1.3.10 Neighbourhood Information Sessions

Prior to the start of work at a public project site, a public meeting is held to provide an overview of the process, timelines, and any anticipated mitigation measures to be implemented. CNL and contractor staff are available to answer questions and address any concerns. CNL held sessions for residents in the vicinity of Alexander Street Ravine, Highland Drive South Ravine, and the former Coal Gasification Plant site.

These meetings provided an opportunity for residents to get specific and detailed information about planned work and possible impacts. The Highland Drive South Ravine meeting in particular provided answers about loss of trees, public access, and possible impacts of flooding.

15.1.3.11 Contractor Communications Training

CNL is the lead for all communications with property owners and the public. CNL communications staff work closely with prime contractors at all project sites, including private properties, to clearly define expectations, maintain consistency, align departments, and ensure adherence to approved CNL communication processes.

15.1.3.12 Dedicated Signage

PHAI trucks, equipment and project sites are marked with CNL signage to provide information on work being conducted; provide detailed health/safety information, requirements; and clear direction on location of LTWMFs to facilitate project traffic and first responder access. All PHAI signage includes contact information for questions/concerns.

15.1.3.13 Internal Communications

Internal communications are shared regularly to ensure that CNL employees are fully apprised of CNL business and PHAI project activities on an ongoing basis.

15.1.3.14 Port Hope Business Community Liaison

CNL is a member of the Port Hope and District Chamber of Commerce and provides a monthly update on project progress, communications, and PHP-related economic opportunities to the Board of Directors. Communications staff works directly with Chamber staff to develop additional opportunities for members including PHP site tours and events targeted toward current and potential project contractors.

To provide access to CNL supply chain opportunities, the PHAI website includes links to a contractor portal, supply chain registration and vendor portal to connect potential or current suppliers with information on procurement opportunities for goods, services, equipment, decommissioning and construction.

Information on specific events including CNL industry day and career fair are circulated to the Chamber of Commerce and any individuals or groups who have expressed interest in career/business opportunities and CNL contracting processes.

CNL partnered with the Port Hope and District Chamber of Commerce in 2023 March to provide a community information session on the PHP.

In addition, CNL developed a business focused information card that was shared with local businesses. This was provided to inform local business about project updates as well as provide a general overview of PHAI work with visitors to the community who may attend local establishments. These were circulated in summer of 2023.

15.1.3.15 Health and Emergency Services

CNL plans are in place to ensure events are properly managed and risks to people and the environment are minimized. In addition to documentation and plans maintained by CNL, communications and regular interface are clearly established between and aligned among CNL, the municipalities, the provinces, and the federal government.

In 2023, CNL communications staff facilitated a meeting between PHAI Health, Safety, Security, Quality, and Environment staff with representatives of local health and emergency services agencies to provide an update on project activities and respond to questions and/or concerns around the project. Attendees were appreciative of the opportunity to gather in person for the first time since COVID-19 restrictions were lifted and expressed no concerns with the information provided.

CNL met with and developed coordinated messaging with the Haliburton-Kawartha-Pine Ridge Health Unit on the potential change to the PHAI Cleanup Criteria. Real Estate and Financial Industry

CNL meets regularly with members of the real estate and financial industries to ensure members have the most up-to-date information on the PHAI.

CNL provided an update to members of the local real estate association and participated in a meeting of the association's task force a group formed in 2018 to address real estate questions/concerns related to the PHAI.

In 2023, three local real estate associations merged into one new association – Central Lakes Association of Realtors - and CNL provided a PHP update to the new group.

15.1.3.16 Newsletters

PHAI project newsletters update the community on the status of the projects, upcoming work, and changes to planned work or programs. Newsletters are distributed to every household in the respective municipality and to an extensive list of federal, provincial, regional, and municipal stakeholders; newsletters are also available online at PHAI.ca.

In March, the PGP newsletter was distributed by mail to approximately 7,000 homes, businesses, and farms and by email to approximately 400 contacts. The newsletter provided an update on Phase 3 of the project and the renewal of the CNSC licence, an overview of community connection initiatives over the years, an update on the 'Project of the Year' recognition awarded by the Ontario Society of Professional Engineers and highlights from the Port Granby Public Attitude Survey conducted in 2022.

The PHP newsletter was distributed in 2023 June by mail to approximately 8,000 homes, businesses, and farms in the Municipality of Port Hope and by email to approximately 400 contacts. The publication provided an overview of the complex process involved in remediating private properties, an overview of work at the major sites and an update on the CNL application to the Canadian Nuclear Safety Commission to amend the PHAI licence with a change to the PHAI Cleanup Criteria.

15.1.3.17 Media Relations

When required, CNL briefs the media and inform the community and broader audiences about imminent project activities, project achievements, and changes to schedule, nature of work or PHAI programs while reinforcing CNL as primary source of accurate, timely information.

CNL monitors the amount and nature of media coverage related to the Port Hope Area Initiative generally or to any specific project activity, the type of media involved (e.g. television, print, social media) and the support or concern that has been expressed with relation to the project or activity.

Local, provincial, national, international, and social media coverage of issues related to the PHAI is monitored and analyzed, enabling CNL to understand trends, respond to media coverage when necessary and identify effective ways to work with the media.

In 2023, the communications staff and all members of senior management participated in a full-day media training that focussed on proper preparation and information sharing in emergent situations.

A list of media coverage of the PHAI is included in Table 27.

Table 27: Media Coverage for 2023

Date	Article	Title of Publication
January 09	Special Council Meeting with PHAI	Myfmradio.ca
January 24	GHD Selected as Contractor for PHP	Environmental Journal
January 24	Port Hope Chemetron Lagoon Contaminant Cleanup	NorthumberlandNews.com
January 25	PHAI Topic of Discussion at Port Hope Council	ClassicRock1079.ca
March 07	Historical Rail Cart Pieces Pulled from Port Hope Harbour	NorthumberlandNews.com
March 23	Port Hope Council Hears from Legion and CNL	Gonorthumberland.ca
May 24	Proposal for a Nature Reserve	Durham Post
September 19	PHAI Project and Cleanup Criteria Update	107.9FM
September 23	Bird Adds Industrial Master Service Agreements for Ontario and Quebec	Financial Post

Media Releases

CNL did not issue any media releases related to the PHAI in 2023.

15.1.4 Education/Science and Technology Communities

Presentations, site tours and program-specific information and demonstrations are provided on request to students at the elementary, high school, college, and university level, and CNL participates on program advisory committees to provide industry perspective on the development of new programs and courses.

National and international education institutions, industry and professional groups also participate in PHAI presentations and site tours and CNL continues to develop outreach activities related to science, technology, engineering, and math education.

In 2023, the CNL quarterly magazine for elementary students, *Kids CONTACT,* expanded distribution to Port Hope community and the PHAI was introduced as a regular feature with stories on the Port Hope Harbour and the use of drone technology in environmental monitoring.

In 2023, CNL staff provided a presentation to the Environmental Science class at Port Hope High School and held its first Science at Work event marking the International Day of Women and Girls in Science with more than 150 high school students attending. The event was very well received with enthusiastic participation from the students and positive feedback from school staff and administration.

CNL communications staff also served as a judge at the high school science fair. In the fall, high school students participated in a dedicated focus group on the CNL application to amend the PHAI licence with a change to the PHAI Cleanup Criteria (Section 15.1.6.7 for more information) to share information on the proposed change and encourage feedback.

At the college level, CNL staff participates in the advisory committee for the Fleming College Waste Management program to provide industry insight into program planning. In the fall, radiation protection staff attended the Loyalist College Industry Day showcasing potential career pathways for graduates of the program. A list of school events for the PHAI is included in Table 28.

Table 28: School Tours/Presentations for 2023

Date	Location	School
January 20	Port Hope	Port Hope High School Environmental Science class - PHAI overview
February 15	Port Hope	Port Hope High School – International Day of Women and Girls in Science: Science at Work event
March 29	Virtual	Fleming Waste Resource Management Advisory Committee meeting
April 05	Port Hope	Port Hope High School Science Fair judging
October 04	Port Hope	Discussion Group: Port Hope High School students

In the science and technology community, CNL participated in environmental remediation industry events both nationally and internationally, providing a PHAI overview and sites tour for representatives of the United States Department of Energy and Ontario Power Generation Decommissioning and Waste Management. CNL staff also provided presentations at the

Bettering Environmental Stewardship and Technology Conference in British Columbia and the IAEA International Conference on the Safety of Radioactive Waste Management, Decommissioning, Environmental Protection and Remediation in Vienna, as well as serving as a technical tour site for delegates of the Nuclear Waste Management Decommissioning and Environmental Remediation conference in Niagara Falls.

15.1.5 Monitoring Public Opinion

Monitoring of public opinion is ongoing to gauge understanding, perceptions, concerns, and opinions about the PHAI and project-related impacts as well as stakeholder support for and awareness of the PHAI.

CNL staff responds promptly and effectively to media coverage and social media posts when necessary. There was particular interest in the work being done on the known industrial site Chemetron Lagoon by CBC Radio. Information was provided on these activities to the media house.

In addition, CNL communications staff answered questions about the impact of PHAI work on tree loss, transportation routes and timing of cleanup on privately owned properties.

15.1.5.1 Public Attitude Survey

CNL has conducted Public Attitude Surveys in Port Hope and in the Port Granby area since 2011 to gain insight into the views of the community and how effectively CNL is communicating with residents about project activities and progress.

With the PGP now complete, a final survey was conducted in the fall of 2022 to gain key insights into attitudes toward the project and communications over time. Results were published in 2023 March with a summary posted on PHAI.ca with the full document available on request. Highlights of the results were included in the March Port Granby newsletter with a link to PHAI.ca for more information.

The survey confirmed that a majority of residents – 71 per cent – living in close proximity to the PGP site are confident that CNL can safely manage historic low-level radioactive waste at the long-term waste management facility. This is a significant increase from previous surveys (71 per cent vs. 44 per cent in 2014). The survey further revealed that 73 per cent of respondents overall are satisfied with efforts to provide information about the PGP.

A Public Attitude Survey for residents in Port Hope is scheduled to be completed in 2024. This survey will focus on the PHP.

15.1.6 Ongoing Projects

Specific engagement programs and communications initiatives may be implemented with targeted engagement to inform, educate, and discuss specific topics with the public, property owners and stakeholders.

A dedicated strategy is developed, and a variety of tactics may be used to provide information, encourage, and facilitate feedback including distribution of information, advertising, information sessions, focus groups and feedback forms.

Of particular interest is the PGP which provides a great example to interested parties of a completed environmental project where an engineered containment system has been capped and closed.

15.1.6.1 Port Hope Private Property Communications

As part of the PHAI, CNL is conducting a Property Radiological Survey on approximately 6,000 properties in urban Port Hope and a small number in rural Port Hope, to confirm which properties require cleanup of historic waste.

In accordance with the *PHAI Communications Plan Small-Scale Sites* [86], CNL staff continued to implement several approaches to ensure ongoing communications and outreach with property owners through all stages of the survey and, for those properties with waste, throughout the remediation and restoration of the property.

15.1.6.2 Individual Property Owner Communications

All property owners included in the survey receive a Consent and Scheduling Package outlining the process and requesting written confirmation of their participation. Once a signed consent is received, individual phone calls are made to schedule survey appointments.

For properties identified as having waste, CNL contacts the owner to provide test results and a design overview booklet - an overview of next steps and what to expect during the process. Design meetings are held with owners to review the design package for the property and make any changes; details are finalized, and the Remediation and Restoration Agreement is signed.

Before work begins on private properties a property owner information session is held to review upcoming work and details on what owners and adjacent neighbours can expect throughout the remediation and restoration process.

From the start of testing through to restoration and closeout of each property, communications staff remain available by phone, email and in person to help property owners navigate the process and to respond to any inquiries and concerns.

In 2023 CNL staff conducted 6,433 interactions with property owners. A summary of private-property owner interactions is provided in Table 29.

Table 29: Private-Property Owner Interactions for 2023

Type of Interaction	No.
Phone Calls	2,281
Written Communications	3,339
Property Owner Meetings	279
Site Visits	534

15.1.6.3 Private Property Information Sessions

In advance of work on private properties, a virtual meeting is held for owners of all properties to be remediated in a neighbourhood. CNL staff and the assigned contractor outline plans for each property including site preparations, mitigation plans and day-to-day coordination including parking, mail delivery, garbage pickup, etc.

15.1.6.4 Communications Field Staff

Communications Field Liaison Officers regularly attend property sites to address emerging issues. Their primary role is to mitigate any escalating situations resulting from property owner concerns with project activities.

The field staff ensures delivery of consistent messaging when explaining property plans, changes and delays and carefully record and address any concerns. Where required, the officers will identify and support the implementation of accommodation measures for those with extenuating circumstances.

15.1.6.5 Decline-to-Participate Letters

In an ongoing effort to encourage participation in the property survey, CNL undertakes a comprehensive process to connect with Port Hope property owners who have not provided consent to participate in or continue the Property Radiological Survey. The aim is to confirm whether they wish to be included in the survey. If no response is received after multiple attempts to engage a property owner, CNL issues a Decline to Participate letter indicating the recipient has 30 days to confirm whether they wish to participate in or decline the PHAI cleanup.

15.1.6.6 Port Hope Property Information Access

At the written request of a property owner, CNL provides a Radiological Status Letter confirming any available results of any radiological investigation and remediation activities on the property to date.

When a property is listed for sale and the owner provides the Radiological Status Letter to prospective buyers, CNL staff is available (with written permission from the owner) to speak with prospective buyers and answer questions related to the information in the letter.

15.1.6.7 Application to Amend PHAI Licence: Change to PHAI Cleanup Criteria (Amendment application)

Following a pause in 2022 for the PHAI licence renewal hearing, CNL re-launched a comprehensive engagement program in 2023 March to inform internal and external audiences and collect feedback on the amendment application (Refer to Section 15.3). CNSC staff were provided with the dates of public engagement events in advance and invited to attend any of the activities. A list of amendment application activities is provided in Table 30.

Table 30: Amendment Application Communications for 2023

Date	Location	Event
Stakeholders/Public		
March 30	Port Hope	PHAI Public Info Session host: Port Hope and District Chamber of Commerce
May 31	Port Hope	Save the Trees group meeting
June 13	Port Hope	Port Hope and District Chamber of Commerce monthly update
June 15	Port Hope	Agreement Monitoring Group meeting
June 22	Port Hope	Northumberland/Clarington Emergency Responders meeting
July 04	Port Hope	Municipality of Port Hope Council quarterly update
July 12	Port Hope	Public Drop-in session - Port Hope Public Library
July 17	Port Hope	Haliburton-Kawartha Pine Ridge Health Unit meeting
July 26	Port Hope	Public Drop-in session - Port Hope Public Library
August 01	Port Hope	External Discussion Group: Amendment application messaging
August 17	Port Hope	Public Discussion Group re: Amendment application
August 23	Port Hope	Public Drop-in session - Port Hope Public Library
Sept 06	Port Hope	MP Philip Lawrence - Project Update
Sept 10	Port Hope	Run, Salmon Run Festival Information Booth
Sept 11	Port Hope	Port Hope Rotary Club presentation
Sept 14	Port Hope	Central Lakes Association of Realtors presentation
Sept 14	Port Hope	Agreement Monitoring Group meeting
Sept 15	Port Hope	Port Hope Fall Fair - three days
Sept 19	Port Hope	Municipality of Port Hope Council quarterly update
Sept 27	Port Hope	Public Information Session - PHAI Cleanup Criteria
Oct 04	Port Hope	Discussion Group: Port Hope High School students
Oct 17	Port Hope	Port Hope and District Chamber of Commerce monthly update

Date	Location	Event
Oct 25	Port Hope	Port Hope and District Chamber of Commerce – PHP Sites Tour
Employees		
June 16	Port Hope	Historic Waste Program All-Staff meeting
July 19	Port Hope	New Employee Orientation presentation
July 27	Port Hope	Employee Discussion Group: Amendment application messaging
August 10	Port Hope	Employee Discussion Group: Amendment application messaging
Sept 21	Port Hope	HWP All-Staff Meeting
Sept 27	Port Hope	New Employee Orientation presentation
Sept 28	Port Hope	New Employee Orientation tour
Communications Products and Website		
June 19	Port Hope	PHP Newsletter delivered
June 23	Port Hope	Webpage updates - Amendment Application
Sept 29	Port Hope	CNL video - Amendment application 101 (PHAI.ca/social media)
Sept 29	Port Hope	Fact Sheet – PHAI Cleanup Criteria Amendment Application
Sept 29	Port Hope	Fact Sheet – Arsenic

Discussion and feedback were recorded and applied, where applicable, to further refine messaging, address common questions and maintain open dialogue about support and concerns throughout the engagement process. Examples include:

- Early in the process, Discussion Group participants recommended removing several pie charts designed to illustrate cancer and non-cancer outcomes associated with arsenic. These were thought to provide too much information that would overwhelm the audience. The feedback was to focus specifically on the risk associated with the actual change in arsenic being recommended by CNL. The charts were removed from subsequent communications.
- Risk information included in the communications material was edited based on feedback, including adjusting the label placement on the 'Risk Thermometer' graphic to make the increment numbers clearer. It was also suggested that information be included to remind the audience that risk is calculated based on several assumptions – as a result, the "Exposure Pathways" slide was created.
- During a Library Drop-In Session, one visitor commented on a statement from the Environmental Assessment that, 'no arsenic was found in the tissue of the fish,' noting that this was misleading as all fish would presumably have some level of arsenic in their tissue. CNL modified this language to read 'no elevated levels of arsenic were identified in the sampled fish.'

- CNL rephrased the statement used in presentations that ‘the cleanup in Port Hope is not as a result of health concerns’ to state that the current and proposed criterion is believed to be protective of human health and the environment.

15.2 Indigenous Relations

In alignment with the Truth and Reconciliation Commission Call to Action #92 Business and Reconciliation [87], CNL is committed to advancing truth and reconciliation through meaningful actions, continued inclusion of and participation by Indigenous Peoples in the planning and execution of CNL missions.

15.2.1 Identified Indigenous Communities and Organizations

CNL is committed to recognizing the Constitutional and Treaty Rights and interests of Indigenous peoples and actively engaging with Indigenous communities and organizations on current and planned PHAI activities.

From the start of Phase 1 planning for the PHAI projects, the Mississauga communities of the Williams Treaties First Nations have been involved in the PHAI and participated in the Environmental Assessment consultation process in the early 2000s, which included more than 40 engagements with Indigenous communities and organizations over the course of eight years. Once the PHAI moved into Phase 2 in 2012, the Mississauga communities requested and began receiving regular ongoing updates about the projects. In more recent years CNL has also shared PHAI updates with other communities and organizations potentially having interest in the project based on their proximity and interest in other projects in the area local to PHAI activities.

Engagement continues to evolve both in the frequency and level of participant involvement.

A list of communities and organizations is provided in Table 31.

Table 31: Indigenous Communities and Organizations

Indigenous Communities (by Representative Organization) and/or Organizations	Identification Rationale
Alderville First Nation	Community with Treaty Rights
Curve Lake First Nation	Community with Treaty Rights
Hiawatha First Nation	Community with Treaty Rights
Mississaugas of Scugog Island First Nation	Community with Treaty Rights
Beausoleil First Nation	Community with Treaty Rights
Chippewas of Georgina Island First Nation	Community with Treaty Rights
Chippewas of Rama First Nation	Community with Treaty Rights
Mohawks of the Bay of Quinte	Community with interests
Métis Nation of Ontario, Regions 6, 8	Community with interests
Anishinabek Nation	Organization with interests
Métis Nation of Ontario	Organization with interests

Detailed information is provided below for each Indigenous community and organization that engages with CNL on the PHAI. Background information on each community, noted in italics, has been adapted from each community's website and other public sources.

15.2.2 Williams Treaties First Nations

The Williams Treaties First Nations are the Chippewas of Beausoleil, Georgina Island and Rama, and the Mississaugas of Alderville, Curve Lake, Hiawatha, and Scugog Island. These seven First Nations are signatories to various 18th and 19th century Treaties that covered lands in different parts of south-central Ontario. In 1923, the Chippewas and Mississaugas signed the Williams Treaties, which included one large tract of land between Lake Huron and the Ottawa River bounded on the north by the Mattawa River-Lake Nipissing and French Line and on the south by earlier concluded treaties.

In 2023, monthly meetings (established at the Nations' request in 2021) continued between CNL ERM staff and representatives of each of the Williams Treaties First Nations. Meetings focused on community updates, information sharing and regular updates on the PHAI, proposed Near Surface Disposal Facility and decommissioning of the Nuclear Power Demonstration. A specific discussion topic was determined for each meeting in advance based on interests of the Nations. These topics included the CNL Earth Day activities, the CNL Indigenous Relations Procurement Strategy, proposed change to the PHAI Cleanup Criteria and an overview of the AECL Government Owned/Contractor Operated procurement process.

While most meetings were held virtually, Hiawatha First Nation hosted the July meeting in-community which included cultural knowledge sharing at the sacred grounds of Serpent Mounds.

In August, a specific meeting was scheduled between PHAI staff and the Williams Treaties First Nations for an in-depth review of recent issues at the harbour (fish mortality and barge drill-rig oil leak). CNL subject matter experts provided the technical information related to the incidents and responded to questions.

At the October Williams Treaties First Nations monthly meeting, the group reviewed the meeting structure and decided that the meetings would move to a quarterly schedule for 2024. It was further noted that CNL was willing to meet with any of the Nations one-on-one to discuss matters specific to their own communities.

15.2.2.1 Alderville First Nation

Alderville has been home to the Mississauga Anishinabeg of the Ojibway Nation since the mid-1830s. Before that time the people lived in their traditional lands around Bay of Quinte (Grape Island) but with the influx of settlement after the American Revolution their existence found itself under increased pressure. The British having lost the American colonies after 1783, were forced to relocate the soldiers and civilians that had been loyal to the King during the conflict. For this reason, the Bay of Quinte became one area of settlement for those who became known as the United Empire Loyalists. The Mississauga then were directly involved in early "land surrenders" along the St. Lawrence River and the Bay, allowing this resettlement to occur.

As signatory to the Gun Shot Treaty, over the years, CNL has engaged in two-way dialogue and mutual information sharing. CNL has provided Alderville First Nation with updates through project information mailings and circulates invitations for special events including Industry Day, career fairs and information sessions.

In 2023, CNL continued to provide information, newsletters, project updates and public disclosures as well as information on the Amendment application with the offer of an update or presentation.

In 2023 June CNL engaged with Alderville, Curve Lake and Hiawatha First Nations to follow up on an archaeology walk down that was conducted at the Lions Recreation Centre Park site in 2022. The three First Nations expressed interest in having Cultural Heritage Liaisons from their respective communities monitor any excavation of native soil for the potential of uncovering items of Indigenous significance. Several meetings with the Nations included CNL Indigenous Relations and environmental staff as well as the contractor's archaeology lead to determine timing and parameters for the planned work.

15.2.2.2 Beausoleil First Nation

Beausoleil First Nation (G'Chimnissing) is an Ojibwe First Nation band government located in Simcoe County, Ontario, Canada. The main settlement is on southern tip of Georgian Bay on Christian, Beckwith and Hope Islands.

Beausoleil First Nation have been identified as potentially having interest in the project based on their proximity and interest in other projects in the area local to PHAI undertakings.

As a member of the Williams Treaties First Nations, over the years, CNL has engaged in two-way dialogue and mutual information sharing. CNL has provided Beausoleil First Nation with updates through project information mailings and circulates invitations for special events including Industry Day, career fairs and information sessions.

In 2023, CNL continued to provide information, newsletters, project updates and public disclosures as well as information on the Amendment application with the offer of an update or presentation.

15.2.2.3 Chippewas of Rama First Nation

The Chippewas of Rama First Nation is located approximately one and a half hours north of Toronto, on 2,500 acres of interspersed land nestled in "Ontario's Lake Country", on the eastern side of Lake Couchiching. The Ojibwe peoples are part of the Three Fires Confederacy along with the Odawa and Pottawatomi Nations.

The Chippewas of Rama First Nation have been identified as potentially having interest in the project based on their proximity and interest in other projects in the area local to PHAI undertakings. As a member of the Williams Treaties First Nations, over the years, CNL has engaged in two-way dialogue and mutual information sharing. CNL has provided Chippewas of Rama First Nation with updates through project information mailings and circulates invitations for special events including Industry Day, career fairs and information sessions.

In 2023, CNL continued to provide information, newsletters, project updates and public disclosures as well as information on the Amendment application with the offer of an update or presentation.

CNL staff met with a Chippewas of Rama First Nation Community Consultation Worker in November as part of the six-month Indigenous Relations Procurement Strategy review to receive feedback and discuss how CNL can incorporate feedback into first annual revision scheduled for 2024 March.

15.2.2.4 Curve Lake First Nation

Curve Lake First Nation people are the Michi Saagig or Mississaugas of the great Anishinaabe (uhnishi-nahbe) nation. The name Anishinaabe is derived from an-ish-aw, meaning "without cause" or "spontaneous," and the word in-au-a-we-se, meaning "human-body." This translates to mean "spontaneous man." The Anishinaabe did not have a written alphabet, but they did have a set of picture symbols or pictographs which were used to educate through stories. Traditional teachings have taught that before contact they shared the land with the Odawa and Huron nations. They are the traditional people of the North shore of Lake Ontario and its tributaries; this has been Mississauga territory since time immemorial.

As signatory to the Gun Shot Treaty, over the years, CNL has engaged in two-way dialogue and mutual information sharing. CNL has provided Curve Lake First Nation with updates through project information mailings and circulates invitations for special events including Industry Day, career fairs and information sessions. In 2023, CNL continued to provide information, newsletters, project updates and public disclosures as well as information on the Amendment application with the offer of an update or presentation.

In 2023, CNL Indigenous Relations staff was invited to participate in two events at Curve Lake First Nation – the Alternative Routes Career Fair in January, where staff provided information on CNL locations, projects and available positions, and a Harvester Symposium in September, where CNL participated with a booth for attendees to learn more about the project and potential economic and employment opportunities.

In recognition of Earth Week in April, CNL arranged for two staff Lunch and Learn sessions on Indigenous Knowledge systems. One of these sessions featured Elders from Curve Lake First Nation speaking about sustainability from an Indigenous worldview. The session was well attended and received very positive feedback.

In 2023 June CNL engaged with Alderville, Curve Lake and Hiawatha First Nations to follow up on an archaeology walk down that was conducted at the Lions Recreation Centre Park site in 2022. The three First Nations expressed interest in having Cultural Heritage Liaisons from their respective communities monitor any excavation of native soil for the potential of uncovering items of Indigenous significance. Several meetings with the Nations included CNL Indigenous Relations and environmental staff as well as the contractor's archaeology lead to determine timing and parameters for the planned work.

In the fall of 2023, CNL staff attended CLFN's annual Pow-Wow, CNL staff were also invited to visit Curve Lake First Nation for a cultural awareness session at the Kinomaage-Waapkong (petroglyphs) site with teachings shared by a community Elder, followed by lunch in the community and opportunity to meet other community leaders and staff.

In late 2022, Curve Lake and Hiawatha First Nations expressed interest in participating in the development of the Restoration Plan for the PHAI Waterworks West site. Over the 2023 year a significant amount of work went into the restoration planning for the Waterworks West site, and particularly the Alexander Creek restoration. This site and the creek are of particular interest to the Williams Treaties First Nations due to the potential/presence of brook trout, a Cultural Keystone Species for the Mississauga peoples. Representatives from both Nations participated in contingent worker safety and procedure training in March to allow them to participate in archaeological observation at the Lions Recreation Centre Park site and survey work at the Waterworks West site including a site assessment, vegetation survey and fish rescue.

Through several collaborative meetings, conversations and review/addressing concerns expressed by the Nations, a draft plan was developed and submitted to the regulator in December. CNL continues to work through final input and design reviews with the consultant.

This cooperative project aligns with CNL efforts for increased input from Indigenous communities and organizations into project planning and fulfils CNL, AECL and CNSC commitments to honour and respect Aboriginal and Treaty Rights by protecting and enhancing lands where the Mississaugas exercise their rights to fish and harvest on the land.

15.2.2.5 Georgina Island First Nation

Chippewas of Georgina Island is an Anishinaabe Nation located on the southern shores of Lake Simcoe. Their ancestors were inhabitants of the Lake Simcoe region long before the arrival of settlers. Six years after a government experiment to colonize the Chippewa people in 1830, Chief Joseph Snake moved his people back to Snake Island, and then to Georgina Island as the community grew. Georgina Island was the first community in Canada to ratify The Framework Agreement on First Nation Lands Management and preserve inherent rights to hunt, fish, and gather.

Georgina Island First Nation have been identified as potentially having interest in the project based on their proximity and interest in other projects in the area local to PHAI undertakings. As a member of the Williams Treaties First Nations, over the years, CNL has engaged in two-way dialogue and mutual information sharing. CNL has provided Georgina Island First Nation with updates through project information mailings and circulates invitations for special events including Industry Day, career fairs and information sessions.

In 2023, CNL continued to provide information, newsletters, project updates and public disclosures as well as information on the Amendment application with the offer of an update or presentation.

In July, CNL staff met with the Community Consultation Worker for Georgina Island First Nation to provide an update on the Amendment application. The staff member initially expressed some concerns around the decision to seek the amendment. After the presentation and receiving answers to many questions, he expressed that the information had made the issue much clearer, and he now agreed with the proposed amendment. He also noted some issues with using the PHAI website and the posted survey on the Amendment application. Immediately following the meeting, the issues on the website were addressed and the survey was removed for internal review.

15.2.2.6 Hiawatha First Nation

Hiawatha First Nation is located on the north-shore of Rice Lake, east of the Otonabee River in Otonabee Township, approximately 30 kilometres south of Peterborough. The First Nation consists of approximately 2,145 acres of land of which 1523 are under certificates of possession.

As signatory to the Gun Shot Treaty, over the years, CNL has engaged in two-way dialogue and mutual information sharing. CNL has provided Hiawatha First Nation with updates through project information mailings and circulates invitations for special events including Industry Day, career fairs and information sessions. In 2023, CNL continued to provide information, newsletters, project updates and public disclosures as well as information on the Amendment application with the offer of an update or presentation.

In recognition of Earth Week in April, CNL arranged for two staff Lunch and Learn sessions on Indigenous Knowledge systems. One of these sessions featured Elders from Hiawatha First

Nation speaking about Nigan Aki (land first) program. The session was well attended and received very positive feedback.

In 2023 June CNL engaged with Alderville, Curve Lake and Hiawatha First Nations to follow up on an archaeology walk down that was conducted at the Lions Recreation Centre Park site in 2022. The three First Nations expressed interest in having Cultural Heritage Liaisons from their respective communities monitor any excavation of native soil for the potential of uncovering items of Indigenous significance. Several meetings with the Nations included CNL Indigenous Relations and environmental staff as well as the contractor's archaeology lead to determine timing and parameters for the planned work.

In late 2022, Curve Lake and Hiawatha First Nations expressed interest in participating in the development of the Restoration Plan for the PHAI Waterworks West site. Over the 2023 year a significant amount of work went into the restoration planning for the Waterworks West site, and particularly the Alexander Creek restoration. This site and the creek are of particular interest to the Williams Treaties First Nations due to the potential/presence of brook trout, a Cultural Keystone Species for the Mississauga peoples. Representatives from both Nations participated in contingent worker safety and procedure training in March to allow them to participate in archaeological observation at the Lions Recreation Centre Park site and survey work at the Waterworks West site including a site assessment, vegetation survey and fish rescue.

Through several collaborative meetings, conversations and review/addressing concerns expressed by the Nations, a draft plan was developed and submitted to the regulator in December. CNL continues to work through final input and design reviews with the consultant.

This cooperative project aligns with CNL efforts for increased input from Indigenous communities and organizations into project planning and fulfils CNL, AECL and CNSC commitments to honour and respect Aboriginal and Treaty Rights by protecting and enhancing lands where the Mississaugas exercise their rights to fish and harvest on the land.

In 2023 December, three cultural heritage liaisons from Hiawatha First Nation attended the site to monitor the excavation work alongside CNL's archaeologist. No items of Indigenous or archaeological significance were uncovered.

15.2.2.7 Mississaugas of Scugog Island First Nation

The Mississaugas of Scugog Island First Nation moved into southern Ontario from their former homeland north of Lake Huron around the year 1700. The Mississaugas are a branch of the greater Ojibwa Nation, one of the largest native groups in Canada. From time immemorial, Mississauga people secured all their needs from the surrounding environment ("Mother Earth"); hunting and fishing and harvesting plant materials for food and medicines. Wild rice, an important food staple, grows in shallow water and was gathered in late summer using birch bark canoes.

As signatory to the Gun Shot Treaty, over the years, CNL has engaged in two-way dialogue and mutual information sharing. CNL has provided Mississaugas of Scugog Island First Nation with updates through project information mailings and circulates invitations for special events including Industry Day, career fairs and information sessions. In 2023, CNL continued to provide information, newsletters, project updates and public disclosures as well as information on the Amendment application with the offer of an update or presentation.

In March, July, and September, CNL Indigenous Relations staff met with Mississaugas of Scugog Island representatives to discuss project activities and specific areas of interest and priority for the community for 2023 engagement. Mississaugas of Scugog Island First Nation expressed interest in participating in a peer review of the risk assessment for the Chemetron Lagoon site once excavation was complete.

In response to a request for sponsorship for the Annual Pow-Wow, CNL was pleased to make a financial contribution to support this important cultural and community event.

CNL met with Mississaugas of Scugog Island First Nation again in December for an update on the process for Risk Assessment and to establish dates for Nation-specific quarterly meetings in 2024.

15.2.3 Nations and Organizations with Interests

15.2.3.1 Anishinabek Nation

The Anishinabek Nation established the Union of Ontario Indians as its secretariat in 1949. The Union of Ontario Indians was established because the Anishinabek Nation did not legally exist and a legal entity was required to enter into legally binding agreements. The Anishinabek Nation is a political advocate for 39 member First Nations across Ontario. The Anishinabek Nation is the oldest political organization in Ontario and can trace its roots back to the Confederacy of Three Fires, which existed long before European contact.

In 2019, the former Chief of Alderville First Nation was appointed as the Eastern Region Deputy Grand Council Chief of Anishinabek Nation. The Deputy Chief reached out to CNL to get reacquainted with the PHAI and potential economic opportunities for member Nations. With this connection CNL established a relationship with Anishinabek Nation and has since had several meetings with representatives and Grand Council members to learn about Anishinabek Nation's role, interests, and concerns, and to share project information including hosting site tours and PHAI presentations and responding to questions and concerns.

In 2023, CNL continued to provide information, newsletters, project updates and public disclosures as well as information on the Amendment application with the offer of an update or presentation.

15.2.3.2 Mohawks of Bay of Quinte

The Mohawks of the Bay of Quinte are a First Nation within Hastings County, Ontario. They control the Tyendinaga Mohawk Territory, which is a 7,362.5 ha reserve on the shores of Bay of Quinte in south-eastern Ontario, east of Belleville. The ancestral homeland of the Mohawk Nation is the Mohawk River Valley, which is in present day New York State. The Mohawks are *considered the easternmost Nation within the Iroquois/Six Nation Confederacy and as such are referred to as the Keepers of Eastern Door. The original Five Nation Confederacy was made up of the Mohawk, Oneida, Onondaga, Cayuga and Seneca Nations. When the Tuscaroras were adopted into the Iroquois Confederacy around 1722, the Iroquois became known as the Six Nations Confederacy.*

Over the years, CNL has provided the Mohawks of the Bay of Quinte with updates through project information mailings and circulates invitations for special events including Industry Day, career fairs and information sessions.

In 2023, CNL continued to provide information, newsletters, project updates and public disclosures as well as information on the Amendment application with the offer of an update or presentation.

15.2.3.3 Métis Nation of Ontario

The Métis Nation of Ontario was formed in 1993 to represent communities and individuals recognized by the Métis Nation within Ontario and works to represent the rights, interests, and collective aspirations of Métis People and communities throughout the province. CNL engages with representatives of Métis Nation of Ontario Regions 6 (eastern Ontario including Peterborough and Ottawa) and 8 (including Durham and the Greater Toronto Area.)

Over the years, CNL has engaged with Métis Nation of Ontario and in particular representatives from Region 6, 8 and the Wapiti District Métis Council, and exchanged dialogue and two-way information sharing. CNL has also provided updates through project information mailings and circulates invitations for special events including Industry Day, career fairs and information sessions. In 2023, CNL continued to provide information, newsletters, project updates and public disclosures.

Since 2020, the Métis Nation of Ontario representatives have participated in PHAI presentations and site tours on several occasions.

In 2023, CNL continued to provide information, newsletters, project updates and public disclosures as well as information on the Amendment application with the offer of an update or presentation.

15.2.4 Engagement with Indigenous Communities and Organizations

In 2023, CNL participated in 44 engagements with Indigenous communities and organizations. A list of all engagements is included in Table 32.

Table 32: Indigenous Engagement Activities for 2023

Date	Location	Activity
January 06	Virtual	Curve Lake First Nation meeting re: Alexander Street Ravine
January 12	Port Hope	Curve Lake First Nation West Beach site visit
January 19	Curve Lake First Nation	Alternative Routes Career Fair - Curve Lake First Nation

Date	Location	Activity
January 25	Virtual	Williams Treaties First Nations monthly ERM meeting
February 03	Port Hope	Curve Lake First Nation/Hiawatha First Nation consultant meeting re: trout habitat at West Beach
February 10	Port Hope	Meeting with Port Hope High School VP re: collaborations on Indigenous learning initiatives
February 22	Ottawa	Canadian Nuclear Association Conference - Indigenous Relations meetings: CNSC, Curve Lake First Nation
March 01	Virtual	Williams Treaties First Nations monthly ERM meeting
March 02	Virtual	Mississaugas of Scugog Island - meeting re: 2023 engagement
March 03	Port Hope	Meeting with 4 Directions, Curve Lake and Hiawatha First Nation reps, Department of Fisheries and Oceans and Ministry of Natural Resources and Forestry re: Waterworks West
March 14	Port Hope	Curve Lake First Nation/Hiawatha First Nation consultant field work - Waterworks West
March 20	Port Hope	Contingent worker training for 4 Directions and First Nation representatives
March 29	Virtual	Williams Treaties First Nations monthly ERM meeting
April 17	Virtual	Earth Week Lunch and Learns sessions: Indigenous Insights
April 25	Port Hope	Port Hope High School Medicine Walk with Indigenous representative from School Board
May 06	Port Hope	Waterworks West: 4 Directions Alexander Creek site assessment survey
May 15	Port Hope	Waterworks West status update/next steps workshop: 4 Directions, Curve Lake First Nation; Hiawatha First Nation; Ministry of Natural Resources and Forestry; Department of Fisheries and Oceans
May 31	Virtual	Williams Treaties First Nations monthly ERM meeting
June 14	Port Hope	Curve Lake First Nation/Hiawatha First Nation consultant: Vegetation Survey
June 16	Port Hope	Curve Lake First Nation/Hiawatha First Nation consultant: Fish rescue
June 23	Port Hope	Meeting with Indigenous construction company regarding procurement
June 26	Virtual	Curve Lake, Hiawatha, Alderville First Nations: excavation/archaeological participation - Lions Park
June 28	Virtual	Williams Treaties First Nations monthly ERM meeting
July 05	Virtual	Métis Nation of Ontario Regions 6 and 8 re: Amendment application (virtual)
July 06	Port Hope	Curve Lake, Hiawatha First Nations - meeting re: Amendment application (hybrid)
July 07	Virtual	Alderville: meeting re Lions Recreation Centre Park
July 13	Virtual	Chippewas of Georgina Island First Nation meeting: Amendment application (virtual)
July 26	Hiawatha First Nation	Williams Treaties First Nations monthly ERM meeting at Hiawatha First Nation

Date	Location	Activity
August 01	Email	Amendment application Community Report circulated to Williams Treaty First Nations; also sent to Mohawks of the Bay of Quinte, Métis Nation of Ontario, Anishinabek Nation in August
August 25	Virtual	Williams Treaties First Nations meeting re: Harbour issues and disclosure (fish mortality and drilling rig oil leak)
August 30	Virtual	Williams Treaties First Nations monthly ERM meeting
September 08	Virtual	Meeting with Mississaugas of Scugog Island First Nation representative
September 11	Port Hope	Procurement meeting with Indigenous business and PHAI contractors
September 15	Port Hope	Curve Lake First Nation/Hiawatha First Nation consultant Waterworks West/WSP meeting
September 18	Curve Lake First Nation	Curve Lake First Nation Cultural Awareness session - CNL executives and Indigenous Relations staff
September 20	Curve Lake First Nation	Curve Lake First Nation Harvester Symposium
October 25	Virtual	Williams Treaties First Nations monthly ERM meeting
November 17	Port Hope	Curve Lake First Nation/Hiawatha First Nation consultant: Waterworks West technical review meeting
November 21	Virtual	Chippewas of Rama First Nation meeting: Indigenous Relations Procurement Strategy review
November 30	Virtual	Hiawatha First Nation meeting: Archaeological Monitoring - Lions Recreation Centre Park site
December 01	Virtual	Hiawatha First Nation meeting follow-up: Archaeological Monitoring - Lions Recreation Centre Park site
December 04	Port Hope	Haudenosaunee Confederacy meeting: project involvement/monitoring
December 04	Port Hope	Hiawatha First Nation Archaeological Monitoring begins: Lions Recreation Centre Park site
December 05	Virtual	Mississaugas of Scugog Island First Nation meeting: general updates

15.2.5 Contribution/Relationship Agreements

CNL supports the development of contribution/relationship agreements to provide funding to ensure Indigenous communities remain actively involved in CNL communications, engagement, and project planning.

Agreements may include financial support for staff time related to administration, community liaison activities and meetings; technical documentation review; and environmental and habitat assessments as well as community capacity building through skills training and job shadowing.

In 2023, CNL renewed one existing Contribution Agreements with a Williams Treaties First Nation; entered into one new Contribution Agreement and began discussions to develop a third agreement with another Williams Treaties community.

CNL remains open to developing Contribution/Relationship Agreements with other Indigenous communities and organizations.

15.2.6 Indigenous Knowledge Systems

CNL is growing its Indigenous Relations program to align with the Truth and Reconciliation Commissions Calls to Action, which includes enhancing participation and collaborations with Indigenous communities and organizations, PHAI is therefore seeking input to apply guidance and Indigenous knowledge systems into project activities. This work is a movement toward the goal of meaningful action and engagement with Indigenous communities and peoples.

In 2023, CNL embarked on a collaboration with Indigenous communities to develop in depth offsetting and restoration plans at the Waterworks West project site and Alexander Creek including the application of Indigenous ecological knowledge. This work supports enhanced fisheries habitat restoration and will support sustainability and protection of Treaty rights to fish and harvest on these lands and waterways. (Refer to Section 15.2.2.4 and Section 15.2.2.6 Curve Lake and Hiawatha First Nations respectively for more details).

Through ongoing collaboration with Indigenous communities, CNL will continue to engage on this approach for various project sites and work to incorporate Indigenous knowledge systems and worldviews into its environmental programming and project planning and execution.

15.2.7 Archaeology Program

The CNL Protocol for Archaeological and Forensic Discovery outlines the required procedure should items of potential archaeological, Indigenous, or cultural heritage significance be uncovered during PHAI work. The protocol requires that the archaeologist overseeing the site engage with cultural heritage liaisons from Indigenous communities. CNL ensures that Indigenous communities remain engaged and involved in all stages of the archaeological work.

Mandatory archaeological training is provided to all PHAI front-line project staff and contractors to outline what to expect during field work, what to watch for and the steps required when uncovering an object of potential significance.

When CNL was advised there may be Indigenous artifacts in Lions Recreation Centre Park in Port Hope, Indigenous communities were informed and representatives from Curve Lake, Hiawatha First Nations joined CNL staff for a site walk-down before the lands were cleared for excavation of contamination (Refer to Section 15.2.2 for more details).

In 2023 December, Cultural Heritage Liaison Monitors from Hiawatha First Nation joined the onsite archaeologist while workers removed native soil contaminated with waste. No items of potential significance were uncovered during the work.

15.2.8 Indigenous Business and Trade Liaison

CNL is committed to implementing Call to Action #92 in the Truth and Reconciliation Commission report to actively promote and enable economic opportunity for Indigenous Businesses.

To facilitate access to CNL supply chain opportunities, the PHAI website includes links to an Indigenous Vendor Portal to connect potential or current Indigenous suppliers with information on procurement opportunities for goods, services, equipment, decommissioning and construction. CNL circulates information on PHAI and CNL business and employment events, including CNL industry days and career fairs as well as job opportunities to Indigenous communities and organizations.

In 2023 January, CNL was invited to participate in the Alternative Routes Career Fair at Curve Lake First Nation to provide information on the PHAI, current job opportunities and information on potential career pathways in the environmental remediation industry.

CNL met with PHAI prime contractors in January to establish contacts for Indigenous businesses to request information on how to get involved in the projects.

In 2023 March, CNL introduced an *Indigenous Relations Procurement Strategy*. The strategy sets out how CNL intends to deliver on its commitments and provides a vehicle for engagement and consultation on CNL's supply chain approach to Reconciliation. In 2023 October, CNL invited Indigenous communities to conduct a six-month review on the strategy and provide any feedback.

In 2023, CNL contracted with an Indigenous environmental consulting firm with fisheries ecology expertise to conduct work at the Waterworks West site including a vegetation survey and participation in a fish rescue at Alexander Creek.

Throughout the year, CNL held meetings with Indigenous businesses and contractors and facilitated introductions to CNL contractors working on the PHAI.

15.2.9 Information Updates

CNL routinely engages in two-way dialogue and encourages information sharing to learn more about local Indigenous communities and organizations. CNL distributes PHAI newsletters, media releases, public disclosures, and invitations to special events to Indigenous communities and organizations via email.

Public Disclosures as detailed in Section 15.1.2 are shared directly with Indigenous communities and organizations by email and discussed as part of the standing agenda at monthly meetings of Williams Treaties First Nations.

15.2.10 Ongoing Projects

15.2.10.1 Application to amend PHAI licence: change to PHAI Cleanup Criteria (Amendment application)

Following a pause in 2022 for the PHAI licence renewal hearing, CNL re-launched a comprehensive engagement program with Indigenous communities and organizations on the Amendment application in 2023 March to inform internal and external audiences and collect feedback on the Amendment application. CNSC staff were provided with the dates of public engagement events in advance and invited to attend any of the activities.

Engagement covered in this report began in 2023 May with the launch of a multi-faceted campaign to communicate information and collect feedback on the Amendment application.

Discussion and feedback were recorded and applied, where applicable, to further refine messaging, address common questions and maintain open dialogue about support and concerns throughout the engagement process.

CNL provided a presentation on the Amendment application at the May 31 monthly meeting with the Williams Treaties First Nations and offered to provide in-depth presentations to each of the Nations at their request. Individual meetings were later scheduled with Curve Lake, Hiawatha, and Mississaugas of Scugog Island First Nations, as well as with Métis Nation of Ontario and Wapiti District Métis Council.

At the June 28 Williams Treaties First Nations meeting, CNL provided an overview presentation on the Amendment application and confirmed that the application included only a requested change to the level for arsenic. The Nations were advised that two reports, the *Port Hope Area Initiative: Arsenic- Impacted Legacy Waste Remediation REV 3* and *Port Hope Area Initiative Arsenic-Impacted Legacy Waste Remediation - Community Report* were being prepared and would be circulated to all Treaty Rights holders for review and comment with feedback incorporated into the formal submission to CNSC.

In July, CNL staff met with the Community Consultation Worker for Georgina Island First Nation at meeting to provide an update on the Amendment application. The staff member initially expressed some concerns around the decision to seek the amendment. After the presentation and receiving answers to many questions, he expressed that the information had made the issue much clearer, and he now agreed with the proposed amendment. He also noted some issues with using the PHAI website and the posted survey on the Amendment application. Immediately following the meeting, the issues on the website were addressed and the survey was removed for internal review.

In 2023 August, CNL shared the reports for review and comment with all Williams Treaties First Nations, MNO, Anishinabek Nation, and Mohawks of Bay of Quinte.

15.2.11 Monitoring Concerns and Incorporating Feedback

CNL maintains open dialogue with Indigenous communities and organizations to strengthen understanding of Indigenous worldviews and relationship to the land and monitor concerns about PHAI activities.

Through ongoing engagement with Indigenous communities, consistent issues and concerns have been identified for CNL to address including:

- How project development might interfere/accommodate animal movement and migration at project sites
- Accommodation/mitigation for Species at Risk in work areas
- Fish relocation and habitat restoration in harbour area

- Maintenance of groundwater quality and the prevention of seepage
- Frequency of well sampling/testing
- Plans to prevent the incursion of invasive species in work areas
- CNL archaeological protocols
- Arsenic and radiological cleanup criterion changes
- Indigenous participation/monitoring of project activities

Indigenous communities have urged CNL to leave remediated sites in better condition than when the project began, balancing the commitment to remove contaminated soils with the protection of lands and waters.

Throughout all engagement activities any questions, concerns, and input about the PHAI and project-related impacts are recorded in writing and implemented where applicable.

Comments received on draft plans, reports, etc. are dispositioned and a record circulated to all reviewers with the updated document outlining how each comment was dispositioned and applied or not applied and the reasoning.

In 2023, CNL circulated draft reports and documents to the Williams Treaties First Nations for review and comment on several projects including the Amendment application technical and community report reports; planting and restoration design plans for the Lions Recreation Centre Park, Chemetron Lagoon sites and the Waterworks West site; and updates to the PHAI Program of Engagement with Indigenous Communities and Organizations. Any edits to language and/or terminology is tracked and shared with CNL's broader Indigenous Relations team corporately to apply for consistency.

CNL received feedback through an intervention filed by Hiawatha First Nation on the annual CNSC Regulatory Oversight Review, as well as feedback from Hiawatha, and Curve Lake First Nations on the cleanup criteria Amendment application documents as well as the PHAI Program of Engagement with Indigenous Communities and Organizations.

15.2.12 Documentation and Reporting

To measure the effectiveness of CNL's engagement plan, all written, telephone and electronic communications, as well as follow-up actions or requests for information, are tracked and recorded in writing. Comments and questions at meetings are recorded in writing for follow-up where required and responses are made available.

As the regulatory authority responsible for licensing and oversight of the PHAI, the CNSC is kept apprised of CNL communications and engagement with Indigenous communities and organizations through quarterly and annual reporting.

To further enhance reporting, CNL requested a regular update meeting with CNSC Indigenous relations staff in 2022 to share details on engagement with Indigenous communities and organizations; those meetings continued in 2023 on a monthly basis.

15.2.13 CNL Staff Education and Awareness

CNL recognizes that all employees are ultimately responsible for the corporate commitment to truth and reconciliation as outlined in Call to Action #92 - Business and Reconciliation [87]. The evolution of CNL Indigenous relations includes ongoing education and awareness training for all employees.

At each quarterly HWP all-staff meeting, Indigenous Relations staff provided an update on recent initiatives and activities along with information on further resources.

In recognition of Earth Week in April, HWP Indigenous Relations staff arranged for two staff Lunch and Learn sessions on Indigenous Knowledge systems. Elders from Curve Lake First Nation spoke about sustainability from an Indigenous worldviews and Elders from Hiawatha First Nation shared information about the Nigan Aki (Land First) program. The sessions were well attended and received very positive feedback.

HWP Indigenous Relations meets on a bi-weekly basis with all CNL Indigenous Relations staff to provide updates and ensure alignment of messaging. HWP staff also participated in bi-monthly meetings with CNL Diversity Equity and Inclusion staff to share information and resources throughout the year.

In May, HWP staff developed a new, multi-page Indigenous Relations section on the HWP intranet site to provide information and resources to support employees in their learning about Indigenous history and current matters in Canada including books, videos, and free courses, as well as a calendar of dates of Indigenous significance. In advance of each date, Indigenous Relations staff distributed information to all HWP employees explaining the meaning of the occasion along with links to specific resources to support further learning. Managers also receive a one-page overview that can be shared at staff meetings and tailgate meetings.

In 2023, CNL staff drafted two staff training modules to be delivered in 2024. The first module, an overview of CNL Indigenous Relations, will be mandatory training for all CNL staff in 2024 and incorporated into New Employee Orientation going forward. The second module provides an overview of the history of Indigenous relations in Canada.

15.3 Remedial Cleanup Criteria

The PHAI cleanup criteria (Cleanup Criteria - PHAI) were developed and introduced during the EA phase of the project. The PHAI cleanup criteria apply to radiological and non-radiological substances. To verify the achievement of the PHAI cleanup criteria, or to confirm that a site already achieves the cleanup criteria, CNL has implemented remediation verification procedures that provide guidance on field screening, verification sampling and laboratory analysis.

In accordance with the *PHAI LCH* [3], CNSC staff were notified of revisions to the following remediation verification procedures:

- *Remedial Verification Approach at Highland Drive Landfill* [88]

- *Port Hope Project – Remediation Verification Standard Operating Procedure – Harbour* [89]

During the reporting period, CNL continued to work closely with the Municipality of Port Hope to ensure council and staff were kept informed on the proposal to amend the PHAI cleanup criteria for arsenic. Feedback from regulators including Health Canada and the MECP is being incorporated as CNL follows the CNSC application and review process. Refer to the PHAI website for details: Application to change the PHAI Cleanup Criteria - PHAI.

16. Concluding Remarks

CNL is committed to achieving high standards of operational safety and security. The information and data presented in this report support the conclusion that safe and secure performance was achieved at the PHAI, while enhancements were implemented to further improve results.

This Annual Compliance Report demonstrates that CNL's PHAI has successfully met the requirements of the Nuclear Safety and Control Act, regulations and the CNSC Waste Nuclear Substance Licence requirements. CNL continues to make adequate provision to protect the health, safety, and security of workers, the public and the environment, and continues to implement Canada's international obligations on the peaceful use of nuclear energy.

17. Acronyms

Acronym	Definition
AAQC	Ambient Air Quality Criteria
ACMR	Annual Compliance Monitoring Report
AECL	Atomic Energy of Canada Limited
ALARA	As Low As Reasonably Achievable
CCME	Canadian Council of Ministers of the Environment
CNL	Canadian Nuclear Laboratories
CNSC	Canadian Nuclear Safety Commission
COPC	Contaminants of Potential Concern
CWQG	Canada Water Quality Guidelines
dBA	Decibels
EA	Environmental Assessment
ERM	Environmental Remediation Management
HWP	Historic Waste Program
HWP MO	Historic Waste Program Management Office
IAEA	International Atomic Energy Agency
ImpAct	Improvement Action
ISQG	Interim Sediment Quality Guidelines
LCH	Licence Conditions Handbook
LEL	Lowest Effect Level
LLRW	Low Level Radioactive Waste
MECP	Ministry of the Environment, Conservation, and Parks (Ontario)
NEW	Nuclear Energy Worker
NNC	Notice of Non-Compliance
OSH	Occupational Safety and Health

Acronym	Definition
PEL	Probable Effect Level
PM	Particulate Matter
PG LTWMF	Port Granby Long-term Waste Management Facility
PGP	Port Granby Project
PG WMF	Port Granby Waste Management Facility
PHAI	Port Hope Area Initiative
PH LTWMF	Port Hope Long-Term Waste Management Facility
PHP	Port Hope Project
PH WWTP	Port Hope Waste Water Treatment Plant
PSQG	Provincial Sediment Quality Guideline
PWQO	Provincial Water Quality Objectives
RP	Radiation Protection
SCA	Safety and Control Area
SEL	Severe Effect Level
SSHC	Site Safety and Health Committee
TDG	Transportation of Dangerous Goods
TLD	Thermoluminescent Dosimeter
TSP	Total Suspended Particulate
TSS	Total Suspended Solids
WHO	World Health Organization
WWMF	Welcome Waste Management Facility

18. References

[1] *An Agreement for the Cleanup and Long-Term Safe Management of Low-Level Radioactive Waste Situated in The Town of Port Hope, The Township of Hope and the Municipality of Clarington*, 4500-513700-110-11000-008, 2001 March 29.

[2] CNSC, *Port Hope Area Initiative Waste Management Project Waste Nuclear Substance Licence*, WNSL-W1-2310.00/2032, Expiry Date: 2032 December 31.

[3] CNSC, *Port Hope Long-Term Low-Level Radioactive Waste Management Project - Licence Conditions Handbook*, WNSL-W1-2310.00/2032, Revision 0, 2023 January 01.

[4] CNSC, REGDOC-3.1.3, *Reporting Requirements for Waste Nuclear Substance Licensees, Class II Nuclear Facilities and Users of Prescribed Equipment, Nuclear Substances and Radiation Devices*, Version 1.0, 2020 February.

[5] CNL, *Annual Compliance Monitoring Report for Canadian Nuclear Laboratories*, 145-00583-ACMR-2023, Revision 0, 2024 April.

[6] *The Nuclear Safety and Control Act*, S.C. 1997, C.9, 2013 July.

[7] Canadian Nuclear Safety Commission, *Summary of Record of Decision for the Port Hope Project Renewal, DEC 22-H13*, 4500-96000-130-000, 2023 Dec.

[8] Canadian Nuclear Safety Commission, *Port Hope Long-Term Low-Level Radioactive Waste Management Project Licence*, WNSL-W1-2310.02/2022, Expiry Date: 2022 December 31.

[9] Canadian Nuclear Safety Commission, *Port Granby Long-Term Low-Level Radioactive Waste Management Project Licence*, WNSL-W1-2311.02/2022, Expiry Date: 2022 December 31.

[10] Canadian Nuclear Safety Commission, *Waste Nuclear Substance Licence, Pine Street Extension Temporary Storage Site*, WNSL-W1-182.0/2022, Expiry Date: 2022 December 31.

[11] Canadian Nuclear Safety Commission, Waste Nuclear Substance Licence, *Port Hope Radioactive Waste Management Facility*, WNSL-W1-344-1.8/ind., Expiry Date: Indefinite.

[12] Letter, G. Rickford (NRCAN) to M. Binder (CNSC), *Untitled*, 145-NRCANNO-15-0001-L, 2015 July 31.

[13] Letter, P. Boyle (CNL) to K. Murthy (CNSC), *CNL Submission of Information Regarding Financial Guarantees for all Atomic Energy of Canada Limited Sites Operated by Canadian Nuclear Laboratories*, 2020 August 25.

[14] CSA Group, N286-12, *Management System Requirements for Nuclear Facilities*, 2012 (R2017).

[15] CNL, *Quality Plan, Historic Waste Program*, 236-514200-QAP-001, Revision 2, 2022 January 11.

[16] CNL, *Management System Manual*, 900-514100-MAN-001, Revision 3.1, 2023 August 08.

[17] CNL, *HWP MO Field Oversight Activities*, 236-514200-PRO-001, Revision 2, 2021 December.

[18] CNSC, REGDOC-2.2.2, *Personnel Training*, Version 2, 2021 October.

[19] CNL, *Port Hope Area Initiative Training Plan*, 4500-510200-PLA-001, Revision 4, 2023 September 01.

[20] Letter, S. Morris (CNL) to R. Buhr (CNSC), *Notification of Revision to the Port Hope Area Initiative Training Plan*, 4500-CNNO-23-0016-L, 2023 September 01.

[21] CNL, *Application of Systematic Approach to Training (SAT) at CNL*, 900-510200-LST-001, Revision 02, 2022 May 30.

[22] CNL, *Process to Determine the Application of the Systematic Approach to Training (SAT) at CNL*, 180-510200-178-000, Revision 0, 2020 March 31.

[23] CNL, *CNL Learning and Development*, 900-510200-STD-005, Revision 0, 2022 April 28.

[24] CNL, *Oversight of Engineering Agencies*, 900-508120-MCP-006, Revision 0, 2021 February 25.

[25] Letter, S. Morris (CNL) to R. Buhr (CNSC), *Prior Notification of Revision to the Port Hope Project Detailed Design Description Report*, 4501-CNNO-23-0041-L, 2023 September 22.

[26] Letter, S. Morris (CNL) to K. Ji (CNSC), *Prior Notification of Revision to the Port Granby Project Detailed Design Description Reports*, 4502-CNNO-23-0016-L, 2023 November 27.

[27] CNL, *Historic Waste Program Management Office Application of Engineering Change Control and Oversight*, 236-508130-COP-001, Revision 2, 2023 August 31.

[28] CNL, *Fitness for Service*, 900-508230-PDD-001, Revision 3, 2023 July 19.

[29] CNSC, *Radiation Protection Regulations*, SOR/2000-203.

[30] CNL, *Port Hope Area Initiative Radiation Protection Plan*, 4500-508740-PLA-001, Revision 7, 2024 February 15.

[31] CNL, *Program Requirements Document, Radiation Protection*, 900-508740-PRD-001, Revision 5, 2023 December 07.

[32] CNL, *Occupational Safety and Health Plan, Port Hope Area Initiative*, 4500-510400-PLA-001, Revision 4, 2022 May 06.

[33] Letter, S. Morris (CNL) to R. Buhr (CNSC), *Notification of Revision to the Port Hope Area Initiative Occupational Health and Safety Plan*, 4500-CNNO-23-0009-L, 2023 June 21.

[34] Canada, *Occupational Health and Safety Regulations*, SOR/86-304.

[35] CNSC REGDOC-2.9.1, *Environmental Protection: Environmental Principles, Assessments and Protection Measures*, Version 1.2, 2020 September.

[36] CNL, *Port Granby Project, Environmental and Biophysical Monitoring Plan*, 4502-509247-PLA-001, Revision 3, 2023 June 30.

[37] CNL, *Port Hope Project Environmental Protection Plan*, 4501-509200-PLA-003, Revision 1, 2023 March 31.

[38] CNL, *Port Hope Project Environmental and Biophysical Monitoring Plan*, 4501-509247-PLA-001, Revision 4, 2018 October 24.

[39] CNL, *Port Hope Area Initiative Dust Management Requirements and Plan*, 4500-509200-PLA-001, Revision 05, 2023 November.

[40] Letter, S. Morris (CNL) to R. Buhr (CNSC), *Prior Notification of Revision to the Port Hope Project Environmental Protection Plan*, 4500-CNNO-22-0005-L, 2023 February 01.

[41] Letter, S. Morris (CNL) to R. Buhr (CNSC), *Prior Notification of Revision to the Port Granby Project, Environmental and Biophysical Monitoring Plan*, 4502-CNNO-23-0012-L, 2023 May 25.

[42] Letter, R. Buhr (CNSC) to S. Morris (CNL), *CNSC Staff's Review of CNL's Assessment of Action Levels and Release Limits for the Port Hope Waste Water Treatment Plant*, 4501-NOCN-23-0020-L, 2023 May 19.

[43] CSA Group, *Establishing and implementing action levels for releases to the environment from nuclear facilities*, N288.8:17, 2022.

[44] Letter, S. Morris (CNL) to R. Buhr (CNSC), *Proposed Revised Liquid Effluent Action Levels for the Port Granby and Port Hope Waste Water Treatment Plants*, 4500-CNNO-23-0012-L, 2023 July 20.

[45] Letter, R. Buhr (CNSC) to S. Morris (CNL), *CNL-PHAI WMP - CNSC Staff's Review of CNL's Proposed Revised Liquid Effluent Action Levels for the Port Granby and Port Hope Waste Water Treatment Plants*, 4500-NOCN-23-0014-L, 2023 August 29.

[46] Government of Canada, *Screening Report – The Port Hope Long-Term Low-Level Radioactive Waste Management Project*, 4501-03710-041-000-0002, Revision 0, 2006 December.

[47] Ontario Ministry of the Environment, *Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act*, 2011 April 15.

[48] Golder Associates Ltd., *Environmental Assessment Study Report for the Port Granby Project*, LLRWMO-03710-ENA-13004, Revision 1, 2007 July.

[49] EcoMetrix Incorporated, *Port Granby Project Aquatic Environment Environmental Effects Assessment Report*, LLRWMO-03270-ENA-13002, Revision 0, 2006 June.

[50] Ontario Ministry of the Environment, *Provincial Water Quality Objectives*, Accessed 2024 January.

[51] EcoMetrix Incorporated, *Aquatic Environment Baseline Characterization Study for the Port Granby Project*, LLRWMO-03270-ENA-13001, Revision 0, 2005 April.

[52] Canadian Council of Ministers of the Environment, *Canadian Water Quality Guidelines for Protection of Aquatic Life*, Accessed 2024 January.

[53] Ontario Ministry of the Environment, *Guidelines for Identifying, Assessing and Managing Contaminated Sediments in Ontario: An Integrated Approach - Provincial Sediment Quality Guidelines*, Revision 0, 2008 May.

[54] Canadian Council of Ministers of the Environment, *Canadian Sediment Quality Guidelines for the Protection of Aquatic Life*, 1999.

[55] Government of Canada, *Screening Report – The Port Granby Long-Term Low-Level Radioactive Waste Management Project*, 2009 August.

[56] Government of Ontario, *Ontario Drinking Water Quality Standards*, O. Reg 169/03.

[57] Ontario Ministry of the Environment, *Ambient Air Quality Criteria (AAQC)*, 2020 April.

[58] Canadian Council of Ministers of the Environment, *Guidance Document on Achievement Determination Canadian Ambient Air Quality Standards for Fine Particulate Matter and Ozone*. Available at: https://ccme.ca/en/res/pn1483_gdad_eng-secured.pdf, Accessed: 2024 March.

[59] CNL, *Port Hope Licensed Sites Environmental Monitoring Program Specifications*, LLRWMO-508760-OLC-11001, Revision 3, 2017 August 16.

[60] CNL, *Environmental Parameters Investigative and Corrective Measures Thresholds for Environmental Monitoring of WNSL-W1-182 Licensed Activities,* LLRWMO-508760-LBD-11001, Revision 3, 2022 September 23.

[61] World Health Organization, *Guidelines for Community Noise*, Edited by B. Berglund, T., 1999.

[62] Golder Associates Ltd., *Port Hope Project Environmental Assessment Study Report*, LLRWMO-03710-ENA-12003, Revision 1D1, 2006 January.

[63] CNL, *Port Hope Harbour Turbidity Monitoring Work Plan*, 4501-121250-PLA-069, Revision 1, 2022 May.

[64] CNL, *Port Hope Area Initiative Emergency Plan*, 4500-508730-PLA-001, Revision 3.2, 2024 February 29.

[65] CNL, *Port Hope Area Initiative Fire Protection Plan*, 4500-508720-PLA-001, Revision 0, 2022 April 08.

[66] Canadian Commission on Building and Fire Codes, National Research Council of Canada, *National Fire Code of Canada*, 2015.

[67] Canadian Commission on Building and Fire Codes, National Research Council of Canada, *National Building Code of Canada*, 2015.

[68] CNSC, REGDOC-2.11.1, *Waste Management, Volume I: Management of Radioactive Waste*, Version 2021.

[69] CSA, N292.0 *General principles for the management of radioactive waste and irradiated fuel*, Version 2019.

[70] CSA, N292.3, *Management of low- and intermediate-level radioactive waste*, Version 2014.

[71] CNL, *Port Granby Waste Management Plan*, 4502-508600-WMP-003, Revision 0, 2021 September 08.

[72] CNL, *Management of Historic Artefact Recovery Program*, 236-508600-WMP-001, Revision 1, 2018 August.

[73] CNL, *Port Hope Area Initiative – Management of Historic Low-Level Radioactive Waste*, 4501-508600-WMP-002, Revision 1, 2019 January.

[74] CNL, *Cameco Decommissioning Waste Management Plan*, 4501-508600-WMP-001, Revision 1, 2018 September.

[75] CNL, *Port Hope Long-Term Waste Management Facility Waste Acceptance Criteria*, 4501-508600-WAC-001, Revision 1, 2022 November 17.

[76] CNL, *Cleanup*, 900-508300-PDD-001, Revision 5, 2023 June 30.

[77] CNSC, REGDOC-2.11.2, *Decommissioning*, 2021 January.

[78] CSA N294:19, *Decommissioning of facilities containing nuclear substances*, 2019 November.

[79] CNL, *Port Granby Project – Preliminary Decommissioning Plan*, 4502-508300-PDP-001, Revision 1, 2023 March 15.

[80] CNL, *Port Hope Area Initiative Security Plan*, 4500-508710-PLA-001, Revision 5, 2024 January 31.

[81] IAEA, *Treaty on the Non-Proliferation of Nuclear Weapons*, INFCIRC/140, 1970 April 22.

[82] CNSC, REGDOC-2.13.1, *Safeguards and Nuclear Material Accountancy*, Version 2018.

[83] CNL, *Port Hope Area Initiative (PHAI) Transportation of Dangerous Goods Plan*, 4500-508520PLA-001, Revision 4, 2018 June 21.

[84] CNSC, REGDOC-3.2.1, *Public Information and Disclosure*, 2018 May.

[85] CNL, *Port Hope Area Initiative (PHAI) Phase 2 and Phase 3 Public Information Program Plan*, 4500-513000-PLA-003, Revision 5, 2023 December 05.

[86] CNL, *Communications Plan Small-Scale Sites*, 4501-121250-PLA-002, Revision 3, 2023 February 23.

[87] Canada, Truth and Reconciliation Commission of Canada: *Calls to Action*, 2015.

[88] Letter, S. Morris (CNL) to R. Buhr (CNSC), *Submission of the Revised Remedial Verification Approach at the Highland Drive Landfill Rev 1*, 4501-CNNO-23-0012-L, 2023 March 30.

[89] Letter, S. Morris (CNL) to R. Buhr (CNSC), *Notification of Revision to the Port Hope Project Harbour Remediation Verification Standard Operating Procedure*, 4501-CNNO-23-0025-L, 2023 June 27.

Appendix A Environmental Compliance Monitoring

A.1 Port Granby Waste Water Treatment Plant Monitoring

Table 33: Port Granby Waste Water Treatment Plant –2023 Liquid Influent Sampling

Influent Parameter (Unit of measure)	Average	Maximum
Radium-226 (Bq/L)	0.24	0.41
pH	7.8	8.7
Nitrite (mg/L)	0.3	1.2
Nitrate (mg/L)	0.5	1.9
Total Suspended Solids (mg/L)	61	131
Total Ammonia-N (mg/L)	2.8	8.0
Total Phosphorus (mg/L)	5.6	11.6
Total Arsenic (µg/L)	1989	3340
Total Cadmium (µg/L)	0.3	6.6
Total Cobalt (µg/L)	22	43
Total Copper (µg/L)	13.3	33.2
Total Molybdenum (µg/L)	182	301
Total Selenium (µg/L)	1.6	16.0
Total Thallium (µg/L)	0.01	0.06
Total Uranium (µg/L)	1371	2621
Total Vanadium (µg/L)	22	36
Note: · Sampling frequency is weekly (as available); in 2023 there were 51 samples		

Table 34: Port Granby Waste Water Treatment Plant Production Quantities of Effluent

Year	Volume (m^3)
2019	239,444
2020	123,031
2021	55,326
2022	37,457
2023	25,917

Table 35: Port Granby Waste Water Treatment Plant – 2023 Liquid Effluent Sampling

Effluent Parameter (Unit of measure)	Total No. of Samples[a]	Maximum	Mean	Action Level (Weekly Mean Concentration Composite Sample)	Release Limit (Weekly Mean Concentration Composite Sample	Release Limit (Monthly Mean Concentration Composite Sample)	No. of Samples Exceeding the Action Level	No. of Samples Exceeding the Release Limit
Acute Toxicity	12	-	-	-	-	Cannot be toxic	-	0
Radium-226(Bq/L)	43	0.018	<0.006	0.05	0.74	0.37	0	0
Total Arsenic (µg/L)	43	31.2	13.78	50	200	100	0	0
Total Cadmium (µg/L)	43	0.06	<0.005	1	2	1	0	0
Total Cobalt (µg/L)	43	0.16	0.08	5	10	5	0	0
Total Copper (µg/L)	43	1.2	0.26	5	10	5	0	0
Total Molybdenum (µg/L)	43	3.6	1.06	39	-	-	0	-
Total Phosphorus (mg/L)	43	0.04	0.02	0.2	0.7	0.35	0	0
Total Selenium (µg/L)	43	0.22	<0.05	0.5	60	30	0	0
Total Thallium (µg/L)	43	0.02	<0.005	0.5	16	8	0	0
Total Uranium (µg/L)	43	9.1	3.6	50	200	100	0	0
Total Vanadium (µg/L)	43	0.22	0.10	5	80	40	0	0
Total Ammonia-N (mg/L)	43	0.23	<0.10	4.9	11.5	5.75	0	0
Nitrite (mg/L)	43	0.07	<0.04	1.5	3	1.5	0	0
Nitrate (mg/L)	43	2.34	<0.16	32	150	75	0	0
pH	43	8.16	7.54	6.5-8.5	<6 or >9.5	<6 or >9.5	0	0
Total Suspended Solids (mg/L)	43	<2.0	<1.0	7.5	30	15	0	0

Note:

a. The total number of effluent samples is less than the total number of influent samples (Table 33) due to recirculation mode operations, where no releases were made.

- "<" denotes some or all results were below the minimum detection limit.
- Action levels and release limits for liquid effluent are defined in:
  - The *Port Granby Project, Environmental and Biophysical Monitoring Plan* [36].
  - Letter of acceptance from CNSC staff [45].

Figure 3: Port Granby Waste Water Treatment Plant Final Effluent Monthly Averages Total Uranium, Total Arsenic, and pH – 5-Year

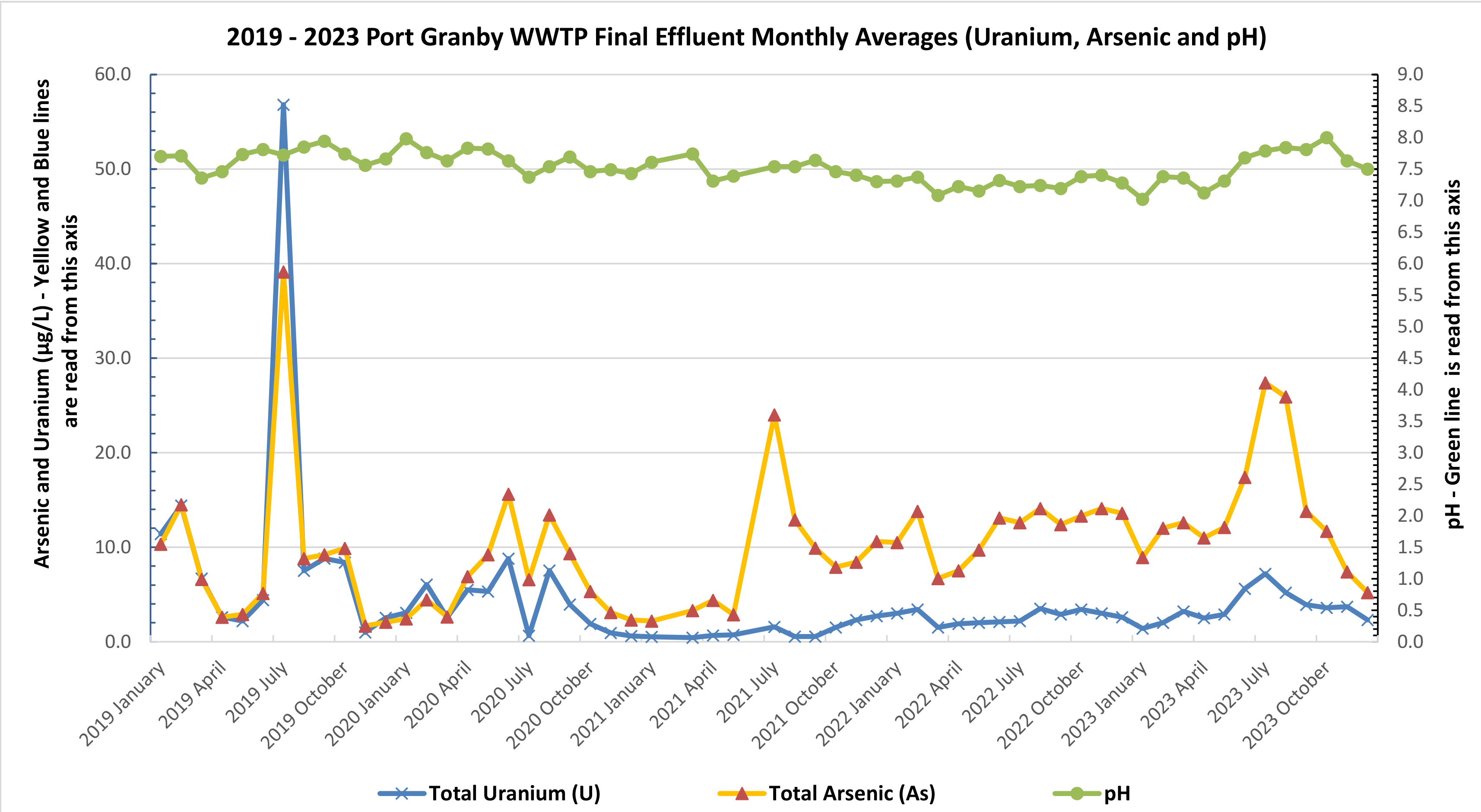


Figure 4: Port Granby Waste Water Treatment Plant Final Effluent Monthly Averages Total Copper and Total Cobalt– 5-year

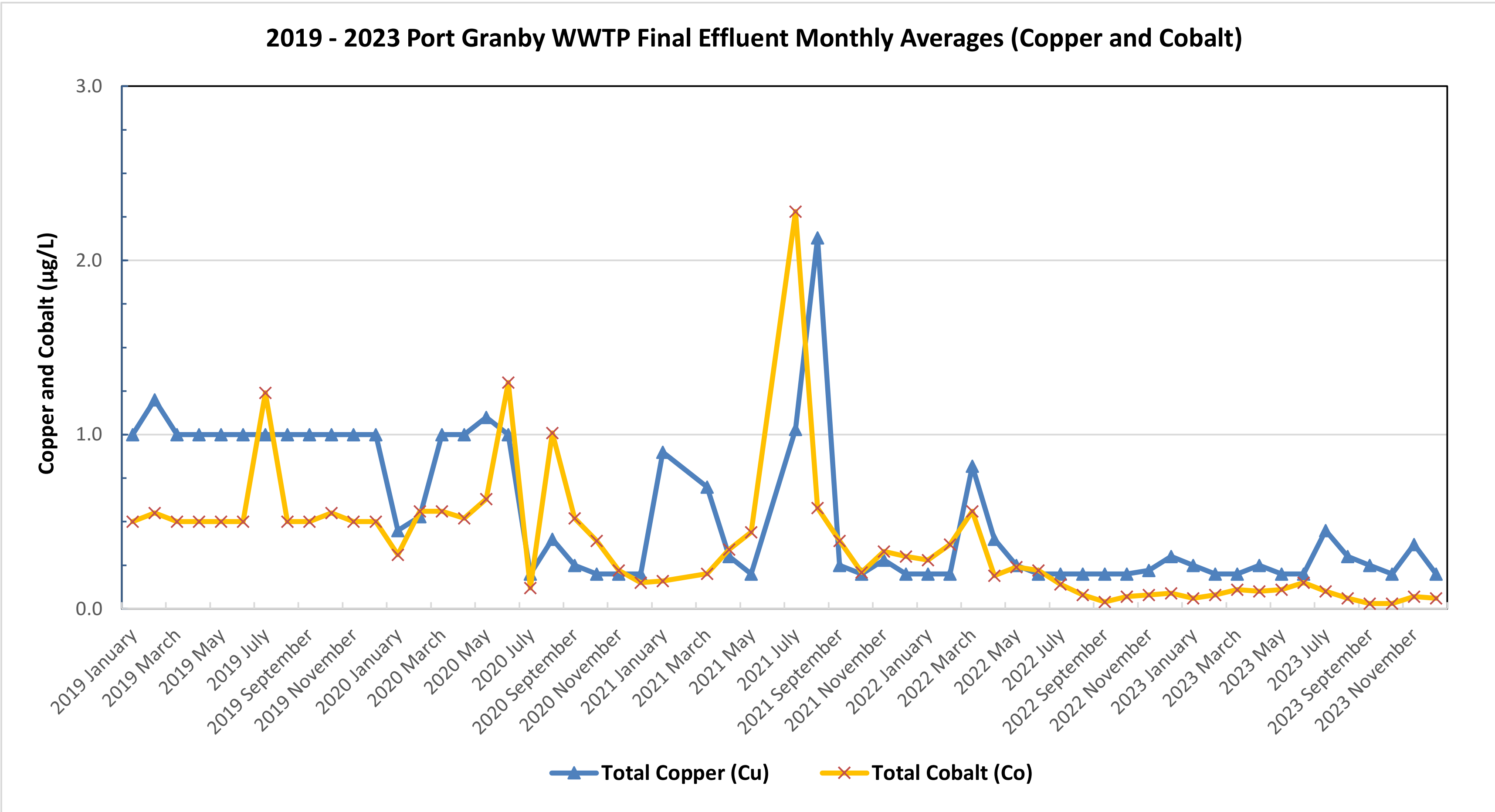


Figure 5: Port Granby Waste Water Treatment Plant Final Effluent Monthly Averages Total Molybdenum and Total Vanadium – 5-Year

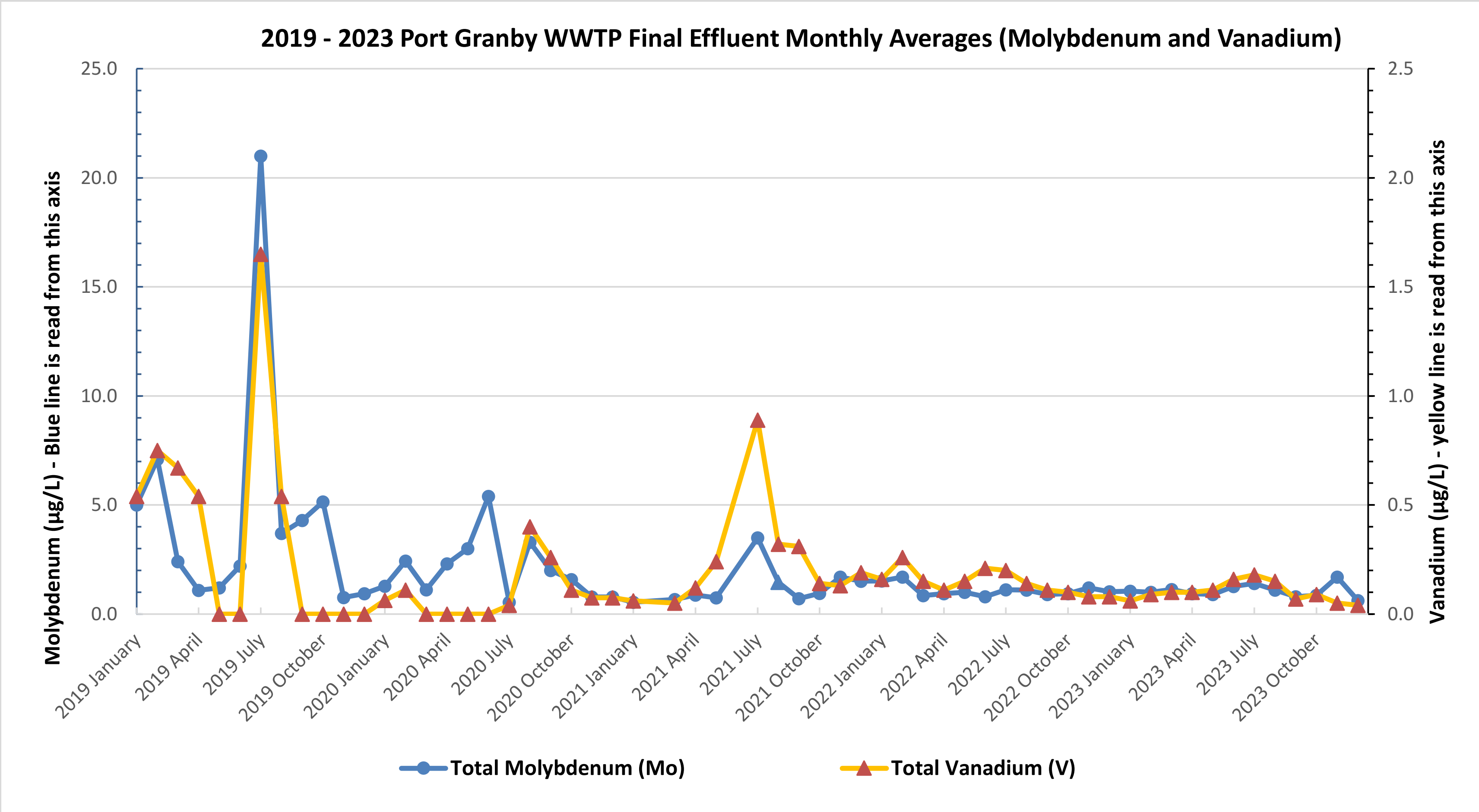
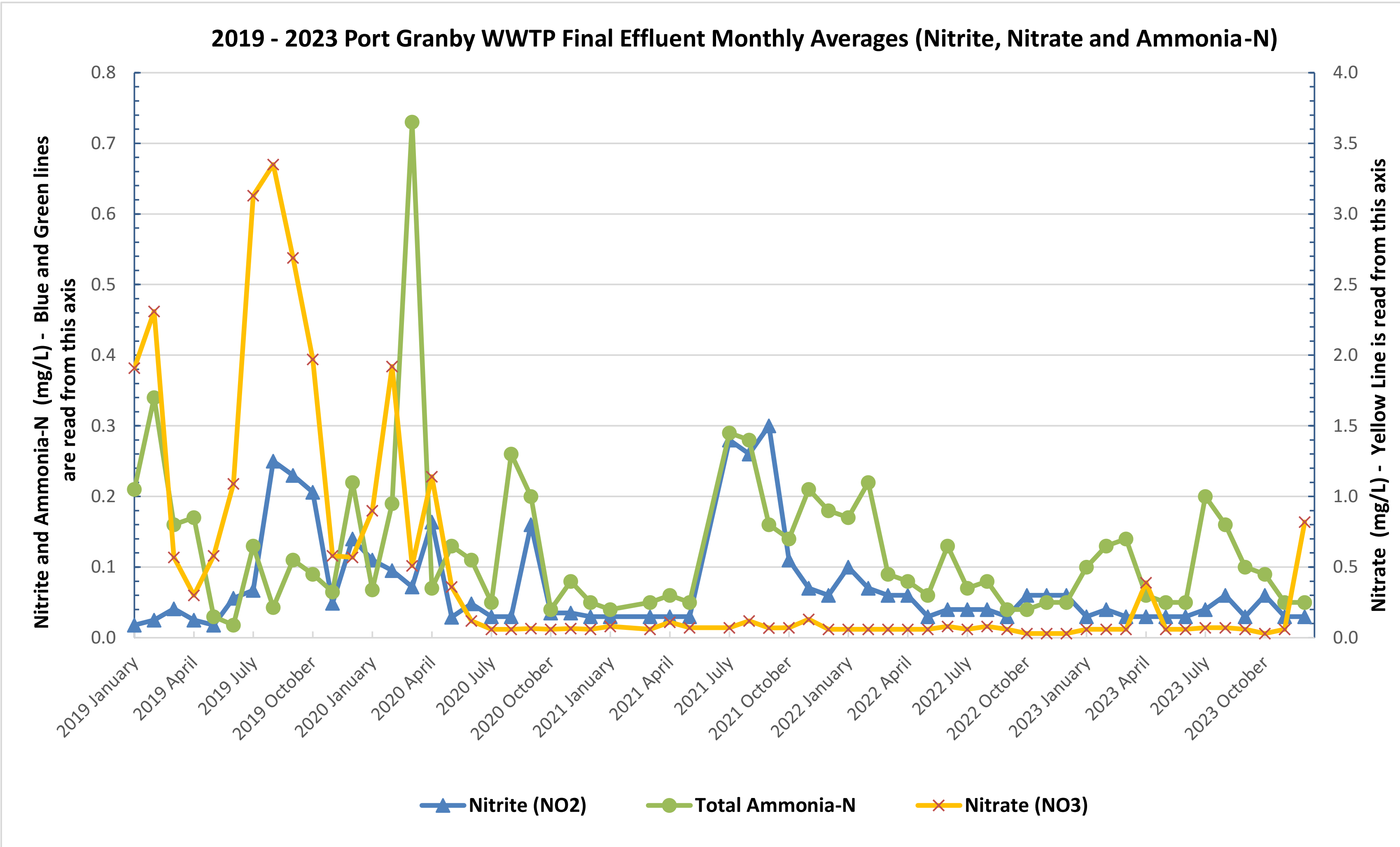


Figure 6: Port Granby Waste Water Treatment Plant Final Effluent Monthly Averages (Total Ammonia, Nitrate, and Nitrite) – 5-Year



A.2 Port Hope Waste Water Treatment Plant Monitoring

Table 36: Port Hope Waste Water Treatment Plant – 2023 Liquid Influent Sampling

Influent Parameter (Unit of measure)	Total No. of Samples	Maximum	Average
Radium-226 (Bq/L)	52	1.8	0.53
pH	52	9.72	8.66
Total Suspended Solids (mg/L)	52	50	20
Total Aluminum (µg/L)	52	1280	280
Total Arsenic (µg/L)	52	941	408
Total Cadmium (µg/L)	52	3.51	0.73
Total Cobalt (µg/L)	52	1360	558
Total Copper (µg/L)	52	324	88
Total Lead (µg/L)	52	482	127
Total Phosphorus (mg/L)	47	2.23	0.73
Total Uranium (µg/L)	52	1490	655
Total Vanadium (µg/L)	52	16.6	8.8
Total Zinc (µg/L)	52	156	79

Note:

- Sampling frequency is weekly (as available).

Table 37: Port Hope Waste Water Treatment Plant Production Quantities of Effluent

Year	Volume (m^3)
2019	156,575
2020	140,216
2021	124,974
2022	102,315
2023	131,889

Table 38: Port Hope Waste Water Treatment Plant– 2023 Results of Liquid Effluent Sampling

Effluent Parameter (Unit of measure)	Total No. of Samples[a]	Maximum	Mean	Action Level (Weekly Mean Concentration Composite Sample)	Release Limit (Weekly Mean Concentration Composite Sample)	Release Limit (Monthly Mean Concentration Composite Sample)	No. of Samples Exceeding the Action Level	No. of Samples Exceeding the Release Limit
Acute Toxicity	11	PASS	-	-	-	Cannot be Toxic-	-	0
Radium-226 (Bq/L)	44	0.01	<0.005	0.05	0.74	0.37	0	0
pH	44	8.34	7.31	6.5 to 8.5	6.0 - 9.0	6.0 - 9.0	0	0
Total Suspended Solids (mg/L)	44	7	<1.2	7.5	30	15	0	0
Total Aluminum (µg/L)	44	3	<1.1	55	220	110	0	0
Total Arsenic (µg/L)	44	9.6	1.93	50	300	150	0	0
Total Cadmium (µg/L)	27	0.009	<0.004	0.14	0.34	0.17	0	0
Total Cobalt (µg/L)	27	0.92	0.44	52	210	105	0	0
Total Copper (µg/L)	44	21.8	1.37	7.5	30	15	1	0
Total Lead (µg/L)	44	1.2	0.16	5	46	23	0	0
Total Phosphorus (mg/L)	27	0.007	<0.004	0.25	1	0.5	0	0
Total Uranium (µg/L)	44	2.86	0.45	55	300	150	0	0
Total Vanadium (µg/L)	27	0.18	<0.022	2.2	8.8	4.4	0	0
Total Zinc (µg/L)	44	25	<2.2	15	420	210	1	0

Note:

a. The total number of effluent samples is less than the total number of influent samples (Table 36) due to recirculation mode operations, where no releases were made.

- "<" denotes some or all results were below the minimum detection limit
- Action levels and release limits for liquid effluent are defined in:
  - The *Port Hope Project Environmental and Biophysical Monitoring Plan* [38].
  - CNSC *Record of Decision In the Matter Of Canadian Nuclear Laboratories Ltd. Application to Renew the Waste Nuclear Substance Licence for the Port Hope Project as a Single Licence for the Port Hope Area Initiative* [7].
  - Letter of acceptance from CNSC staff [42].
  - Letter of acceptance from CNSC staff [45].

Figure 7: Port Hope Waste Water Treatment Plant Final Effluent Monthly Averages Total Arsenic and Total Uranium – 5-Year

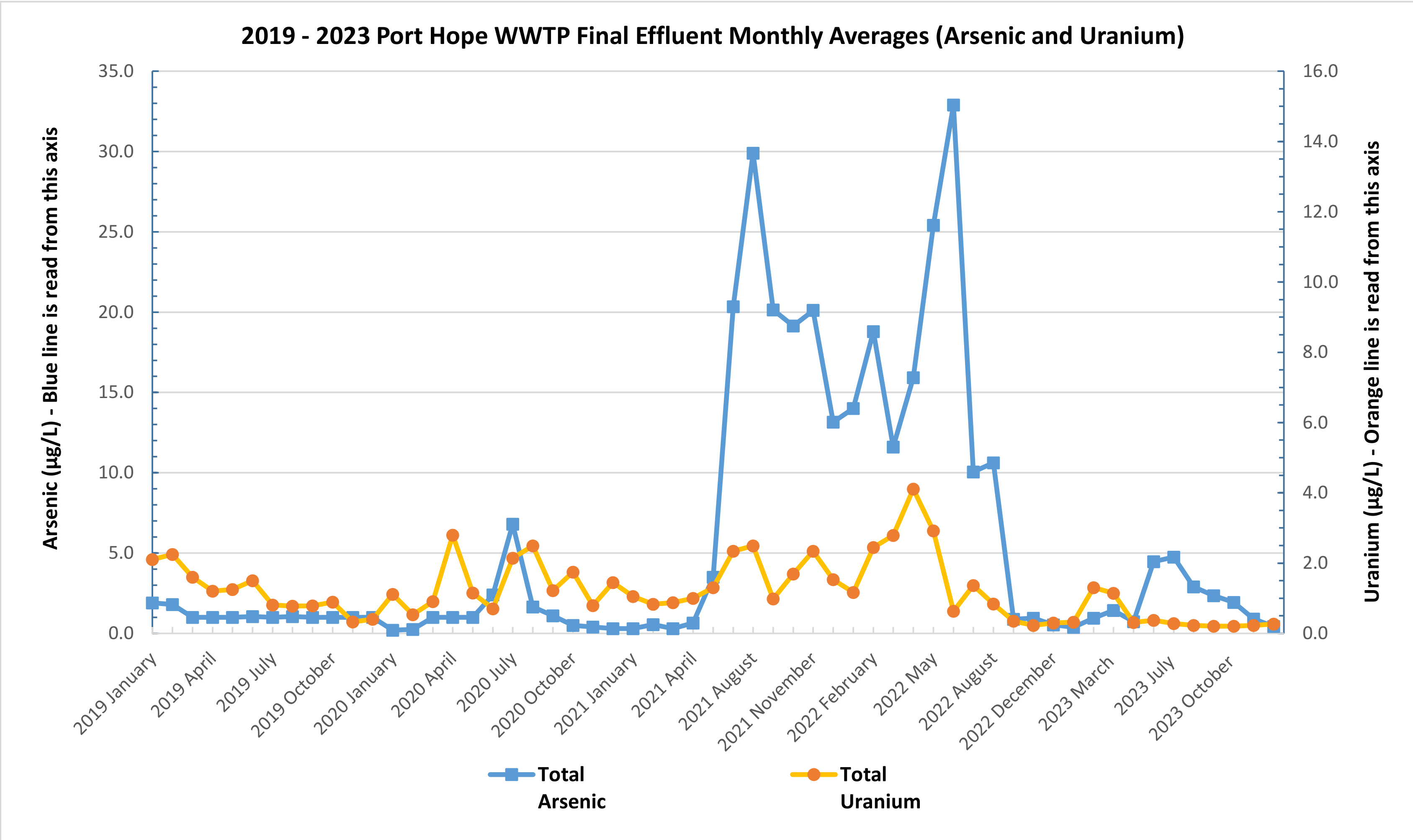


Figure 8: Port Hope Waste Water Treatment Plant Final Effluent Monthly Averages Total Copper and Total Lead – 5-Year

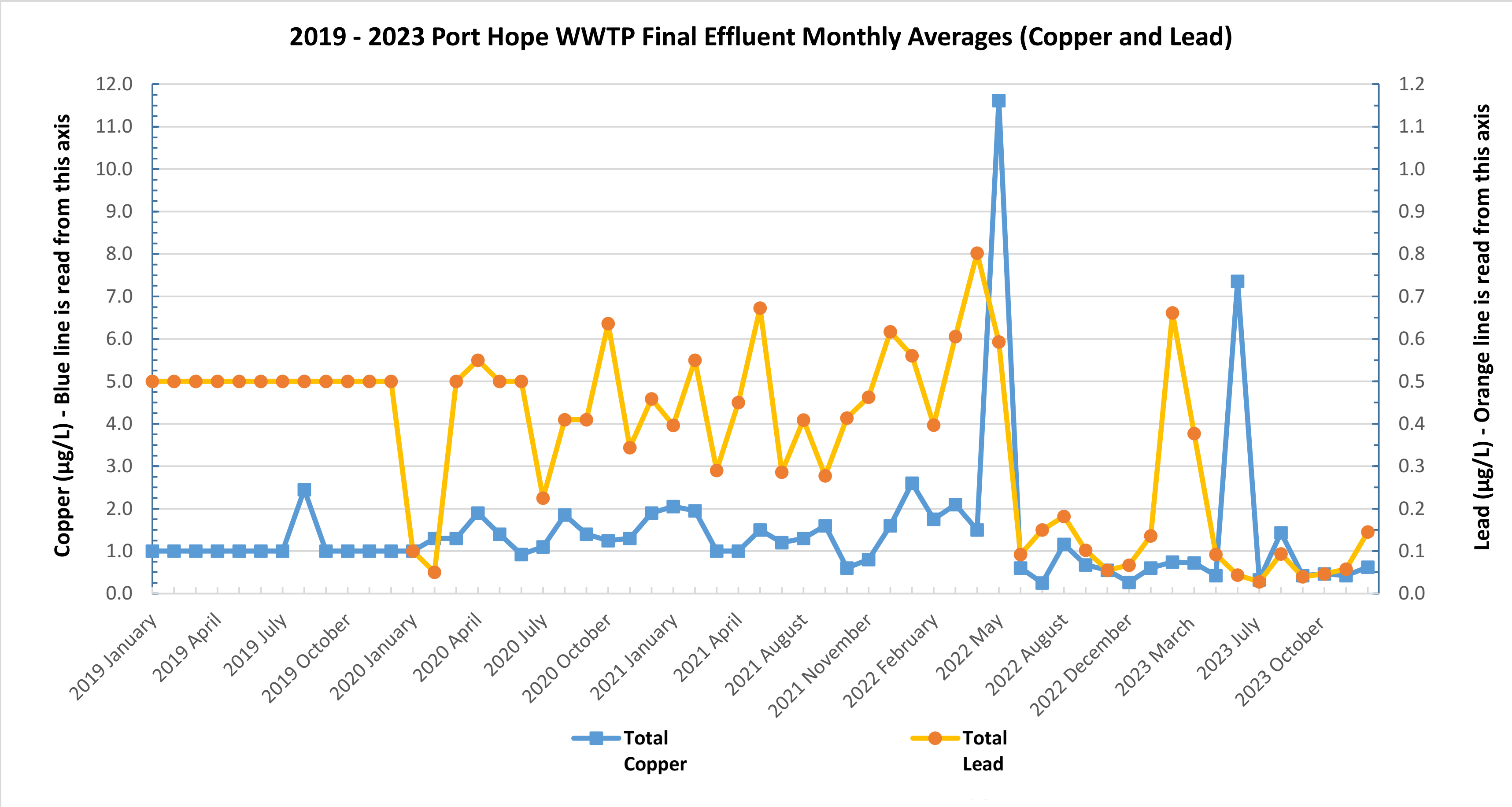


Figure 9: Port Hope Waste Water Treatment Plant Final Effluent Monthly Averages Total Zinc and pH – 5-Year

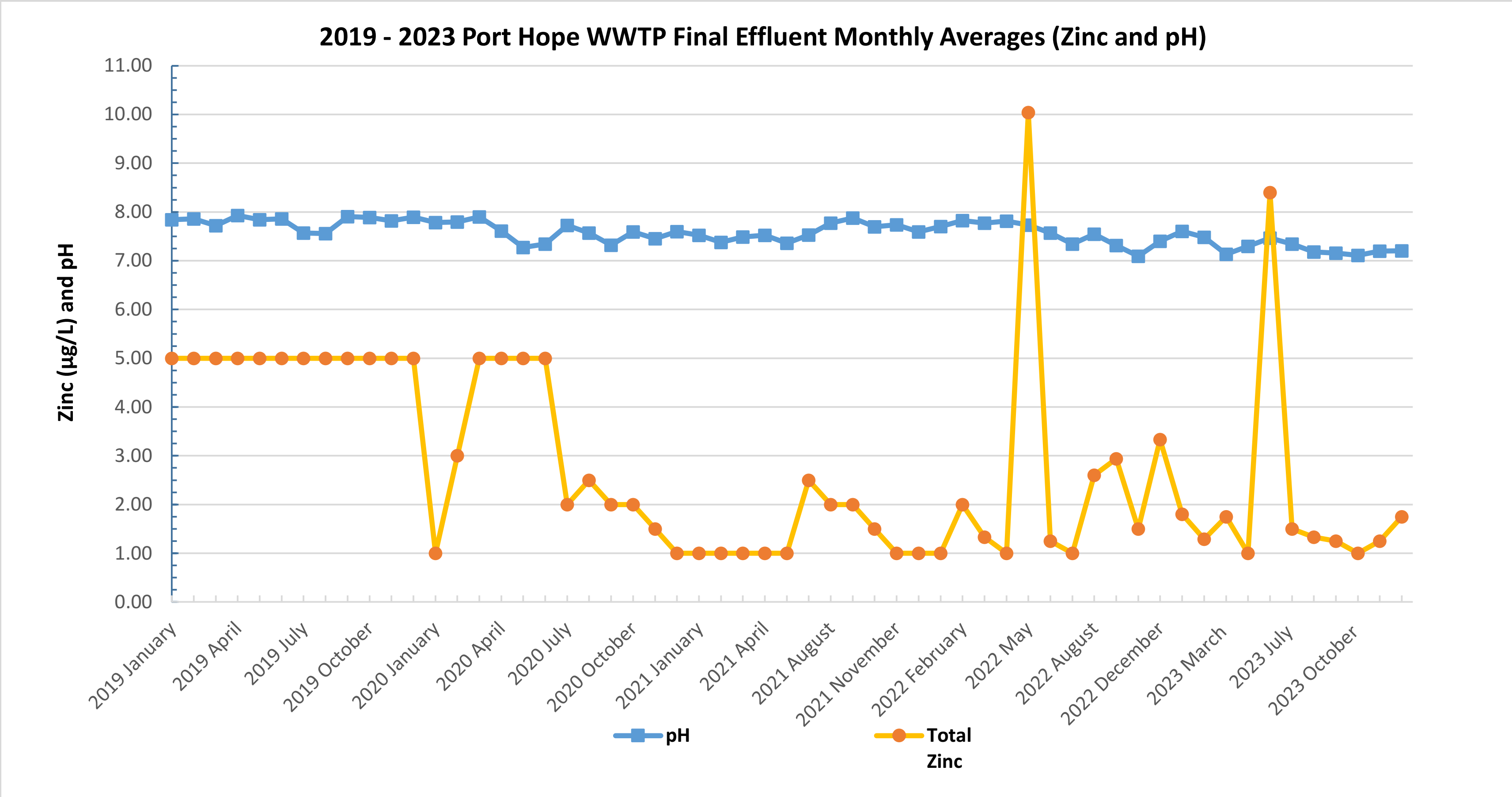
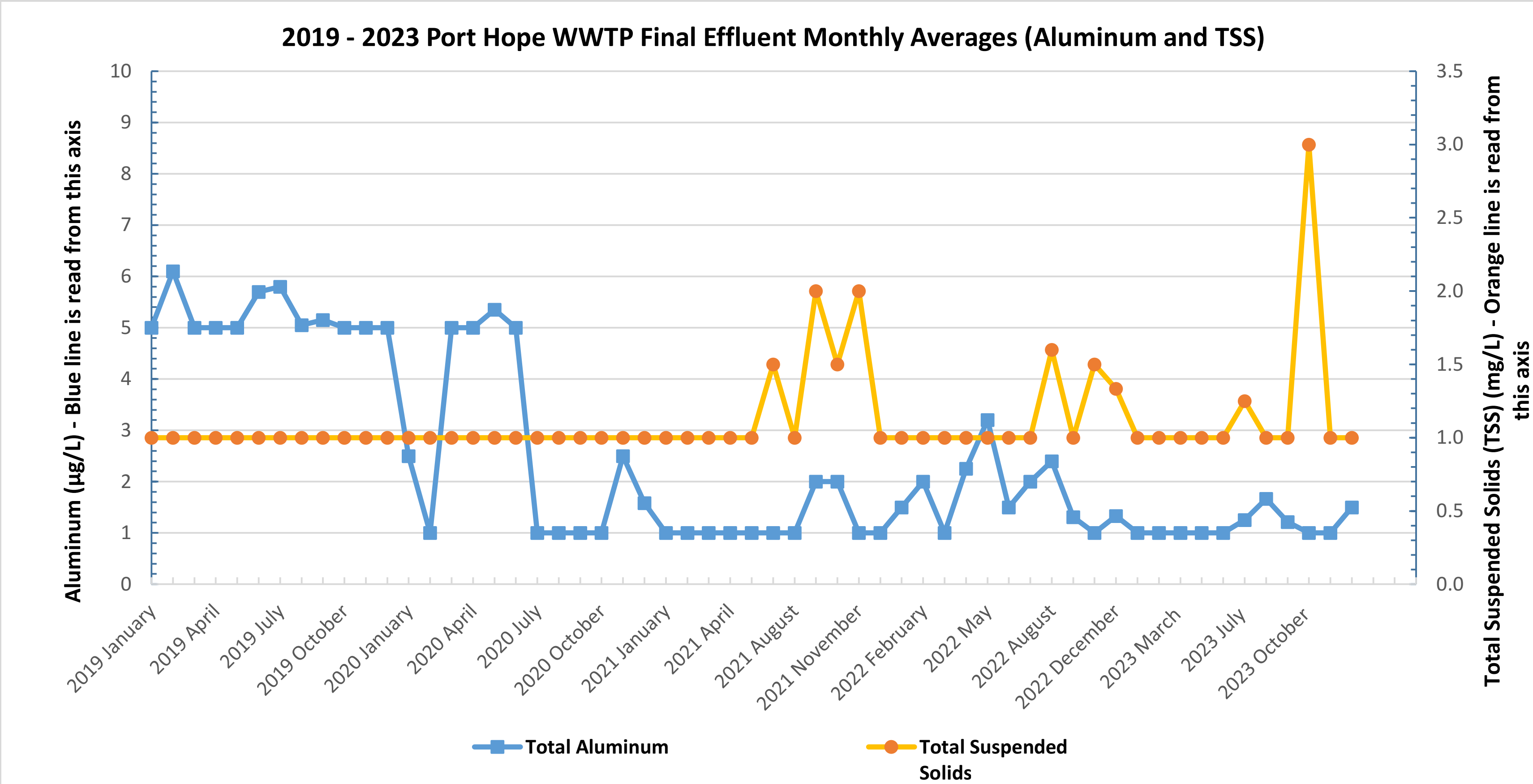


Figure 10: Port Hope Waste Water Treatment Plant Final Effluent Monthly Averages Total Aluminum and Total Suspended Solids – 5-Year



Appendix B Operational Environmental Monitoring

B.1 Operational Groundwater Monitoring

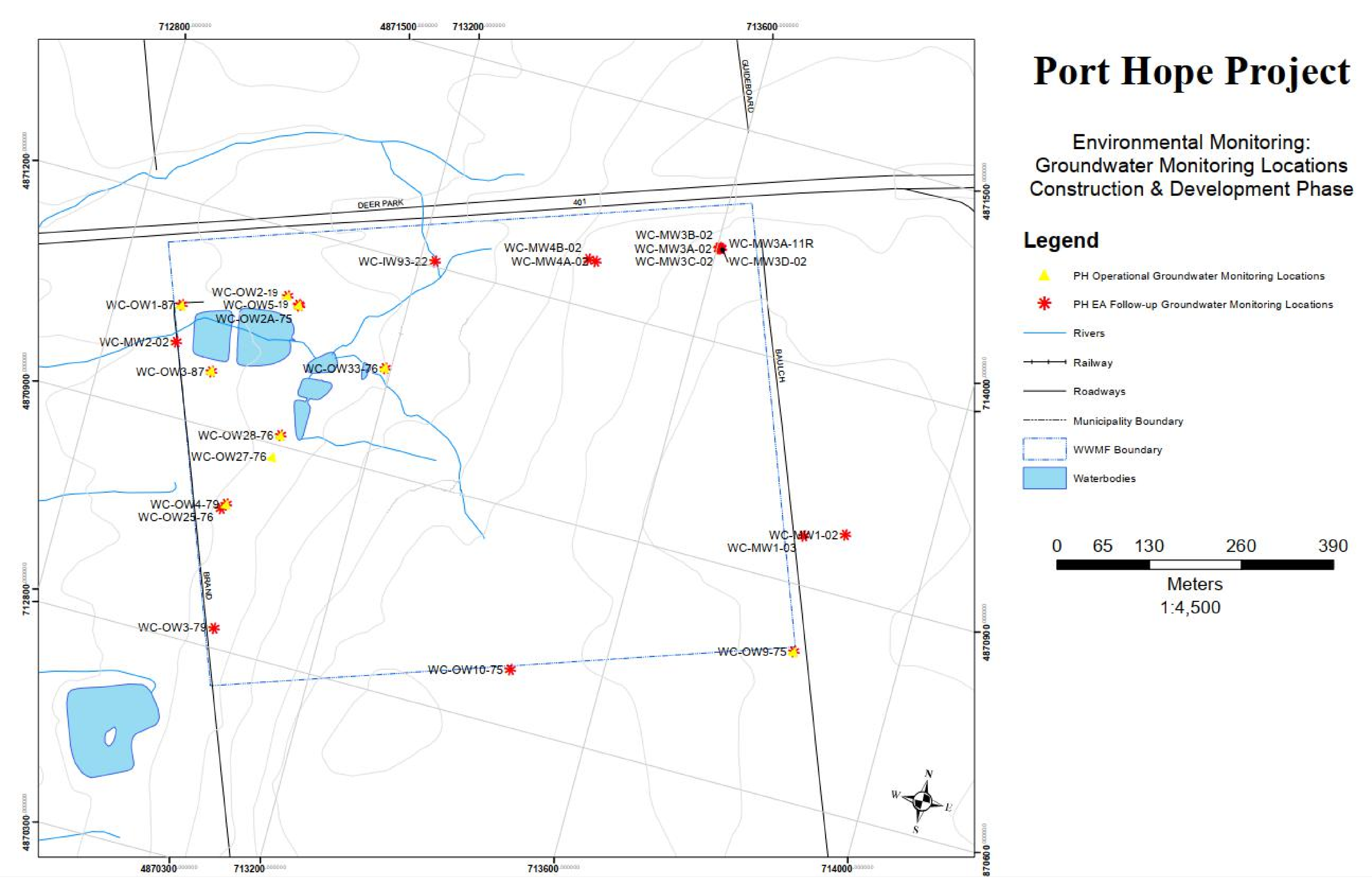


Figure 11: Port Hope Long-Term Waste Management Facility Groundwater Monitoring Well Locations

Table 39: Port Hope Long-Term Waste Management Facility Operational Observation Well Sampling Results

Operational Observation Wells - Upgradient									
			Year	**2019**	**2020**	**2021**	**2022**	**2023**	**2023**
			Total No. of Samples	10	10	10	10	10	10
Parameter	**Unit of Measure**	**Criteria**		**Average**					**Maximum**
Primary COPC		**Table A2.5 [46]**	**Table 3 [47]**						
Arsenic (total)	µg/L	25	1900	2.8	2.4	2.2	2.4	3.6	5.7
Radium-226	Bq/L	0.49	-	<0.04	0.01	0.01	<0.01	0.01	0.02
Uranium (total)	µg/L	20	420	1.7	1.1	1.6	1.2	2.3	6.2
Additional Parameters									
pH	-	-	-	7.75	7.56	7.52	7.54	7.51	7.80
Operational Observation Wells - Downgradient									
			Year	**2019**	**2020**	**2021**	**2022**	**2023**	**2023**
			Total No. of Samples	8	8	8	8	8	8
Parameter	**Unit of Measure**	**Criteria**		**Average**					**Maximum**
Primary COPC		**Table A2.5 [46]**	**Table 3 [47]**						
Arsenic (total)	µg/L	25	1900	1.2	0.8	0.8	0.8	0.8	1.7
Radium-226	Bq/L	0.49	-	<0.04	0.01	<0.01	0.01	0.02	0.02
Uranium (total)	µg/L	20	420	0.3	0.2	0.3	0.3	0.4	1.06
Additional Parameters									
pH	-	-	-	8.16	7.97	7.83	7.79	7.81	8.14

Note:

- Annual averages are based on semi-annual (2) samples (as available).
- \- Indicates no data.
- Decommissioned, lost, or replaced wells: WC-OW1-75, WC-OW2-75, WC-OW12-75, WC-OW18-76, and WC-OW36-76.

Table 40: Port Hope Long-Term Waste Management Facility Sentinel Well Monitoring

PH LTWMF Sentinel Well					
Parameter	**Arsenic (dissolved) (µg/L)**				
Year	**2019**	**2020**	**2021**	**2022**	**2023**
Criteria Trigger Level [38]	**50 µg/L**				
Observation/Sentinel Well Identifier	**Average**				
WC-IW93-22	1.3	1.5	1.5	1.6	1.7
WC-OW1-87	<1.0	0.8	0.9	1.2	4.2
WC-OW2A-19	1.4	0.6	0.7	0.4	0.4
WC-OW2-19	<1.0	1.5	1.8	1.3	1.5
WC-OW3-79	3.2	3.8	3.7	4.0	3.4
WC-OW3-87	4.2	5.1	5.0	5.7	5.7
WC-OW4-79	<1.0	0.7	0.8	0.6	0.5
WC-OW5-19	2.8	3.4	2.6	2.7	4.5
WC-OW25-76	<1.0	0.8	0.7	0.8	0.7
WC-OW27-76	<1.0	0.4	0.4	0.4	0.4
WC-OW28-76	<1.0	0.6	0.5	0.5	0.4
WC-OW33-76	<1.0	1.2	0.6	1.2	3.3

Note:

- Averages are based on semi-annual (2) samples as available.
- < - indicates the result was less than the laboratory method detection limit.

B.2 Operational Bluff Seepage Monitoring

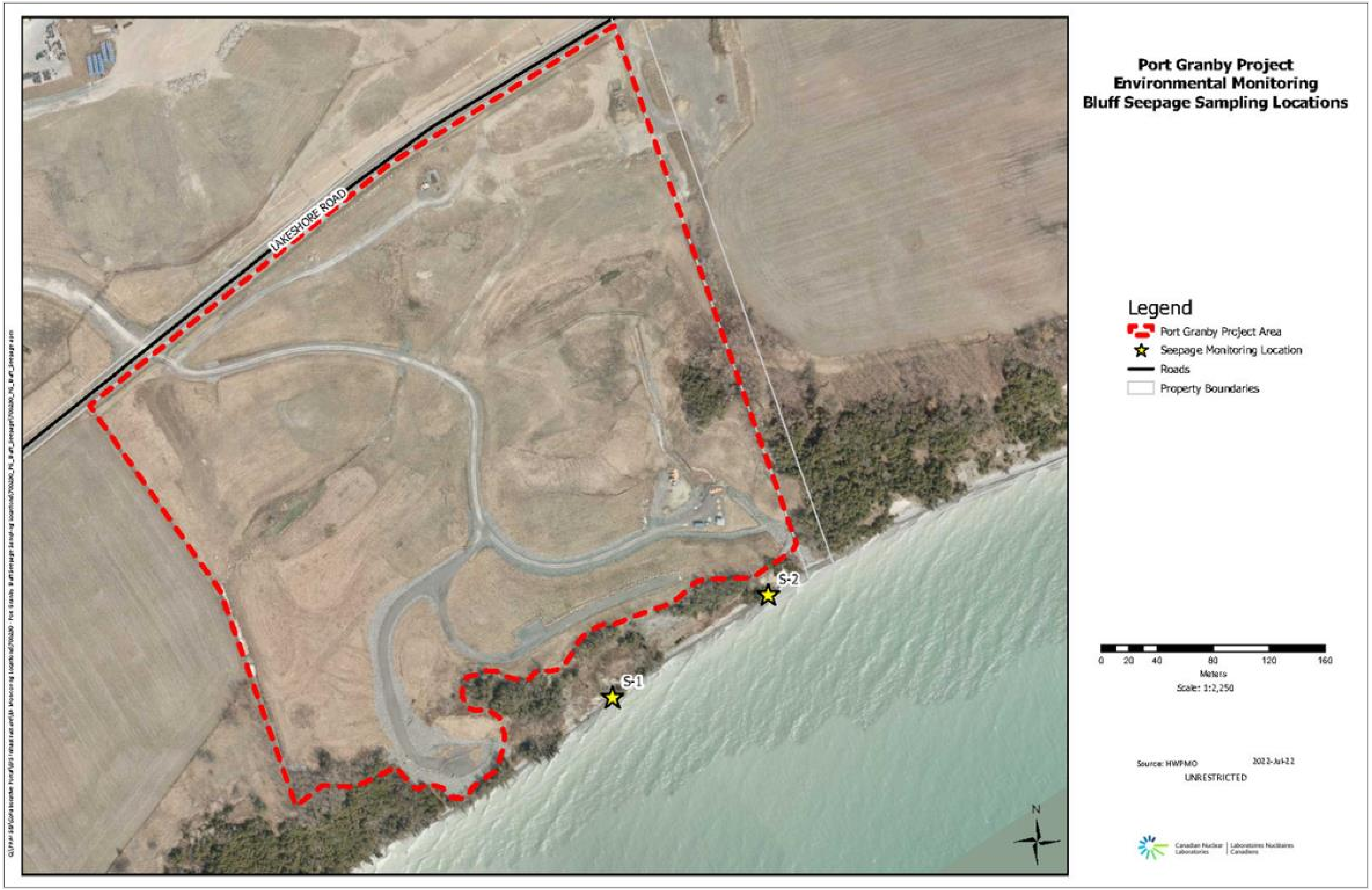


Figure 12: Port Granby Project Bluff Seepage Sampling Locations

Table 41: Port Granby Long-Term Waste Management Facility Bluff Seepage Water Quality (PG-S-1)

PG-S-1									
Year				**2019**	**2020**	**2021**	**2022**	**2023**	**2023**
Total No. of Samples				**0**	**2**	**1**	**0**	**0**	**0**
Parameter	**Unit of Measure**	**Criteria**							
		PWQO [50]	**CWQG [52]**	**Average**					**Maximum**
Primary COPC									
Radium-226	Bq/L	1	-	-[1]	0.14	0.55	-[1]	-[1]	-[1]
Arsenic (total)	µg/L	100	5	-[1]	**757**	**967**	-[1]	-[1]	-[1]
Uranium (total)	µg/L	5	15	-[1]	0.14	0.55	-[1]	-[1]	-[1]
PG WWTP Effluent									
Ammonia + Ammonium (N)	mg/L	-	-	-[1]	20.4	26.0	-[1]	-[1]	-[1]
Nitrate (as N)	mg/L	-	13	-[1]	**194**	**227**	-[1]	-[1]	-[1]

Note:

- Annual averages are based on quarterly (4) sampling results (as available) per year.
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- [1] – Inaccessible due to water levels/bluff erosion.

Table 42: Port Granby Long-Term Waste Management Facility Bluff Seepage Water Quality (PG-S-2)

PG-S-2									
			Year	**2019**	**2020**	**2021**	**2022**	**2023**	**2023**
			Total No. of Samples	**2**	**3**	**4**	**3**	**3**	**3**
Parameter	**Unit of Measure**	**Criteria**							
		PWQO [50]	**CWQG [52]**	**Average**					**Maximum**
Primary COPC									
Radium-226	Bq/L	1	-	<0.04	0.01	0.02	<0.01	0.02	0.02
Arsenic (total)	µg/L	100	5	**439**	**543**	**520**	**700**	**458**	**509**
Uranium (total)	µg/L	5	15	**229**	**124**	**131**	**82**	**78**	**98**
PG WWTP Effluent									
Ammonia + Ammonium (N)	mg/L	-	-	0.153	0.060	0.053	0.05	0.05	0.08
Nitrate (as N)	mg/L	-	13	0.29	2.10	2.97	1.71	2.84	5.17

Note:

- Annual averages are based on quarterly (4) sampling results (as available) per year.
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.

Table 43: Port Granby Long-Term Waste Management Facility Bluff Seepage Water Quality (PG-S-3)

PG-S-3									
			Year	**2019**	**2020**	**2021**	**2022**	**2023**	**2023**
			Total No. of Samples	**3**	**2**	0	0	0	0
Parameter	**Unit of Measure**	**Criteria**							
		PWQO [50]	**CWQG [52]**	**Average**					**Maximum**
Primary COPC									
Radium-226	Bq/L	1	-	<0.04	<0.04	-[1]	-[1]	-[1]	-[1]
Arsenic (total)	µg/L	100	5	**420**	**461**	-[1]	-[1]	-[1]	-[1]
Uranium (total)	µg/L	5	15	**1467**	**1715**	-[1]	-[1]	-[1]	-[1]
PG WWTP Effluent									
Ammonia + Ammonium (N)	mg/L	-	-	3.0	3.6	-[1]	-[1]	-[1]	-[1]
Nitrate (as N)	mg/L	-	13	**80.2**	**83**	-[1]	-[1]	-[1]	-[1]

Note:

- Annual averages are based on quarterly (4) sampling results (as available) per year.
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- [1] – Inaccessible due to water levels/bluff erosion.

B.3 Operational Sediment Monitoring

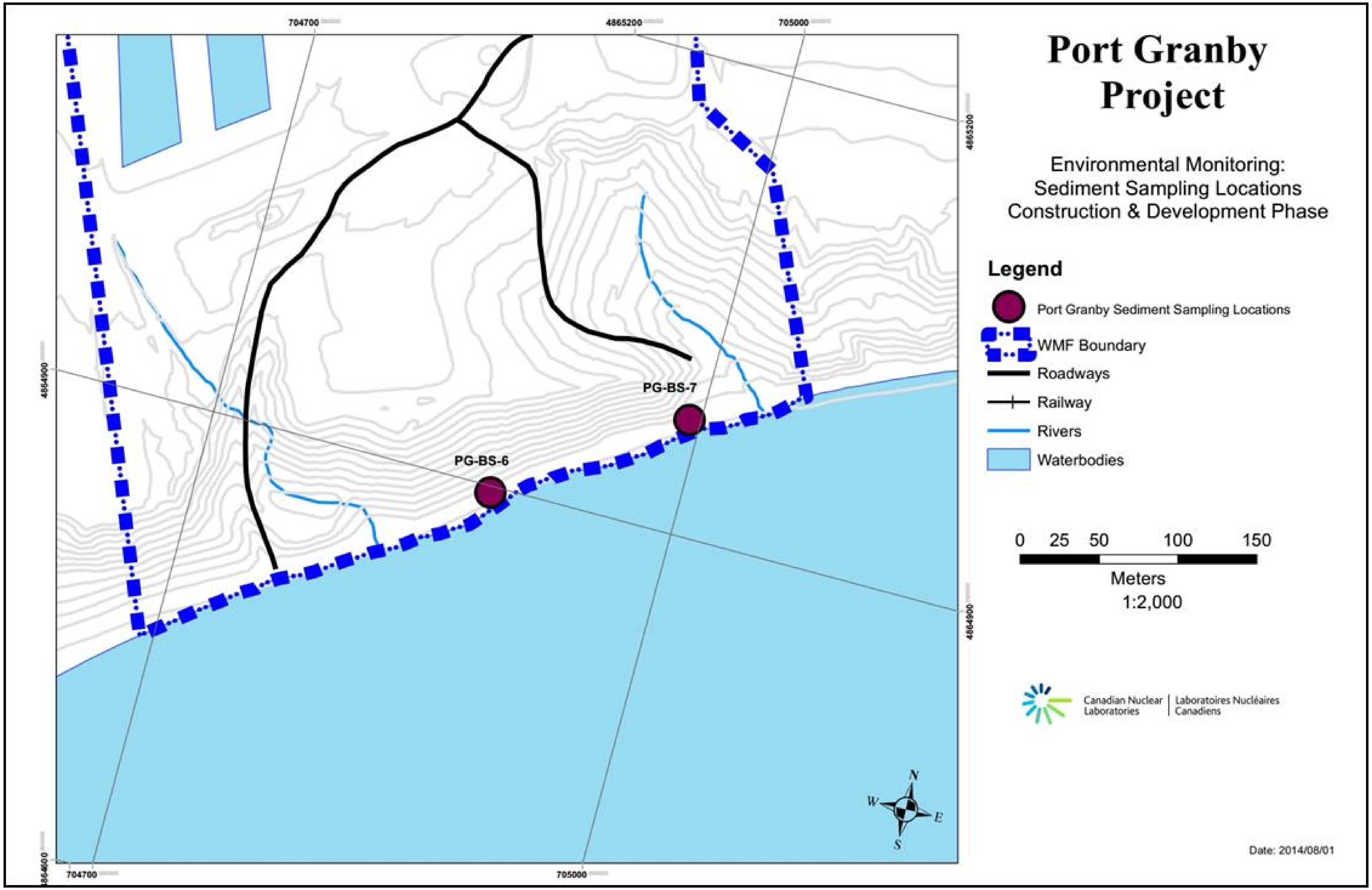


Figure 13: Port Granby Project Sediment Sampling Locations

Table 44: Port Granby Long-Term Waste Management Facility Sediment Quality – Location 1 (PG-BS-6)

Location 1 – PG-BS-6									
Parameter	Unit of Measure	Criteria							
		PSQG [53]	CCME [54]	2019	2020	2021	2022	2023	2023
		LEL/SEL	ISQG/PEL	Average					Maximum
Primary COPC									
Antimony	µg/g	-	-	-[1]	<0.80	<0.80	-[1]	-[1]	-[1]
Arsenic	µg/g	6/33	5.9/17	-[1]	2.2	1.9	-[1]	-[1]	-[1]
Cobalt	µg/g	-	-	-[1]	2.4	2.4	-[1]	-[1]	-[1]
Copper	µg/g	16/110	35.7/197	-[1]	4.2	2.4	-[1]	-[1]	-[1]
Lead	µg/g	31/250	35/91.3	-[1]	2.0	1.7	-[1]	-[1]	-[1]
Nickel	µg/g	16/75	-	-[1]	4.2	3.0	-[1]	-[1]	-[1]
Radium-226	Bq/g	-	-	-[1]	0.12	0.08	-[1]	-[1]	-[1]
Thorium-230	Bq/g	-	-	-[1]	0.25	0.25	-[1]	-[1]	-[1]
Thorium-232	Bq/g	-	-	-[1]	0.01	0.06	-[1]	-[1]	-[1]
Uranium	µg/g	-	-	-[1]	2.1	1.2	-[1]	-[1]	-[1]
Secondary COPC									
Barium	µg/g	-	-	-[1]	30	15	-[1]	-[1]	-[1]
Beryllium	µg/g	-	-	-[1]	0.12	0.10	-[1]	-[1]	-[1]
Boron (water soluble)	µg/g	-	-	-[1]	<0.50	<0.50	-[1]	-[1]	-[1]
Cadmium	µg/g	0.6/10	0.6/3.5	-[1]	0.03	0.04	-[1]	-[1]	-[1]
Mercury	µg/g	0.2/2	0.17/0.486	-[1]	<0.05	<0.05	-[1]	-[1]	-[1]
Molybdenum	µg/g	-	-	-[1]	0.8	0.7	-[1]	-[1]	-[1]
Selenium	µg/g	-	-	-[1]	<0.7	<0.7	-[1]	-[1]	-[1]
Silver	µg/g	-	-	-[1]	<0.05	<0.05	-[1]	-[1]	-[1]
Vanadium	µg/g	-	-	-[1]	13	33	-[1]	-[1]	-[1]

Note:

- Averages are based on semi-annual (2) sampling results (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- [1] – Inaccessible due to water levels/bluff erosion.

Table 45: Port Granby Long-Term Waste Management Facility Sediment Quality – Location 2 (PG-BS-7)

Location 2 – PG-BS-7									
Parameter	Unit of Measure	Criteria							
		PSQG [53]	CCME [54]	2019	2020	2021	2022	2023	2023
		LEL/SEL	ISQG/PEL	Average					Maximum
Primary COPC									
Antimony	µg/g	-	-	<0.20	<0.80	<0.80	<0.80	<0.80	0.80
Arsenic	µg/g	6/33	5.9/17	15	12	19	14	**26**	**46**
Cobalt	µg/g	-	-	2.6	2.3	3.6	4.1	8.9	15.0
Copper	µg/g	16/110	35.7/197	3.2	4.3	2.0	5.2	2.7	3.5
Lead	µg/g	31/250	35/91.3	1.2	1.9	1.7	2.7	2.0	2.1
Nickel	µg/g	16/75	-	3.7	3.8	3.8	5.6	3.4	4.2
Radium-226	Bq/g	-	-	<0.05	0.05	0.05	0.04	0.05	0.10
Thorium-230	Bq/g	-	-	<0.4	0.15	<0.20	<0.20	0.10	0.50
Thorium-232	Bq/g	-	-	<0.04	0.01	0.03	0.01	0.02	0.022
Uranium	µg/g	-	-	0.8	2.0	1.2	2.2	0.8	0.9
Secondary COPC									
Barium	µg/g	-	-	11	19	15	26	13	14
Beryllium	µg/g	-	-	<0.20	0.13	0.09	0.56	0.11	0.11
Boron (water soluble)	µg/g	-	-	<0.05	<0.50	<0.50	0.70	<0.50	0.50
Cadmium	µg/g	0.6/10	0.6/3.5	<0.10	0.03	0.04	0.06	<0.05	0.05
Mercury	µg/g	0.2/2	0.17/0.486	<0.05	<0.05	<0.05	<0.05	<0.05	0.05
Molybdenum	µg/g	-	-	<0.5	0.6	0.3	0.7	0.5	0.5
Selenium	µg/g	-	-	<0.5	<0.7	<0.7	<0.7	0.2	0.2
Silver	µg/g	-	-	<0.20	<0.05	<0.05	0.07	<0.05	0.9
Vanadium	µg/g	-	-	13	12	32	12	18	23

Note:

- Averages are based on semi-annual (2) sampling results (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.

B.4 Operational Storm Water Management Monitoring

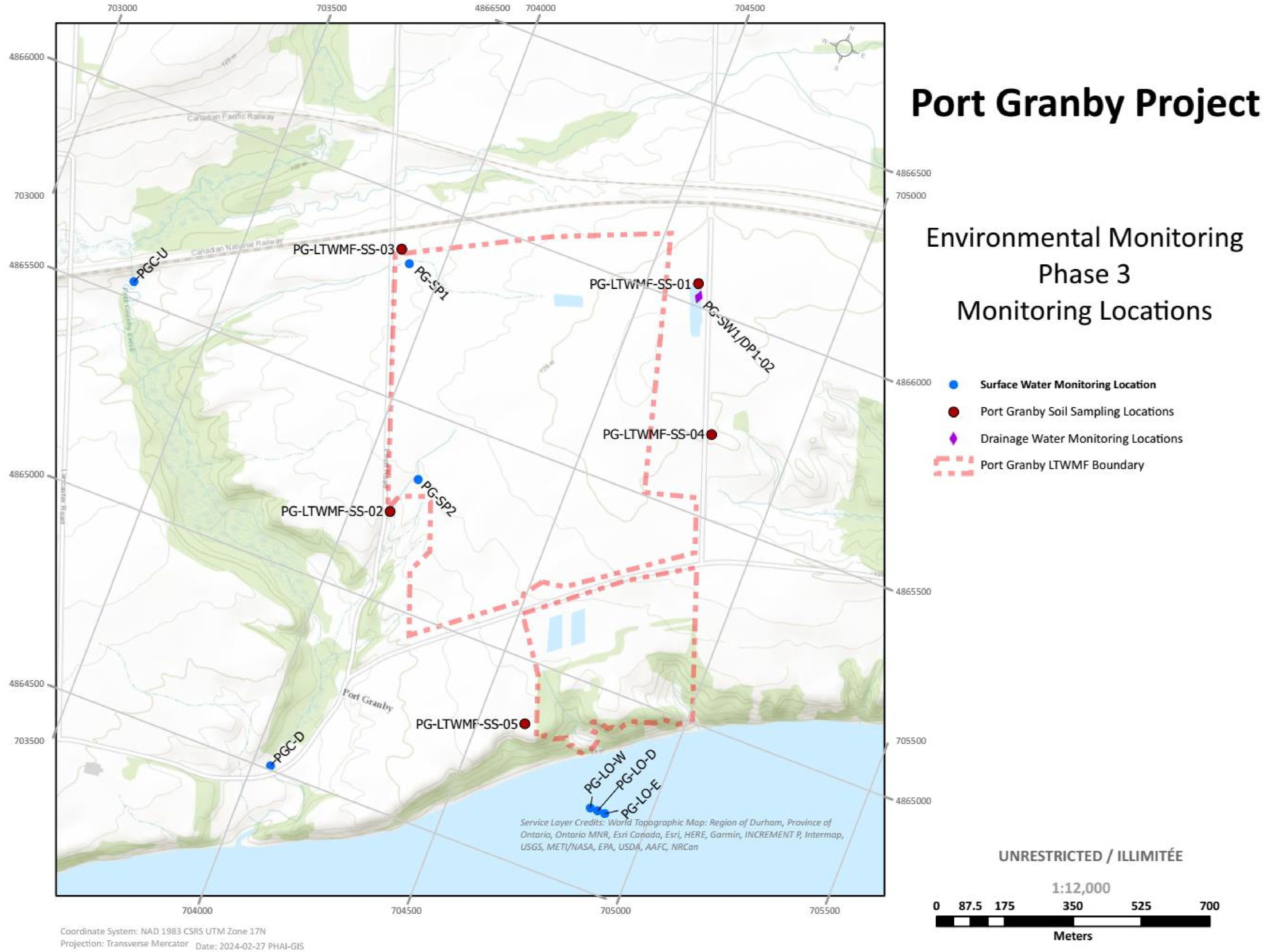


Figure 14: Port Granby Project Aquatic Environmental Monitoring Locations

Table 46: Port Granby Long-Term Waste Management Facility Surface Water Quality North Storm Water Pond – Location 1 (PG-SP1)

PG-SP1										
			Year	2019	2020	2021	2022	2023	2023
			Total No. of Samples	7	11	10	9	12	12
Parameter	**Unit of Measure**	**Criteria**		**Average**					**Maximum**
		PWQO [50]	**CWQG [52]**						
Primary COPC									
Radium-226	Bq/L	1	-	0.10	0.02	0.02	<0.01	<0.01	0.02
Thorium-230	Bq/L	-	-	0.09	<0.02	<0.02	<0.02	<0.02	0.027
Thorium-232	Bq/L	-	-	<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Arsenic (total)	µg/L	100	5	**190.9**	3	**5**	3	3	**5.4**
Antimony (total)	µg/L	20	-	1.7	<0.9	<0.9	<0.9	<0.9	0.9
Cobalt (total)	µg/L	0.90	-	1.62	0.579	0.309	0.297	0.147	0.201
Copper (total)	µg/L	5	-	3.7	2.3	1.5	1.3	0.8	1.5
Nickel (total)	µg/L	25	25	3.2	1.2	0.7	0.8	0.4	0.6
Uranium (total)	µg/L	5	15	**52**	4	3	2	1	2.4
Lead (total)	µg/L	5	7	1.44	0.52	0.33	0.27	0.22	0.37
Secondary COPC									
Barium (total)	µg/L	-	-	36	47	31	21	20	34
Beryllium (total)	µg/L	1100	-	<0.50	0.029	0.015	0.014	0.014	0.089
Boron (total)	µg/L	200	1500	77	36	44	33	31	44
Cadmium (total)	µg/L	0.20	0.09	<0.10	0.012	0.010	0.012	0.010	0.021
Mercury (dissolved)	µg/L	0.20	0.026	<0.01	<0.01	<0.01	0.01	<0.01	0.01
Molybdenum (total)	µg/L	40	73	13.9	2.35	1.68	1.37	0.89	1.39
Selenium (total)	µg/L	100	1	<2.0	0.16	0.15	0.16	0.11	0.42
Silver (total)	µg/L	0.1	0.25	0.11	<0.05	<0.05	<0.05	<0.05	0.05
Vanadium (total)	µg/L	6	-	**7.60**	2.01	1.29	1.35	1.02	1.55
Zinc (total)	µg/L	30	30	<5.0	5	4	4	4	10

Note:

- Averages are based on monthly (12) sampling results (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- [1] – Location not accessible.

Table 47: Port Granby Long-Term Waste Management Facility Surface Water Quality South Storm Water Pond – Location 2 (PG-SP2)

PG-SP2										
			Year	**2019**	**2020**	**2021**	**2022**	**2023**	**2023**
			Total No. of Samples	9	10	10	9	11	11
Parameter	**Unit of Measure**	**Criteria**		**Average**					**Maximum**
		PWQO [50]	**CWQG [52]**						
Primary COPC									
Radium-226	Bq/L	1	-	0.12	0.01	0.01	<0.01	<0.01	0.02
Thorium-230	Bq/L	-	-	0.12	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	-	-	<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Arsenic (total)	µg/L	100	5	**6**	**18**	**22**	**7**	2	3.5
Antimony (total)	µg/L	20	-	<0.5	<0.9	<0.9	<0.9	<0.9	0.9
Cobalt (total)	µg/L	0.90	-	<0.50	0.628	0.845	0.32	0.13	0.45
Copper (total)	µg/L	5	-	1.2	1.0	0.9	0.7	0.6	1.8
Nickel (total)	µg/L	25	25	<1.0	3.2	3.3	1.4	0.6	1.1
Uranium (total)	µg/L	5	15	2	3	**50**	**6**	2	**5.01**
Lead (total)	µg/L	5	7	0.51	0.30	0.32	0.12	0.21	0.86
Secondary COPC									
Barium (total)	µg/L	-	-	20	27	30	16	17	23
Beryllium (total)	µg/L	1100	-	<0.50	0.009	0.012	0.008	0.014	0.054
Boron (total)	µg/L	200	1500	19	24	42	28	23	44
Cadmium (total)	µg/L	0.20	0.09	<0.10	0.006	0.018	0.006	0.007	0.034
Mercury (dissolved)	µg/L	0.20	0.026	<0.01	<0.01	<0.01	<0.01	<0.01	0.01
Molybdenum (total)	µg/L	40	73	0.61	2.58	6.16	1.51	0.63	1.83
Selenium (total)	µg/L	100	1	<2.0	0.05	0.07	0.07	0.07	0.10
Silver (total)	µg/L	0.1	0.25	<0.10	<0.05	<0.05	<0.05	<0.05	0.05
Vanadium (total)	µg/L	6	-	0.83	0.42	0.69	0.39	0.69	2.85
Zinc (total)	µg/L	30	30	5.1	4	3	<2	<2	5

Note:

- Averages are based on monthly (12) sampling results (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- [1] – Location not accessible.

Appendix C Environmental Effects Monitoring

Table 48: Port Granby Project Environmental Assessment Follow-Up Monitoring Plan Summary, 2023

Predicted Environmental Effect [55]	Mitigation Measures	Residual Effects after Mitigation	Status of Mitigation Measures - 2023	EA Follow-Up Monitoring Requirements	Predicted Environmental Effect – 2023	Status of EA Commitments - 2023
Atmospheric Environment						
Air Quality: **For $PM_{2.5}$ particulate emissions, there will be occasional and slight exceedances along the edge of the existing WMF site. Development Phase of the LTWMF.**	Implementation of a high level of dust control measures at waste site.	No residual adverse effects.	The *Dust Management and Requirements Plan* [39] was followed during Phase 2 activities. Phase 2 ended in 2022 December. Hydro seeding and tree planting were undertaken over the LTWMF after construction activities were completed commencing in 2022 Fall. Re-planting and monitoring of the hydro seeding and trees continued throughout 2023.	Dust monitoring (TSP and $PM_{2.5}$) at sites adjacent to construction activities during the Construction and Development Phase. The proponent should use recent/up-to-date data to establish baseline conditions.	The *Dust Management and Requirements Plan* [39] was followed during Phase 2 activities. Phase2 ended in 2022 December.	PG LTWMF transitioned to Phase 3 monitoring in 2023 January. Dust monitoring (TSP and $PM_{2.5}$) were not required as outlined in the *Dust Management and Requirements Plan* [39].
Noise: **Levels will increase by 6 dBA to 56 dBA at both the LTWMF and the existing facility in predicted zones of maximum influence as worst-case scenarios. There will be nuisance noise impacts on local receptors.**	1. Construction equipment will comply with emission standards as outlined in NPC-115 of the *Ontario Model Municipal Noise Control By-law*. 2. Trucks and other equipment will be equipped with mufflers. Tailgate banging will be avoided. 3. Empty trucks will be required to reduce speed at construction sites and on local roads to avoid excessive cargo box and tray noise. 4. Construction hoarding will be erected where practicable. 5. All construction activities would be limited to daylight hours.	No likely residual adverse effects.	Phase 2 ended in 2022 December. PG LTWMF transitioned to Phase 3 monitoring in 2023 January. Noise monitoring was not required as outlined in the *Port Granby Environmental and Biophysical Monitoring Plan*. [36].	Verify implementation of mitigation measures. Periodically measure noise levels at receptor locations near the Site Study Area during the Construction and Development Phase. Incorporate additional post-EA data collection results and use to verify EA predictions.	PG LTWMF transitioned to Phase 3 monitoring in 2023 January. Noise monitoring was not required as outlined in the *Port Granby Environmental and Biophysical Monitoring Plan* [36].	PG LTWMF transitioned to Phase 3 monitoring in 2023 January. Noise monitoring was not required as outlined in the *Port Granby Environmental and Biophysical Monitoring Plan* [36].
Radiological Effects: ***Radon*** **The highest predicted annual average radon concentration is 5.1 Bq/m³ during construction and development.**	1. Working areas containing contaminated materials will be minimized. 2. Application of dust suppressants including water and possibly chemical suppressants. 3. Covering of stockpiles and exposed areas overnight and on weekends using foam agents, geotextiles, or other appropriate materials. 4. Placing wind fencing around exposed stockpiles. 5. Possible cessation of activities under high wind conditions. 6. Mulching or re-vegetating completed cells and excavation areas as soon as possible.	No residual adverse effects.	Mitigation measures were executed as outlined in the '*Mitigation Measures*' column.	Verify implementation of mitigation measures at time appropriate to the measure. Radon and long-lived alpha (LLA) monitoring during the Construction and Development Phase and monitoring during Early Life.	LLA and radon monitoring were being performed by the contractor, on a routine basis under their approved Dust Plan and Radiation Protection Plan. In 2023, CNL continued to perform monthly radon monitoring, and increased the total number of monitoring locations at the PG LTWMF and PG WMF to 15, 6 to monitor the capped engineered containment system. The average annual radon concentration measured at these locations was 60 Bq/m³. The trigger level for radon monitoring is 150 Bq/m³.	Radon gas was monitored on a routine monthly basis at the former PG WMF and LTMWF during the 2023 calendar year.
Radiological Effects: **Particulate Radioactivity**	No additional mitigation measures.	No likely residual adverse effects.	The *Dust Management and Requirements Plan* [39] was followed during Phase 2 activities. Phase 2 ended in 2022 December.	Measure levels of radionuclides to verify modelling predictions.	PG LTWMF transitioned to Phase 3 monitoring in 2023 January. Particulate rradionuclide monitoring was not required	PG LTWMF transitioned to Phase 3 monitoring in 2023 January. Dust monitoring (TSP and $PM_{2.5}$) were not required as

Predicted Environmental Effect [55]	Mitigation Measures	Residual Effects after Mitigation	Status of Mitigation Measures - 2023	EA Follow-Up Monitoring Requirements	Predicted Environmental Effect – 2023	Status of EA Commitments - 2023
The maximum predicted annual concentrations for the radionuclides are below the Health Canada reference values.	*(See mitigation measures for Atmospheric Environment – Radiological Effects, Radon).*		Hydro seeding and tree planting were undertaken over the LTWMF after construction activities were completed commencing in 2022 Fall. Re-planting and monitoring of the hydro seeding and trees continued throughout 2023.		as outlined in the *Dust Management and Requirements Plan* [39].	outlined in the *Dust Management and Requirements Plan* [39].
Aquatic Environment						
Sediment Quality: ***Non-Radiological Effects:*** **Improvement to sediment quality by a decreasing contaminant transport.** **Environmental media sampling will be collected along the Lake Ontario shoreline to evaluate efficacy of mitigation measures intended to control offsite mitigation of contaminated wastes during excavation.**	Prompt removal of excavation water after rainfall along Lake Ontario shoreline, if remediation necessary. Fuel oil spilled to the Port Granby Creek will be cleaned by high pressure washing of cobble and gravel.	No likely residual adverse effects.	In 2023, there were no fuel spills or sedimentation events that took place.	In case of a sedimentation event or spill to Port Granby Creek – in which case, a post-cleanup monitoring plan is to be established during the Construction and Development Phase and the Maintenance and Monitoring Phase. Environmental media sampling will be collected along the Lake Ontario shoreline to evaluate efficacy of mitigation measures intended to control offsite migration of contaminated wastes during excavation.	No residual adverse effects.	There was no sedimentation event that entered Port Granby Creek in 2023. Sediment monitoring along the Lake Ontario shoreline is performed twice per year (Section 9.3.3).
Surface Water Quality: ***Non-Radiological and Radiological Effects:*** **Long-term improvement to down-gradient surface water quality; reduced contaminant loading to down-gradient lake; and no measurable change to Port Granby Creek.**	Groundwater, stormwater and drainage water collection and treatment systems, including flow control and quality control, will be in place.	Beneficial long-term effects.	Construction of the PG LTWMF for the treatment and control of groundwater is complete. Active commissioning commenced in 2016 April.	Conduct additional background data collection, field data collection and analysis and benchtop testing necessary to finalize the preferred treatment technology. Verify predicted improvements in surface water at existing and new water treatment system once the preferred treatment technology has been established. Compare the effluent quality performance with the predicted performance for the preferred technology. Proponent must ensure that discharge is not deleterious to the aquatic environment at the point of discharge. This must be confirmed through appropriate monitoring and toxicity testing. Verify reduction of contaminant loadings due to leachate discharging to Lake Ontario via site groundwater seepage sampling program and, in cases where seep locations are adjacent to Lake Ontario, an accompanying mixing zone surface water sampling program.	No residual adverse effects. Based on the predicted effluent concentrations from the pilot scale work, effluent parameters at the new WWTP are less than what was predicted during the pilot scale test work. However, influent concentrations are also currently less than what was predicted. Actual removal efficiencies (comparing influent to effluent numbers), for elements where there is a reasonable detectable quantity, indicate that removal efficiencies are >99% for most licensed parameters or design objectives. This is as expected from the pilot scale test work.	Preferred treatment technology was evaluated in 2011 through the *Water Treatment Definition – Port Granby Project.* Toxicity testing was conducted monthly. (Appendix A.1 Table 35). Effluent quality at the WWTP was measured in 2016 April once the plant was commissioned, based on the design objectives in the PGP LCH [3]. Approved release limits [7] have been implemented at the PG WWTP and updated in the PGP Quarterly Effluent Reports. Groundwater seepage samples from the bluffs are collected on a quarterly basis (Section 9.3.2).
Geology and Groundwater Environment						
Soil Quality: ***Radiological Effects:***	*(See mitigation measures included in the Atmospheric and*	No likely residual adverse effects.	The *Dust Management and Requirements Plan* [39] was followed during Phase 2	Monitor soil quality in all project phases as described for the	No residual adverse effects.	Soil samples are collected at perimeter locations on an annual basis (Section

Predicted Environmental Effect [55]	Mitigation Measures	Residual Effects after Mitigation	Status of Mitigation Measures - 2023	EA Follow-Up Monitoring Requirements	Predicted Environmental Effect – 2023	Status of EA Commitments - 2023
The mean incremental concentrations of radiological contaminants are expected to be less than 20% of background. The exception is thorium-230, with an expected 38% increase in concentration over baseline, during Construction and Development Phase of the LTWMF.	*Terrestrial Environment components of the EASR).*		activities. Phase 2 ended in 2022 December. Hydro seeding and tree planting were undertaken over the LTWMF after construction activities were completed commencing in 2022 Fall. Re-planting and monitoring of the hydro seeding and trees continued throughout 2023.	Terrestrial Environment component.	Thorium-230 soil concentration in 2023 have remained consistent with baseline data and monitoring data from previous years.	9.4.3.2).
Groundwater Quality: ***Non-Radiological and Radiological Effects:*** **Volume of groundwater collected for treatment in the LTWMF site groundwater and drainage water collection system would decrease by approximately 75%; contaminant concentration expected to decline over time.**	Collected groundwater will be treated to requirements set by the CNSC during licensing of the LTWMF.	No residual adverse effects.	Construction of WWTP for the treatment and control of groundwater is complete. Active commissioning occurred in 2016 April.	Measurement of volume and concentrations of contaminants in groundwater samples at selected monitoring wells; additional wells near the LTWMF may be required. Groundwater flow model to be revised by incorporating additional post-EA data collection results and used to verify EA predictions.	No residual adverse effects. Contaminant concentrations in groundwater at the former PG WMF are expected to decline as remediation progresses and natural attenuation occurs.	Groundwater was sampled and analyzed quarterly in 2023. The monitoring data for each well is presented in Appendix C.2. On the site of the LTWMF, changes to groundwater quality are expected to be minimal due to the presence of a containment system made from several barriers and water collection system. Sentinel monitoring will be used at the site perimeter locations to confirm effectiveness of containment system (Section 9.4.3.1).
Groundwater Flow: **Groundwater discharge to Port Granby Creek is predicted to decrease by 1.6% due to operation of the engineered containment system leachate containment system.**	No mitigation measures necessary.	No residual adverse effects.	No mitigation measures necessary.	Measure groundwater levels at an expanded network of groundwater monitoring wells, to ensure that there are sufficient monitors distributed in each hydro stratigraphic unit, both vertically and horizontally, to properly define groundwater flow. Measure groundwater levels at monitoring wells four times yearly during Construction and Development Phase, and annually during Early, Mid and Late Life Phases. Prior to the beginning of the construction several monitoring wells will require proper abandonment in accordance with *Ontario Regulation 903*.	No residual adverse effects.	Groundwater levels are measured quarterly at the current groundwater network (Section 9.4.3.1). Wells that were decommissioned in 2016 were completed as per *Ontario Regulation 903*.
Groundwater: **No measurable changes in quality or quantity of groundwater and drainage water during LTWMF construction.**	No mitigation measures necessary.	No residual adverse effects.	No mitigation measures necessary.	Monitor quantity and quality of groundwater and drainage water intercepted during construction to confirm predictions of no measurable change. Monitoring of the existing PG WMFwill continue as long as required based on evaluated contaminant concentrations, including bluff seepage. Monitoring is to be undertaken downgradient of the current PG WMF and in the East and West Gorges.	No residual adverse effects.	Groundwater samples are collected on a quarterly basis at perimeter locations of the LTWMF (Section 9.4.3.1). Operational groundwater monitoring was not conducted in 2023. The wells were decommissioned in 2016 as they were located within or adjacent to the PG WMF excavation areas. All wells were decommissioned as per *Ontario Regulation 903*. Sampling of the bluff seepage is performed on a quarterly basis (Section 9.3.2).
Design of LTWMF, including liner and cover: **Clay Liner Unit would have maximum**	No mitigation measures necessary.	No residual adverse effects.	No mitigation measures necessary.	Monitor leakage through the liner system to verify hydraulic	No residual adverse effects.	Monitoring of volume of excavated waste was performed when active waste removal

Predicted Environmental Effect [55]	Mitigation Measures	Residual Effects after Mitigation	Status of Mitigation Measures - 2023	EA Follow-Up Monitoring Requirements	Predicted Environmental Effect – 2023	Status of EA Commitments - 2023
hydraulic conductivity of 1x10^{-7} cm/s. Cover would have a maximum hydraulic conductivity of 1x10^{-7} cm/s. Volume of leachate generated within the LTWMF is predicted to be 100 m^3 /year based on the assumption of 1 mm/a leakage through the cover. **Volumes of excavated wastes to be stored in the LTWMF are predicted to be as follows: 204,400 m^3 of low-level radioactive waste (LLRW), 101,000 m^3 of marginally contaminated soils.**				conductivity of the liner unit. Monitor settlement of the LTWMF cover, to confirm the assumption that there will not be excessive settlements of the waste under the cover that would compromise the cover performance. Monitor rate of infiltration through the LTWMF cover to verify the hydraulic conductivity of the cover and to confirm the assumed leakage rate through the cover system. Verify the volume and concentration of excavated waste prior to emplacement in the LTWMF, to confirm the source term volumes and contaminant concentrations used to predict long-term environmental effects.		commenced in 2016 November. Radioactivity levels were monitored through the vehicle portal monitor before emplacement in the LTWMF. Leakage monitoring is in progress and is performed on a monthly basis using the SuperSting EC Measurement Device. This monitoring is performed by the PG WWTP. Settlement monitoring to be performed in the maintenance and monitoring phase. Rate of infiltration monitoring to be performed in the maintenance and monitoring phase.
Terrestrial Environment						
Preparation of the LTWMF site will result in temporary loss of vegetation of 2.2% in the Local Study Area and 6% in the Site Study Area, with permanent conversion of vegetation communities in 6.1% of Local Study Area and 15.3% of Site Study Area.	Relocation of the LTWMF stormwater management pond out of the cultural thicket and into an agricultural field. Development of site-specific Landscape Plan by a qualified landscape architect or biologist for terrestrial environment at each work site. Development of new vegetation communities at the LTWMF site rather than simply re-creating pre-construction conditions. Development of a Protection and Rehabilitation Plan for the fen vegetation near the East Gorge.	No residual adverse effects.	The existing pond located to the east of the LTWMF was removed in 2016 as part of the site preparation work and has been replaced with the new north stormwater management pond. Development of a site-specific Landscape plan is completed and vegetation planting commenced in 2022. Development of new vegetation communities at the LTWMF site will take place after the completion of the LTWMF construction. The development of a protection and rehabilitation plan for the fen vegetation near the East Gorge was completed (4500-03710-REPT-004).	Verify relocation of stormwater management pond. Verify development of protection and rehabilitation plans for the fen vegetation near the East Gorge. Verify implementation of erosion and sediment control structures; application of dust suppression techniques, and rehabilitation of sites. Monitor radiological and non-radiological COPC in surficial soil during Construction and Development Phase and Early Life Maintenance and Monitoring Phase. Verify extent and duration of temporary and permanent vegetation loss/change.	No residual adverse effects.	The existing stormwater management pond was relocated in 2016. The development of a protection and rehabilitation plan for the fen vegetation near the East Gorge was completed [62]. Soil samples are collected at perimeter locations on an annual basis (Section 9.4.3.2). The extent of vegetation/loss change will be evaluated in Phase 3.
Human Health and Safety - *Workers: Non-Radiological Effects*						
Particulate matter is not predicted to have a measurable effect on workers' health. **For construction activities – estimations predict a total of 4.6 lost time accidents and 15.3 recordable accidents.** **Noise level would reach 93 to 95 dBA within 15 m of the LTWMF and existing PG WMF.**	Use of personal protection equipment such as dust masks and respirators to reduce the exposure to arsenic. Personal protection equipment to mitigate noise, if necessary. Adopt a policy that all	No residual adverse effects.	Independent construction contractor worksites will be required to adhere to provincial legislation related to the protection of health and safety. Contractors that support the CNL operated and led activities will fall under CNL programs and federal regulations. Compliance monitoring by CNL will occur during the active construction period.	Monitor compliance with federal legislation related to protection of health and safety. Monitor accident rate.	For construction activities there were no recordable accidents at the PG LTWMF in 2023, and no lost time. Further details are provided in (Section 8).	Construction contractors are required to adhere to federal and provincial legislation related to the protection of health and safety. Compliance monitoring by CNL will occur during the active construction period. If they occur, accident reports and causes are reviewed with the contractors to ensure that appropriate measures are in place to reduce the possibility of recurrence.

Predicted Environmental Effect [55]	Mitigation Measures	Residual Effects after Mitigation	Status of Mitigation Measures - 2023	EA Follow-Up Monitoring Requirements	Predicted Environmental Effect – 2023	Status of EA Commitments - 2023
	occupational illnesses and injuries are preventable and the formal establishment of the objective of zero-time occupational illnesses and injuries. Develop and implement a formal Health and Safety Program.		Accident rate is being monitored (Section 8). CNL reviewed and approved contractor plans for the Health and Safety Program.			PG LTWMF transitioned to Phase 3 monitoring in 2023 January. Noise monitoring was not required as outlined in the *Port Granby Environmental and Biophysical Monitoring Plan* [36].
Human Health and Safety - *Members of the Public: Non-Radiological Effects*						
1. Air Quality and Noise: **2. Non-radiological contaminants:** **Risk assessment on non-radiological contaminants predicted that any incremental risks associated with the Project would not pose an unreasonable risk to human health.** **3. General health and well-being:** **Reduced feelings of health and sense of wellbeing; feelings of personal security; and feelings of satisfaction with living in the community.**	(*See Atmospheric Environment Component*) Evaluation of the appropriateness of mitigation measures to prevent or minimize the potential public exposure to the effluents in the portion of Lake Ontario that may be affected by treated effluent or bluff seepage if needed. Continued and consistent protocols for delivering information and receiving input to/from residents in the Local and Regional Study Areas.	No likely residual adverse effects. Some residual adverse effects predicted. However, these are considered to be minor.	Effluent sampling takes place on a weekly schedule from the PG WWTP. These results are presented in Section 9.2.2.1. No exceedance of these specified limits occurred during the reporting period. Bluff seepage sampling takes place on a quarterly basis. The results are presented in Section 9.3.2. It is noted that there are elevated levels, arsenic and uranium in the seepage water that are above Ontario's *Provincial Water Quality Objectives* (PWQO) [50] and the Canadian Council of the Ministers of the Environment (CCME) *Canadian Water Quality Guidelines for the Protection of Aquatic Life* (CWQG) [52] however, the total contaminant plume to Lake Ontario remains small. The majority of the plume is estimated to have contaminant concentrations equivalent to 1% of the original concentration observed in the bluff seepage samples. In Phase 3, no visible work is being conducted at the LTWMF and minimal traffic in and out of the site is anticipated. CNL staff remain available to respond to and communicate regarding any emergency situations and to address any questions or concerns from stakeholders and the public. A summary of the communications and outreach activities related to the PGP are presented in Section 15.1. The Complaints Resolution Program was regularly monitored in 2023 as discussed in Section 15.1.	Monitor communication protocols. Survey members of the public to confirm the level of satisfaction within the community. *(See Aquatic Environment Components)* Monitor complaints resolution process.	No residual adverse effects.	The last public attitude survey was completed during 2021. Additional surveys are not anticipated during Phase 3. [85]. Complaints Resolution Program is being regularly monitored (See Section 15.1).
Human Health and Safety - *Workers: Radiological Effects*						
Annual radiation doses are predicted to range between 2.1 and 7.1 mSv/a. **During the Maintenance and Monitoring Phase, doses are predicted to be around 0.1 mSv/a.**	Application of the ALARA principle. No additional proposed mitigation.	No residual adverse effects.	The Radiation Protection program was implemented effectively to ensure doses to the public are ALARA and are below the limited predicted effects.	Monitor radiation doses to confirm accuracy of predictions.	For PHAI, the individual annual doses ranged from 0.01 mSv to 0.79 mSv. The collective radiation dose was 20.28 person-mSv. The average annual dose was 0.01 mSv.	Upon comparison between the actual and predicted doses, the doses exposed to the workers are generally below the predicted levels. These dose levels prove that the mitigation measures were effectively executed; and reflect the fact that the engineered containment system has been capped.

Predicted Environmental Effect [55]	Mitigation Measures	Residual Effects after Mitigation	Status of Mitigation Measures - 2023	EA Follow-Up Monitoring Requirements	Predicted Environmental Effect – 2023	Status of EA Commitments - 2023
Human Health and Safety - *Members of Public: Radiological Effects*						
During construction and development, the only measurable radiation doses predicted are to adjacent resident child and infant; 0.12 to 0.14 mSv/a for median dietary intakes and 0.12 to 0.15 mSv/a for upper bound dietary intakes. However, all predicted doses are within 15% of the CNSC public dose limit of 1 mSv/a, and would occur for only a relatively short duration for the infant and child.	Application of the ALARA principle. Radiation Protection Program No additional proposed mitigation.	No residual adverse effects.	Excavation and transfer of waste commenced in 2016 November. The Radiation Protection program was implemented effectively to ensure doses to the public are ALARA and are below the limited predicted effects.	Monitor radiation doses to confirm accuracy of predictions.	The radiation dose to public was estimated to be 0.4% of the annual dose limit of 1 mSv for exposures for members of the public. Total effective dose to the public was assessed with the inclusion of radon exposure at the fence-line. A total effective dose was estimated to be around 1.5% for exposures for members of the public.	Upon comparison of the actual and predicted public doses, the doses exposed to the public are below the predicted levels. This has proven the mitigation measures were effectively executed.
Cumulative Effects						
Radiological: **The combined predicted incremental annual average radon concentration associated with both the Port Hope and PGPs would be indistinguishable from background at a distance of approximately 2 km.**	1. Working areas containing contaminated materials will be minimized. 2. Application of dust suppressants including water and possibly chemical suppressants. 3. Covering of stockpiles and exposed areas overnight and on weekends using foam agents, geotextiles, or other appropriate materials. 4. Placing wind fencing around exposed stockpiles. 5. Possible cessation of activities under high wind conditions. 6. Mulching or re-vegetating completed cells and excavation areas as soon as possible.	No likely residual adverse effects.	Mitigation measures are implemented as outlined.	Verify radon concentrations and radiological constituents of resuspended dust at a distance of 2 km.	Radon monitoring commenced at 3 locations around the PG LTWMF in 2017 December. These locations were less than 2 km distance from the LTWMF Controlled Area fenced boundary. The average radon concentration for 2023 at these locations read 26.3 Bq/m^3. The highest noted radon concentration level was 33 Bq/m^3 which is below the environmental trigger level for radon 150 Bq/m^3.	Assessment of average radon concentrations at 2 km will be performed on a quarterly basis.
The radiological constituents of re-suspended dust would not be measurable beyond approximately 2 km from the sites.	1. Working areas containing contaminated materials will be minimized. 2. Application of dust suppressants including water and possibly chemical suppressants. 3. Covering of stockpiles and exposed areas overnight and on weekends using foam agents, geotextiles, or other appropriate materials. 4. Placing wind fencing around exposed stockpiles. 5. Possible cessation of activities under high wind conditions. 6. Mulching or re-vegetating completed cells and excavation areas as soon as possible.	No likely residual adverse effects.	The *Dust Management and Requirements Plan* [39] was followed during Phase 2 activities. Phase 2 ended in 2022 December. Hydro seeding and tree planting were undertaken over the LTWMF after construction activities were completed commencing in 2022 Fall. Re-planting and monitoring of the hydro seeding and trees continued throughout 2023.	Verify radiological constituents of resuspended dust at a distance of 2 km.	No residual adverse effect.	PG LTWMF transitioned to Phase 3 monitoring in 2023 January. Dust monitoring (TSP and $PM_{2.5}$) were not required as outlined in the *Dust Management and Requirements Plan* [39]. A yearly soil (dust deposition) monitoring program at a residential property located approximately 1 km east of the Site commenced in 2016 June and concluded at the end of Phase 2 activities The soil results are compared yearly to verify radiological constituents in soil as a result of dust deposition.

Table 49: Port Hope Project Environmental Assessment Follow-Up Monitoring Plan Summary, 2023

Predicted Environmental Effect [46]	Mitigation Measure	Residual Environmental Effect (remaining after mitigation)	Status of Mitigation Measures – 2023	EA Follow-up Monitoring Requirement	Predicted Environmental Effect - 2023	Status of EA Commitments - 2023
Atmospheric Environment						
Air Quality **24-hour average Ambient Air Quality Criteria (AAQC) will be exceeded for arsenic and cobalt on occasions at offsite locations, including public receptor locations.** **Total suspended particulates of PM_{10}, $PM_{2.5}$ and NO_2 will exceed the 24-hour AAQC at some offsite locations.**	Reduce travel distances within LTWMF from 200 m to 50 m, for equipment distributing off-loaded contaminants. Install a fence-type barrier or other movable barrier at specific targeted locations. Construction equipment to meet Off-Road Compression-Ignition Engine Emission Regulations for use in areas of denser urbanization, where practicable.	No residual adverse effects.	Construction equipment met Off-Road Compression-Ignition Engine Emission Regulations for PH LTWMF activities.	Verify implementation of mitigation measures. Monitor arsenic and cobalt at offsite locations, including public receptor locations. Compare measured concentrations to predictions. Monitor levels of $PM_{2.5}$ at offsite locations. Compare measured levels of $PM_{2.5}$ to correlate the predicted air quality relationships between PM_{10} and $PM_{2.5}$; and relationships between NO_2 and $PM_{2.5}$.	There were no exceedances of the 24-hour AAQC [57] for arsenic or cobalt in 2023. CCME adopted the Air Quality Management System [58]. Canadian Ambient Air Quality Standards for Fine Particulate Matter ($PM_{2.5}$) are included, which replace the Canada-wide standards developed in 2000. A 2020 value of 27 µg/m^3 is used for $PM_{2.5}$ (98th percentile averaged over 3 years) was exceeded in 2023 due to poor air quality in Ontario from 2023 June to September. As described in the *Port Hope Environmental and Biophysical Monitoring Plan* [38], compliance with this criterion will also be protective of the potential effects from PM_{10} and NO_2.	Air quality monitoring was conducted throughout 2022 at the PH LTWMF Site. A holiday shutdown took place from 2023 December 21 to 2024 January 02. The Overriding Limit of 120 µg/m^3 for TSP, as defined in the *Dust Management Requirements and Plan* [39] was exceeded in 2023 due to poor air quality in Ontario from 2023 June to September. The Canadian Ambient Air Quality Standards for $PM_{2.5}$ of 27 µg/m^3 (98th percentile averaged over 3 years) was exceeded in 2023. The sample containing the highest net weight of TSP collected each week at each of the monitoring stations was sent for additional analysis to determine the concentration of metals and radionuclides in suspended dust. There were no exceedances of the AAQC [57] for metals in 2023. Radionuclide analysis results are discussed under *Radiological, Particulate Radioactivity*.
Odour **MECP guideline for odour may be exceeded at properties near Highland Drive Landfill and the Port Hope Harbour.**	Lime may be added to waste, for sulphur-related odours; foaming agents may be used to minimize surface odours; odour suppression sprays may be used.	No residual adverse effects.	Contractors are required to submit Odour Control Plans prior to odour generating activities that are reviewed by CNL. Any odour suppressants are reviewed by CNL prior to use.	During pre-construction and construction phases, conduct odour analysis at Highland Drive Landfill and Port Hope Harbour sites. Implement mitigation measures if odour analysis indicates they are necessary.	A third-party odour monitoring contractor performed pre-construction and construction phase odour monitoring to support the dredging activities at the Port Hope Harbour and remediation at the Highland Drive Landfill in 2023. Twice daily off-site upwind and downwind odour measurements were performed when dredging was taking place in 2023. There were 0 instances when the threshold level of 5 dilution-to-threshold was reached during dredging activities at Port Hope Harbour and Highland Drive Landfill off-site receptors. Pre-construction odour monitoring was conducted in 2021 June ahead of the commencement of dredging in 2021 July.	A third-party odour monitoring contractor was procured in 2020 to support the monitoring during dredging in the Port Hope Harbour. Odour monitoring commenced in 2021 June. Mobilization of the Highland Drive Landfill took place in 2022 fall. The third party odour monitoring contractor supported odour monitoring at the Highland Drive Landfill in 2023.
Noise **Noise levels will increase by 12 dBA, to 63 dBA, for residents adjacent to the LTWMF, during construction and development; by 13 dBA, to 67 dBA, for residents adjacent to the Alexander Ravine; and by 12 dBA, to 61 dBA, for residents along the**	Hours of work will comply with Port Hope By-Law No 30/2002, which prohibits construction between 11:00 pm and 7:00 am. At small and medium scale	Nuisance noise impacts on local receptors.	Complied with Port Hope By-Law No 30/2002 and World Health Organization's 70 dBA over a 24-hour period [60]. Trucks and other equipment will be equipped with mufflers. Tailgate	Verify implementation of mitigation measures. Measure noise levels at the LTWMF including the intersection of the proposed access road [now constructed] and Toronto Road during construction; at Alexander	Noise monitoring was conducted around the LTWMF in 2023. The 2023 results are compared to 2015 baseline results prior to the start of the EW3a construction (when levels of activity around the site were comparatively low), it can be	Implementation of mitigation measures is verified during compliance inspections. Work was scheduled in compliance with local by laws. Four main monitoring campaigns (January, April, August, and November)

Predicted Environmental Effect [46]	Mitigation Measure	Residual Environmental Effect (remaining after mitigation)	Status of Mitigation Measures – 2023	EA Follow-up Monitoring Requirement	Predicted Environmental Effect - 2023	Status of EA Commitments - 2023
Strachan Street transportation route.	remediation sites in residential areas, activities would be limited to daylight hours and would conclude by 7:00 p.m. Construction equipment will comply with emission standards as outlined in Noise Pollution Control-115 of the Ontario Model Municipal Noise Control By-Law. Trucks and other equipment will be equipped with mufflers. Tailgate banging will be avoided. Empty trucks will be required to reduce speed at construction sites and on local roads to avoid excessive cargo box and tray noise. Construction hoarding will be erected where practical. Develop and implement a noise mitigation plan for the intersection of the new access road and Toronto Road involving physical (e.g., berms) and operational (e.g., transportation protocols) elements.		banging was avoided. Physical and operational elements were built into the design of the new access road; construction of a berm and installation of traffic lights.	Ravine during remediation; and along the Strachan Street transportation route, to verify accuracy of predictions and effectiveness of mitigation measures. Monitor noise levels for compliance with appropriate by laws and regulations governing hours of work and levels of noise.	observed that the 2023 results are similar to 2022 with no notable increases of results. All values were below the predicted range of 12 dBA and the World Health Organization's *Guideline for Community Noise* level of 70 dBA over a 24-hour period [60]. The North, South and Central Transportation Routes were also monitored in 2023. Monitoring along the Transportation Routes showed little to no increase from the baseline monitoring that took place prior to the remedial activities.	were completed for noise monitoring in 2023 at the PH LTWMF. The 2023 results are similar to 2022 with no notable increases. The North, South and Central Transportation Routes were also monitored in 2023. Please note, the Central Transportation Route monitoring incorporates Strachan Street Consolidation Site. Monitoring along the Transportation Routes showed little to no increase from the baseline monitoring that took place prior to the remedial activities.
Radiological, Radon **Annual average radon concentrations, downwind from the LTWMF during construction and development, are expected to be 25.3 Bq/m^3.** **The radon pathway will be eliminated.**	Covering stockpiles and exposed areas overnight and on weekends. Applying dust suppressants. Restricting or ceasing work under high wind conditions. Minimizing the exposed working face. Re-vegetation of completed cells and excavation areas as soon as possible. Modify methane gas piping exit vents to mitigate radon gas emanating from Cell 3 of	No residual adverse effects.	CNL approved dust suppressants are used. Work was restricted or ceased under high wind conditions Revegetation of the work areas is to be completed at the end of the PH LTWMF project. On-site remediation continued in 2023. Activities were performed by the contractor in accordance with a radiation protection plan, approved by CNL. Requirements of the plan include ALARA principles, completion of a radiological safety assessment and use of radiological work permits/assessments. Dose tracking and work planning measures are in	Verify implementation of mitigation measures at times appropriate to the measure. During construction and during development, measure concentrations of radon and long-lived alpha emitters downwind from the LTWMF to verify modelling predictions. During construction and operations measure radon gas concentrations in the area immediately surrounding the methane gas piping exit vents at Cell 3 of the LTWMF. Length of monitoring would be limited to several years if no impact demonstrated.	Radon measurements are taken monthly at the fence line as a representative reading to the public and around the existing engineered containment system. Measurements taken are located at the fence line around boundary. At the fence line, the average radon measurements ranged between 15 Bq/m^3 to 348 Bq/m^3. The trigger level for radon monitoring is 150 Bq/m^3. Results from the 2023 radon monitoring program confirm a public dose estimate to be 15.3 µSv (or 1.5% of the annual limit for the public) based on the maximum readings from Radon measured along the fence line, with a conservative occupancy period of 60 hours per year. The integrity of the ALARA program is managed	Radon gas and radon progeny was monitored on a routine monthly basis at the LTWMF during the 2023 calendar year.

Predicted Environmental Effect [46]	Mitigation Measure	Residual Environmental Effect (remaining after mitigation)	Status of Mitigation Measures – 2023	EA Follow-up Monitoring Requirement	Predicted Environmental Effect - 2023	Status of EA Commitments - 2023
	the LTWMF.		place to ensure worker dose is ALARA.		through routine monitoring and reviews of dose records to confirm that no adverse trends or exceedances have occurred.	
Radiological, Particulate Radioactivity **The predicted levels for the following radionuclides are below Health Canada reference levels: ^{226}Ra (0.000049 Bq/m^3, compared with 0.05 Bq/m^3); ^{230}Th (0.00042 Bq/m^3, compared with 0.01 Bq/m^3), ^{232}Th (0.000057 µg/m^3 compared with 0.006 Bq/m^3); and uranium (0.0018 µg/m^3 compared with 4.07 µg/m^3).**	Implement watering, to control dust on unpaved roads and excavation areas. Implement vacuum sweeping and water flushing on paved roads.	No residual adverse effects.	Watering trucks and spray on technology used in areas of excavation.	Verify implementation of mitigation measures. Measure levels of ^{226}Ra; ^{230}Th; ^{232}Th, and uranium at work sites and along haul roads, to verify modelling predictions.	TSP high volume air sampler filters were sent for additional laboratory analysis in 2023. Radium-226 thorium-232, and uranium exceeded the predicted values for some of the filters in 2023; however, they remained well below the Health Canada reference values. It should be noted that the exceedances of the predicted values are related to laboratory detection limits (uncalculated laboratory results were less than the limit of detection for radium-226 and thorium-232). The predicted values were based on modeling PM_{10} concentrations. Comparing particulate radioactivity on TSP filters to the modelled predictions is taking a conservative approach.	The sample containing the highest net weight of TSP collected each week at each of the monitoring stations was sent for additional analysis to determine the concentration of Contaminants of Potential Concern (COPC) in suspended dust.
Aquatic Environment						
Sediment Quality (Sculthorpe Marsh) **If remediation work is carried out in the Sculthorpe Marsh, the effect resulting from the sediment removal is expected to reduce invertebrate productivity temporarily.** **(See also, *Terrestrial Environment Component*)**	Conduct sediment toxicity testing to confirm the need for remediation and /or refine area/extent/scope of any required sediment removal. Develop a Marsh Protection and Restoration Plan, which could include replacement of coarse organic matter and re-planting of shoreline vegetation.	No residual adverse effects.	Remediation is still being discussed with the Municipality of Port Hope. Site Specific Risk Assessment will be conducted prior to any remediation activities.	The remediation of the Sculthorpe Marsh is not required at this time. The following follow up actions with respect to the Sculthorpe Marsh; monitor recovery of benthic invertebrates and aquatic communities against predicted timelines are not incorporated into this plan.	Remediation is still being discussed with the Municipality of Port Hope. Site Specific Risk Assessment will be conducted prior to any remediation activities.	Remediation is still being discussed with the Municipality of Port Hope. Site Specific Risk Assessment will be conducted prior to any remediation activities.
Surface Water Quality, Radiological **Concentrations of arsenic and uranium will decrease by 78-88% in the Highland Drive, South Creek, and Brewery Creek.** **Concentrations of uranium and ^{226}Ra would decrease similarly in Alexander Creek.** **Concentrations of ^{226}Ra and uranium are expected to increase in the area between the harbour and the Ganaraska River, during dredging of the harbour, but to remain below Provincial Water Quality Guidelines (PWQOs).**	The mitigation measures include the design (e.g., the low-permeability cover on the LTWMF and permeable reactive barriers installed in Highland Drive South Ravine), operation and management (e.g., storm water management) features of the project proposal. An Emergency Response Plan will be developed to address unexpected events. A Spill Contingency Plan will be developed to deal with	No residual adverse effects.	A temporary wave attenuator and use of turbidity curtain(s) are present at the Harbour. Emergency Response Plans are developed for project sites and reviewed by CNL. A Spill Contingency Plan has been developed to deal with unexpected spills of fuels and lubricants. Spill control and clean-up equipment is provided at all work locations. Erosion and sediment control structures are in place and are inspected and maintained regularly.	Measure concentrations of arsenic and uranium at the Highland Drive South Creek and Brewery Creek; and concentrations of uranium and ^{226}Ra in Alexander Creek; concentrations of ^{226}Ra and uranium in the area between the harbour and the Ganaraska River during dredging of the harbour; and uranium concentrations in the groundwater and down-gradient surface water in the area of the LTWMF, to verify accuracy of predictions. Review Emergency Response Plan, Spill Contingency Plan and require revisions if necessary, until plans are deemed acceptable.	No residual adverse effects on surface water. There was no observable decrease in uranium concentrations in Brand Creek (downgradient of the LTWMF). This is not expected until the project evolves, and the waste is remediated. In the Port Hope Harbour, uranium concentrations were observed to exceed the PWQO [50] during dredging. The original EA prediction used theoretical/predicted data inputs to the model. Actual conditions related to daily inputs of water to the inner harbour during	Monitoring of surface water at the Highland Drive South Ravine Creek, Brewery Creek, Brand Creek, and Alexander Creek was completed in 2023. Surface water sampling was completed during the Port Hope Harbour dredging activities. Uranium exceeded the PWQO [50] and CWQG [52] at PHH-2 in 2023 June, September and November. Monitoring of the surface water downgradient of the LTWMF (including Lake Ontario) is performed on a continuous, quarterly basis. (Section 9.4.4.2).

Predicted Environmental Effect [46]	Mitigation Measure	Residual Environmental Effect (remaining after mitigation)	Status of Mitigation Measures – 2023	EA Follow-up Monitoring Requirement	Predicted Environmental Effect - 2023	Status of EA Commitments - 2023
Uranium concentrations in the groundwater and down-gradient surface water in the area of the LTWMF are expected to decrease by 63%.	unexpected spills of fuels and lubricants. Spill control and clean-up equipment will be provided in all work locations. Erosion and sediment control structures will be in place and will be inspected and maintained regularly.			Verify presence of spill control and clean-up equipment at all work locations. Verify presence of erosion and sediment control structures, and review inspection and maintenance protocol.	dredging have resulted in a different set of conditions, requiring that the proposed EA mitigation measures be modified. CNL engaged Responsible Authorities to ensure a path forward for the protection of Lake Ontario and the Ganaraska River. This has resulted in the creation of a robust monitoring program to ensure the protection of the aquatic environment while dredging activities continue at the Port Hope Harbour.	Oversight (Section 1.5) is used by CNL personnel to confirm the suitability, implementation and effectiveness of processes applied to PHAI project activities in order to comply with contractual obligations, licensing requirements, federal/provincial acts and regulations, environmental management and protection plans, compliance plans and technical specifications. Oversight (Section 1.5) is applied by CNL taking into consideration the importance and complexity of activities and the organization(s) involved in the management of these activities. Activities performed by PHAI consultants, contractors and service providers are subject to oversight.
Surface Water Quality, Non-Radiological **Long-term improvement to down-gradient surface water quality; reduced contaminant loadings to down-gradient streams; and no measurable change to Ganaraska River are the effects predicted.** **Any storm water flow which permeates the dike during harbour cleanup is not expected to raise contaminant concentrations above PWQOs in the harbour or Ganaraska River.** **Surface water infiltration into and through contaminated materials, to groundwater and down-gradient surface water, is expected to decrease.** **Contaminant loadings from LTWMF leachate, discharging to the lake, would be reduced by 44%.**	Groundwater, stormwater, and drainage water collection and treatment systems, including flow control and quality control, will be in place. Dike and silt screen will isolate harbour work from Lake Ontario.	No residual adverse effects.	Required sampling of groundwater, storm water and drainage water took place during the PH LTWMF construction activities. No residual adverse effects for the PH LTWMF construction work. Sampling took place at Highland Drive South Ravine Creek, Brewery Creek, Brand Creek, and Alexander Creek in 2023 and will continue to take place in 2024. It is to be noted that subsequent to the acceptance of the Environmental Assessment by the RAs, the preliminary design for the PHP continued to be refined in support of the licence application and some changes to preliminary design concepts were made. Among the design changes was the substitution of the proposed dike for purposes of separating the Approach Channel and Turning Basin from the Outer Harbour during dredging operations with a series of silt curtains to prevent transmission of suspended solids out of the Harbour during dredging; with the curtains being protected from wave damage by a floating wave attenuator designed for the dissipation of wave energy in harbours. This (and all other design refinements), and the potential environmental effects	Verify predicted improvements in surface water. Proponent must ensure that discharge is not deleterious to aquatic environment (fish) at point of discharge and appropriate monitoring must be employed to confirm this. Monitor contaminant concentrations in the harbour and Ganaraska River during the harbour cleanup following any storms. Monitor mercury and levels of other COPCs in fish tissue to verify predictions. Verify reduction of contaminant loadings due to leachate discharging to Lake Ontario. Monitor the maintenance of silt curtains.	There was no observable decrease in contaminant concentrations to downgradient Brand Creek; however, this is not expected until the project evolves, and the waste is remediated. Sampling took place at Highland Drive South Ravine Creek, Brewery Creek, Port Hope Harbour, and Alexander Creek in 2023.	Monitoring of surface water at the Highland Drive South Ravine Creek, Brewery Creek, Brand Creek, and Alexander Creek was completed in 2023. Monitoring of surface water at the Port Hope Harbour and Ganaraska River Confluence was completed in 2023 and will continue in 2024. Monitoring of the surface water downgradient of the LTWMF (including Lake Ontario) is performed on a continuous, quarterly basis. The PH LTWMF construction activities did not appear to be affecting surface water quality (Section 9.4.4.2). Monitoring of COPCs in fish tissue to occur during the Maintenance and Monitoring Phase. Monitoring of the maintenance of the silt curtains will occur during the construction period around water features at Alexander Creek, Highland Drive South Creek, Brand Creek, if necessary, and near Lake Ontario.

Predicted Environmental Effect [46]	Mitigation Measure	Residual Environmental Effect (remaining after mitigation)	Status of Mitigation Measures – 2023	EA Follow-up Monitoring Requirement	Predicted Environmental Effect - 2023	Status of EA Commitments - 2023
			associated with the change, were described in the Engineering Change Summary Report, which was submitted to, and approved by, the RAs. Therefore, the silt barrier and wave attenuator are incorporated into the detailed design description report.			
Sediment Quality (Harbour) **A long-term improvement to harbour sediment quality and habitat conditions is predicted.**	Beneficial effects will be enhanced by the development of fish habitat enhancement incorporated into the harbour detailed design.	Beneficial effect.	Design of harbour incorporates enhancement to fish habitat. Monitoring to take place in the maintenance and monitoring phase.	Verify design enhancements have improved the fish habitat in the harbour. Monitor sediment quality and habitat conditions.	Not applicable. Expected to be a beneficial effect. Monitoring to take place in the maintenance and monitoring phase.	Monitoring to occur during Maintenance and Monitoring Phase.
Geology and Groundwater Environment						
Soil Quality, Radiological **The mean incremental concentrations of radiological contaminants are expected to be less than 10% of background at remediation sites. The incremental concentrations at the LTWMF would be less than 20% of background.** **The exception is ^{230}Th, with an expected 63% increase in concentration over baseline, during construction and development of the LTWMF, to a predicted mean concentration of 97.7 Bq/kg, with a maximum predicted concentration of 141.9 Bq/kg.**	Reduce travel distances within LTWMF from 200 m to 50 m, for equipment distributing off-loaded contaminants. Implementation of a Dust Management Requirements and Plan.	No residual adverse effects.	The *Dust Management and Requirements Plan* [39] was implemented during the PH LTWMF construction activities and remediation at major sites. The *Dust Management and Requirements Plan – Small-Scale Sites Remediation* was implemented and used for the Small-Scale Sites remediation in 2023.	Measure concentrations of all radiological contaminants at all remediation sites and at the LTWMF to verify modelling predictions. Monitor concentrations of ^{230}Th at the LTWMF perimeter fence, and in the surface soils adjacent to it.	No residual adverse effects. LTWMF: In 2023, Thorium-230 soil concentrations have not increased from baseline (Section 9.4.3.2).	Surface soil monitoring for radiological contaminants of interest around the PH LTWMF and the Highland Drive Landfill Site were monitored in 2023. Monitoring is planned annually for the remainder of the project for both Sites.
Soil Quality, Non-Radiological **Relates to potential disposition of contaminants on surface at perimeter of LTWMF (see *Atmospheric Environmental Component*). Predicted maximum concentrations: arsenic 4.7 mg/kg; cobalt – 6.67 mg/kg.**	See *Atmospheric Environment Component*.	No residual adverse effects.	No residual adverse effects for PH LTWMF construction work. Watering trucks and spray on technology used in areas of excavation.	Verify predicted soil concentrations of arsenic and cobalt at perimeter of LTWMF.	LTWMF: In 2023, concentration of arsenic (27 µg/g) was greater than the predicted concentration at PH-WWMF-SS-05. All other sampling locations were below predicted concentrations. (Section9.4.3.2). There are no immediate environmental concerns.	Surface soil monitoring for non-radiological contaminants of interest around the perimeter of the PH LTWMF and the Highland Drive Landfill Site occurred in the 2023. Monitoring is planned annually for the remainder of the project for both Sites.
Groundwater Quality, Radiological **With removal of source contamination, uranium concentrations at Mill Street and Alexander Street sites are predicted to decline below applicable criterion value within approximately 25 years.**	No mitigation required.	No residual effects	Pre-construction groundwater monitoring at the Mill Street South site occurred in 2012-2013. Monitoring of selected remediated sites will occur following remediation to verify EA predictions.	Measure uranium concentrations at remediated Mill Street and Alexander Street sites. Report measurements annually to verify modelling predictions.	No residual adverse effects.	Pre-construction groundwater monitoring at the Mill Street South site occurred in 2012-2013. Monitoring of selected remediated sites will occur following remediation to verify EA predictions.
Groundwater Quality **Volume of groundwater collected for treatment in the LTWMF groundwater drainage water collection system would decrease by approximately 30%; contaminant concentrations expected to decline over time.**	Collected groundwater water will be treated to requirements set by the CNSC during licensing of the LTWMF.	No residual adverse effects.	WWTP construction was completed in 2016 – active commissioning commenced in the Fall of 2016.	Measure volume and concentrations of contaminants in LTWMF groundwater collection system annually to verify predictions.	Elevated concentrations of some COPCs are identified in samples collected of drainage water in 2023. Changes in drainage water quality and volume were expected to occur after remediation work commenced. It should be noted that drainage water on site is treated prior to release to the environment.	Monitoring of LTWMF groundwater-drainage water collection system occurred in 2023. Monitoring of groundwater and drainage water will continue throughout the Construction and Development Phase.

Predicted Environmental Effect [46]	Mitigation Measure	Residual Environmental Effect (remaining after mitigation)	Status of Mitigation Measures – 2023	EA Follow-up Monitoring Requirement	Predicted Environmental Effect - 2023	Status of EA Commitments - 2023
Drainage water volume **A 66% reduction is predicted for the volume of drainage water to be collected in the groundwater/drainage water collection and treatment system, to 27,380 m^3/a after the cover is placed on the LTWMF.** **A reduction of 92,110 m^3/a to 116,280 m^3/a is predicted for the sum of groundwater and drainage water discharge, an overall volume reduction of 44%.**	Not applicable.	No applicable.	Not applicable.	Measure volume of drainage water at the LTWMF annually to verify predictions.	Not applicable. Predictions to be verified in the Maintenance and Monitoring Phase when the cover is placed on the LTWMF.	Monitoring of groundwater and drainage water will continue throughout the Construction and Development Phase.
Groundwater Flow **It is predicted that the water table will be lower by 10 m, and that the groundwater mounding under the existing facility will dissipate.** **Groundwater discharge to Brand Creek is predicted to decrease by 2%.** **Groundwater discharge to the onsite drainage system is predicted to decrease by 30%.** **The treated effluent volume to be discharged to Lake Ontario is predicted to decrease by 42%.**	Not applicable.	Not applicable.	Not applicable.	Confirm lowering of water table. Confirm dissipation of mounding by monitoring water table beneath and adjacent to the LTWMF. Monitor stream flow and perform base flow separation to get groundwater discharge, to confirm 2% decrease is not exceeded, and that there is a 30% decrease in groundwater discharge to the onsite drainage system, and a 42% decrease in the volume of treated effluent discharged to Lake Ontario. Monitor groundwater flow and direction to verify assessment assumption. Continue monitoring to increase understanding.	No residual adverse effects.	The average water levels in groundwater monitoring wells in 2023 are generally comparable to previous years. Monitoring will continue throughout the Construction and Development Phase. The volume of treated effluent discharged to Lake Ontario is monitored on a continuous basis. Monthly Effluent volumes discharged to Lake Ontario are provided in Table 38. The total effluent volume in 2023 was 132,000 m^3.
Groundwater Quality and Quantity **No measurable changes of quality or quantity of groundwater and drainage water during LTWMF construction.** **Maximum breakthrough of COPCs through the LTWMF would be 1% of PWQO [50] and Ontario Drinking Water Standards [56] criteria.**	Not applicable.	Not applicable.	Not applicable.	Monitor quantity and quality of groundwater and drainage water intercepted during construction to confirm prediction of no measurable change.	No measurable change to groundwater and drainage water quality was observed in 2023 sampling results (Section 9.4.4.2).	Drainage water and groundwater were monitored in 2023 and will continue to be monitored throughout the Construction and Development Phase.
Design of LTWMF, including liners and covers **Primary and secondary liner units would have maximum hydraulic conductivity of $1x10^{-7}$ cm/s. Cover would have a maximum hydraulic conductivity of 10^{-8} cm/s.** **Volume (annual) of leachate generated within the LTWMF is predicted to be 150 m^3 based on the assumption of 1 mm/a leakage through the cover.**	Not applicable.	Not applicable.	Not applicable.	Monitor leakage through the primary liner using collection system installed between the primary and secondary liners to verify hydraulic conductivity of the liner units. Monitor settlement of the LTWMF cover, to confirm the assumption that there will not be excessive settlements of the waste under the cover that would compromise the cover performance. Monitor rate of infiltration through the LTWMF cover to verify the hydraulic conductivity of the cover and confirm the assumed leakage rate through the cover system.	Not applicable until Maintenance and Monitoring Phase.	Monitoring to occur in the Maintenance and Monitoring Phase.

Predicted Environmental Effect [46]	Mitigation Measure	Residual Environmental Effect (remaining after mitigation)	Status of Mitigation Measures – 2023	EA Follow-up Monitoring Requirement	Predicted Environmental Effect - 2023	Status of EA Commitments - 2023
Volumes of Excavated Wastes **Volumes of excavated wastes to be stored in the LTWMF are predicted to be as follows: 620,000 m³ of low-level radioactive waste (LLRW); 572,000 m³ of material mixed with LLRW; 51,250 m³ of industrial waste; and 150,000 m³ of Cameco decommissioning and stored waste. Predictions of contaminant concentrations are found in Tables 9.2.2-1 and 9.2.1-2 of the *PHP EA Study Report* [62].**	Not applicable.	Not applicable.	Not applicable.	Verify the volume and concentrations of excavated waste prior to emplacement in the LTWMF, to confirm the source term volumes and contaminant concentrations used to predict long-term environmental effects.	On-site waste movement occurred from 2023 January 01 to 2023 December 31 (Section 11.1).	Volume of waste will be monitored as waste is placed in the cells of the PH LTWMF.
Terrestrial Environment						
Preparation of the LTWMF site will result in temporary loss of vegetation of 3% in Local Study Area and 11% in Site Study Area, with permanent conversion of vegetation communities in 11% of Local Study Area and 47% of Site Study Area. **Remediation of sites within Ward 1 will result in temporary loss of 7.6% of vegetation within Local Study Area and 53% in Site Study Area.** **Remediation of sites outside the Highland Drive Site Local Study Area will result in temporary loss of 34% (18.3 ha) of vegetation.**	Relocation of the LTWMF storm water management pond out of the wooded area into an area of Cultural Meadow vegetation. Development of new vegetation communities at the LTWMF site, rather than re-establishing pre-construction conditions. Development of a protection and rehabilitation plan for the fen and beach vegetation at the Waterworks West site. Implementation of erosion and sediment control structures around cleared sites. Application of dust suppression techniques. Rehabilitation of sites after completion of waste removal. Development of a site-specific landscape plan of each work site. Vegetation clearing should not take place in migratory bird habitat during the breeding season. In exceptions, when the breeding season cannot be avoided, an avian biologist will conduct a nest survey immediately prior (e.g., within 2 days) to starting any work potentially impacting	No residual adverse effects.	CNL performed oversight (Section 1.5) on a regular basis to ensure compliance with the approved Environmental Protection and Management Plans. CNL-approved dust suppressant was used when needed to aid in the dust management for the construction activities. Site-specific rehabilitation and landscape plans will be created at the end of the construction and remediation activities.	Verify relocation of stormwater management pond. Verify development of protection and rehabilitation plans for the fen and beach vegetation at the Waterworks site. Verify implementation of erosion and sediment control structures; application of dust suppression techniques; and rehabilitation of sites. Verify extent and duration of temporary and permanent loss/change. Confirm that no vegetation clearing is occurring during breeding season. In exceptions, confirm that nest survey was conducted and reviewed. Review site-specific remediation plans to confirm incorporation of structural habitat qualities and variability.	No residual adverse effects.	CNL performed oversight (Section 1.5) on a regular basis to ensure compliance with the approved Environmental Protection and Management plans. A Dust Monitoring Program was carried out by an independent contractor (not the prime contractor or CNL) for the PH LTWMF activities to ensure that perceived organizational conflicts regarding dust monitoring results and work activities had been avoided. Continuous monitoring occurs during the work hours and results are reported on a 15-minute interval. Any exceedances as identified in *Dust Management and Requirements Plan* [39] are immediately reported to CNL and the prime contractor to initiate corrective action. CNL-approved dust suppressant was used when needed to aid in the dust management for the PH LTWMF construction activities. The PH LTWMF site clearing activities were completed from November-March which is outside the migratory bird breeding season for this area.

Predicted Environmental Effect [46]	Mitigation Measure	Residual Environmental Effect (remaining after mitigation)	Status of Mitigation Measures – 2023	EA Follow-up Monitoring Requirement	Predicted Environmental Effect - 2023	Status of EA Commitments - 2023
	migratory bird habitat, to identify and locate active nests of species covered by the Migratory Birds Convention Act. A mitigation plan would be developed to address any potential impacts on migratory birds or their active nests and forwarded for review to Environment Canada prior to implementation. Site-specific rehabilitation plans will incorporate features to re-establish structural habitat qualities and variability for sites (including at Sculthorpe Marsh, if its remediation is warranted).					
Terrestrial (Sculthorpe Marsh)	If remediation occurs (in the Marsh), a Protection and Restoration Plan would be developed to ensure no net loss of wetland function, and should include: No excavation into beach bar; Protection of willow trees along public trails, from excavation or onsite movement of machinery; Erosion prevention, and; Accelerated soil stabilization and plant growth.		Not currently applicable, remediation is still being discussed with the Municipality of Port Hope. A Site-Specific Risk Assessment will be conducted prior to any remediation activities.	Follow-up actions with respect to the Sculthorpe Marsh, including the requirement for its remediation, are the subjects of a separate report. Should remediation of Sculthorpe Marsh be required, EA follow-up monitoring would comprise: Verify development of Protection and Restoration Plan that is acceptable to provincial and federal regulatory agencies. Verify no net loss of wetland functions.	Not currently applicable, remediation is still being discussed with the Municipality of Port Hope. An MECP approved Site-Specific Risk Assessment will be conducted prior to any remediation activities.	Remediation of Sculthorpe Marsh is still being discussed with the Municipality of Port Hope. A Site-Specific Risk Assessment will be conducted prior to any remediation activities.
Human Health and Safety						
Workers, Non-Radiological **Maximum dust exposures to non-radiological conventional contaminants - within established weighted average criteria (AAQC) for acute 8-hour exposures.** **For construction activities: annual accident rate of 2.0 to 3.0 Lost time Accidents, and 8.0 to 10.0 Total Recordable Accidents per 100 workers. This equates to 24.4 recordable accidents during construction and development, with 7.3 of the accidents resulting in lost time; 7.8 recordable accidents during site remediation work, with 2.3 of the accidents resulting in lost time.**	(See *Atmospheric Environmental Component*). Personal protection equipment would be supplied to mitigate noise effects. All workers would be provided with and required to implement worker protection measures as set out by the Port Hope Site Health and Safety Plan. Implement a policy that all occupational illnesses and injuries are preventable and adopt an operational objective of zero occupational illnesses and injuries (For details, see the specific elements of this policy as listed under Mitigation Measures in Table	No residual adverse effects.	CNL reviewed and approved contractor plan for Health and Safety for the PH LTWMF projects. Construction contractors are required to adhere to federal or provincial legislation related to the protection of health and safety where applicable. Compliance oversights (Section 1.5) occurred during the PH LTWMF activities. An overview of the compliance oversight is in Section 8.1. Implemented a Health and Safety Plan procedure and an Environmental Protection Plan protocol to address the demolition of buildings and the appropriate management of debris materials generated from these	Monitor compliance with relevant federal legislation related to protection of health and safety. Monitor accident rate. Verify the development of an operational policy, and confirm the details conform to the elements proposed as mitigation measures. (Note that some follow-up elements in the Atmospheric Environment are also relevant in that they are fundamentally intended for the protection of worker health and safety).	No residual adverse effects. For construction activities at the PH LTWMF there were no recordable events in 2023.	Contractors are required to adhere to federal or provincial legislation related to the protection of health and safety depending on the site and project activity where applicable. Compliance oversight (Section 1.5) occurred during the PH LTWMF activities. An overview of the compliance oversight is in Section 8.1. Incident rates are being monitored (Section 8.1.3). Contractors conducting work on behalf of the PHAI submit health and safety plans, for CNL's review and acceptance, which are consistent with the requirements of the *PHAI OSH Plan* [32].

Predicted Environmental Effect [46]	Mitigation Measure	Residual Environmental Effect (remaining after mitigation)	Status of Mitigation Measures – 2023	EA Follow-up Monitoring Requirement	Predicted Environmental Effect - 2023	Status of EA Commitments - 2023
Noise levels would reach 88 to 96 dBA in construction areas.	11.9.1 of the *PHP Screening Report*) [46]. Implement a Health and Safety Plan procedure and an Environmental Protection Plan protocol to address the demolition of buildings and the appropriate management of debris materials generated from these activities. Notify residents when activities are expected to result in a 6 dBA increase in noise. Establish an operational protocol that will maintain noise levels at the fence line below 70 dBA. Prevent public access to areas where noise levels may exceed 70 dBA.		activities. Residents were notified when activities were expected to result in a 6 dBA increase in noise. Noise levels at the fence line of the PH LTWMF did not exceed 70 dBA. Public access was restricted to the PH LTWMF site.			Noise monitoring was completed by CNL over four campaigns in 2023 around the PH LTWMF. It can be observed that there are some increases in 2023 but below the predicted range of 12 dBA and the *World Health Organization's Guideline for Community Noise* level of 70 dBA over a 24-hour period [61].
Members of the Public, ***Non-Radiological*** **Air quality; Noise and Non radiological contaminants: See *Atmospheric Environment Component* for predicted effects; mitigation measures; residual effects after mitigation; and follow-up program features.** **General Health and Well-being. 22% of people surveyed expect their level of satisfaction with the community to increase with completion of the project; 14%, to decrease.**	(See *Atmospheric Environmental Component)* Implement protocols for delivering information to and receiving concerns from, residents to address their concerns for health, sense of well-being, feelings of safety and security and of satisfaction with their community.	Increased stress and adverse effects to health and general well-being resulting from negative changes to people's feelings of health and sense of well-being, feelings of personal security, and feelings of satisfaction with their community.	In 2023, CNL received twenty-two Tier 1 complaints related to the PHP. Eighteen of which were resolved at the CNL level. The remaining four tier 2 complaints continue into 2024 for further investigation. In 2023, CNL received forty-six Tier 2 complaints related to the PHP. Thirty-five of which were resolved at the CNL level with one escalated to AECL. The remaining ten complaints continue into 2024 for further investigation. A public attitude survey was completed in 2018. The next public attitude survey is scheduled to be completed in 2024.	Monitor communications protocol. Survey members of the public to confirm level of satisfaction with the community.	Public attitude survey was completed in 2018. The next public attitude survey is to take place in 2023.	Since 2002, the CNL has commissioned bi-annual public attitude surveys to monitor public awareness of the PHAI, identify issues and concerns, determine communication needs of the public, and provide data regarding public attitudes. (Section 15.1.5.1) discusses PHAI interactions within the community of Port Hope. The next scheduled public attitude survey is scheduled to be completed in 2024.
Workers, ***Radiological*** **Workers excavating onsite wastes and placing on- and offsite wastes are expected to receive annual radiation doses between 1.6 and 2.7 mSv/a.** **Workers dewatering sediment during harbour cleanup are expected to receive doses up to 7.6 mSv/a.**	(See *Atmospheric Environmental Component*) If necessary, workers would be rotated in and out of positions where there is a risk of receiving a higher dose.	No residual adverse effects.		Monitor radiation doses to confirm accuracy of predictions. (Note that some follow-up elements in the Atmospheric Environment are also relevant in that they are fundamentally intended for the protection of worker health and safety).	For PHAI, individual annual doses ranged from 0.01 mSv to 0.79 mSv. The collective radiation dose was 20.28 person-mSv. The average annual dose was 0.01 mSv.	Upon comparison between the actual and predicted doses, the doses exposed to the workers were below the predicted levels. This has proven the mitigation measures were effectively executed.
Members of the Public, ***Radiological*** **During remediation, Ward 1 adjacent residents: radiation dose of 0.074 mSv/a for adult on median diet, 0.16 mSv/a, for infant on upper bound diet.** **During construction and development, Ward 1 residents: 0.06 mSv/a for an adult, to 0.25 mSv/a, for an infant. Ward 2**	(See *Atmospheric Environment Component*) No additional proposed mitigation.	No residual adverse effects.	Remediation activities continued in 2023.	Monitor radiation doses to confirm accuracy of predictions. (Note that some follow-up elements in the Atmospheric Environment are also relevant in that they are fundamentally intended for the protection of the health and safety of members of the public).	Fence line gamma dose in 2023 contributed to 0.3% of the annual dose limited for occupational exposures for members of the public of 1 mSv/a. Total dose to the public was assessed with the inclusion of radon exposure at the fence line. A total effective dose was estimated to be 1.9% for exposures for members of the public.	The radiation dose to public was measured to be 0.02 mSv/a, which is 2% of the annual dose limit for occupational exposures for members of the public of 1 mSv/a (1000 µSv/a).

Predicted Environmental Effect [46]	Mitigation Measure	Residual Environmental Effect (remaining after mitigation)	Status of Mitigation Measures – 2023	EA Follow-up Monitoring Requirement	Predicted Environmental Effect - 2023	Status of EA Commitments - 2023
residents: 0.12 mSv/a, for an adult on a median diet, to 0.25 mSv/a, for an infant on an upper bound diet.						
Cumulative Effect (in the Biophysical Environment)						
Radiological **Incremental annual average radon concentrations would be indistinguishable from background at a distance of 2 km; radiological constituents of resuspended dust would not be measurable beyond approximately 1 km.**	(See *Atmospheric Environment Component*).	No residual adverse effects.	Remediation activities continued in 2023.	Verify radon concentrations, radiological constituents of re suspended dust, at distance of 2 km and 1 km, respectively. (Note that this follow-up monitoring requirement is incorporated into the *Atmospheric Environment* follow-up program.)	Radon monitoring commenced at four (4) locations around the PH LTWMF in 2018. These locations were positioned at approximately 2 km distance from the LTWMF Controlled Area fenced boundary. The average radon concentration for 2023 across all locations was calculated to be 30.8 Bq/m^3. The highest noted radon concentration level was 67 Bq/m^3 which is below the environmental trigger level for radon 150 Bq/m^3.	Assessment of average radon concentrations at 2 km will be performed on a quarterly basis to receive better statistics. In 2018 July, CNL deployed a dust fall jar monthly, following the MECP siting requirements, to measure the potential dust deposition at 1 km from the site. The location was approximately 1 km north of the PH LTWMF site. The dustfall jar was deployed until one year of data was collected, in which the EA prediction that radiological constituents of resuspended dust will not be measurable beyond approximately 1 km from the Site was verified.

C.1 Atmospheric Monitoring

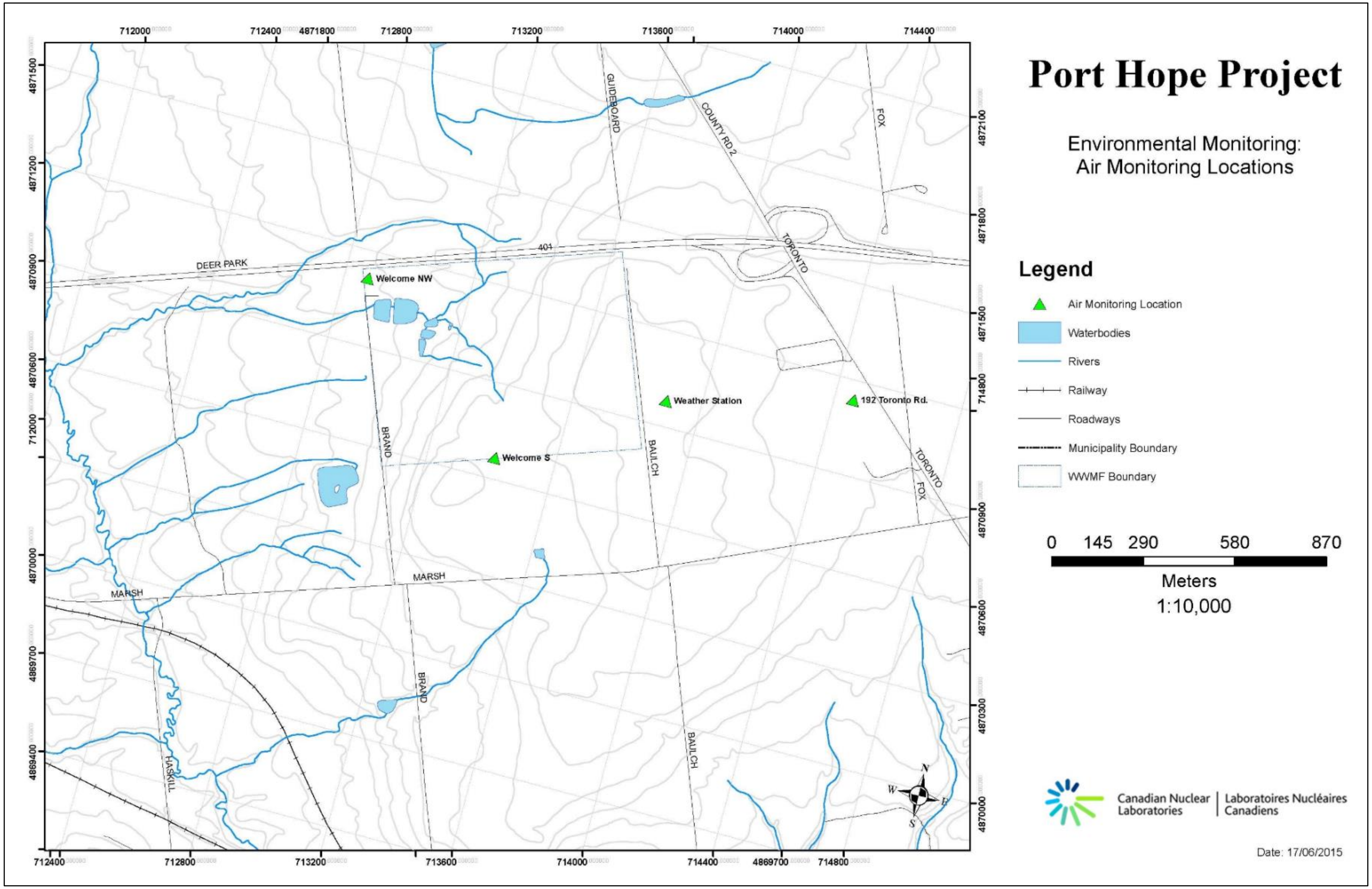


Figure 15: Port Hope Long-Term Waste Management Facility Air Monitoring Locations

Table 50: Port Hope Long-Term Waste Management Facility Air Quality Monitoring – Weather Station (Hi-Vol)

PH LTWMF Weather Station (Hi-Vol)										
Year	**2019**		**2020**		**2021**		**2022**		**2023**	
Parameter	**$PM_{2.5}$**	**TSP**	**$PM_{2.5}$**	**TSP**	**$PM_{2.5}$**	**TSP**	**$PM_{2.5}$**	**TSP**	**$PM_{2.5}$**	**TSP**
Unit of Measure	**µg/m³**									
Observations	240	237	171	169	223	222	232	227	239	239
Geometric Mean	5	16	5	18	7	19	8	21	10	25
Arithmetic Mean	5	19	8	22	9	24	11	26	20	37
Median	4	17	6	19	8	19	9	24	15	31
98th Percentile	18	-	20	-	20	-	24	-	**55** [1]	-
Maximum	17	158	21	85	49	116	33	110	91	**137**
Exceedances	0%	0.4%	0%	0%	0%	0%	0%	0%	0%	2%

Note:

- TSP values are compared to the Overriding Limit of 120 µg/m³ [39] and AAQC [57].
- $PM_{2.5}$ 98th percentile is compared to the 2000 Canadian Air Quality Standards for Fine Particulate Matter value of 30 µg/m³ and the proposed 2020 value of 27 µg/m³ [58].
- - indicates no data is available.
- [1] averaged over three years (current and previous two years).
- Bold values = exceedance of the criteria.

Table 51: Port Hope Long-Term Waste Management Facility Air Quality Monitoring – Northwest (Hi-Vol)

PH LTWMF Northwest (Hi-Vol)										
Year	**2019**		**2020**		**2021**		**2022**		**2023**	
Parameter	**$PM_{2.5}$**	**TSP**	**$PM_{2.5}$**	**TSP**	**$PM_{2.5}$**	**TSP**	**$PM_{2.5}$**	**TSP**	**$PM_{2.5}$**	**TSP**
Unit of Measure	**µg/m³**									
Observations	240	240	166	158	219	220	210	177	58	137
Geometric Mean	4	21	6	21	7	21	9	20	5	18
Arithmetic Mean	5	24	8	25	9	25	11	24	7	23
Median	4	19	6	22	8	21	9	21	5	19
98th Percentile	18	-	19	-	20	-	24	-	24 [1]	-
Maximum	17	96	21	179	52	97	27	95	30	112
Exceedances	0%	0%	0%	0.63%	0%	0%	0%	0%	0%	0%

Note:

- TSP values are compared to the Overriding Limit of 120 µg/m³ [39] and AAQC [57].
- $PM_{2.5}$ 98th percentile is compared to the 2000 Canadian Air Quality Standards for Fine Particulate Matter value of 30 µg/m³ and the proposed 2020 value of 27 µg/m³ [58].
- - indicates no data is available.
- [1] averaged over three years (current and previous two years).

Table 52: Port Hope Long-Term Waste Management Facility Air Quality Monitoring – Northwest (MiniVol)

PH LTWMF Northwest (MiniVol)										
Year	**2019**		**2020**		**2021**		**2022**		**2023**	
Parameter	**$PM_{2.5}$**	**TSP**	**$PM_{2.5}$**	**TSP**	**$PM_{2.5}$**	**TSP**	**$PM_{2.5}$**	**TSP**	**$PM_{2.5}$**	**TSP**
Unit of Measure	**µg/m³**									
Observations	-	-	-	-	-	-	-	-	84	85
Geometric Mean	-	-	-	-	-	-	-	-	30	31
Arithmetic Mean	-	-	-	-	-	-	-	-	62	58
Median	-	-	-	-	-	-	-	-	42	46
98th Percentile	-	-	-	-	-	-	-	-	**153** [1]	-
Maximum	-	-	-	-	-	-	-	-	**447**	**155**
Exceedances	-	-	-	-	-	-	-	-	26%	24%

Note:

- TSP values are compared to the Overriding Limit of 120 µg/m³ [39] and AAQC [57].
- $PM_{2.5}$ 98th percentile is compared to the 2000 Canadian Air Quality Standards for Fine Particulate Matter value of 30 µg/m³ and the proposed 2020 value of 27 µg/m³ [58].
- - indicates no data is available.
- [1] averaged over one year (current year).
- Bold values = exceedance of the criteria.

Table 53: Port Hope Long-Term Waste Management Facility Air Quality Monitoring –South

PH LTWMF South										
Year	**2019**		**2020**		**2021**		**2022**		**2023**	
Parameter	**$PM_{2.5}$**	**TSP**	**$PM_{2.5}$**	**TSP**	**$PM_{2.5}$**	**TSP**	**$PM_{2.5}$**	**TSP**	**$PM_{2.5}$**	**TSP**
Unit of Measure	**µg/m³**									
Observations	240	240	136	169	217	220	229	217	238	239
Geometric Mean	5	14	6	15	7	17	8	17	10	22
Arithmetic Mean	5	17	8	18	9	21	10	20	20	32
Median	4	14	8	17	9	18	9	19	16	26
98th Percentile	19	-	19	-	20	-	24	-	**53** [1]	-
Maximum	22	85	22	73	53	84	26	52	102	**147**
Exceedances	0%	0%	0%	0%	0%	0%	0%	0%	0%	0.4%

Note:

- TSP values are compared to the Overriding Limit of 120 µg/m³ [39] and AAQC [57].
- $PM_{2.5}$ 98th percentile is compared to the 2000 Canadian Air Quality Standards for Fine Particulate Matter value of 30 µg/m³ and the proposed 2020 value of 27 µg/m³ [58].
- - indicates no data is available.
- [1] averaged over three years (current and previous two years).
- Bold values = exceedance of the criteria.

Table 54: Port Hope Long-Term Waste Management Facility Air Quality Monitoring - 192 Toronto Road

PH LTWMF 192 Toronto Road										
Year	**2019**		**2020**		**2021**		**2022**		**2023**	
Parameter	**$PM_{2.5}$**	**TSP**	**$PM_{2.5}$**	**TSP**	**$PM_{2.5}$**	**TSP**	**$PM_{2.5}$**	**TSP**	**$PM_{2.5}$**	**TSP**
Unit of Measure	**µg/m³**									
Observations	237	242	170	166	221	17	225	171	237	213
Geometric Mean	4	18	5	19	7	24	8	22	11	27
Arithmetic Mean	4	21	8	21	9	29	11	25	21	36
Median	3	18	6	21	8	30	9	23	16	33
98th Percentile	17	-	19	-	20	-	24	-	**55** [1]	-
Maximum	12	75	21	58	51	72	41	76	101	**139**
Exceedances	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%

Note:

- TSP values are compared to the Overriding Limit of 120 µg/m³ [39] and AAQC [57].
- $PM_{2.5}$ 98th percentile is compared to the 2000 Canadian Air Quality Standards for Fine Particulate Matter value of 30 µg/m³ and the proposed 2020 value of 27 µg/m³ [58].
- \- indicates no data is available.
- [1] averaged over three years (current and previous two years).
- Bold values = exceedance of the criteria.

Table 55: Port Hope Long-Term Waste Management Facility Metals and Radionuclides Concentrations in Total Suspended Particulates –Weather Station

PH LTWMF Weather Station									
			Year	**2019**	**2020**	**2021**	**2022**	**2023**	**2023**
			Total No. of Samples	51	38	49	48	53	53
Parameter Primary COPC	**Unit of Measure**	**Criteria**		**Average**					**Maximum**
		AAQC [57]	**Health Canada Reference Level [46]**						
Radium-226	Bq/m^3	-	0.05	0.000072	0.000030	0.000033	0.000029	0.000031	0.000060
Thorium-230	Bq/m^3	-	0.01	0.00029	0.00006	0.00006	0.00006	0.00006	0.00012
Thorium-232	Bq/m^3	-	0.006	0.000278	0.000059	0.000063	0.000061	0.000059	0.000119
Uranium	ng/m^3	300	4070	0.5	3.0	3.0	2.7	4.99	16.09

Note:

- - indicates no data is available.
- Bold values = exceedance of the criteria.

Table 56: Port Hope Long-Term Waste Management Facility Metals and Radionuclides Concentrations in Total Suspended Particulates – Northwest

PH LTWMF Northwest										
			Year	2019	2020	2021	2022	2023	2023
			Total No. of Samples	51	34	49	41	30	30
Parameter Primary COPC	Unit of Measure	Criteria		Average					Maximum
		AAQC [57]	Health Canada Reference Level [46]						
Radium-226	Bq/m^3	-	0.05	0.000060	0.000030	0.000031	0.000028	0.000029	0.000051
Thorium-230	Bq/m^3	-	0.01	0.00027	0.00006	0.00006	0.00007	0.00006	0.00006
Thorium-232	Bq/m^3	-	0.006	0.000274	0.000056	0.000062	0.000061	0.000057	0.000060
Uranium	ng/m^3	300	4070	0.4	3.0	2.9	2.8	3.06	6.15

Note:

- \- indicates no data is available.
- Bold values = exceedance of the criteria.

Table 57: Port Hope Long-Term Waste Management Facility Metals and Radionuclides Concentrations in Total Suspended Particulates – South

PH LTWMF South									
			Year	2019	2020	2021	2022	2023	2023
			Total No. of Samples	51	38	49	49	53	53
Parameter Primary COPC	Unit of Measure	Criteria		Average					Maximum
		AAQC [57]	Health Canada Reference Level [46]						
Radium-226	Bq/m^3	-	0.05	0.000060	0.000028	0.000032	0.000028	0.000029	0.000058
Thorium-230	Bq/m^3	-	0.01	0.00027	0.00006	0.00006	0.00007	0.00006	0.00017
Thorium-232	Bq/m^3	-	0.006	0.000271	0.000056	0.000062	0.000060	0.000057	0.000059
Uranium	ng/m^3	300	4070	0.4	3.0	2.9	2.8	4.73	14.04

Note:

- - indicates no data is available.
- Bold values = exceedance of the criteria.

Table 58: Port Hope Long-Term Waste Management Facility Metals and Radionuclides Concentrations in Total Suspended Particulates – 192 Toronto Road

PH LTWMF 192 Toronto Road									
			Year	**2019**	**2020**	**2021**	**2022**	**2023**	**2023**
			Total No. of Samples	51	38	5	39	49	49
Parameter Primary COPC	**Unit of Measure**	**Criteria**		**Average**					**Maximum**
		AAQC [57]	**Health Canada Reference Level [46]**						
Radium-226	Bq/m^3	-	0.05	0.000056	0.000030	0.000029	0.000028	0.000031	0.000057
Thorium-230	Bq/m^3	-	0.01	0.00027	0.00006	0.00006	0.00006	0.00006	0.00009
Thorium-232	Bq/m^3	-	0.006	0.000271	0.000056	0.000059	0.000059	0.000057	0.000090
Uranium	ng/m^3	300	4070	0.4	2.8	3.3	2.4	4.68	12.87

Note:

- - indicates no data is available.
- Bold values = exceedance of the criteria.

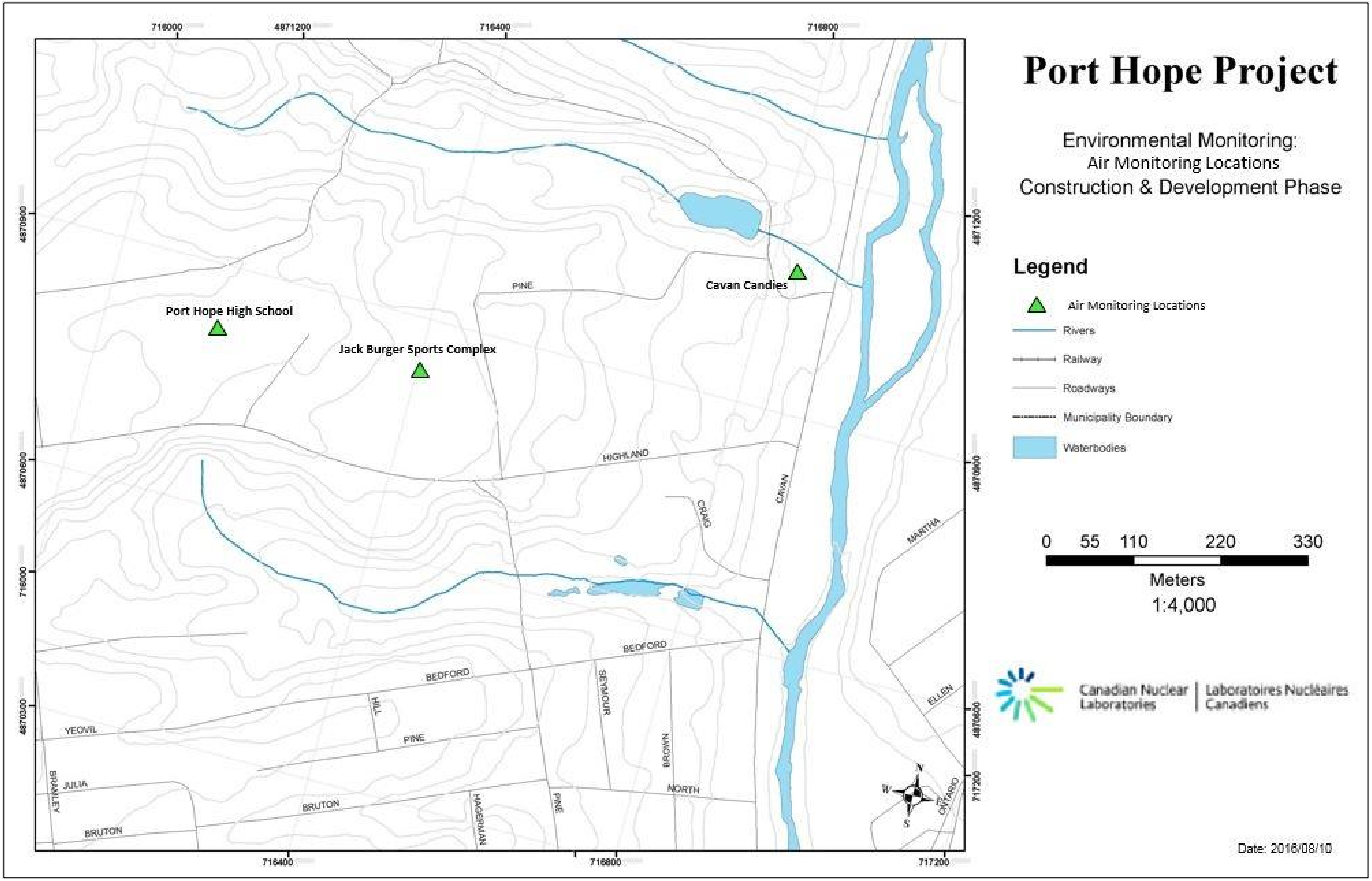


Figure 16: Port Hope Project Highland Drive and Vicinity Sites Air Monitoring Locations

Table 59: Highland Drive and Vicinity Sites Air Quality Monitoring – Cavan Candies (Hi-Vol)

Cavan Candies (Hi-Vol)										
Year	**2019**		**2020**		**2021**		**2022**		**2023**	
Parameter	**$PM_{2.5}$**	**TSP**	**$PM_{2.5}$**	**TSP**	**$PM_{2.5}$**	**TSP**	**$PM_{2.5}$**	**TSP**	**$PM_{2.5}$**	**TSP**
Unit of Measure	**µg/m³**									
Observations	-	-	36	36	177	179	114	117	147	114
Geometric Mean	-	-	3	9	6	17	4	11	11	19
Arithmetic Mean	-	-	4	11	8	21	6	14	19	30
Median	-	-	3	10	8	20	5	12	18	20
98th Percentile	-	-	10	-	20	-	21	-	**42** [1]	-
Maximum	-	-	11	22	53	83	25	39	58	110
Exceedances	-	-	0%	0%	0%	0%	0%	0%	0%	0%

Note:

- TSP values are compared to the Overriding Limit of 120 µg/m³ [39] and AAQC [57].
- $PM_{2.5}$ 98th percentile is compared to the 2000 Canadian Air Quality Standards for Fine Particulate Matter value of 30 µg/m³ and the proposed 2020 value of 27 µg/m³ [58].
- - indicates no data is available.
- [1] averaged over three years (current and previous two years).

Table 60: Highland Drive and Vicinity Sites Air Quality Monitoring – Cavan Candies (Mini-Vol)

Cavan Candies (Mini-Vol)										
Year	**2019**		**2020**		**2021**		**2022**		**2023**	
Parameter	**$PM_{2.5}$**	**TSP**	**$PM_{2.5}$**	**TSP**	**$PM_{2.5}$**	**TSP**	**$PM_{2.5}$**	**TSP**	**$PM_{2.5}$**	**TSP**
Unit of Measure	**µg/m^3**									
Observations	-	-	-	-	-	-	-	-	-	85
Geometric Mean	-	-	-	-	-	-	-	-	-	25
Arithmetic Mean	-	-	-	-	-	-	-	-	-	53
Median	-	-	-	-	-	-	-	-	-	28
Maximum	-	-	-	-	-	-	-	-	-	**175**
Exceedances	-	-	-	-	-	-	-	-	-	21%

Note:

- Samples were collected using a Mini-Vol portable air sampler beginning 2023 July 10 to 2023 December 21
- TSP values are compared to the Overriding Limit of 120 µg/m^3 [39] and AAQC [57].
- - indicates no data is available.
- Bold values = exceedance of the criteria.

Table 61: Highland Drive and Vicinity Sites Air Quality Monitoring – Jack Burger Sports Complex (Hi-Vol)

Jack Burger Sports Complex (Hi-Vol)										
Year	**2019**		**2020**		**2021**		**2022**		**2023**	
Parameter	**$PM_{2.5}$**	**TSP**	**$PM_{2.5}$**	**TSP**	**$PM_{2.5}$**	**TSP**	**$PM_{2.5}$**	**TSP**	**$PM_{2.5}$**	**TSP**
Unit of Measure	**µg/m³**									
Observations	-	-	36	35	179	177	117	117	237	39
Geometric Mean	-	-	2	10	6	16	5	12	9	9
Arithmetic Mean	-	-	3	12	9	20	7	15	19	11
Median	-	-	2	11	8	17	5	14	14	11
98th Percentile	-	-	10	-	24	-	24	-	**54** [1]	-
Maximum	-	-	13	45	52	89	24	40	85	29
Exceedances	-	-	0%	0%	0%	0%	0%	0%	0%	0%

Note:

- TSP values are compared to the Overriding Limit of 120 µg/m³ [39] and AAQC [57].
- $PM_{2.5}$ 98th percentile is compared to the 2000 Canadian Air Quality Standards for Fine Particulate Matter value of 30 µg/m³ and the proposed 2020 value of 27 µg/m³ [58].
- - indicates no data is available.
- [1] averaged over three years (current and previous two years).
- Bold values = exceedance of the criteria.

Table 62: Highland Drive and Vicinity Sites Air Quality Monitoring – Jack Burger Sports Complex (Mini-Vol)

Jack Burger Sports Complex (Mini-Vol)										
Year	**2019**		**2020**		**2021**		**2022**		**2023**	
Parameter	**$PM_{2.5}$**	**TSP**	**$PM_{2.5}$**	**TSP**	**$PM_{2.5}$**	**TSP**	**$PM_{2.5}$**	**TSP**	**$PM_{2.5}$**	**TSP**
Unit of Measure	**µg/m³**									
Observations	-	-	-	-	-	-	-	-	-	150
Geometric Mean	-	-	-	-	-	-	-	-	-	24
Arithmetic Mean	-	-	-	-	-	-	-	-	-	47
Median	-	-	-	-	-	-	-	-	-	32
Maximum	-	-	-	-	-	-	-	-	-	**181** [1]
Exceedances	-	-	-	-	-	-	-	-	-	14%

Note:

- Samples were collected using a Mini-Vol portable air sampler beginning 2023 April 18 to 2023 December 21.
- TSP values are compared to the Overriding Limit of 120 µg/m³ [39] and AAQC [57].
- - indicates no data is available.
- [1] averaged over one year (current year).
- Bold values = exceedance of the criteria.

Table 63: Highland Drive and Vicinity Sites Air Quality Monitoring – Port Hope High School (Hi-Vol)

Port Hope High School Complex (Hi-Vol)										
Year	**2019**		**2020**		**2021**		**2022**		**2023**	
Parameter	**$PM_{2.5}$**	**TSP**	**$PM_{2.5}$**	**TSP**	**$PM_{2.5}$**	**TSP**	**$PM_{2.5}$**	**TSP**	**$PM_{2.5}$**	**TSP**
Unit of Measure	**µg/m³**									
Observations	-	-	36	34	177	172	115	114	237	236
Geometric Mean	-	-	3	9	7	15	4	11	9	18
Arithmetic Mean	-	-	4	11	9	19	6	13	19	29
Median	-	-	2	9	8	16	5	12	14	23
98th Percentile	-	-	12	-	23	-	24	-	**55** [1]	-
Maximum	-	-	13	26	51	86	26	36	85	**127**
Exceedances	-	-	0%	0%	0%	0%	0%	0%	0%	0%

Note:

- TSP values are compared to the Overriding Limit of 120 µg/m³ [39] and AAQC [57].
- $PM_{2.5}$ 98th percentile is compared to the 2000 Canadian Air Quality Standards for Fine Particulate Matter value of 30 µg/m³ and the proposed 2020 value of 27 µg/m³ [58].
- \- indicates no data is available.
- [1] averaged over three years (current and previous two years).

Table 64: Highland Drive and Vicinity Sites Metals and Radionuclides Concentrations in Total Suspended Particulates – Cavan Candies

Cavan Candies									
			Year	2019	2020	2021	2022	2023	2023
			Total No. of Samples	0	9	43	27	26	26
Parameter	Unit of Measure	Criteria		Average					Maximum
		AAQC [57]	Health Canada Reference Level [46]						
Primary COPC									
Radium-226	Bq/m^3	-	0.05	-	0.000028	0.000032	0.000028	0.000029	0.000039
Thorium-230	Bq/m^3	-	0.01	-	0.00006	0.00007	0.00005	0.00006	0.00006
Thorium-232	Bq/m^3	-	0.006	-	0.000057	0.000062	0.000055	0.000057	0.000060
Thorium (natural)	ng/m^3	-	-	-	0.00011	0.00012	0.00011	0.00011	0.00012
Uranium (natural)[1]	ng/m^3	300	4070	-	0.000001	0.000002	0.000004	0.000003	0.000015
Additional Parameter									
Lead-210	Bq/m^3	-	-	-	0.0008	0.0007	0.0007	0.0006	0.0013

Note:

- - indicates no data is available.
- Bold values = exceedance of the criteria.
- [1] calculated laboratory value.

Table 65: Highland Drive and Vicinity Sites Metals and Radionuclides Concentrations in Total Suspended Particulates – Jack Burger Sports Complex

Jack Burger Sports Complex										
			Year	**2019**	**2020**	**2021**	**2022**	**2023**	**2023**
			Total No. of Samples	0	9	43	26	9	9
Parameter	**Unit of Measure**	**Criteria**		**Average**					**Maximum**
		AAQC [57]	**Health Canada Reference Level [46]**						
Primary COPC									
Radium-226	Bq/m^3	-	0.05	-	0.000028	0.000032	0.000029	0.000029	0.000030
Thorium-230	Bq/m^3	-	0.01	-	0.00006	0.00006	0.00006	0.00006	0.00006
Thorium-232	Bq/m^3	-	0.006	-	0.000057	0.000063	0.000057	0.000057	0.000060
Thorium (natural)	ng/m^3	-	-	-	0.00011	0.00012	0.00011	0.00011	0.00012
Uranium (natural)[1]	ng/m^3	300	4070	-	0.000001	000001	0.000003	0.000001	0.000004
Additional Parameter									
Lead-210	Bq/m^3	-	-	-	0.0009	0.0007	0.0008	0.0008	0.0014

Note:

- \- indicates no data is available.
- Bold values = exceedance of the criteria.
- [1] calculated laboratory value.

Table 66: Highland Drive and Vicinity Sites Metals and Radionuclides Concentrations in Total Suspended Particulates – Port Hope High School

Port Hope High School									
			Year	**2019**	**2020**	**2021**	**2022**	**2023**	**2023**
			Total No. of Samples	0	9	43	26	53	53
Parameter	**Unit of Measure**	**Criteria**		**Average**					**Maximum**
		AAQC [57]	**Health Canada Reference Level [46]**						
Primary COPC									
Radium-226	Bq/m^3	-	0.05	-	0.000029	0.000033	0.000029	0.000029	0.000043
Thorium-230	Bq/m^3	-	0.01	-	0.00006	0.00006	0.00006	0.000057	0.000060
Thorium-232	Bq/m^3	-	0.006	-	0.000057	0.000062	0.000057	0.000057	0.000060
Thorium (natural)	ng/m^3	-	-	-	0.00011	0.00012	0.00011	0.00011	0.00012
Uranium (natural)[1]	ng/m^3	300	4070	-	0.000001	0.000001	0.000002	0.000003	0.000030
Additional Parameter									
Lead-210	Bq/m^3	-	-	-	0.007	0.0007	0.0008	0.0007	0.0023

Note:

- - indicates no data is available.
- Bold values = exceedance of the criteria.
- [1] calculated laboratory value.

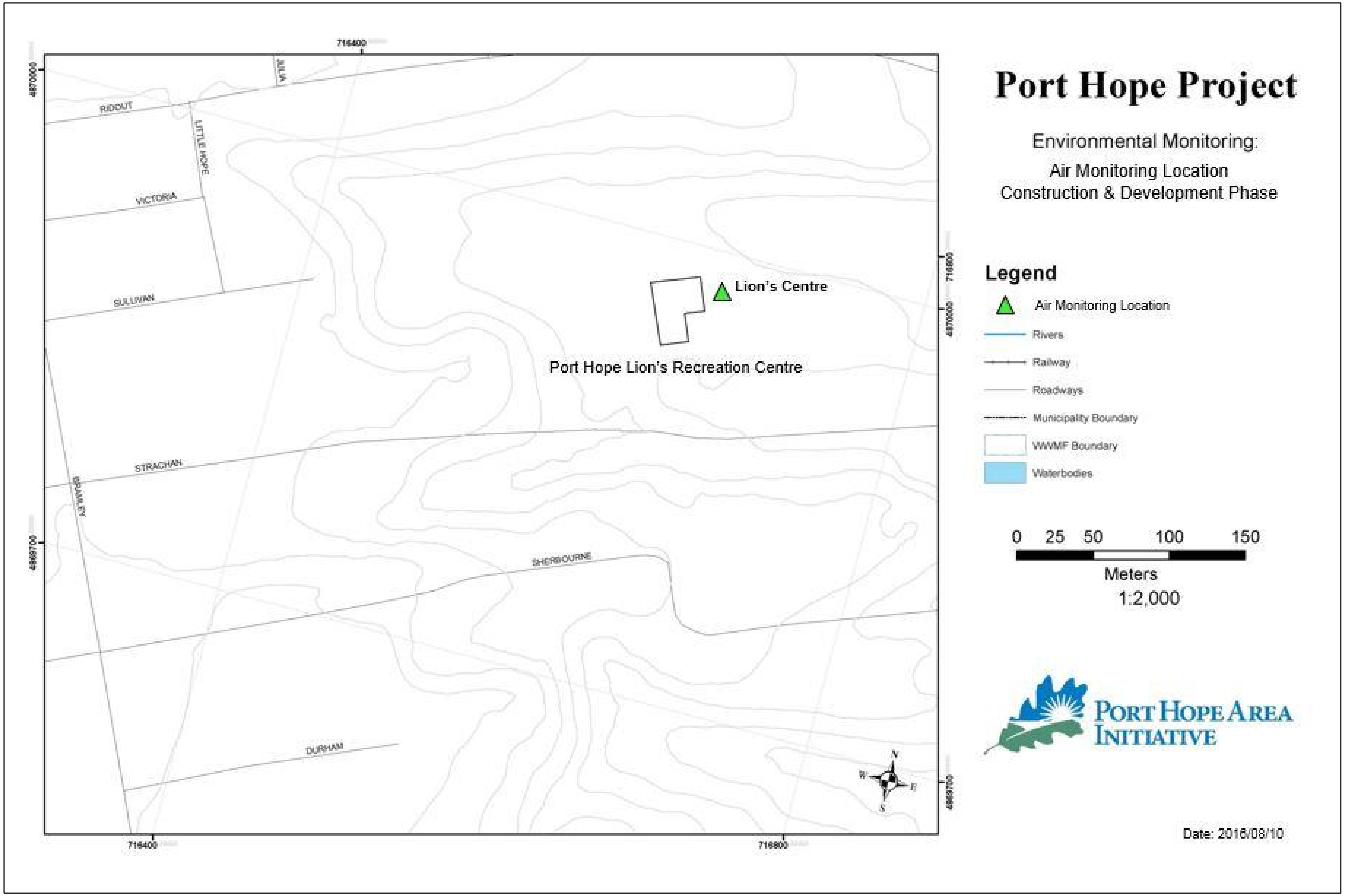


Figure 17: Port Hope Project Lion's Recreation Centre Air Monitoring Locations

Table 67: Lions Recreational Centre Air Quality Monitoring – (Mini-Vol)

Lions Recreational Centre (Mini-Vol)										
Year	**2019**		**2020**		**2021**		**2022**		**2023**	
Parameter	**$PM_{2.5}$**	**TSP**	**$PM_{2.5}$**	**TSP**	**$PM_{2.5}$**	**TSP**	**$PM_{2.5}$**	**TSP**	**$PM_{2.5}$**	**TSP**
Unit of Measure	**µg/m³**									
Observations	-	-	-	-	-	-	-	-	114	88
Geometric Mean	-	-	-	-	-	-	-	-	18	25
Arithmetic Mean	-	-	-	-	-	-	-	-	42	52
Median	-	-	-	-	-	-	-	-	6	32
98th Percentile	-	-	-	-	-	-	-	-	**157**	-
Maximum	-	-	-	-	-	-	-	-	**174**	**159**
Exceedances	-	-	-	-	-	-	-	-	20%	22%

Note:

- Samples were collected using a Mini-Vol portable air sampler beginning 2023 April 18 to 2023 December 21.
- TSP values are compared to the Overriding Limit of 120 µg/m³ [39] and AAQC [57].
- $PM_{2.5}$ 98th percentile is compared to the 2000 Canadian Air Quality Standards for Fine Particulate Matter value of 30 µg/m³ and the proposed 2020 value of 27 µg/m³ [58].
- \- indicates no data is available; remediation was initiated in 2023.
- Bold values = exceedance of the criteria.

Table 68: Harbour/Centre Pier Air Quality Monitoring – Volatile Organic Compounds – Downwind

Harbour/Centre Pier (HCP) Downwind Location							
		Quarter and Year	**January to March**	**April to June**	**July to September**	**October to December**	**2023**
		Total No. of Samples	10	11	7	5	33
Parameter	**Unit of Measure**	**Criteria (AAQC) [57]**	**Average**				**Maximum**
Acetone (2-Propanone)	µg/m^3	11880	5.2	12.2	9.7	8.5	62.2
1,3-Butadiene	µg/m^3	2	<0.44	0.48	<0.44	<0.44	0.88
Benzene	µg/m^3	2.3	<0.64	0.85	<0.64	0.67	2.90
Bromoform	µg/m^3	55	<2.1	2.3	<2.1	<2.1	4.10
Chloroform	µg/m^3	1	<1	1	1	1	3.90
Chloromethane	µg/m^3	5600	1.2	1.4	1.1	1.2	2.3
Carbon tetrachloride	µg/m^3	2.4	<1.3	1.4	<1.3	<1.3	2.5
Cyclohexane	µg/m^3	6100	<1	1.9	<1	<1	14
1,1-Dichloroethane	µg/m^3	165	<1	<1	<1	<1	1.6
1,2-Dibromoethane (EDB)	µg/m^3	3	<2	<2	<2	<2	3.10
trans-1,2-Dichloroethylene	µg/m^3	105	<1	<1	<1	<1	1.60
cis-1,2-Dichloroethylene	µg/m^3	105	<1	<1	<1	<1	1.60
o-Dichlorobenzene	µg/m^3	30500	<1.2	1.3	<1.2	<1.2	2.40
p-Dichlorobenzene	µg/m^3	95	<1.2	1.3	<1.2	<1.2	2.40
Ethylbenzene	µg/m^3	1000	<1	<1	<1	<1	1.70
Freon 114	µg/m^3	700000	<1.4	1.5	<1.4	<1.4	2.80
Heptane	µg/m^3	11000	<1	1.2	<1	<1	4.90
Hexane	µg/m^3	7500	<1	3.6	8.5	<2.7	33
Isopropyl Alcohol	µg/m^3	7300	1.4	4.9	<1.0	1.0	42.5
Methylene chloride	µg/m^3	220	1.1	2.7	16.1	4.5	53.8
Methyl ethyl ketone	µg/m^3	1000	<1	1.2	1.2	1.0	6.2
Methyl Isobutyl Ketone	µg/m^3	1200	<1	<1	<1	<1	1.60
Methyl Tert Butyl Ether	µg/m^3	7000	<1	<1	<1	<1	1.40
Naphthalene	µg/m^3	22.5	<1.0	1.1	<1.0	<1.0	2.10
Propylene	µg/m^3	4000	<1	<1	<1	<1	1.70
Styrene	µg/m^3	400	<1	<1	<1	<1	2.60
1,1,1-Trichloroethane	µg/m^3	115000	<1	1.3	<1	<1	2.2
1,2,4-Trichlorobenzene	µg/m^3	400	<2	<2	<2	<2	3
1,2,4-Trimethylbenzene	µg/m^3	220	<1.0	1.1	<1.0	<1.0	2.0
1,3,5-Trimethylbenzene	µg/m^3	220	<1.0	1.1	<1.0	<1.0	2.0
Tetrahydrofuran	µg/m^3	93000	<1	<1	<1	<1	1.2
Toluene	µg/m^3	2000	1	5	1	1	41.5
Trichloroethylene	µg/m^3	12	0.2	0.2	0.2	0.3	0.8
Trichlorofluoromethane	µg/m^3	6000	1.2	1.4	2.0	1.5	4.6
Vinyl chloride	µg/m^3	1	<1	<1	<1	<1	1
m,p-Xylene	µg/m^3	730	<1	<1	<1	<1	1
o-Xylene	µg/m^3	730	<1	<1	<1	<1	1
Xylenes (total)	µg/m^3	730	<1	<1	<1	<1	1

Note:

- Bold values = exceedance of the criteria.

Table 69: Harbour/Centre Pier Air Quality Monitoring – Volatile Organic Compounds – Upwind

Harbour/Centre Pier (HCP) Upwind Location							
		Quarter and Year	**January to April**	**March to June**	**July to September**	**October to December**	**2023**
		Total No. of Samples	9	12	9	5	35
Parameter	**Unit of Measure**	**Criteria (AAQC) [57]**	**Average**				**Maximum**
Acetone (2-Propanone)	µg/m^3	11880	6.0	7.8	12.0	9.0	21.0
1,3-Butadiene	µg/m^3	2	<0.44	0.48	0.58	0.46	1.80
Benzene	µg/m^3	2.3	<0.65	0.73	<0.85	0.69	**2.60**
Bromoform	µg/m^3	55	<2.1	2.3	2.7	2.2	8.30
Chloroform	µg/m^3	1	<1	**1**	**1**	**1**	**3.90**
Chloromethane	µg/m^3	5600	1.3	1.2	1.2	1.2	1.90
Carbon tetrachloride	µg/m^3	2.4	<1.3	1.4	<1.7	1.4	**5.0**
Cyclohexane	µg/m^3	6100	<1	<1	<1	<1	2.80
1,1-Dichloroethane	µg/m^3	165	<1	<1	1	<1	3.20
1,2-Dibromoethane (EDB)	µg/m^3	3	<2	<2	2	<2	**6**
trans-1,2-Dichloroethylene	µg/m^3	105	<1	<1	1	<1	3.2
cis-1,2-Dichloroethylene	µg/m^3	105	1	<1	1	<1	3.70
o-Dichlorobenzene	µg/m^3	30500	<1.2	1.3	1.6	1.3	4.80
p-Dichlorobenzene	µg/m^3	95	<1.2	1.3	1.6	1.3	4.80
Ethylbenzene	µg/m^3	1000	<1	<1	1	<1	3.50
Freon 114	µg/m^3	700000	<1.4	1.5	1.8	1.5	5.60
Heptane	µg/m^3	11000	<1	<1	1	<1	3.3
Hexane	µg/m^3	7500	<1	7.3	9.4	4.3	77.9
Isopropyl Alcohol	µg/m^3	7300	0.8	1.4	2.1	1.1	11
Methylene chloride	µg/m^3	220	1.4	6.2	16.0	7.7	131
Methyl ethyl ketone	µg/m^3	1000	<1	1.1	1.1	0.9	4.10
Methyl Isobutyl Ketone	µg/m^3	1200	<1	<1	1	<1	3.30
Methyl Tert Butyl Ether	µg/m^3	7000	<1	<1	<1	<1	2.90
Naphthalene	µg/m^3	22.5	1	1	1	1	4.20
Propylene	µg/m^3	4000	<1	<1	1	<1	3.40
Styrene	µg/m^3	400	<1	<1	1	<1	3.40
1,1,1-Trichloroethane	µg/m^3	115000	<1	1.3	<1	<1	2.20
1,2,4-Trichlorobenzene	µg/m^3	400	<2	<2	<2	<2	3
1,2,4-Trimethylbenzene	µg/m^3	220	<1.0	1.1	<1.0	<1.0	2
1,3,5-Trimethylbenzene	µg/m^3	220	<1.0	1.1	<1.0	<1.0	2
Tetrahydrofuran	µg/m^3	93000	<1	<1	<1	<1	2
Toluene	µg/m^3	2000	1	5	1	1	41.5
Trichloroethylene	µg/m^3	12	0.2	0.2	0.2	0.3	0.81
Trichlorofluoromethane	µg/m^3	6000	1.2	1.4	2.0	1.5	4.6
Vinyl chloride	µg/m^3	1	<1	<1	<1	<1	**1.6**
m,p-Xylene	µg/m^3	730	<1	<1	<1	<1	4
o-Xylene	µg/m^3	730	<1	<1	<1	<1	1.7
Xylenes (total)	µg/m^3	730	<1	<1	<1	<1	5.4

Note:

- Bold values = exceedance of the criteria.

Table 70: Highland Drive Air Quality Monitoring – Volatile Organic Compounds – Downwind

Highland Drive Downwind Location						
		Quarter and Year	April to June	July to September	October to December	2023
		Total No. of Samples	12	9	13	34
Parameters	**Unit of Measure**	**Criteria (AAQC) [57]**	**Average**			**Maximum**
Acetone (2-Propanone)	µg/m³	11880	12.2	13.5	5.8	54.4
1,3-Butadiene	µg/m³	2	<0.44	<0.44	<0.44	0.4
Benzene	µg/m³	2.3	0.72	0.64	0.65	1.2
Bromoform	µg/m³	55	<2.1	<2.1	<2.1	2.1
Chloroform	µg/m³	1	<1	<1	**1**	**1.6**
Chloromethane	µg/m³	5600	1.2	1.1	1.1	1.8
Carbon tetrachloride	µg/m³	2.4	<1.3	<1.3	<1.3	1.4
Cyclohexane	µg/m³	6100	<1	<1	<1	0.7
1,1-Dichloroethane	µg/m³	165	<1	<1	<1	0.8
1,2-Dibromoethane (EDB)	µg/m³	3	<2	<2	<2	1.5
trans-1,2-Dichloroethylene	µg/m³	105	<1	<1	<1	0.8
cis-1,2-Dichloroethylene	µg/m³	105	<1	<1	<1	1.3
o-Dichlorobenzene	µg/m³	30500	<1.2	<1.2	<1.2	1.2
p-Dichlorobenzene	µg/m³	95	<1.2	<1.2	<1.2	1.2
Ethylbenzene	µg/m³	1000	1	<1	<1	0.9
Freon 114	µg/m³	700000	<1.4	<1.4	<1.4	1.4
Heptane	µg/m³	11000	<1	<1	<1	1.6
Hexane	µg/m³	7500	2	3	3	25.0
Isopropyl Alcohol	µg/m³	7300	2.3	0.8	0.8	8.6
Methylene chloride	µg/m³	220	2.2	3.9	3.4	27.0
Methyl ethyl ketone	µg/m³	1000	0.9	1.5	0.8	5.0
Methyl Isobutyl Ketone	µg/m³	1200	<1	<1	<1	0.8
Methyl Tert Butyl Ether	µg/m³	7000	<1	<1	<1	2.1
Naphthalene	µg/m³	22.5	<1	<1	<1	1.0
Propylene	µg/m³	4000	<1	<1	<1	0.9
Styrene	µg/m³	400	<1	<1	<1	0.9
1,1,1-Trichloroethane	µg/m³	115000	<1.1	<1.1	<1.1	1.1
1,2,4-Trichlorobenzene	µg/m³	400	<2	<2	<2	1.7
1,2,4-Trimethylbenzene	µg/m³	220	1.5	<1.0	<1.0	5.4
1,3,5-Trimethylbenzene	µg/m³	220	1.0	<1.0	<1.0	1.5
Tetrahydrofuran	µg/m³	93000	<1	<1	<1	1.9
Toluene	µg/m³	2000	2	1	1	4.9
Trichloroethylene	µg/m³	12	0.6	2.2	0.5	**20**
Trichlorofluoromethane	µg/m³	6000	1.3	1.4	1.4	3.0
Vinyl chloride	µg/m³	1	<1	<1	<1	0.5
m,p-Xylene	µg/m³	730	1	<1	<1	3.8
o-Xylene	µg/m³	730	<1	<1	<1	1.1
Xylenes (total)	µg/m³	730	1	<1	<1	4.9

Note:

- Bold values = exceedance of the criteria.
- No samples were collected from 2023 January to March as remediation activities were not taking place.

Table 71: Highland Drive Air Quality Monitoring – Volatile Organic Compounds – Upwind

Highland Drive Upwind Location						
		Quarter and Year	**April to June**	**July to September**	**October to December**	**2023**
		Total No. of Samples	11	7	13	31
Parameters	**Unit of Measure**	**Criteria (AAQC) [57]**	**Average**			**Maximum**
Acetone (2-Propanone)	µg/m^3	11880	9.3	16.2	6.9	44.2
1,3-Butadiene	µg/m^3	2	<0.44	<0.44	<0.44	0.4
Benzene	µg/m^3	2.3	0.72	0.77	<0.64	1.5
Bromoform	µg/m^3	55	2.8	<2.1	<2.1	9.4
Chloroform	µg/m^3	1	<1	<1	1	**1**
Chloromethane	µg/m^3	5600	1.3	1.0	1.2	1.8
Carbon tetrachloride	µg/m^3	2.4	<1.3	<1.3	<1.3	1.3
Cyclohexane	µg/m^3	6100	<1	<1	<1	1.5
1,1-Dichloroethane	µg/m^3	165	<1	<1	<1	0.8
1,2-Dibromoethane (EDB)	µg/m^3	3	<2	<2	<2	1.5
trans-1,2-Dichloroethylene	µg/m^3	105	<1	<1	<1	0.8
cis-1,2-Dichloroethylene	µg/m^3	105	<1	<1	<1	2.8
o-Dichlorobenzene	µg/m^3	30500	<1.2	<1.2	<1.2	1.2
p-Dichlorobenzene	µg/m^3	95	<1.2	<1.2	<1.2	1.2
Ethylbenzene	µg/m^3	1000	<1	<1	<1	0.9
Freon 114	µg/m^3	700000	<1.4	<1.4	<1.4	1.4
Heptane	µg/m^3	11000	<1	<1	<1	0.8
Hexane	µg/m^3	7500	6	3	2	28
Isopropyl Alcohol	µg/m^3	7300	1.3	1.1	0.7	4.7
Methylene chloride	µg/m^3	220	14.6	4.3	2.4	43.1
Methyl ethyl ketone	µg/m^3	1000	0.9	3.9	0.8	12
Methyl Isobutyl Ketone	µg/m^3	1200	<1	<1	<1	0.8
Methyl Tert Butyl Ether	µg/m^3	7000	<1	<1	<1	0.7
Naphthalene	µg/m^3	22.5	<1	<1	<1	1.0
Propylene	µg/m^3	4000	<1	<1	<1	0.9
Styrene	µg/m^3	400	<1	<1	<1	0.9
1,1,1-Trichloroethane	µg/m^3	115000	<1.1	<1.1	<1.1	1.1
1,2,4-Trichlorobenzene	µg/m^3	400	<2	<2	<2	1.5
1,2,4-Trimethylbenzene	µg/m^3	220	<1.0	<1.0	<1.0	1.4
1,3,5-Trimethylbenzene	µg/m^3	220	<1.0	<1.0	<1.0	1.0
Tetrahydrofuran	µg/m^3	93000	<1	<1	<1	1.4
Toluene	µg/m^3	2000	1	4	1	19
Trichloroethylene	µg/m^3	12	2.8	<0.2	0.3	**29**
Trichlorofluoromethane	µg/m^3	6000	1.7	1.4	1.3	2.5
Vinyl chloride	µg/m^3	1	<1	<1	<1	0.5
m,p-Xylene	µg/m^3	730	<1	<1	<1	0.9
o-Xylene	µg/m^3	730	<1	<1	<1	0.9
Xylenes (total)	µg/m^3	730	<1	<1	<1	0.9

Note:

- Bold values = exceedance of the criteria.
- No samples were collected from 2023 January to March as remediation activities were not taking place.

Table 72: Chemetron Lagoon Air Quality Monitoring – Volatile Organic Compounds – Downwind

Chemetron Lagoon Downwind Location					
		Quarter and Year	**July to September Average**	**October to December Average**	**2023**
		Total No. of Samples	6	8	14
Parameters	**Unit of Measure**	**Criteria (AAQC) [57]**	**Average**		**Maximum**
Acetone (2-Propanone)	μg/m³	11880	11.9	6.5	23
1,3-Butadiene	μg/m³	2	<0.44	<0.44	0.44
Benzene	μg/m³	2.3	0.87	<0.64	1.5
Bromoform	μg/m³	55	<2.1	<2.1	2.1
Chloroform	μg/m³	1	**2**	<1	**14**
Chloromethane	μg/m³	5600	1.0	1.1	1.5
Carbon tetrachloride	μg/m³	2.4	<1.3	<1.3	1.3
Cyclohexane	μg/m³	6100	<1	<1	0.68
1,1-Dichloroethane	μg/m³	165	<1	<1	0.81
1,2-Dibromoethane (EDB)	μg/m³	3	<2	<2	1.5
trans-1,2-Dichloroethylene	μg/m³	105	<1	<1	0.79
cis-1,2-Dichloroethylene	μg/m³	105	<1	<1	0.79
o-Dichlorobenzene	μg/m³	30500	<1.2	<1.2	1.2
p-Dichlorobenzene	μg/m³	95	9.9	<1.2	61.9
Ethylbenzene	μg/m³	1000	<1	<1	0.87
Freon 114	μg/m³	700000	<1.4	<1.4	1.4
Heptane	μg/m³	11000	<1	<1	0.82
Hexane	μg/m³	7500	10	<1	71.2
Isopropyl Alcohol	μg/m³	7300	0.9	0.8	1.5
Methylene chloride	μg/m³	220	12.7	2.0	77.8
Methyl ethyl ketone	μg/m³	1000	1.4	0.8	3.2
Methyl Isobutyl Ketone	μg/m³	1200	<1	<1	0.82
Methyl Tert Butyl Ether	μg/m³	7000	<1	<1	0.72
Naphthalene	μg/m³	22.5	<1	<1	1
Propylene	μg/m³	4000	<1	<1	1.1
Styrene	μg/m³	400	<1	<1	0.85
1,1,1-Trichloroethane	μg/m³	115000	<1.1	<1.1	1.1
1,2,4-Trichlorobenzene	μg/m³	400	16	<2	65
1,2,4-Trimethylbenzene	μg/m³	220	<1.0	<1.0	0.98
1,3,5-Trimethylbenzene	μg/m³	220	<1.0	<1.0	0.98
Tetrahydrofuran	μg/m³	93000	<1	<1	0.83
Toluene	μg/m³	2000	<2	1	4.1
Trichloroethylene	μg/m³	12	<0.2	<0.2	0.21
Trichlorofluoromethane	μg/m³	6000	1.5	1.3	3.3
Vinyl chloride	μg/m³	1	<1	<1	0.51
m,p-Xylene	μg/m³	730	<1	<1	1.2
o-Xylene	μg/m³	730	<1	<1	0.87
Xylenes (total)	μg/m³	730	<1	<1	1.2

Note:

- Bold values = exceedance of the criteria.
- No samples were collected from 2023 January to June as remediation activities were not taking place.

Table 73: Chemetron Lagoon Air Quality Monitoring – Volatile Organic Compounds – Upwind

Chemetron Lagoon Upwind Location					
		Quarter and Year	July to September	October to December	2023
		Total No. of Samples	8	10	18
Parameters	Unit of Measure	Criteria (AAQC) [57]	Average		Maximum
Acetone (2-Propanone)	µg/m³	11880	9.4	8.9	27.1
1,3-Butadiene	µg/m³	2	<0.44	<0.44	0.44
Benzene	µg/m³	2.3	0.86	0.66	1.5
Bromoform	µg/m³	55	<2.1	<2.1	2.1
Chloroform	µg/m³	1	<1	<1	0.98
Chloromethane	µg/m³	5600	1.0	1.1	1.7
Carbon tetrachloride	µg/m³	2.4	<1.3	<1.3	1.3
Cyclohexane	µg/m³	6100	<1	<1	0.68
1,1-Dichloroethane	µg/m³	165	<1	<1	0.81
1,2-Dibromoethane (EDB)	µg/m³	3	<2	<2	1.5
trans-1,2-Dichloroethylene	µg/m³	105	<1	<1	0.79
cis-1,2-Dichloroethylene	µg/m³	105	<1	2	7.5
o-Dichlorobenzene	µg/m³	30500	<1.2	<1.2	1.2
p-Dichlorobenzene	µg/m³	95	10.1	<1.2	54
Ethylbenzene	µg/m³	1000	<1	<1	0.87
Freon 114	µg/m³	700000	<1.4	<1.4	1.4
Heptane	µg/m³	11000	<1	<1	0.28
Hexane	µg/m³	7500	2	<1	3.9
Isopropyl Alcohol	µg/m³	7300	0.9	1.5	4.7
Methylene chloride	µg/m³	220	3.0	0.8	7.3
Methyl ethyl ketone	µg/m³	1000	0.9	1.1	3.8
Methyl Isobutyl Ketone	µg/m³	1200	<1	<1	0.82
Methyl Tert Butyl Ether	µg/m³	7000	<1	<1	0.72
Naphthalene	µg/m³	22.5	<1	<1	1
Propylene	µg/m³	4000	<1	<1	0.86
Styrene	µg/m³	400	<1	<1	0.85
1,1,1-Trichloroethane	µg/m³	115000	<1.1	<1.1	1.1
1,2,4-Trichlorobenzene	µg/m³	400	5	<2	16
1,2,4-Trimethylbenzene	µg/m³	220	<1.0	<1.0	0.98
1,3,5-Trimethylbenzene	µg/m³	220	<1.0	<1.0	0.98
Tetrahydrofuran	µg/m³	93000	<1	<1	0.59
Toluene	µg/m³	2000	2	1	5.3
Trichloroethylene	µg/m³	12	0.4	0.3	1.5
Trichlorofluoromethane	µg/m³	6000	1.3	1.3	1.7
Vinyl chloride	µg/m³	1	<1	<1	0.51
m,p-Xylene	µg/m³	730	<1	1	1.3
o-Xylene	µg/m³	730	<1	<1	0.87
Xylenes (total)	µg/m³	730	<1	1	1.5

Note:

- Bold values = exceedance of the criteria.
- No samples were collected from 2023 January to June as remediation activities were not taking place.

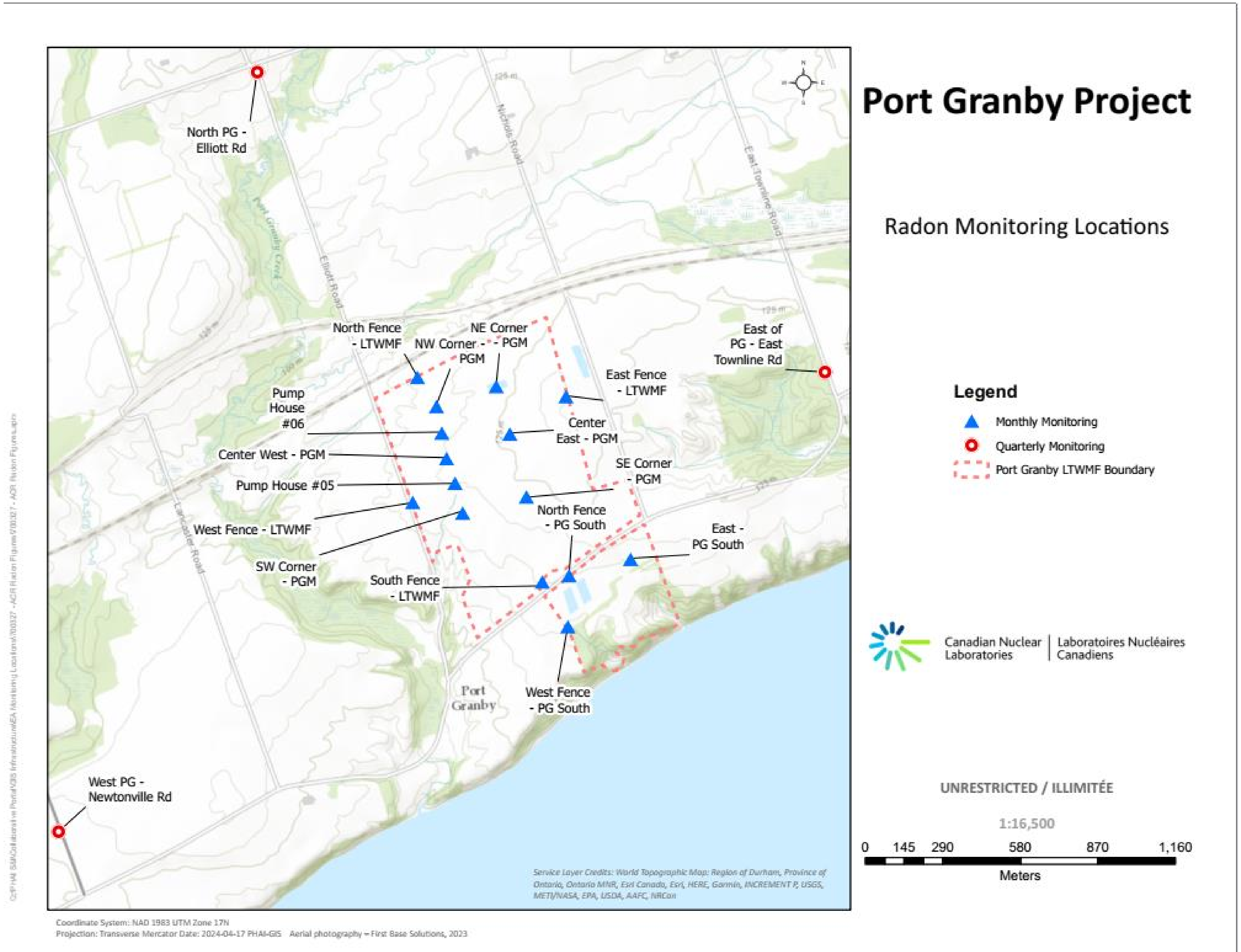


Figure 18: Port Granby Long-Term Waste Management Facility - Radon Monitoring Locations (Maintenance and Monitoring Phase)

Table 74: Port Granby Project- Summary Results of Radon Monitoring

	PG LTWMF (4 locations)	**PG South (3 locations)**	**PG Community (3 locations)**	**PG Engineered Containment System (8 locations)**
Total No. of Samples	48	34	12	64
Maximum (Bq/m^3)	163	118	33	204
Average (Bq/m^3)	60	54	26	74
% of Samples Exceeding Criteria	2%	0%	0%	2%

Note:

- The laboratory method detection limit is 7 Bq/m^3
- Bold font indicates value exceeds the investigative threshold (Administrative Control Level) of 150 Bq/m^3

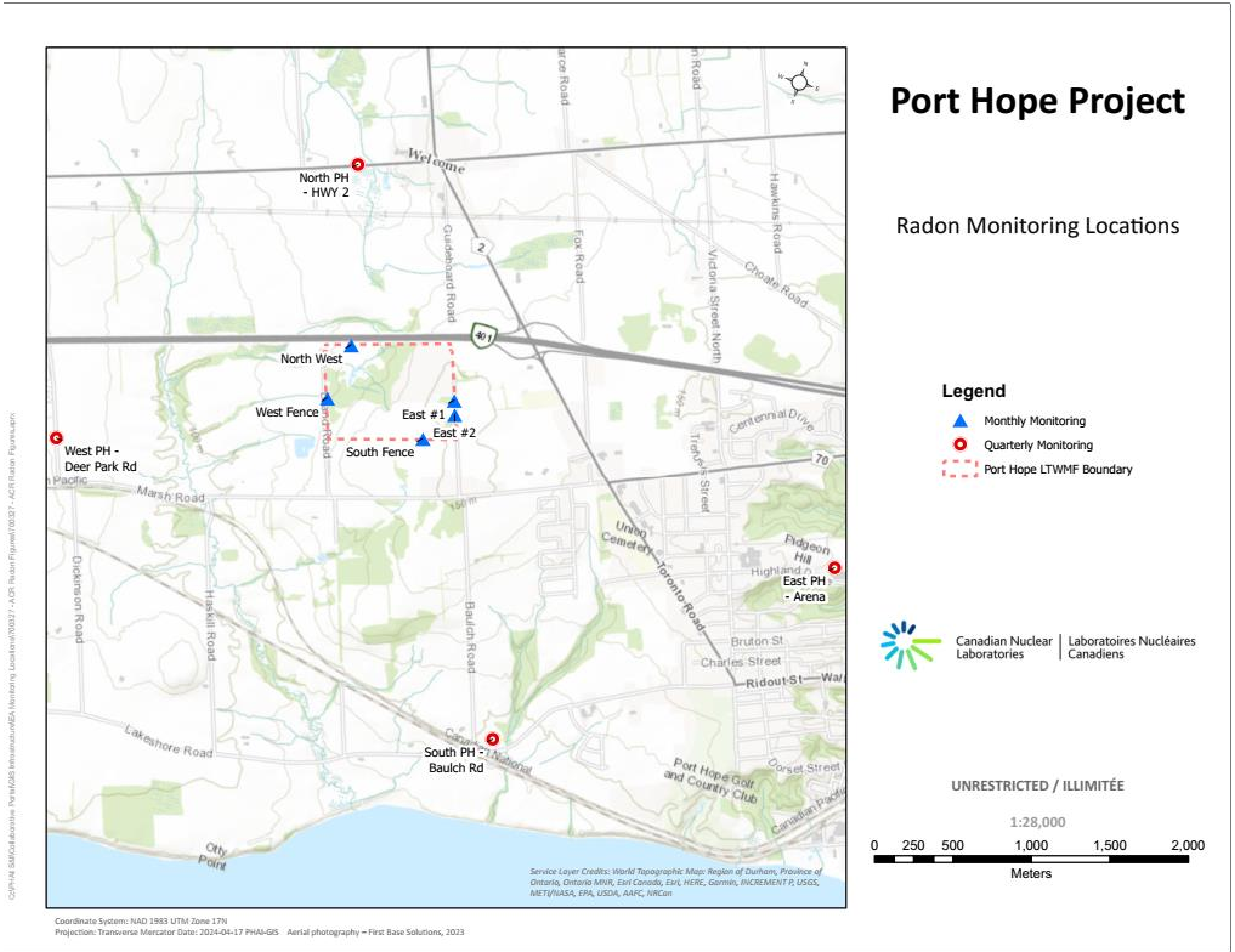


Figure 19: Port Hope Long-Term Waste Management Facility - Radon Monitoring Locations

Table 75: Port Hope Project – Summary Results of Radon Monitoring

	PH LTWMF (5 locations)	PH Community (2 km radius PH LTWMF) (4 locations)	Pine Street Extension Consolidation Site (3 locations)	Strachan Street Consolidation Site (3 locations)	PH Centre Pier/Harbor (5 locations)	Highland Drive Landfill (4 locations)	West Beach (4 locations)
Total No. of Samples	60	15	3	3	63	34	16
Maximum (Bq/m^3)	348	67	33	22	387	89	58
Average (Bq/m^3)	74	31	26	22	47	28	23
% of Samples Exceeding Criteria	5%	0%	0%	0%	2%	0%	0%

Note:

- The laboratory method detection limit is 7 Bq/m^3.
- Bold font indicates value exceeds the investigative threshold (Administrative Control Level) of 150 Bq/m^3.

Table 76: Summary Results of Radon Monitoring - Pine Street Extension Temporary Storage Site

Pine Street Extension Temporary Storage Site				
	Pad-1 NW	**Pad-1 SE**	**Pad-2 E**	**Pad-2 N**
Unit of Measure	Bq/m^3			
2023 Average	28.4			
First Quarter (January to March)	37	22	18	18
Second Quarter (April to June)	26	18	18	26
Third Quarter (July to September)	41	41	26	33
Fourth Quarter (October to December)	41	37	30	22

Note:

- The laboratory method detection limit is 7 Bq/m^3.
- Bold font indicates value exceeds the investigative threshold (Administrative Control Level) of 150 Bq/m^3.
- The annual average from background locations was 34.2 Bq/m^3.

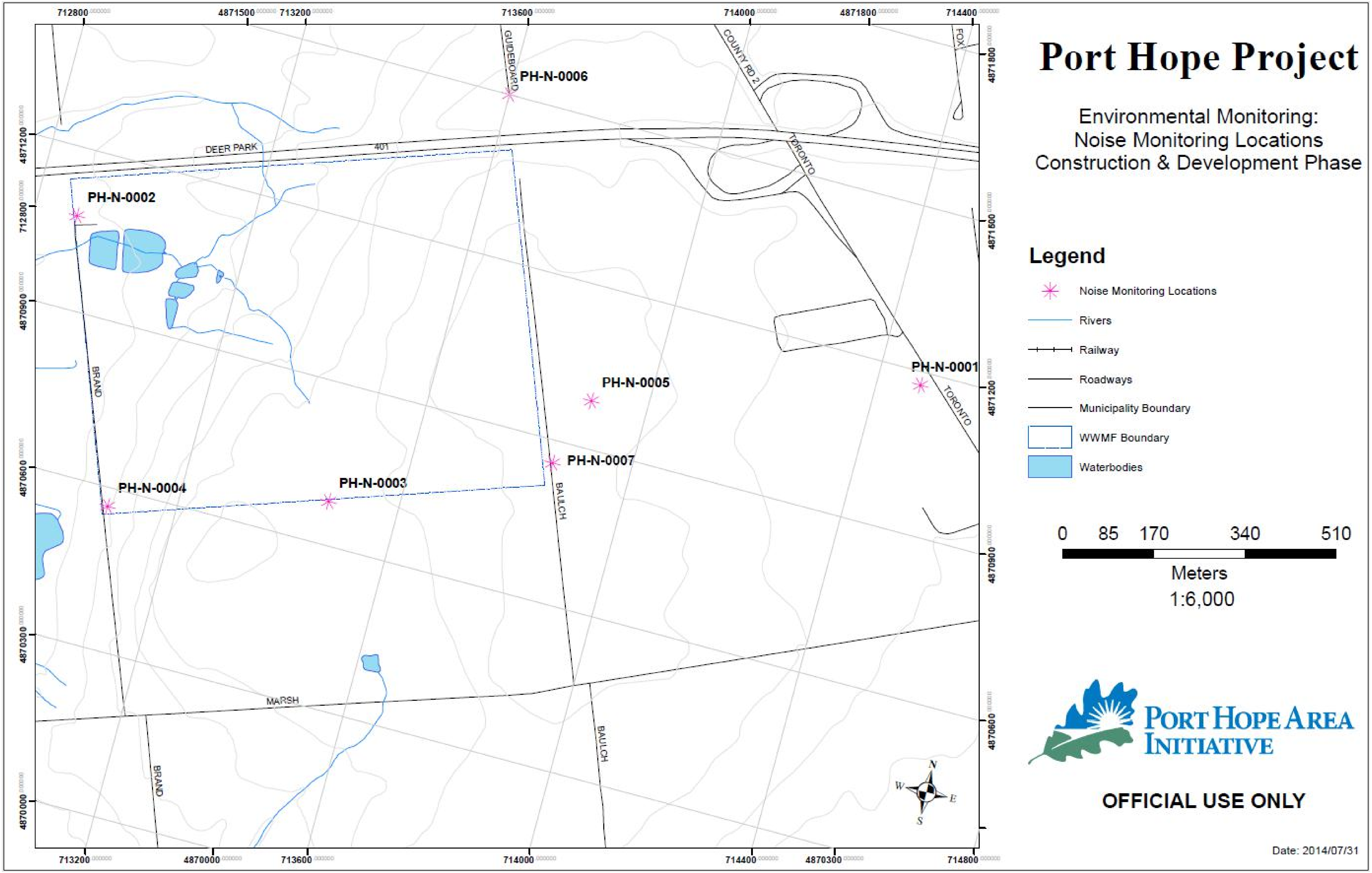


Figure 20: Port Hope Long-Term Waste Management Facility Noise Monitoring Locations

Table 77: Port Hope Long-Term Waste Management Facility Noise Monitoring

PH LTWMF								
Unit of Measure		L_{eq} (dBA)						
Monitoring Location	Time of Measurement	Criteria Baseline (2015)[a]	2019	2020	2021	2022	2023	2023
			Average					Maximum Average
PH-N-0001	Day (07:00-19:00)	63	67	65	65	65	67	71
	Evening (19:00-23:00)	31	62	62	61	61	62	65
	Night (23:00-07:00)	59	61	59	60	59	60	63
PH-N-0002	Day (07:00-19:00)	66	55	65	64	62	63	66
	Evening (19:00-23:00)	67	65	65	64	62	64	66
	Night (23:00-07:00)	64	64	63	63	61	62	64
PH-N-0003	Day (07:00-19:00)	52	58	53	54	55	54	57
	Evening (19:00-23:00)	23	54	52	52	56	53	56
	Night (23:00-07:00)	52	51	49	51	54	51	55
PH-N-0004	Day (07:00-19:00)	56	56	56	56	54	55	57
	Evening (19:00-23:00)	55	57	58	54	55	54	55
	Night (23:00-07:00)	53	55	55	54	54	53	54
PH-N-0005	Day (07:00-19:00)	54	62	57	58	57	60	61
	Evening (19:00-23:00)	54	55	52	53	53	53	57
	Night (23:00-07:00)	52	56	50	55	53	52	54
PH-N-0006	Day (07:00-19:00)	62	66	64	67	65	66	67
	Evening (19:00-23:00)	61	65	65	67	65	65	67
	Night (23:00-07:00)	58	63	63	65	64	63	64
PH-N-0007	Day (07:00-19:00)	-	58	56	55	55	56	61
	Evening (19:00-23:00)	-	56	52	55	55	52	54
	Night (23:00-07:00)	-	55	52	54	54	52	53

Note:

- - indicates no data is available.
- Noise monitoring are results compared to:
    - The WHO [60] guideline recommends <70 dBA in a 24-hour period.

a. 12 difference from Baseline (2015) monitoring results [46].

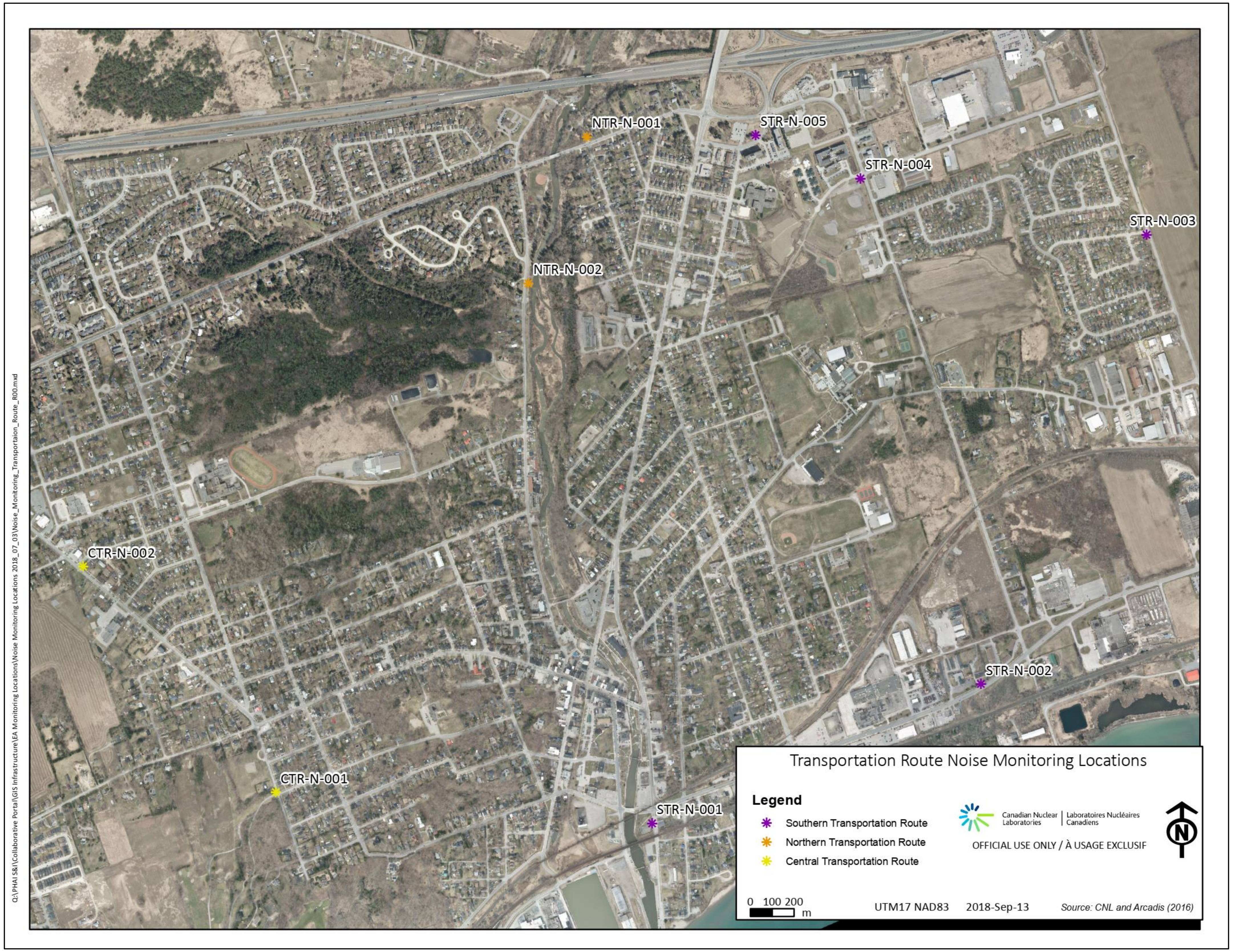


Figure 21: Port Hope Project Transportation Route Noise Monitoring Locations

Table 78: Port Hope Project Central, Northern and Southern Transportation Routes Noise Monitoring

PHP Transportation Routes							
Unit of Measure		L_{eq} (dBA)					
Time of Measurements		Day (07:00-19:00)					
Monitoring Location	Criteria Baseline (2018)	2019	2020	2021	2022	2023	2023
		Average					Maximum Average
Central - CTR-N-001	61 [a]	64	62	64	64	64	66
Central - CTR-N-002	69 [a]	71	69	69	69	69	70
Northern - NTR-N-001	63 [b]	61	62	62	64	62	63
Northern - NTR-N-002	62 [b]	61	65	68	65	64	65
Southern - STR-N-001	70 [b]	70	70	69	69	69	69
Southern - STR-N-002	69 [b]	70	70	70	69	69	70
Southern - STR-N-003	68 [b]	68	68	68	68	67	69
Southern - STR-N-004	63 [b]	65	65	65	64	64	67
Southern - STR-N-005	61 [b]	60	61	61	61	60	61

Note:

- The WHO [60] guideline recommends <70 dBA in a 24-hour period.
- a – 12 dBA difference from Baseline (2018) monitoring results [46].
- b – 1 to 2 dBA difference from Baseline (2018) monitoring results [46].

Figure 22: Port Hope Project Highland Drive and Vicinity Sites Noise Monitoring Locations

Table 79: Highland Drive and Vicinity Sites Noise Monitoring

Highland Drive and Vicinity Sites								
	Unit of Measure	L_{eq} (dBA)						
Monitoring Location	Time of Measurement	Criteria Baseline (2020) [a]	2019	2020	2021	2022	2023	2023
			Average					Maximum Average
HD-N-0001	Day (07:00-19:00)	48	-	48	45	48	43	44
	Evening (19:00-23:00)	48	-	48	47	50	45	45
	Night (23:00-07:00)	47	-	47	46	48	43	45
HD-N-0002	Day (07:00-19:00)	50	-	50	53	53	54	58
	Evening (19:00-23:00)	48	-	48	51	53	49	50
	Night (23:00-07:00)	48	-	48	52	52	49	51
HD-N-0003	Day (07:00-19:00)	61	-	61	61	62	59	60
	Evening (19:00-23:00)	55	-	55	56	59	55	56
	Night (23:00-07:00)	54	-	54	52	54	51	51

Note:

- The WHO [60] guideline recommends <70 dBA in a 24-hour period.
- \- indicates no data is available; remediation activities were not taking place.
- a – 5 dBA difference from Baseline (2020) monitoring results [46].

C.2 Geology and Groundwater Monitoring

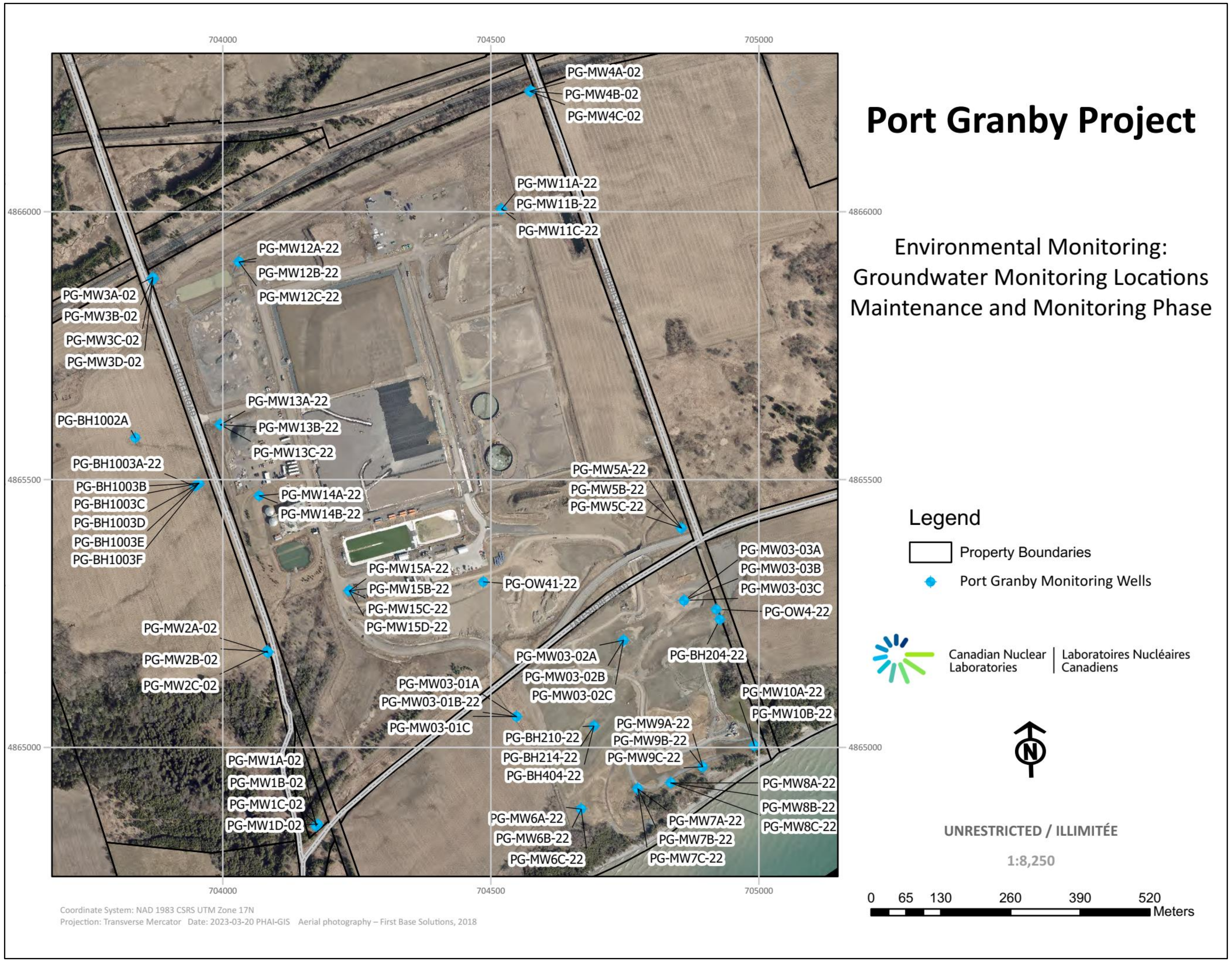


Figure 23: Port Granby Project Groundwater Monitoring Locations

Table 80: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-BH1002A

PG-BH1002A									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	<1.0	0.2	<0.2	0.3	<0.2	0.3
Cobalt (dissolved)	µg/L	-	66	<0.50	0.04	0.04	0.05	0.049	0.074
Copper (dissolved)	µg/L	1000	87	1.2	0.9	1.1	1.1	0.8	0.9
Lead (dissolved)	µg/L	10	25	<0.50	0.03	0.07	<0.09	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	<1.0	0.2	0.2	0.2	0.2	0.2
Uranium (dissolved)	µg/L	20	420	0.275	0.348	0.254	0.307	0.248	0.293
Radium-226	Bq/L	0.49	-	<0.04	<0.01	<0.01	<0.01	0.01	0.02
Thorium-230	Bq/L	0.65	-	<0.07	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.6	-	<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	62	59	43	50	39	44
Beryllium (dissolved)	µg/L	-	67	<0.50	0.007	<0.007	<0.007	0.012	0.026
Boron (dissolved)	µg/L	5000	45 000	<10	6	7	6	7	13
Cadmium (dissolved)	µg/L	5	2.7	<0.10	0.011	0.006	0.008	0.021	0.073
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	<0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	<0.50	0.44	0.28	0.29	0.24	0.28
Selenium (dissolved)	µg/L	10	63	<2.0	1.10	1.36	1.16	1.53	2.7
Silver (dissolved)	µg/L	-	1.5	<0.10	0.05	<0.05	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	<0.50	0.20	0.17	0.21	0.25	0.29
Zinc (dissolved)	µg/L	-	1 100	<5	2	<2	<2	<2	3
Additional Parameters									
pH	--	-	-	7.67	7.63	7.60	7.68	7.68	7.76

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available.

Table 81: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-BH1003A

PG-BH1003A									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	-	-	-	-	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	-	-	-	-	3.4	4.4
Cobalt (dissolved)	µg/L	-	66	-	-	-	-	0.132	0.294
Copper (dissolved)	µg/L	1000	87	-	-	-	-	<0.2	0.2
Lead (dissolved)	µg/L	10	25	-	-	-	-	0.17	0.36
Nickel (dissolved)	µg/L	-	490	-	-	-	-	1.7	2.7
Uranium (dissolved)	µg/L	20	420	-	-	-	-	1.680	2.61
Radium-226	Bq/L	0.49	-	-	-	-	-	<0.01	0.01
Thorium-230	Bq/L	0.65	-	-	-	-	-	<0.02	0.02
Thorium-232	Bq/L	0.6	-	-	-	-	-	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	-	-	-	-	92	96
Beryllium (dissolved)	µg/L	-	67	-	-	-	-	0.013	0.031
Boron (dissolved)	µg/L	5000	45 000	-	-	-	-	17	25
Cadmium (dissolved)	µg/L	5	2.7	-	-	-	-	0.019	0.065
Mercury (dissolved)	µg/L	1	0.29	-	-	-	-	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	-	-	-	-	10.74	17.8
Selenium (dissolved)	µg/L	10	63	-	-	-	-	0.29	1.1
Silver (dissolved)	µg/L	-	1.5	-	-	-	-	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	-	-	-	-	0.99	1.1
Zinc (dissolved)	µg/L	-	1 100	-	-	-	-	<2	2
Additional Parameters									
pH	-	-	-	-	-	-	-	8.05	8.11

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- - indicates no data is available; well was damaged.

Table 82: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-BH1003B

PG-BH1003B									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	<1.0	<0.2	0.2	0.3	<0.2	0.3
Cobalt (dissolved)	µg/L	-	66	<0.50	0.04	0.03	0.04	0.034	0.038
Copper (dissolved)	µg/L	1000	87	<1.0	0.9	0.4	0.8	0.4	0.5
Lead (dissolved)	µg/L	10	25	<0.50	0.04	0.07	0.11	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	<1.0	0.3	0.2	0.5	0.3	0.3
Uranium (dissolved)	µg/L	20	420	0.465	0.546	0.364	1.323	0.524	0.565
Radium-226	Bq/L	0.49	-	<0.04	<0.01	0.01	<0.01	<0.01	0.01
Thorium-230	Bq/L	0.65	-	<0.07	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.6	-	<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	60	62	54	74	68	73
Beryllium (dissolved)	µg/L	-	67	<0.50	<0.008	<0.007	0.009	0.013	0.032
Boron (dissolved)	µg/L	5000	45 000	10	7	10	12	8	10
Cadmium (dissolved)	µg/L	5	2.7	<0.10	0.00	0.01	0.006	0.017	0.058
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	<0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	<0.50	0.34	0.24	0.41	0.35	0.61
Selenium (dissolved)	µg/L	10	63	<2.0	1.0	1.4	0.84	1.26	2.3
Silver (dissolved)	µg/L	-	1.5	<0.10	<0.05	<0.05	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	<0.50	0.47	0.21	0.31	0.32	0.35
Zinc (dissolved)	µg/L	-	1 100	<5	3	<2	3	4	10
Additional Parameters									
pH	-	-	-	7.88	7.78	7.69	7.71	7.65	7.68

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available.

Table 83: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-BH1003C

PG-BH1003C									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	<1.0	0.2	0.2	0.3	0.3	0.4
Cobalt (dissolved)	µg/L	-	66	<0.50	0.042	0.024	0.047	0.026	0.032
Copper (dissolved)	µg/L	1000	87	<1.0	0.8	0.8	0.8	0.8	1.3
Lead (dissolved)	µg/L	10	25	<0.50	0.04	0.07	<0.12	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	<1.0	0.3	0.3	0.3	0.3	0.4
Uranium (dissolved)	µg/L	20	420	2.800	2.325	2.970	2.183	5.253	5.290
Radium-226	Bq/L	0.49	-	<0.04	0.01	0.01	<0.01	<0.01	0.01
Thorium-230	Bq/L	0.65	-	<0.07	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.6	-	<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	66	54	69	76	66	68
Beryllium (dissolved)	µg/L	-	67	<0.50	<0.007	<0.007	0.008	0.016	0.044
Boron (dissolved)	µg/L	5000	45 000	<10	7	14	10	9	11
Cadmium (dissolved)	µg/L	5	2.7	<0.10	0.004	0.003	0.004	0.021	0.058
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	<0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	0.71	0.67	0.76	0.60	1.03	1.14
Selenium (dissolved)	µg/L	10	63	<2.0	0.38	0.70	0.76	0.80	1.8
Silver (dissolved)	µg/L	-	1.5	<0.10	<0.05	<0.05	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	0.52	0.42	0.56	0.45	0.70	0.76
Zinc (dissolved)	µg/L	-	1 100	<5	<2	3	<2	<2	2
Additional Parameters									
pH	-	-	-	7.87	7.68	7.76	7.81	7.74	7.81

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available.

Table 84: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-BH1003D

PG-BH1003D									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	<1.0	0.3	0.2	0.3	0.2	0.3
Cobalt (dissolved)	µg/L	-	66	<0.50	0.29	0.03	0.03	0.03	0.043
Copper (dissolved)	µg/L	1000	87	<1.0	1.5	0.9	0.7	0.6	0.7
Lead (dissolved)	µg/L	10	25	<0.50	0.38	0.07	<0.09	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	<1.0	0.8	0.4	0.3	0.23	0.30
Uranium (dissolved)	µg/L	20	420	0.625	1.538	0.640	0.689	0.710	0.782
Radium-226	Bq/L	0.49	-	<0.04	<0.01	0.01	<0.01	<0.01	0.01
Thorium-230	Bq/L	0.65	-	<0.07	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.6	-	<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	61	70	61	68	65	67
Beryllium (dissolved)	µg/L	-	67	<0.50	0.030	<0.007	<0.007	0.013	0.031
Boron (dissolved)	µg/L	5000	45 000	<10	8	9	8	8	9
Cadmium (dissolved)	µg/L	5	2.7	<0.10	0.02	0.01	0.00	0.020	0.072
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	<0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	<0.50	0.45	0.24	0.24	0.35	0.57
Selenium (dissolved)	µg/L	10	63	<2.0	0.7	0.9	0.7	0.93	1.8
Silver (dissolved)	µg/L	-	1.5	<0.10	0.06	<0.05	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	0.70	1.71	0.79	0.76	0.77	0.85
Zinc (dissolved)	µg/L	-	1 100	<5	5	4	<4	<2	2
Additional Parameters									
pH	-	-	-	7.85	7.68	7.67	7.71	7.77	7.99

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available.

Table 85: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-BH204-22

PG-BH204-22									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	-	-	-	-	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	-	-	-	-	1.0	1.5
Cobalt (dissolved)	µg/L	-	66	-	-	-	-	0.03	0.054
Copper (dissolved)	µg/L	1000	87	-	-	-	-	0.3	0.4
Lead (dissolved)	µg/L	10	25	-	-	-	-	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	-	-	-	-	0.2	0.3
Uranium (dissolved)	µg/L	20	420	-	-	-	-	0.66	1.06
Radium-226	Bq/L	0.49	-	-	-	-	-	<0.01	0.01
Thorium-230	Bq/L	0.65	-	-	-	-	-	<0.02	0.02
Thorium-232	Bq/L	0.6	-	-	-	-	-	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	-	-	-	-	173	186
Beryllium (dissolved)	µg/L	-	67	-	-	-	-	0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	-	-	-	-	9	13
Cadmium (dissolved)	µg/L	5	2.7	-	-	-	-	0.003	0.003
Mercury (dissolved)	µg/L	1	0.29	-	-	-	-	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	-	-	-	-	1.08	1.38
Selenium (dissolved)	µg/L	10	63	-	-	-	-	0.04	0.04
Silver (dissolved)	µg/L	-	1.5	-	-	-	-	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	-	-	-	-	0.30	0.71
Zinc (dissolved)	µg/L	-	1 100	-	-	-	-	<2	2
Additional Parameters									
pH	-	-	-	-	-	-	-	7.82	7.87

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available; well installed in 2022.

Table 86: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-BH210-22

PG-BH210-22									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	-	-	-	-	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	-	-	-	-	1.8	3.2
Cobalt (dissolved)	µg/L	-	66	-	-	-	-	0.529	1.290
Copper (dissolved)	µg/L	1000	87	-	-	-	-	0.6	0.8
Lead (dissolved)	µg/L	10	25	-	-	-	-	1.29	3.68
Nickel (dissolved)	µg/L	-	490	-	-	-	-	1.4	3.5
Uranium (dissolved)	µg/L	20	420	-	-	-	-	1.18	2.42
Radium-226	Bq/L	0.49	-	-	-	-	-	0.01	0.02
Thorium-230	Bq/L	0.65	-	-	-	-	-	<0.02	0.02
Thorium-232	Bq/L	0.6	-	-	-	-	-	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	-	-	-	-	127	160
Beryllium (dissolved)	µg/L	-	67	-	-	-	-	0.072	0.201
Boron (dissolved)	µg/L	5000	45 000	-	-	-	-	15	17
Cadmium (dissolved)	µg/L	5	2.7	-	-	-	-	0.013	0.033
Mercury (dissolved)	µg/L	1	0.29	-	-	-	-	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	-	-	-	-	1.40	1.49
Selenium (dissolved)	µg/L	10	63	-	-	-	-	<0.04	0.04
Silver (dissolved)	µg/L	-	1.5	-	-	-	-	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	-	-	-	-	1.62	4.46
Zinc (dissolved)	µg/L	-	1 100	-	-	-	-	7	16
Additional Parameters									
pH	-	-	-	-	-	-	-	8.00	8.28

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- - indicates no data is available; well reinstalled in 2022.

Table 87: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-BH214-22

PG-BH214-22									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	-	-	-	-	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	-	-	-	-	**300**	**448**
Cobalt (dissolved)	µg/L	-	66	-	-	-	-	0.252	0.345
Copper (dissolved)	µg/L	1000	87	-	-	-	-	0.7	1.7
Lead (dissolved)	µg/L	10	25	-	-	-	-	0.36	0.51
Nickel (dissolved)	µg/L	-	490	-	-	-	-	2.1	2.4
Uranium (dissolved)	µg/L	20	420	-	-	-	-	3.92	12.10
Radium-226	Bq/L	0.49	-	-	-	-	-	<0.01	0.01
Thorium-230	Bq/L	0.65	-	-	-	-	-	<0.02	0.02
Thorium-232	Bq/L	0.6	-	-	-	-	-	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	-	-	-	-	45	52
Beryllium (dissolved)	µg/L	-	67	-	-	-	-	0.019	0.031
Boron (dissolved)	µg/L	5000	45 000	-	-	-	-	9	12
Cadmium (dissolved)	µg/L	5	2.7	-	-	-	-	0.005	0.008
Mercury (dissolved)	µg/L	1	0.29	-	-	-	-	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	-	-	-	-	0.48	0.85
Selenium (dissolved)	µg/L	10	63	-	-	-	-	0.07	0.1
Silver (dissolved)	µg/L	-	1.5	-	-	-	-	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	-	-	-	-	0.65	1.0
Zinc (dissolved)	µg/L	-	1 100	-	-	-	-	3	4
Additional Parameters									
pH	-	-	-	-	-	-	-	7.62	7.96

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- - indicates no data is available; well reinstalled in 2022.

Table 88: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-BH404-22

PG-BH404-22									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	-	-	-	-	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	-	-	-	-	0.5	0.9
Cobalt (dissolved)	µg/L	-	66	-	-	-	-	0.99	1.08
Copper (dissolved)	µg/L	1000	87	-	-	-	-	1.7	2.3
Lead (dissolved)	µg/L	10	25	-	-	-	-	0.18	0.44
Nickel (dissolved)	µg/L	-	490	-	-	-	-	2.1	2.3
Uranium (dissolved)	µg/L	20	420	-	-	-	-	**177**	**229**
Radium-226	Bq/L	0.49	-	-	-	-	-	0.15	0.24
Thorium-230	Bq/L	0.65	-	-	-	-	-	<0.02	0.02
Thorium-232	Bq/L	0.6	-	-	-	-	-	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	-	-	-	-	78.1	93.5
Beryllium (dissolved)	µg/L	-	67	-	-	-	-	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	-	-	-	-	37	41
Cadmium (dissolved)	µg/L	5	2.7	-	-	-	-	0.005	0.006
Mercury (dissolved)	µg/L	1	0.29	-	-	-	-	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	-	-	-	-	4.93	5.58
Selenium (dissolved)	µg/L	10	63	-	-	-	-	0.23	0.32
Silver (dissolved)	µg/L	-	1.5	-	-	-	-	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	-	-	-	-	0.47	0.63
Zinc (dissolved)	µg/L	-	1 100	-	-	-	-	<2	2
Additional Parameters									
pH	-	-	-	-	-	-	-	7.26	7.48

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available; well reinstalled in 2022.

Table 89: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-MW03-01A

PG-MW03-01A									
Parameter	**Unit of Measure**			**Annual Average**					**Maximum**
		Criteria		**2019**	**2020**	**2021**	**2022**	**2023**	**2023**
		Table A2.3 [55]	**Table 3 [47]**						
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	-[1]	<0.90	-[2]	-[2]	1.05	1.20
Arsenic (dissolved)	µg/L	25	1900	-[1]	1.3	-[2]	-[2]	1.2	1.30
Cobalt (dissolved)	µg/L	-	66	-[1]	0.13	-[2]	-[2]	0.22	0.35
Copper (dissolved)	µg/L	1000	87	-[1]	1.4	-[2]	-[2]	0.5	0.8
Lead (dissolved)	µg/L	10	25	-[1]	0.08	-[2]	-[2]	0.22	0.35
Nickel (dissolved)	µg/L	-	490	-[1]	0.6	-[2]	-[2]	0.7	1.0
Uranium (dissolved)	µg/L	20	420	-[1]	0.205	-[2]	-[2]	0.274	0.374
Radium-226	Bq/L	0.49	-	-[1]	<0.01	-[2]	-[2]	<0.01	0.01
Thorium-230	Bq/L	0.65	-	-[1]	<0.02	-[2]	-[2]	<0.02	0.02
Thorium-232	Bq/L	0.6	-	-[1]	<0.02	-[2]	-[2]	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	-[1]	135	-[2]	-[2]	126	133
Beryllium (dissolved)	µg/L	-	67	-[1]	<0.01	-[2]	-[2]	0.012	0.016
Boron (dissolved)	µg/L	5000	45 000	-[1]	22	-[2]	-[2]	15	15
Cadmium (dissolved)	µg/L	5	2.7	-[1]	<0.003	-[2]	-[2]	0.005	0.005
Mercury (dissolved)	µg/L	1	0.29	-[1]	<0.01	-[2]	-[2]	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	-[1]	1.54	-[2]	-[2]	1.16	1.17
Selenium (dissolved)	µg/L	10	63	-[1]	<0.04	-[2]	-[2]	<0.04	0.04
Silver (dissolved)	µg/L	-	1.5	-[1]	<0.05	-[2]	-[2]	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	-[1]	0.94	-[2]	-[2]	0.91	1.35
Zinc (dissolved)	µg/L	-	1 100	-[1]	2	-[2]	-[2]	3	4
Additional Parameters									
pH	-	-	-	-[1]	7.95	-[2]	-[2]	7.93	7.94

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- -[1] indicates no data is available; well was inaccessible.
- -[2] indicates no data is available due to insufficient volume to sample.

Table 90: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-MW03-01B

PG-MW03-01B									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	-	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	-	1.2	1.2	1.0	2.3	2.3
Cobalt (dissolved)	µg/L	-	66	-	0.06	0.17	0.17	0.142	0.210
Copper (dissolved)	µg/L	1000	87	-	0.7	4.8	<0.2	0.9	1.1
Lead (dissolved)	µg/L	10	25	-	0.03	0.11	<0.09	0.18	0.27
Nickel (dissolved)	µg/L	-	490	-	0.3	1.6	0.5	0.6	0.7
Uranium (dissolved)	µg/L	20	420	-	0.285	0.323	0.480	0.669	0.710
Radium-226	Bq/L	0.49	-	-	0.01	0.02	<0.01	0.01	0.01
Thorium-230	Bq/L	0.65	-	-	0.02	0.03	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.6	-	-	0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	-	67	54	57	69	70
Beryllium (dissolved)	µg/L	-	67	-	<0.007	<0.007	0.009	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	-	12	14	25	115	133
Cadmium (dissolved)	µg/L	5	2.7	-	0.003	0.007	0.012	<0.003	0.003
Mercury (dissolved)	µg/L	1	0.29	-	0.02	<0.01	<0.01	0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	-	0.89	1.19	1.11	3.19	3.54
Selenium (dissolved)	µg/L	10	63	-	<0.04	0.09	0.04	0.06	0.08
Silver (dissolved)	µg/L	-	1.5	-	<0.05	<0.05	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	-	0.40	0.23	0.50	1.02	1.02
Zinc (dissolved)	µg/L	-	1 100	-	2	4	<4	<2	2
Additional Parameters									
pH	-	-	-	-	7.83	7.79	7.86	7.98	7.98

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available; well was inaccessible.

Table 91: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-MW03-01C

PG-MW03-01C									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	--	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	--	0.23	0.58	0.4	0.23	0.30
Cobalt (dissolved)	µg/L	-	66	--	0.03	0.03	0.03	0.04	0.059
Copper (dissolved)	µg/L	1000	87	--	0.6	0.6	0.7	0.5	0.9
Lead (dissolved)	µg/L	10	25	--	0.02	0.07	<0.09	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	--	0.2	0.3	0.3	0.2	0.3
Uranium (dissolved)	µg/L	20	420	--	0.499	0.504	0.451	0.527	0.567
Radium-226	Bq/L	0.49	-	--	<0.01	<0.01	0.01	<0.01	0.01
Thorium-230	Bq/L	0.65	-	--	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.6	-	-	0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	--	40	44	42	45	50
Beryllium (dissolved)	µg/L	-	67	--	0.009	<0.007	0.008	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	-	20	19	24	25	26
Cadmium (dissolved)	µg/L	5	2.7	-	0.005	0.004	0.005	0.003	0.003
Mercury (dissolved)	µg/L	1	0.29	-	0.01	<0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	-	0.13	0.07	0.04	0.11	0.26
Selenium (dissolved)	µg/L	10	63	-	0.59	0.44	0.58	0.59	0.84
Silver (dissolved)	µg/L	-	1.5	-	<0.05	<0.05	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	-	0.65	0.64	0.57	0.65	0.69
Zinc (dissolved)	µg/L	-	1 100	-	<2	4	3	<2	2
Additional Parameters									
pH	-	-	-	-	7.54	7.56	7.58	7.55	7.66

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- - indicates no data is available; well was inaccessible.

Table 92: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-MW03-02A

PG-MW03-02A									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	-	<0.90	-	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	-	1.9	-	1.7	1.70	2.00
Cobalt (dissolved)	µg/L	-	66	-	0.035	-	0.09	0.16	0.309
Copper (dissolved)	µg/L	1000	87	-	0.4	-	2.3	0.5	1.3
Lead (dissolved)	µg/L	10	25	-	0.01	-	<0.09	0.18	0.45
Nickel (dissolved)	µg/L	-	490	-	0.4	-	0.3	0.8	1.5
Uranium (dissolved)	µg/L	20	420	-	0.591	-	0.188	0.280	0.608
Radium-226	Bq/L	0.49	-	-	0.13	-	0.02	<0.01	0.01
Thorium-230	Bq/L	0.65	-	-	<0.04	-	<0.03	<0.02	0.02
Thorium-232	Bq/L	0.6	-	-	<0.04	-	<0.03	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	-	62.4	-	68	85	98
Beryllium (dissolved)	µg/L	-	67	-	<0.007	-	<0.007	0.009	0.013
Boron (dissolved)	µg/L	5000	45 000	-	15	-	58	17	20
Cadmium (dissolved)	µg/L	5	2.7	-	0.003	-	0.004	0.005	0.010
Mercury (dissolved)	µg/L	1	0.29	-	-	-	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	-	1.03	-	1.01	0.99	1.08
Selenium (dissolved)	µg/L	10	63	-	<0.04	-	0.06	<0.04	0.04
Silver (dissolved)	µg/L	-	1.5	-	<0.05	-	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	-	1.14	-	0.87	0.87	1.66
Zinc (dissolved)	µg/L	-	1 100	-	<2	-	<2	4	10
Additional Parameters									
pH	-	-	-	-	-	-	7.88	8.07	8.15

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available; well was inaccessible.

Table 93: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-MW03-02B

PG-MW03-02B									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	-	<0.90	-	-	-	-
Arsenic (dissolved)	µg/L	25	1900	-	0.5	-	-	-	-
Cobalt (dissolved)	µg/L	-	66	-	0.023	-	-	-	-
Copper (dissolved)	µg/L	1000	87	-	<0.2	-	-	-	-
Lead (dissolved)	µg/L	10	25	-	0.03	-	-	-	-
Nickel (dissolved)	µg/L	-	490	-	0.1	-	-	-	-
Uranium (dissolved)	µg/L	20	420	-	0.053	-	-	-	-
Radium-226	Bq/L	0.49	-	-	<0.01	-	-	-	-
Thorium-230	Bq/L	0.65	-	-	<0.02	-	-	-	-
Thorium-232	Bq/L	0.6	-	-	<0.02	-	-	-	-
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	-	233	-	-	-	-
Beryllium (dissolved)	µg/L	-	67	-	<0.01	-	-	-	-
Boron (dissolved)	µg/L	5000	45 000	-	11	-	-	-	-
Cadmium (dissolved)	µg/L	5	2.7	-	<0.003	-	-	-	-
Mercury (dissolved)	µg/L	1	0.29	-	0.01	-	-	-	-
Molybdenum (dissolved)	µg/L	-	9 200	-	0.83	-	-	-	-
Selenium (dissolved)	µg/L	10	63	-	<0.04	-	-	-	-
Silver (dissolved)	µg/L	-	1.5	-	<0.05	-	-	-	-
Vanadium (dissolved)	µg/L	-	250	-	0.12	-	-	-	-
Zinc (dissolved)	µg/L	-	1 100	-	<2	-	-	-	-
Additional Parameters									
pH	-	-	-	-	7.91	-	-	-	-

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available; well was inaccessible or damaged.

Table 94: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-MW03-02C

PG-MW03-02C									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	-	<0.90	-	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	-	0.3	-	0.2	0.3	0.4
Cobalt (dissolved)	µg/L	-	66	-	0.04	-	0.06	0.05	0.08
Copper (dissolved)	µg/L	1000	87	-	0.3	-	0.2	0.3	0.7
Lead (dissolved)	µg/L	10	25	-	0.02	-	<0.09	0.12	0.19
Nickel (dissolved)	µg/L	-	490	-	0.2	-	0.2	0.2	0.3
Uranium (dissolved)	µg/L	20	420	-	2.375	-	1.252	1.398	1.450
Radium-226	Bq/L	0.49	-	-	0.01	-	<0.01	<0.01	0.01
Thorium-230	Bq/L	0.65	-	-	<0.02	-	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.6	-	-	<0.02	-	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	-	70	-	60	66	71
Beryllium (dissolved)	µg/L	-	67	-	<0.01	-	<0.01	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	-	11	-	22	9	9
Cadmium (dissolved)	µg/L	5	2.7	-	0.003	-	<0.003	<0.003	0.003
Mercury (dissolved)	µg/L	1	0.29	-	0.04	-	0.03	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	-	0.93	-	0.98	0.91	1.03
Selenium (dissolved)	µg/L	10	63	-	<0.04	-	<0.04	0.05	0.08
Silver (dissolved)	µg/L	-	1.5	-	<0.05	-	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	-	0.17	-	0.11	0.15	0.16
Zinc (dissolved)	µg/L	-	1 100	-	<2	-	<2	<2	2
Additional Parameters									
pH	-	-	-	-	7.80	-	7.68	7.96	7.98

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available; well was inaccessible or damaged.

Table 95: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-MW03-03B

PG-MW03-03B									
Parameter	**Unit of Measure**	**Criteria**		**Annual Average**					**Maximum**
		Table A2.3 [55]	**Table 3 [47]**	**2019**	**2020**	**2021**	**2022**	**2023**	**2023**
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	-	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	-	<0.2	<0.2	<0.2	<0.2	0.2
Cobalt (dissolved)	µg/L	-	66	-	0.021	0.018	0.022	0.012	0.026
Copper (dissolved)	µg/L	1000	87	-	<0.2	<0.2	<0.2	0.2	0.3
Lead (dissolved)	µg/L	10	25	-	0.05	<0.01	<0.09	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	-	<0.1	<0.1	<0.1	0.1	0.1
Uranium (dissolved)	µg/L	20	420	-	0.052	0.031	0.094	0.028	0.032
Radium-226	Bq/L	0.49	-	-	<0.01	<0.01	0.01	0.01	0.01
Thorium-230	Bq/L	0.65	-	-	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.6	-	-	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	-	197	175	185	170	181
Beryllium (dissolved)	µg/L	-	67	-	<0.007	<0.007	<0.007	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	-	8	8	9	9	12
Cadmium (dissolved)	µg/L	5	2.7	-	<0.003	0.003	<0.003	<0.003	0.003
Mercury (dissolved)	µg/L	1	0.29	-	<0.01	<0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	-	1.14	1.06	1.06	1.21	1.25
Selenium (dissolved)	µg/L	10	63	-	<0.04	<0.04	0.06	<0.04	0.04
Silver (dissolved)	µg/L	-	1.5	-	<0.05	<0.05	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	-	0.18	0.07	1.49	0.06	0.10
Zinc (dissolved)	µg/L	-	1 100	-	<2	<2	<2	<2	3
Additional Parameters									
pH	-	-	-	-	7.90	7.92	7.78	7.81	8.01

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available; well was inaccessible.

Table 96: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-MW03-03C

PG-MW03-03C									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	-	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	-	<0.2	<0.2	<0.2	0.2	0.2
Cobalt (dissolved)	µg/L	-	66	-	0.075	0.055	0.058	0.040	0.058
Copper (dissolved)	µg/L	1000	87	-	0.4	0.2	<0.2	0.3	0.3
Lead (dissolved)	µg/L	10	25	-	0.04	0.07	<0.09	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	-	<0.1	0.1	0.1	0.1	0.1
Uranium (dissolved)	µg/L	20	420	-	9.980	9.985	9.117	9.613	10.300
Radium-226	Bq/L	0.49	-	-	<0.01	0.01	0.01	0.01	0.02
Thorium-230	Bq/L	0.65	-	-	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.6	-	-	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	-	61	56	53	54	55
Beryllium (dissolved)	µg/L	-	67	-	<0.007	<0.007	<0.007	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	-	10	12	11	12	13
Cadmium (dissolved)	µg/L	5	2.7	-	<0.003	0.003	0.003	<0.003	0.003
Mercury (dissolved)	µg/L	1	0.29	-	<0.01	<0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	-	1.4	1.6	1.4	1.4	2.0
Selenium (dissolved)	µg/L	10	63	-	0.40	1.00	0.67	0.48	0.55
Silver (dissolved)	µg/L	-	1.5	-	<0.05	<0.05	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	-	0.39	0.41	0.43	0.47	0.54
Zinc (dissolved)	µg/L	-	1 100	-	<2	<2	<2	<2	2
Additional Parameters									
pH	-	-	-	-	7.87	7.87	7.90	7.95	8.00

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- - indicates no data is available; well was inaccessible.

Table 97: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-MW1A-02

PG-MW1A-02									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	1.0	<0.90	<0.90	-	2.10	2.10
Arsenic (dissolved)	µg/L	25	1900	1.2	1.2	1.4	-	1.5	1.5
Cobalt (dissolved)	µg/L	-	66	<0.50	0.055	0.113	-	0.074	0.074
Copper (dissolved)	µg/L	1000	87	<1.0	<0.2	1.2	-	0.3	0.3
Lead (dissolved)	µg/L	10	25	<0.50	0.02	0.31	-	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	<1.0	0.2	0.3	-	0.5	0.5
Uranium (dissolved)	µg/L	20	420	0.480	0.931	0.967	-	1.110	1.110
Radium-226	Bq/L	0.49	-	<0.04	<0.01	0.01	-	<0.01	0.01
Thorium-230	Bq/L	0.65	-	<0.07	<0.02	<0.02	-	<0.02	0.02
Thorium-232	Bq/L	0.6	-	<0.06	<0.02	<0.02	-	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	93	78	41	-	73	73
Beryllium (dissolved)	µg/L	-	67	<0.50	<0.007	0.022	-	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	265	260	215	-	229	229
Cadmium (dissolved)	µg/L	5	2.7	<0.10	<0.003	<0.003	-	0.003	0.003
Mercury (dissolved)	µg/L	1	0.29	<0.1	<0.01	<0.01	-	0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	9.50	11.80	10.76	-	9.0	9.0
Selenium (dissolved)	µg/L	10	63	<2.0	0.04	<0.04	-	0.05	0.05
Silver (dissolved)	µg/L	-	1.5	<0.10	<0.05	<0.05	-	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	0.51	0.45	0.27	-	1.02	1.02
Zinc (dissolved)	µg/L	-	1 100	<5	<2	3	-	<2	2
Additional Parameters									
pH	-	-	-	8.13	8.21	8.27	-	8.14	8.14

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available; well volume insufficient to sample.

Table 98: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-MW1B-02

PG-MW1B-02									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	2.0	0.4	0.5	0.4	0.3	0.4
Cobalt (dissolved)	µg/L	-	66	<0.50	0.09	0.37	0.05	0.081	0.133
Copper (dissolved)	µg/L	1000	87	1.9	0.3	0.8	0.3	0.3	0.5
Lead (dissolved)	µg/L	10	25	<0.50	0.08	0.69	<0.09	0.10	0.11
Nickel (dissolved)	µg/L	-	490	<1.0	0.3	0.8	0.3	0.3	0.6
Uranium (dissolved)	µg/L	20	420	0.733	0.153	0.314	0.096	0.135	0.156
Radium-226	Bq/L	0.49	-	<0.04	<0.01	0.01	<0.01	<0.01	0.01
Thorium-230	Bq/L	0.65	-	<0.07	<0.02	0.03	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.6	-	-	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	64	63	80	62	69	76
Beryllium (dissolved)	µg/L	-	67	<0.50	0.01	0.05	<0.01	0.014	0.033
Boron (dissolved)	µg/L	5000	45 000	267	257	244	260	264	313
Cadmium (dissolved)	µg/L	5	2.7	<0.100	0.005	0.010	0.004	0.018	0.059
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	<0.01	<0.01	0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	11	12	12	11	11	11.7
Selenium (dissolved)	µg/L	10	63	<2.0	<0.04	<0.04	<0.04	0.31	1.10
Silver (dissolved)	µg/L	-	1.5	<0.10	<0.05	<0.05	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	<0.50	0.48	1.36	0.36	0.56	0.61
Zinc (dissolved)	µg/L	-	1 100	5	<2	4	<2	<2	2
Additional Parameters									
pH	-	-	-	8.11	8.24	7.94	8.12	8.20	8.25

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available; well was inaccessible.

Table 99: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-MW1C-02

PG-MW1C-02									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	<1.0	0.3	0.3	0.3	0.2	0.3
Cobalt (dissolved)	µg/L	-	66	<0.50	0.056	0.061	0.03	0.039	0.051
Copper (dissolved)	µg/L	1000	87	<1.0	0.5	<0.2	<0.2	<0.2	0.2
Lead (dissolved)	µg/L	10	25	<0.50	0.02	0.07	<0.09	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	<1.0	0.2	0.2	0.1	0.1	0.2
Uranium (dissolved)	µg/L	20	420	0.143	0.199	0.149	0.159	0.171	0.188
Radium-226	Bq/L	0.49	-	<0.04	0.01	0.01	<0.01	0.01	0.01
Thorium-230	Bq/L	0.65	-	<0.07	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.6	-	<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	230	223	222	222	229	243
Beryllium (dissolved)	µg/L	-	67	<0.50	<0.007	<0.007	<0.01	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	<12	11	11	12	11	12
Cadmium (dissolved)	µg/L	5	2.7	<0.10	<0.003	<0.003	<0.003	<0.003	0.003
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	<0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	0.62	0.58	0.74	1	0.62	0.66
Selenium (dissolved)	µg/L	10	63	<2.0	0.05	<0.04	<0.04	0.05	0.07
Silver (dissolved)	µg/L	-	1.5	<0.10	<0.05	0.06	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	<0.50	0.08	0.11	0.04	0.03	0.04
Zinc (dissolved)	µg/L	-	1 100	<5	<2	<2	<2	<2	2
Additional Parameters									
pH	-	-	-	7.93	7.89	7.86	7.68	7.80	7.94

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- - indicates no data is available; well was inaccessible.

Table 100: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-MW1D-02

PG-MW1D-02									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	<1.0	<0.2	<0.2	<0.2	0.2	0.3
Cobalt (dissolved)	µg/L	-	66	<0.50	0.03	0.07	0.03	0.041	0.053
Copper (dissolved)	µg/L	1000	87	<1.0	1.0	0.7	0.6	0.6	0.7
Lead (dissolved)	µg/L	10	25	<0.50	<0.01	<0.09	<0.09	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	<1.0	0.2	0.3	0.2	0.2	0.2
Uranium (dissolved)	µg/L	20	420	0.765	0.829	0.859	0.931	0.859	1.010
Radium-226	Bq/L	0.49	-	0.03	0.01	<0.01	<0.01	<0.01	0.01
Thorium-230	Bq/L	0.65	-	0.07	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.6	-	0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	46	42	47	46	38	40
Beryllium (dissolved)	µg/L	-	67	<0.50	<0.007	0.008	<0.01	0.012	0.022
Boron (dissolved)	µg/L	5000	45 000	11	7	7	6	9	17
Cadmium (dissolved)	µg/L	5	2.7	<0.10	0.003	0.004	0.00	0.022	0.060
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	<0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	<0.50	0.20	0.19	0.17	0.31	0.48
Selenium (dissolved)	µg/L	10	63	<2.0	0.1	0.2	0.11	0.63	1.62
Silver (dissolved)	µg/L	-	1.5	<0.10	<0.05	<0.05	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	<0.50	0.20	0.28	0.22	0.23	0.29
Zinc (dissolved)	µg/L	-	1 100	<5	<2	<2	<2	<2	2
Additional Parameters									
pH	-	-	-	7.70	7.71	7.45	7.44	7.71	8.20

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- - indicates no data is available; well was inaccessible.

Table 101: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-MW1D-02

PG-MW1D-02									
Parameter	**Unit of Measure**	**Criteria**		**Annual Average**					**Maximum**
		Table A2.3 [55]	**Table 3 [47]**	**2019**	**2020**	**2021**	**2022**	**2023**	**2023**
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	<1.0	<0.2	<0.2	<0.2	0.2	0.2
Cobalt (dissolved)	µg/L	-	66	<0.50	0.03	0.07	0.03	0.041	0.053
Copper (dissolved)	µg/L	1000	87	<1.0	1 .0	0.7	0.6	0.6	0.7
Lead (dissolved)	µg/L	10	25	<0.50	<0.01	<0.09	<0.09	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	<1.0	0.2	0.3	0.2	0.2	0.2
Uranium (dissolved)	µg/L	20	420	0.765	0.829	0.859	0.931	0.859	1.010
Radium-226	Bq/L	0.49	-	0.03	0.01	<0.01	<0.01	<0.01	0.01
Thorium-230	Bq/L	0.65	-	0.06	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.6	-	0.05	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	46	42	47	46	38	40
Beryllium (dissolved)	µg/L	-	67	<0.50	<0.007	0.008	<0.01	0.012	0.022
Boron (dissolved)	µg/L	5000	45 000	11	7	7	6	9	17
Cadmium (dissolved)	µg/L	5	2.7	<0.10	0.003	0.004	0.004	0.022	0.060
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	<0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	<0.50	0.20	0.19	0.17	0.31	0.48
Selenium (dissolved)	µg/L	10	63	<2.0	0.1	0.2	0.11	0.63	1.62
Silver (dissolved)	µg/L	-	1.5	<0.10	<0.05	<0.05	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	<0.50	0.20	0.28	0.22	0.23	0.29
Zinc (dissolved)	µg/L	-	1 100	<5	<2	<2	<2	<2	2
Additional Parameters									
pH	-	-	-	7.70	7.71	7.45	7.44	7.71	8.20

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- - indicates no data is available.

Table 102: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-MW2B-02

PG-MW2B-02									
Parameter	**Unit of Measure**	**Criteria**		**Annual Average**					**Maximum**
		Table A2.3 [55]	**Table 3 [47]**	**2019**	**2020**	**2021**	**2022**	**2023**	**2023**
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	<1.0	<0.2	<0.2	<0.2	0.4	1.1
Cobalt (dissolved)	µg/L	-	66	<0.50	0.096	0.149	0.14	0.117	0.140
Copper (dissolved)	µg/L	1000	87	<1.0	0.9	<0.2	<0.2	<0.2	0.2
Lead (dissolved)	µg/L	10	25	<0.50	<0.01	0.07	<0.09	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	<1.0	<0.1	<0.1	<0.1	<0.1	0.1
Uranium (dissolved)	µg/L	20	420	<0.100	0.013	0.005	0.004	0.005	0.005
Radium-226	Bq/L	0.49	-	0.03	0.01	<0.01	<0.01	<0.01	0.01
Thorium-230	Bq/L	0.65	-	0.05	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.6	-	0.04	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	120	119	127	130	121	124
Beryllium (dissolved)	µg/L	-	67	<0.50	<0.007	<0.007	<0.01	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	36	35	39	36	39	49
Cadmium (dissolved)	µg/L	5	2.7	<0.10	<0.003	<0.003	<0.00	<0.003	0.003
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	<0.01	<0.01	0.01	0.02
Molybdenum (dissolved)	µg/L	-	9 200	0.76	0.70	0.94	1	0.82	0.94
Selenium (dissolved)	µg/L	10	63	<2.0	<0.04	<0.04	<0.04	<0.04	0.04
Silver (dissolved)	µg/L	-	1.5	<0.10	<0.05	<0.05	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	<0.50	<0.01	0.05	0.01	0.02	0.03
Zinc (dissolved)	µg/L	-	1 100	<5	3	<2	<2	<2	2
Additional Parameters									
pH	-	-	-	8.13	8.08	8.09	8.07	8.08	8.24

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available.

Table 103: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-MW2C-02

PG-MW2C-02									
Parameter	**Unit of Measure**	**Criteria**		**Annual Average**					**Maximum**
		Table A2.3 [55]	**Table 3 [47]**	**2019**	**2020**	**2021**	**2022**	**2023**	**2023**
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	-	-	-	-
Arsenic (dissolved)	µg/L	25	1900	<1.0	<0.2	-	-	-	-
Cobalt (dissolved)	µg/L	-	66	<0.50	0.03	-	-	-	-
Copper (dissolved)	µg/L	1000	87	<1.0	0.8	-	-	-	-
Lead (dissolved)	µg/L	10	25	<0.50	0.02	-	-	-	-
Nickel (dissolved)	µg/L	-	490	<1.0	0.3	-	-	-	-
Uranium (dissolved)	µg/L	20	420	0.410	0.435	-	-	-	-
Radium-226	Bq/L	0.49	-	<0.04	<0.01	-	-	-	-
Thorium-230	Bq/L	0.65	-	<0.07	<0.02	-	-	-	-
Thorium-232	Bq/L	0.6	-	<0.06	<0.02	-	-	-	-
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	27	23	-	-	-	-
Beryllium (dissolved)	µg/L	-	67	<0.50	<0.01	-	-	-	-
Boron (dissolved)	µg/L	5000	45 000	18	11	-	-	-	-
Cadmium (dissolved)	µg/L	5	2.7	<0.10	<0.003	-	-	-	-
Mercury (dissolved)	µg/L	1	0.29	<0.10	0.01	-	-	-	-
Molybdenum (dissolved)	µg/L	-	9 200	<0.50	0.20	-	-	-	-
Selenium (dissolved)	µg/L	10	63	<2.0	0.2	-	-	-	-
Silver (dissolved)	µg/L	-	1.5	<0.10	0.05	-	-	-	-
Vanadium (dissolved)	µg/L	-	250	<0.50	0.21	-	-	-	-
Zinc (dissolved)	µg/L	-	1 100	<5	5	-	-	-	-
Additional Parameters									
pH	-	-	-	7.72	7.49	-	-	-	-

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available; insufficient volume of groundwater for sample collection.

Table 104: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-MW3A-02

PG-MW3A-02									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	-	-	1.50	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	<1.0	-	-	0.6	0.3	0.4
Cobalt (dissolved)	µg/L	-	66	<0.50	-	-	0.04	0.015	0.022
Copper (dissolved)	µg/L	1000	87	<1.0	-	-	0.8	0.7	0.09
Lead (dissolved)	µg/L	10	25	<0.50	-	-	<0.09	0.07	0.8
Nickel (dissolved)	µg/L	-	490	<1.0	-	-	0.2	0.4	0.083
Uranium (dissolved)	µg/L	20	420	<0.100	-	-	0.042	0.061	0.083
Radium-226	Bq/L	0.49	-	<0.04	-	-	0.03	0.11	0.30
Thorium-230	Bq/L	0.65	-	<0.07	-	-	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.6	-	<0.06	-	-	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	**4100**	-	-	**4160**	**2980**	**3210**
Beryllium (dissolved)	µg/L	-	67	<0.50	-	-	<0.01	0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	750	-	-	658	659	760
Cadmium (dissolved)	µg/L	5	2.7	<0.10	-	-	0.01	0.005	0.010
Mercury (dissolved)	µg/L	1	0.29	<0.10	-	-	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	<0.50	-	-	0.66	0.46	0.90
Selenium (dissolved)	µg/L	10	63	<2.0	-	-	0.1	0.06	0.07
Silver (dissolved)	µg/L	-	1.5	<0.10	-	-	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	<0.50	-	-	0.57	0.14	0.25
Zinc (dissolved)	µg/L	-	1 100	<5	-	-	4	6	10
Additional Parameters									
pH	-	-	-	7.52	-	-	7.35	7.53	7.64

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available; well damaged.

Table 105: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-MW3B-02

PG-MW3B-02									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	2.1	2.1	2.3	2.4	2.2	2.3
Cobalt (dissolved)	µg/L	-	66	<0.50	0.009	0.013	0.04	0.012	0.019
Copper (dissolved)	µg/L	1000	87	<1.0	<0.2	0.2	0.3	<0.2	0.2
Lead (dissolved)	µg/L	10	25	<0.50	0.02	0.07	0.16	0.10	0.14
Nickel (dissolved)	µg/L	-	490	<1.0	<0.1	<0.1	0.1	<0.1	0.1
Uranium (dissolved)	µg/L	20	420	<0.100	0.110	0.082	0.234	0.079	0.111
Radium-226	Bq/L	0.49	-	0.03	0.01	<0.01	<0.01	<0.01	0.01
Thorium-230	Bq/L	0.65	-	0.06	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.6	-	0.05	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	57.5	54.3	52.3	55	53.8	57.4
Beryllium (dissolved)	µg/L	-	67	<0.50	<0.007	<0.007	0.01	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	66	63	57	63	70	79
Cadmium (dissolved)	µg/L	5	2.7	<0.10	<0.003	<0.003	0.00	<0.003	0.003
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	<0.01	<0.01	0.02	0.01
Molybdenum (dissolved)	µg/L	-	9 200	1.50	1.41	1.47	1.41	1.43	1.51
Selenium (dissolved)	µg/L	10	63	<2.0	<0.04	<0.04	<0.0	<0.04	0.04
Silver (dissolved)	µg/L	-	1.5	<0.10	<0.05	<0.05	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	<0.50	0.06	0.09	0.14	0.06	0.12
Zinc (dissolved)	µg/L	-	1 100	<5	<2	<2	<2	<2	2
Additional Parameters									
pH	-	-	-	8.23	8.31	8.19	8.28	8.20	8.34

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available.

Table 106: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-MW3C-02

PG-MW3C-02									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	<1.0	0.3	0.3	0.3	0.6	1.0
Cobalt (dissolved)	µg/L	-	66	<0.50	0.024	0.035	0.04	0.222	0.711
Copper (dissolved)	µg/L	1000	87	<1.0	0.4	0.4	0.3	0.7	1.8
Lead (dissolved)	µg/L	10	25	<0.50	0.02	0.10	<0.09	0.98	3.54
Nickel (dissolved)	µg/L	-	490	<1.0	0.2	0.1	0.2	0.4	1.30
Uranium (dissolved)	µg/L	20	420	0.875	0.936	0.792	1.113	1.480	2.030
Radium-226	Bq/L	0.49	-	<0.04	0.01	<0.01	<0.01	<0.01	0.01
Thorium-230	Bq/L	0.65	-	<0.07	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.6	-	<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	83	85	86	77	67	97.6
Beryllium (dissolved)	µg/L	-	67	<0.50	<0.007	<0.007	<0.01	0.054	0.192
Boron (dissolved)	µg/L	5000	45 000	13	12	11	13	20	32
Cadmium (dissolved)	µg/L	5	2.7	<0.10	<0.003	<0.003	<0.003	0.012	0.032
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	<0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	<0.50	0.32	0.42	0.38	0.63	0.89
Selenium (dissolved)	µg/L	10	63	<2.0	0.32	0.34	0.3	0.32	0.46
Silver (dissolved)	µg/L	-	1.5	<0.10	<0.05	<0.05	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	0.76	0.77	0.91	0.76	1.28	3.00
Zinc (dissolved)	µg/L	-	1 100	<5	3	6	<2	3	7
Additional Parameters									
pH	-	-	-	7.79	7.66	7.59	7.60	7.70	7.83

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available

Table 107: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-MW3D-02

PG-MW3D-02									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	<1.0	<0.2	0.3	<0.2	0.2	0.2
Cobalt (dissolved)	µg/L	-	66	<0.50	0.027	0.174	0.01	0.037	0.041
Copper (dissolved)	µg/L	1000	87	<1.0	1.5	0.7	0.4	0.6	0.8
Lead (dissolved)	µg/L	10	25	<0.50	0.02	<0.09	<0.09	0.09	0.09
Nickel (dissolved)	µg/L	-	490	<1.0	0.3	1.3	<0.1	0.2	0.2
Uranium (dissolved)	µg/L	20	420	0.210	0.203	0.213	0.209	0.238	0.340
Radium-226	Bq/L	0.49	-	0.03	0.02	<0.01	<0.01	0.01	0.01
Thorium-230	Bq/L	0.65	-	0.06	<0.02	<0.02	0.02	0.02	0.02
Thorium-232	Bq/L	0.6	-	0.05	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	32	23	46	31	33	48.4
Beryllium (dissolved)	µg/L	-	67	<0.50	<0.007	<0.007	<0.01	0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	29	17	33	13	17	23
Cadmium (dissolved)	µg/L	5	2.7	<0.10	0.005	0.007	0.00	0.004	0.007
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	<0.01	<0.01	0.02	0.03
Molybdenum (dissolved)	µg/L	-	9 200	<0.50	0.18	0.22	0.10	0.16	0.26
Selenium (dissolved)	µg/L	10	63	<2.0	0.15	0.27	0.2	0.27	0.37
Silver (dissolved)	µg/L	-	1.5	<0.10	<0.05	<0.05	<0.05	0.05	0.05
Vanadium (dissolved)	µg/L	-	250	0.50	0.35	0.49	0.41	0.46	0.53
Zinc (dissolved)	µg/L	-	1 100	<5	3	3	2	3	5
Additional Parameters									
pH	-	-	-	7.74	7.61	7.34	7.38	7.53	7.62

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available.

Table 108: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-MW4A-02

PG-MW4A-02									
Parameter	**Unit of Measure**	**Criteria**		**Annual Average**					**Maximum**
		Table A2.3 [55]	**Table 3 [47]**	**2019**	**2020**	**2021**	**2022**	**2023**	**2023**
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	<1.0	<0.2	0.5	<0.2	<0.2	0.2
Cobalt (dissolved)	µg/L	-	66	<0.50	0.028	0.019	0.02	0.012	0.016
Copper (dissolved)	µg/L	1000	87	<1.0	1.1	<0.2	<0.2	<0.2	0.2
Lead (dissolved)	µg/L	10	25	<0.50	0.02	0.08	<0.09	0.12	0.17
Nickel (dissolved)	µg/L	-	490	<1.0	<0.1	0.1	<0.1	0.3	0.7
Uranium (dissolved)	µg/L	20	420	<0.100	0.013	0.025	0.004	0.033	0.093
Radium-226	Bq/L	0.49	-	<0.04	0.02	0.01	<0.01	<0.01	0.01
Thorium-230	Bq/L	0.65	-	<0.07	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.6	-	<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	93	87	103	100	89	95
Beryllium (dissolved)	µg/L	-	67	<0.50	<0.007	<0.007	<0.01	0.009	0.014
Boron (dissolved)	µg/L	5000	45 000	177	163	182	174	171	200
Cadmium (dissolved)	µg/L	5	2.7	<0.10	<0.003	<0.003	0.00	<0.003	0.003
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	<0.01	0.04	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	2.53	2.60	2.75	2.37	2.19	2.27
Selenium (dissolved)	µg/L	10	63	<2.0	<0.04	0.29	0.1	<0.04	0.04
Silver (dissolved)	µg/L	-	1.5	<0.10	<0.05	<0.05	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	<0.50	0.05	0.19	0.03	0.03	0.04
Zinc (dissolved)	µg/L	-	1 100	<5	3	<2	<2	<2	2
Additional Parameters									
pH	-	-	-	7.87	8.30	8.06	8.28	8.31	8.33

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available.

Table 109: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-MW4B-02

PG-MW4B-02									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	1.9	2.2	2.3	2.2	2.2	2.2
Cobalt (dissolved)	µg/L	-	66	<0.50	0.118	0.018	0.03	0.024	0.032
Copper (dissolved)	µg/L	1000	87	<1.0	0.4	<0.2	0.3	0.4	0.7
Lead (dissolved)	µg/L	10	25	<0.50	0.18	0.07	<0.09	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	<1.0	0.2	<0.1	<0.1	<0.1	0.1
Uranium (dissolved)	µg/L	20	420	0.180	0.295	0.166	0.244	0.192	0.221
Radium-226	Bq/L	0.49	-	0.03	0.01	<0.01	<0.01	<0.01	0.01
Thorium-230	Bq/L	0.65	-	0.05	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.6	-	0.04	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	65	66	75	78	66	69.8
Beryllium (dissolved)	µg/L	-	67	<0.50	0.014	<0.007	0.01	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	29	30	32	35	31	40
Cadmium (dissolved)	µg/L	5	2.7	<0.10	0.005	0.004	0.003	0.004	0.005
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	<0.01	0.02	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	0.97	0.91	1.01	0.96	0.89	0.90
Selenium (dissolved)	µg/L	10	63	<2.0	<0.04	0.29	0.1	<0.04	0.04
Silver (dissolved)	µg/L	-	1.5	<0.10	<0.05	<0.05	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	<0.50	0.33	0.04	0.12	0.08	0.13
Zinc (dissolved)	µg/L	-	1 100	<5	3	<2	<2	<2	2
Additional Parameters									
pH	-	-	-	8.13	8.16	8.04	8.12	8.08	8.15

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- - indicates no data is available.

Table 110: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-MW4C-02

PG-MW4C-02									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	2.0	1.9	2.2	2.0	2.0	2.1
Cobalt (dissolved)	µg/L	-	66	0.67	0.583	0.667	0.29	0.282	0.563
Copper (dissolved)	µg/L	1000	87	1.1	0.5	0.3	0.3	<0.2	0.2
Lead (dissolved)	µg/L	10	25	<0.50	0.02	0.11	<0.09	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	<1.0	0.1	0.2	<0.1	<0.1	0.1
Uranium (dissolved)	µg/L	20	420	0.153	0.175	0.143	0.143	0.102	0.111
Radium-226	Bq/L	0.49	-	<0.04	0.01	0.01	<0.01	0.01	0.01
Thorium-230	Bq/L	0.65	-	<0.07	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.6	-	<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	163	160	177	170	155	165
Beryllium (dissolved)	µg/L	-	67	<0.50	<0.007	0.008	<0.01	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	<10	11	12	24	9	12
Cadmium (dissolved)	µg/L	5	2.7	<0.10	<0.003	0.005	0.004	<0.003	0.003
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	0.76	0.73	0.72	0.65	0.59	0.54
Selenium (dissolved)	µg/L	10	63	<2.0	<0.04	0.32	0.1	<0.04	0.04
Silver (dissolved)	µg/L	-	1.5	<0.10	<0.05	<0.05	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	<0.50	0.10	0.19	0.06	0.01	0.02
Zinc (dissolved)	µg/L	-	1 100	<5	4	<2	<2	<2	2
Additional Parameters									
pH	-	-	-	7.98	7.90	7.86	7.85	7.75	7.83

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available.

Table 111: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-MW5A-22

PG-MW5A-22									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	-	-	-	-	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	-	-	-	-	2.1	2.2
Cobalt (dissolved)	µg/L	-	66	-	-	-	-	0.408	1.13
Copper (dissolved)	µg/L	1000	87	-	-	-	-	1.1	3.0
Lead (dissolved)	µg/L	10	25	-	-	-	-	1.12	3.17
Nickel (dissolved)	µg/L	-	490	-	-	-	-	1.3	2.7
Uranium (dissolved)	µg/L	20	420	-	-	-	-	0.399	0.624
Radium-226	Bq/L	0.49	-	-	-	-	-	<0.01	0.01
Thorium-230	Bq/L	0.65	-	-	-	-	-	<0.02	0.02
Thorium-232	Bq/L	0.6	-	-	-	-	-	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	-	-	-	-	151	189
Beryllium (dissolved)	µg/L	-	67	-	-	-	-	0.041	0.108
Boron (dissolved)	µg/L	5000	45 000	-	-	-	-	157	169
Cadmium (dissolved)	µg/L	5	2.7	-	-	-	-	0.009	0.021
Mercury (dissolved)	µg/L	1	0.29	-	-	-	-	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	-	-	-	-	0.97	1.40
Selenium (dissolved)	µg/L	10	63	-	-	-	-	<0.04	0.04
Silver (dissolved)	µg/L	-	1.5	-	-	-	-	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	-	-	-	-	1.44	3.44
Zinc (dissolved)	µg/L	-	1 100	-	-	-	-	5	8
Additional Parameters									
pH	-	-	-	-	-	-	-	8.07	8.12

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- - indicates data is not available; well was repaired in 2022.

Table 112: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-MW5B-22

PG-MW5B-22									
Parameter	**Unit of Measure**	**Criteria**		**Annual Average**					**Maximum**
		Table A2.3 [55]	**Table 3 [47]**	**2019**	**2020**	**2021**	**2022**	**2023**	**2023**
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	-	-	-	-	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	-	-	-	-	2.0	2.3
Cobalt (dissolved)	µg/L	-	66	-	-	-	-	0.052	0.062
Copper (dissolved)	µg/L	1000	87	-	-	-	-	0.4	0.8
Lead (dissolved)	µg/L	10	25	-	-	-	-	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	-	-	-	-	0.4	0.4
Uranium (dissolved)	µg/L	20	420	-	-	-	-	0.800	1.050
Radium-226	Bq/L	0.49	-	-	-	-	-	0.01	0.02
Thorium-230	Bq/L	0.65	-	-	-	-	-	<0.02	0.02
Thorium-232	Bq/L	0.6	-	-	-	-	-	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	-	-	-	-	267	303
Beryllium (dissolved)	µg/L	-	67	-	-	-	-	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	-	-	-	-	10	11
Cadmium (dissolved)	µg/L	5	2.7	-	-	-	-	<0.003	0.003
Mercury (dissolved)	µg/L	1	0.29	-	-	-	-	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	-	-	-	-	1.03	1.31
Selenium (dissolved)	µg/L	10	63	-	-	-	-	<0.04	0.04
Silver (dissolved)	µg/L	-	1.5	-	-	-	-	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	-	-	-	-	0.32	0.42
Zinc (dissolved)	µg/L	-	1 100	-	-	-	-	3	4
Additional Parameters									
pH	-	-	-	-	-	-	-	7.89	7.94

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates data is not available; well was repaired in 2022.

Table 113: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-MW5C-22

PG-MW5C-22									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	-	-	-	-	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	-	-	-	-	0.3	0.3
Cobalt (dissolved)	µg/L	-	66	-	-	-	-	0.025	0.039
Copper (dissolved)	µg/L	1000	87	-	-	-	-	0.7	0.9
Lead (dissolved)	µg/L	10	25	-	-	-	-	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	-	-	-	-	0.1	0.2
Uranium (dissolved)	µg/L	20	420	-	-	-	-	0.269	0.370
Radium-226	Bq/L	0.49	-	-	-	-	-	<0.02	0.02
Thorium-230	Bq/L	0.65	-	-	-	-	-	<0.02	0.02
Thorium-232	Bq/L	0.6	-	-	-	-	-	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	-	-	-	-	18	20
Beryllium (dissolved)	µg/L	-	67	-	-	-	-	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	-	-	-	-	13	15
Cadmium (dissolved)	µg/L	5	2.7	-	-	-	-	<0.003	0.003
Mercury (dissolved)	µg/L	1	0.29	-	-	-	-	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	-	-	-	-	1.01	1.13
Selenium (dissolved)	µg/L	10	63	-	-	-	-	0.48	0.55
Silver (dissolved)	µg/L	-	1.5	-	-	-	-	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	-	-	-	-	0.65	0.68
Zinc (dissolved)	µg/L	-	1 100	-	-	-	-	<2	2
Additional Parameters									
pH	-	-	-	-	-	-	-	7.64	7.78

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates data is not available; well was repaired in 2022.

Table 114: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-MW6A-22

PG-MW6A-22									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	-	-	-	-	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	-	-	-	-	3.4	8.3
Cobalt (dissolved)	µg/L	-	66	-	-	-	-	0.036	0.050
Copper (dissolved)	µg/L	1000	87	-	-	-	-	<0.2	0.2
Lead (dissolved)	µg/L	10	25	-	-	-	-	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	-	-	-	-	0.3	0.4
Uranium (dissolved)	µg/L	20	420	-	-	-	-	0.86	1.19
Radium-226	Bq/L	0.49	-	-	-	-	-	<0.01	0.01
Thorium-230	Bq/L	0.65	-	-	-	-	-	<0.02	0.02
Thorium-232	Bq/L	0.6	-	-	-	-	-	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	-	-	-	-	80	81
Beryllium (dissolved)	µg/L	-	67	-	-	-	-	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	-	-	-	-	6	6
Cadmium (dissolved)	µg/L	5	2.7	-	-	-	-	0.008	0.018
Mercury (dissolved)	µg/L	1	0.29	-	-	-	-	0.01	0.02
Molybdenum (dissolved)	µg/L	-	9 200	-	-	-	-	1.90	2.20
Selenium (dissolved)	µg/L	10	63	-	-	-	-	0.05	0.07
Silver (dissolved)	µg/L	-	1.5	-	-	-	-	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	-	-	-	-	0.72	0.82
Zinc (dissolved)	µg/L	-	1 100	-	-	-	-	2	2
Additional Parameters									
pH	-	-	-	-	-	-	-	7.72	7.92

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates data is not available; well was repaired in 2022.

Table 115: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-MW6C-22

PG-MW6C-22									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	-	-	-	-	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	-	-	-	-	2.1	3.2
Cobalt (dissolved)	µg/L	-	66	-	-	-	-	0.309	0.370
Copper (dissolved)	µg/L	1000	87	-	-	-	-	1.1	1.3
Lead (dissolved)	µg/L	10	25	-	-	-	-	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	-	-	-	-	0.9	1.0
Uranium (dissolved)	µg/L	20	420	-	-	-	-	**231**	**257**
Radium-226	Bq/L	0.49	-	-	-	-	-	0.02	0.03
Thorium-230	Bq/L	0.65	-	-	-	-	-	<0.02	0.02
Thorium-232	Bq/L	0.6	-	-	-	-	-	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	-	-	-	-	147	167
Beryllium (dissolved)	µg/L	-	67	-	-	-	-	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	-	-	-	-	66	74
Cadmium (dissolved)	µg/L	5	2.7	-	-	-	-	0.008	0.010
Mercury (dissolved)	µg/L	1	0.29	-	-	-	-	0.02	0.03
Molybdenum (dissolved)	µg/L	-	9 200	-	-	-	-	14.33	15.50
Selenium (dissolved)	µg/L	10	63	-	-	-	-	0.07	0.09
Silver (dissolved)	µg/L	-	1.5	-	-	-	-	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	-	-	-	-	0.50	0.53
Zinc (dissolved)	µg/L	-	1 100	-	-	-	-	<2	2
Additional Parameters									
pH	-	-	-	-	-	-	-	7.19	7.25

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates data is not available; well was repaired in 2022.

Table 116: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-MW7B-22

PG-MW7B-22									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	-	-	-	-	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	-	-	-	-	**1134**	**1580**
Cobalt (dissolved)	µg/L	-	66	-	-	-	-	1.93	2.07
Copper (dissolved)	µg/L	1000	87	-	-	-	-	1.8	2.6
Lead (dissolved)	µg/L	10	25	-	-	-	-	0.29	0.90
Nickel (dissolved)	µg/L	-	490	-	-	-	-	16.1	17.0
Uranium (dissolved)	µg/L	20	420	-	-	-	-	**129**	**131**
Radium-226	Bq/L	0.49	-	-	-	-	-	<0.01	0.01
Thorium-230	Bq/L	0.65	-	-	-	-	-	<0.02	0.02
Thorium-232	Bq/L	0.6	-	-	-	-	-	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	-	-	-	-	16.3	21.6
Beryllium (dissolved)	µg/L	-	67	-	-	-	-	0.023	0.070
Boron (dissolved)	µg/L	5000	45 000	-	-	-	-	16	27
Cadmium (dissolved)	µg/L	5	2.7	-	-	-	-	2.60	**3.38**
Mercury (dissolved)	µg/L	1	0.29	-	-	-	-	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	-	-	-	-	6735	6910
Selenium (dissolved)	µg/L	10	63	-	-	-	-	4.44	6.41
Silver (dissolved)	µg/L	-	1.5	-	-	-	-	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	-	-	-	-	0.17	0.22
Zinc (dissolved)	µg/L	-	1 100	-	-	-	-	8	20
Additional Parameters									
pH	-	-	-	-	-	-	-	7.47	7.59

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates data is not available; well installed in 2022.

Table 117: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-MW8A-22

PG-MW8A-22									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	-	-	-	-	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	-	-	-	-	0.8	1.2
Cobalt (dissolved)	µg/L	-	66	-	-	-	-	0.11	0.14
Copper (dissolved)	µg/L	1000	87	-	-	-	-	0.6	0.8
Lead (dissolved)	µg/L	10	25	-	-	-	-	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	-	-	-	-	0.6	0.9
Uranium (dissolved)	µg/L	20	420	-	-	-	-	5.91	9.39
Radium-226	Bq/L	0.49	-	-	-	-	-	<0.01	0.01
Thorium-230	Bq/L	0.65	-	-	-	-	-	<0.02	0.02
Thorium-232	Bq/L	0.6	-	-	-	-	-	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	-	-	-	-	65	71
Beryllium (dissolved)	µg/L	-	67	-	-	-	-	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	-	-	-	-	12	17
Cadmium (dissolved)	µg/L	5	2.7	-	-	-	-	0.003	0.004
Mercury (dissolved)	µg/L	1	0.29	-	-	-	-	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	-	-	-	-	4	7.22
Selenium (dissolved)	µg/L	10	63	-	-	-	-	0.18	0.47
Silver (dissolved)	µg/L	-	1.5	-	-	-	-	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	-	-	-	-	0.35	0.63
Zinc (dissolved)	µg/L	-	1 100	-	-	-	-	<2	2
Additional Parameters									
pH	-	-	-	-	-	-	-	7.89	7.89

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates data is not available; well installed in 2022.

Table 118: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-MW9A-22

PG-MW9A-22									
Parameter	**Unit of Measure**	**Criteria**		**Annual Average**					**Maximum**
		Table A2.3 [55]	**Table 3 [47]**	**2019**	**2020**	**2021**	**2022**	**2023**	**2023**
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	-	-	-	-	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	-	-	-	-	**34.6**	**78.8**
Cobalt (dissolved)	µg/L	-	66	-	-	-	-	0.15	0.17
Copper (dissolved)	µg/L	1000	87	-	-	-	-	0.4	0.8
Lead (dissolved)	µg/L	10	25	-	-	-	-	0.10	0.12
Nickel (dissolved)	µg/L	-	490	-	-	-	-	1.0	1.2
Uranium (dissolved)	µg/L	20	420	-	-	-	-	5.71	6.28
Radium-226	Bq/L	0.49	-	-	-	-	-	<0.01	0.01
Thorium-230	Bq/L	0.65	-	-	-	-	-	<0.02	0.02
Thorium-232	Bq/L	0.6	-	-	-	-	-	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	-	-	-	-	65	69
Beryllium (dissolved)	µg/L	-	67	-	-	-	-	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	-	-	-	-	16	20
Cadmium (dissolved)	µg/L	5	2.7	-	-	-	-	0.007	0.015
Mercury (dissolved)	µg/L	1	0.29	-	-	-	-	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	-	-	-	-	17.0	20.0
Selenium (dissolved)	µg/L	10	63	-	-	-	-	<0.04	0.04
Silver (dissolved)	µg/L	-	1.5	-	-	-	-	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	-	-	-	-	0.26	0.45
Zinc (dissolved)	µg/L	-	1 100	-	-	-	-	2	3
Additional Parameters									
pH	-	-	-	-	-	-	-	7.76	7.86

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates data is not available; well installed in 2022.

Table 119: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-MW10A-22

PG-MW10A-22									
Parameter	**Unit of Measure**	**Criteria**		**Annual Average**					**Maximum**
		Table A2.3 [55]	**Table 3 [47]**	**2019**	**2020**	**2021**	**2022**	**2023**	**2023**
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	-	-	-	-	3.65	0.90
Arsenic (dissolved)	µg/L	25	1900	-	-	-	-	**282**	**311**
Cobalt (dissolved)	µg/L	-	66	-	-	-	-	0.38	0.47
Copper (dissolved)	µg/L	1000	87	-	-	-	-	1.1	2.3
Lead (dissolved)	µg/L	10	25	-	-	-	-	0.09	0.10
Nickel (dissolved)	µg/L	-	490	-	-	-	-	2.9	3.4
Uranium (dissolved)	µg/L	20	420	-	-	-	-	**71.7**	**74.6**
Radium-226	Bq/L	0.49	-	-	-	-	-	0.02	0.03
Thorium-230	Bq/L	0.65	-	-	-	-	-	<0.02	0.02
Thorium-232	Bq/L	0.6	-	-	-	-	-	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	-	-	-	-	96	114
Beryllium (dissolved)	µg/L	-	67	-	-	-	-	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	-	-	-	-	33	35
Cadmium (dissolved)	µg/L	5	2.7	-	-	-	-	0.013	0.021
Mercury (dissolved)	µg/L	1	0.29	-	-	-	-	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	-	-	-	-	33.8	40.8
Selenium (dissolved)	µg/L	10	63	-	-	-	-	0.64	0.67
Silver (dissolved)	µg/L	-	1.5	-	-	-	-	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	-	-	-	-	8.99	10.60
Zinc (dissolved)	µg/L	-	1 100	-	-	-	-	2	3
Additional Parameters									
pH	-	-	-	-	-	-	-	7.75	7.83

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates data is not available; well installed in 2022.

Table 120: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-MW11A-22

PG-MW11A-22									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	-	-	-	-	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	-	-	-	-	1.2	1.8
Cobalt (dissolved)	µg/L	-	66	-	-	-	-	0.042	0.046
Copper (dissolved)	µg/L	1000	87	-	-	-	-	2.3	8.6
Lead (dissolved)	µg/L	10	25	-	-	-	-	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	-	-	-	-	0.5	0.9
Uranium (dissolved)	µg/L	20	420	-	-	-	-	0.5	0.5
Radium-226	Bq/L	0.49	-	-	-	-	-	<0.01	0.01
Thorium-230	Bq/L	0.65	-	-	-	-	-	<0.02	0.02
Thorium-232	Bq/L	0.6	-	-	-	-	-	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	-	-	-	-	34	41
Beryllium (dissolved)	µg/L	-	67	-	-	-	-	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	-	-	-	-	11	12
Cadmium (dissolved)	µg/L	5	2.7	-	-	-	-	0.003	0.003
Mercury (dissolved)	µg/L	1	0.29	-	-	-	-	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	-	-	-	-	2.8	3.7
Selenium (dissolved)	µg/L	10	63	-	-	-	-	0.08	0.19
Silver (dissolved)	µg/L	-	1.5	-	-	-	-	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	-	-	-	-	0.05	0.07
Zinc (dissolved)	µg/L	-	1 100	-	-	-	-	3	4
Additional Parameters									
pH	-	-	-	-	-	-	-	7.77	7.89

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates data is not available; well installed in 2022.

Table 121: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-MW11B-22

PG-MW11B-22									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	-	-	-	-	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	-	-	-	-	1.0	1.0
Cobalt (dissolved)	µg/L	-	66	-	-	-	-	0.05	0.10
Copper (dissolved)	µg/L	1000	87	-	-	-	-	1.2	2.7
Lead (dissolved)	µg/L	10	25	-	-	-	-	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	-	-	-	-	0.4	0.4
Uranium (dissolved)	µg/L	20	420	-	-	-	-	2.05	2.41
Radium-226	Bq/L	0.49	-	-	-	-	-	0.01	0.02
Thorium-230	Bq/L	0.65	-	-	-	-	-	<0.02	0.02
Thorium-232	Bq/L	0.6	-	-	-	-	-	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	-	-	-	-	98	100
Beryllium (dissolved)	µg/L	-	67	-	-	-	-	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	-	-	-	-	53	56
Cadmium (dissolved)	µg/L	5	2.7	-	-	-	-	0.003	0.003
Mercury (dissolved)	µg/L	1	0.29	-	-	-	-	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	-	-	-	-	6.94	8.01
Selenium (dissolved)	µg/L	10	63	-	-	-	-	0.11	0.12
Silver (dissolved)	µg/L	-	1.5	-	-	-	-	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	-	-	-	-	2.02	2.39
Zinc (dissolved)	µg/L	-	1 100	-	-	-	-	<2	2
Additional Parameters									
pH	-	-	-	-	-	-	-	-[1]	-[1]

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates data is not available; well installed in 2022; [1]insufficient volume of groundwater for sample collection.

Table 122: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-MW11C-22

PG-MW11C-22									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	-	-	-	-	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	-	-	-	-	0.4	0.5
Cobalt (dissolved)	µg/L	-	66	-	-	-	-	0.045	0.054
Copper (dissolved)	µg/L	1000	87	-	-	-	-	0.5	0.9
Lead (dissolved)	µg/L	10	25	-	-	-	-	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	-	-	-	-	0.4	0.4
Uranium (dissolved)	µg/L	20	420	-	-	-	-	2.02	2.42
Radium-226	Bq/L	0.49	-	-	-	-	-	<0.01	0.01
Thorium-230	Bq/L	0.65	-	-	-	-	-	<0.02	0.02
Thorium-232	Bq/L	0.6	-	-	-	-	-	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	-	-	-	-	56	62
Beryllium (dissolved)	µg/L	-	67	-	-	-	-	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	-	-	-	-	17	18
Cadmium (dissolved)	µg/L	5	2.7	-	-	-	-	0.009	0.011
Mercury (dissolved)	µg/L	1	0.29	-	-	-	-	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	-	-	-	-	25.0	26.9
Selenium (dissolved)	µg/L	10	63	-	-	-	-	0.71	1.51
Silver (dissolved)	µg/L	-	1.5	-	-	-	-	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	-	-	-	-	0.95	1.05
Zinc (dissolved)	µg/L	-	1 100	-	-	-	-	3	5
Additional Parameters									
pH	-	-	-	-	-	-	-	7.80	7.95

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates data is not available; well installed in 2022.

Table 123: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-MW12A-22

PG-MW12A-22									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	-	-	-	-	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	-	-	-	-	1.0	1.1
Cobalt (dissolved)	µg/L	-	66	-	-	-	-	0.031	0.064
Copper (dissolved)	µg/L	1000	87	-	-	-	-	0.6	0.9
Lead (dissolved)	µg/L	10	25	-	-	-	-	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	-	-	-	-	0.5	0.7
Uranium (dissolved)	µg/L	20	420	-	-	-	-	0.407	0.602
Radium-226	Bq/L	0.49	-	-	-	-	-	<0.01	0.01
Thorium-230	Bq/L	0.65	-	-	-	-	-	<0.02	0.02
Thorium-232	Bq/L	0.6	-	-	-	-	-	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	-	-	-	-	69	71
Beryllium (dissolved)	µg/L	-	67	-	-	-	-	0.010	0.018
Boron (dissolved)	µg/L	5000	45 000	-	-	-	-	40	49
Cadmium (dissolved)	µg/L	5	2.7	-	-	-	-	0.016	0.056
Mercury (dissolved)	µg/L	1	0.29	-	-	-	-	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	-	-	-	-	2.2	4.9
Selenium (dissolved)	µg/L	10	63	-	-	-	-	0.19	0.63
Silver (dissolved)	µg/L	-	1.5	-	-	-	-	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	-	-	-	-	1.55	3.47
Zinc (dissolved)	µg/L	-	1 100	-	-	-	-	<2	2
Additional Parameters									
pH	-	-	-	-	-	-	-	8.23	8.33

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates data is not available; well installed in 2022.

Table 124: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-MW12B-22

PG-MW12B-22									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	-	-	-	-	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	-	-	-	-	0.5	0.7
Cobalt (dissolved)	µg/L	-	66	-	-	-	-	0.138	0.396
Copper (dissolved)	µg/L	1000	87	-	-	-	-	1.7	3.4
Lead (dissolved)	µg/L	10	25	-	-	-	-	0.29	0.69
Nickel (dissolved)	µg/L	-	490	-	-	-	-	0.4	0.9
Uranium (dissolved)	µg/L	20	420	-	-	-	-	0.111	0.155
Radium-226	Bq/L	0.49	-	-	-	-	-	<0.01	0.01
Thorium-230	Bq/L	0.65	-	-	-	-	-	<0.02	0.02
Thorium-232	Bq/L	0.6	-	-	-	-	-	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	-	-	-	-	48	52
Beryllium (dissolved)	µg/L	-	67	-	-	-	-	0.015	0.031
Boron (dissolved)	µg/L	5000	45 000	-	-	-	-	61	71
Cadmium (dissolved)	µg/L	5	2.7	-	-	-	-	0.012	0.018
Mercury (dissolved)	µg/L	1	0.29	-	-	-	-	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	-	-	-	-	21.3	28.1
Selenium (dissolved)	µg/L	10	63	-	-	-	-	<0.04	0.04
Silver (dissolved)	µg/L	-	1.5	-	-	-	-	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	-	-	-	-	0.51	1.22
Zinc (dissolved)	µg/L	-	1 100	-	-	-	-	4	7
Additional Parameters									
pH	-	-	-	-	-	-	-	8.16	8.21

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates data is not available; well installed in 2022.

Table 125: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-MW12C-22

PG-MW12C-22									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	-	-	-	-	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	-	-	-	-	1.0	1.1
Cobalt (dissolved)	µg/L	-	66	-	-	-	-	0.161	0.202
Copper (dissolved)	µg/L	1000	87	-	-	-	-	0.4	0.9
Lead (dissolved)	µg/L	10	25	-	-	-	-	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	-	-	-	-	0.4	0.6
Uranium (dissolved)	µg/L	20	420	-	-	-	-	0.512	0.570
Radium-226	Bq/L	0.49	-	-	-	-	-	<0.01	0.01
Thorium-230	Bq/L	0.65	-	-	-	-	-	<0.02	0.02
Thorium-232	Bq/L	0.6	-	-	-	-	-	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	-	-	-	-	100	117
Beryllium (dissolved)	µg/L	-	67	-	-	-	-	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	-	-	-	-	14	16
Cadmium (dissolved)	µg/L	5	2.7	-	-	-	-	0.003	0.003
Mercury (dissolved)	µg/L	1	0.29	-	-	-	-	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	-	-	-	-	1.7	2.3
Selenium (dissolved)	µg/L	10	63	-	-	-	-	<0.04	0.04
Silver (dissolved)	µg/L	-	1.5	-	-	-	-	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	-	-	-	-	0.65	0.77
Zinc (dissolved)	µg/L	-	1 100	-	-	-	-	<2	2
Additional Parameters									
pH	-	-	-	-	-	-	-	7.78	7.81

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates data is not available; well installed in 2022.

Table 126: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-MW13A-22

PG-MW13A-22									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	-	-	-	-	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	-	-	-	-	3.3	3.7
Cobalt (dissolved)	µg/L	-	66	-	-	-	-	0.018	0.022
Copper (dissolved)	µg/L	1000	87	-	-	-	-	<0.2	0.2
Lead (dissolved)	µg/L	10	25	-	-	-	-	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	-	-	-	-	0.3	0.6
Uranium (dissolved)	µg/L	20	420	-	-	-	-	0.130	0.179
Radium-226	Bq/L	0.49	-	-	-	-	-	<0.01	0.01
Thorium-230	Bq/L	0.65	-	-	-	-	-	<0.02	0.02
Thorium-232	Bq/L	0.6	-	-	-	-	-	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	-	-	-	-	152	157
Beryllium (dissolved)	µg/L	-	67	-	-	-	-	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	-	-	-	-	10	10
Cadmium (dissolved)	µg/L	5	2.7	-	-	-	-	<0.003	0.003
Mercury (dissolved)	µg/L	1	0.29	-	-	-	-	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	-	-	-	-	1.0	1.2
Selenium (dissolved)	µg/L	10	63	-	-	-	-	0.05	0.09
Silver (dissolved)	µg/L	-	1.5	-	-	-	-	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	-	-	-	-	0.07	0.11
Zinc (dissolved)	µg/L	-	1 100	-	-	-	-	<2	2
Additional Parameters									
pH	-	-	-	-	-	-	-	7.90	7.94

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates data is not available; well installed in 2022.

Table 127: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-MW13B-22

PG-MW13B-22									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	-	-	-	-	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	-	-	-	-	0.2	0.2
Cobalt (dissolved)	µg/L	-	66	-	-	-	-	0.024	0.029
Copper (dissolved)	µg/L	1000	87	-	-	-	-	0.3	0.4
Lead (dissolved)	µg/L	10	25	-	-	-	-	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	-	-	-	-	0.2	0.2
Uranium (dissolved)	µg/L	20	420	-	-	-	-	1.065	1.100
Radium-226	Bq/L	0.49	-	-	-	-	-	<0.01	0.01
Thorium-230	Bq/L	0.65	-	-	-	-	-	<0.02	0.02
Thorium-232	Bq/L	0.6	-	-	-	-	-	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	-	-	-	-	57	61
Beryllium (dissolved)	µg/L	-	67	-	-	-	-	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	-	-	-	-	8	9
Cadmium (dissolved)	µg/L	5	2.7	-	-	-	-	<0.003	0.003
Mercury (dissolved)	µg/L	1	0.29	-	-	-	-	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	-	-	-	-	0.4	0.8
Selenium (dissolved)	µg/L	10	63	-	-	-	-	0.37	0.49
Silver (dissolved)	µg/L	-	1.5	-	-	-	-	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	-	-	-	-	1.18	1.29
Zinc (dissolved)	µg/L	-	1 100	-	-	-	-	<2	2
Additional Parameters									
pH	-	-	-	-	-	-	-	7.68	7.74

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates data is not available; well installed in 2022.

Table 128: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-MW13C-22

PG-MW13C-22									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	-	-	-	-	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	-	-	-	-	0.2	0.2
Cobalt (dissolved)	µg/L	-	66	-	-	-	-	0.732	1.350
Copper (dissolved)	µg/L	1000	87	-	-	-	-	0.5	0.8
Lead (dissolved)	µg/L	10	25	-	-	-	-	0.16	0.31
Nickel (dissolved)	µg/L	-	490	-	-	-	-	0.7	1.5
Uranium (dissolved)	µg/L	20	420	-	-	-	-	0.704	0.870
Radium-226	Bq/L	0.49	-	-	-	-	-	<0.01	0.01
Thorium-230	Bq/L	0.65	-	-	-	-	-	<0.02	0.02
Thorium-232	Bq/L	0.6	-	-	-	-	-	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	-	-	-	-	59	64
Beryllium (dissolved)	µg/L	-	67	-	-	-	-	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	-	-	-	-	11	12
Cadmium (dissolved)	µg/L	5	2.7	-	-	-	-	0.005	0.010
Mercury (dissolved)	µg/L	1	0.29	-	-	-	-	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	-	-	-	-	1.3	2.9
Selenium (dissolved)	µg/L	10	63	-	-	-	-	0.16	0.26
Silver (dissolved)	µg/L	-	1.5	-	-	-	-	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	-	-	-	-	0.71	0.80
Zinc (dissolved)	µg/L	-	1 100	-	-	-	-	9	23
Additional Parameters									
pH	-	-	-	-	-	-	-	7.59	7.68

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- - indicates data is not available; well installed in 2022.

Table 129: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-MW15A-22

PG-MW15A-22									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	-	-	-	-	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	-	-	-	-	1.6	1.7
Cobalt (dissolved)	µg/L	-	66	-	-	-	-	0.175	0.185
Copper (dissolved)	µg/L	1000	87	-	-	-	-	0.3	0.4
Lead (dissolved)	µg/L	10	25	-	-	-	-	0.10	0.11
Nickel (dissolved)	µg/L	-	490	-	-	-	-	0.5	0.5
Uranium (dissolved)	µg/L	20	420	-	-	-	-	1.662	2.173
Radium-226	Bq/L	0.49	-	-	-	-	-	<0.01	0.01
Thorium-230	Bq/L	0.65	-	-	-	-	-	<0.02	0.02
Thorium-232	Bq/L	0.6	-	-	-	-	-	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	-	-	-	-	88	100
Beryllium (dissolved)	µg/L	-	67	-	-	-	-	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	-	-	-	-	12	12
Cadmium (dissolved)	µg/L	5	2.7	-	-	-	-	0.004	0.005
Mercury (dissolved)	µg/L	1	0.29	-	-	-	-	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	-	-	-	-	6.4	8.8
Selenium (dissolved)	µg/L	10	63	-	-	-	-	0.07	0.10
Silver (dissolved)	µg/L	-	1.5	-	-	-	-	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	-	-	-	-	1.94	2.20
Zinc (dissolved)	µg/L	-	1 100	-	-	-	-	<2	2
Additional Parameters									
pH	-	-	-	-	-	-	-	7.86	7.90

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates data is not available; well installed in 2022.

Table 130: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-MW15B-22

PG-MW15B-22									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	-	-	-	-	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	-	-	-	-	0.5	1.0
Cobalt (dissolved)	µg/L	-	66	-	-	-	-	0.087	0.142
Copper (dissolved)	µg/L	1000	87	-	-	-	-	0.9	1.3
Lead (dissolved)	µg/L	10	25	-	-	-	-	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	-	-	-	-	0.5	0.8
Uranium (dissolved)	µg/L	20	420	-	-	-	-	3.090	7.340
Radium-226	Bq/L	0.49	-	-	-	-	-	<0.01	0.01
Thorium-230	Bq/L	0.65	-	-	-	-	-	<0.02	0.02
Thorium-232	Bq/L	0.6	-	-	-	-	-	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	-	-	-	-	75	77
Beryllium (dissolved)	µg/L	-	67	-	-	-	-	0.008	0.009
Boron (dissolved)	µg/L	5000	45 000	-	-	-	-	9	14
Cadmium (dissolved)	µg/L	5	2.7	-	-	-	-	0.005	0.007
Mercury (dissolved)	µg/L	1	0.29	-	-	-	-	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	-	-	-	-	2.0	7.1
Selenium (dissolved)	µg/L	10	63	-	-	-	-	0.38	0.70
Silver (dissolved)	µg/L	-	1.5	-	-	-	-	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	-	-	-	-	0.52	0.73
Zinc (dissolved)	µg/L	-	1 100	-	-	-	-	2	2
Additional Parameters									
pH	-	-	-	-	-	-	-	7.78	7.84

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates data is not available; well installed in 2022.

Table 131: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-MW15C-22

PG-MW15C-22									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	-	-	-	-	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	-	-	-	-	3.9	7.5
Cobalt (dissolved)	µg/L	-	66	-	-	-	-	1.004	3.880
Copper (dissolved)	µg/L	1000	87	-	-	-	-	2.9	10.0
Lead (dissolved)	µg/L	10	25	-	-	-	-	1.26	4.78
Nickel (dissolved)	µg/L	-	490	-	-	-	-	2.2	8.2
Uranium (dissolved)	µg/L	20	420	-	-	-	-	0.867	1.500
Radium-226	Bq/L	0.49	-	-	-	-	-	<0.01	0.01
Thorium-230	Bq/L	0.65	-	-	-	-	-	<0.02	0.02
Thorium-232	Bq/L	0.6	-	-	-	-	-	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	-	-	-	-	174	281
Beryllium (dissolved)	µg/L	-	67	-	-	-	-	0.093	0.349
Boron (dissolved)	µg/L	5000	45 000	-	-	-	-	26	30
Cadmium (dissolved)	µg/L	5	2.7	-	-	-	-	0.016	0.056
Mercury (dissolved)	µg/L	1	0.29	-	-	-	-	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	-	-	-	-	2.5	4.0
Selenium (dissolved)	µg/L	10	63	-	-	-	-	0.05	0.09
Silver (dissolved)	µg/L	-	1.5	-	-	-	-	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	-	-	-	-	5.18	20.20
Zinc (dissolved)	µg/L	-	1 100	-	-	-	-	8	25
Additional Parameters									
pH	-	-	-	-	-	-	-	8.04	8.12

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates data is not available; well installed in 2022.

Table 132: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-MW15D-22

PG-MW15D-22									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	-	-	-	-	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	-	-	-	-	**394**	**651**
Cobalt (dissolved)	µg/L	-	66	-	-	-	-	5.573	6.900
Copper (dissolved)	µg/L	1000	87	-	-	-	-	2.2	4.1
Lead (dissolved)	µg/L	10	25	-	-	-	-	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	-	-	-	-	66.6	93.2
Uranium (dissolved)	µg/L	20	420	-	-	-	-	1.131	1.350
Radium-226	Bq/L	0.49	-	-	-	-	-	0.01	0.02
Thorium-230	Bq/L	0.65	-	-	-	-	-	<0.02	0.02
Thorium-232	Bq/L	0.6	-	-	-	-	-	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	-	-	-	-	162	215
Beryllium (dissolved)	µg/L	-	67	-	-	-	-	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	-	-	-	-	16	41
Cadmium (dissolved)	µg/L	5	2.7	-	-	-	-	0.025	0.026
Mercury (dissolved)	µg/L	1	0.29	-	-	-	-	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	-	-	-	-	0.4	0.75
Selenium (dissolved)	µg/L	10	63	-	-	-	-	1.07	1.39
Silver (dissolved)	µg/L	-	1.5	-	-	-	-	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	-	-	-	-	0.41	0.49
Zinc (dissolved)	µg/L	-	1 100	-	-	-	-	6	16
Additional Parameters									
pH	-	-	-	-	-	-	-	7.35	7.51

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- - indicates data is not available; well installed in 2022.

Table 133: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-OW4-22

PG-OW4-22									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.3 [55]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	-	-	-	-	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	-	-	-	-	<0.2	0.2
Cobalt (dissolved)	µg/L	-	66	-	-	-	-	0.055	0.080
Copper (dissolved)	µg/L	1000	87	-	-	-	-	1.8	1.9
Lead (dissolved)	µg/L	10	25	-	-	-	-	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	-	-	-	-	1.2	3.7
Uranium (dissolved)	µg/L	20	420	-	-	-	-	3.393	4.450
Radium-226	Bq/L	0.49	-	-	-	-	-	0.01	0.02
Thorium-230	Bq/L	0.65	-	-	-	-	-	<0.02	0.02
Thorium-232	Bq/L	0.6	-	-	-	-	-	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	-	-	-	-	153	165
Beryllium (dissolved)	µg/L	-	67	-	-	-	-	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	-	-	-	-	44	47
Cadmium (dissolved)	µg/L	5	2.7	-	-	-	-	<0.003	0.003
Mercury (dissolved)	µg/L	1	0.29	-	-	-	-	0.04	0.13
Molybdenum (dissolved)	µg/L	-	9 200	-	-	-	-	1.2	1.5
Selenium (dissolved)	µg/L	10	63	-	-	-	-	0.88	0.90
Silver (dissolved)	µg/L	-	1.5	-	-	-	-	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	-	-	-	-	0.56	0.66
Zinc (dissolved)	µg/L	-	1 100	-	-	-	-	<2	2
Additional Parameters									
pH	-	-	-	-	-	-	-	7.51	7.66

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates data is not available; well installed in 2022.

Table 134: Port Granby Long-Term Waste Management Facility Groundwater Monitoring Well - PG-OW41-22

PG-OW41-22									
Parameter	**Unit of Measure**	**Criteria**		**Annual Average**					**Maximum**
		Table A2.3 [55]	**Table 3 [47]**	**2019**	**2020**	**2021**	**2022**	**2023**	**2023**
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	-	-	-	-	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	-	-	-	-	<0.2	0.2
Cobalt (dissolved)	µg/L	-	66	-	-	-	-	0.014	0.025
Copper (dissolved)	µg/L	1000	87	-	-	-	-	0.3	0.4
Lead (dissolved)	µg/L	10	25	-	-	-	-	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	-	-	-	-	<0.1	0.1
Uranium (dissolved)	µg/L	20	420	-	-	-	-	0.322	0.492
Radium-226	Bq/L	0.49	-	-	-	-	-	<0.01	0.01
Thorium-230	Bq/L	0.65	-	-	-	-	-	<0.02	0.02
Thorium-232	Bq/L	0.6	-	-	-	-	-	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	-	-	-	-	20	23
Beryllium (dissolved)	µg/L	-	67	-	-	-	-	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	-	-	-	-	13	14
Cadmium (dissolved)	µg/L	5	2.7	-	-	-	-	<0.003	0.003
Mercury (dissolved)	µg/L	1	0.29	-	-	-	-	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	-	-	-	-	0.3	0.5
Selenium (dissolved)	µg/L	10	63	-	-	-	-	0.38	0.48
Silver (dissolved)	µg/L	-	1.5	-	-	-	-	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	-	-	-	-	0.55	0.63
Zinc (dissolved)	µg/L	-	1 100	-	-	-	-	<2	2
Additional Parameters									
pH	-	-	-	-	-	-	-	7.87	8.10

Note:

- Annual averages are based on quarterly (4) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- - indicates data is not available; well installed in 2022.

Table 135: Port Hope Long-Term Waste Management Facility Groundwater Well WC-IW93-22

WC-IW93-22									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.5 [46]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	1.3	1.6	1.5	1.6	1.7	1.7
Cobalt (dissolved)	µg/L	-	66	<0.50	0.01	0.02	0.01	0.011	0.014
Copper (dissolved)	µg/L	1000	87	<1.0	<0.2	0.3	<0.2	<0.2	0.2
Lead (dissolved)	µg/L	10	25	<0.50	0.01	<0.09	<0.09	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	<1.0	<0.1	<0.1	<0.1	<0.1	0.1
Uranium (dissolved)	µg/L	20	420	<0.10	0.03	0.04	0.01	0.032	0.039
Radium-226	Bq/L	0.49	-	<0.04	0.01	<0.01	<0.01	<0.01	0.01
Thorium-230	Bq/L	0.65	-	<0.07	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.60	-	<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	54	57	58	59	60.0	60.8
Beryllium (dissolved)	µg/L	-	67	<0.50	<0.01	<0.01	<0.01	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	73	70	64	79	81	87
Cadmium (dissolved)	µg/L	5	2.7	<0.10	<0.003	<0.003	<0.003	<0.003	0.003
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	<0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	1.9	1.8	1.9	1.8	1.83	1.87
Selenium (dissolved)	µg/L	10	63	<2.0	<0.04	<0.04	<0.04	<0.04	0.04
Silver (dissolved)	µg/L	-	1.5	<0.10	<0.05	<0.05	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	<0.50	0.01	0.03	0.01	0.01	0.01
Zinc (dissolved)	µg/L	-	1 100	<5	<2	<2	<2	<2	2
Additional Parameters									
pH	-	-	-	8.23	8.30	8.35	8.21	8.16	8.23

Note:

- Annual averages are based on semi-annual (2) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available.

Table 136: Port Hope Long-Term Waste Management Facility Groundwater Well WC-LTWMF-MW-06

WC-LTWMF-MW-06									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.5 [46]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	1.9	1.3	1.5	1.8	1.7	2.1
Cobalt (dissolved)	µg/L	-	66	<0.50	0.01	0.01	0.02	0.010	0.018
Copper (dissolved)	µg/L	1000	87	<1.0	0.5	0.3	0.4	0.5	0.7
Lead (dissolved)	µg/L	10	25	<0.50	0.03	<0.90	<0.90	<0.90	0.90
Nickel (dissolved)	µg/L	-	490	<1.0	0.2	0.1	0.1	0.09	0.09
Uranium (dissolved)	µg/L	20	420	0.79	0.33	0.94	0.86	1.06	1.34
Radium-226	Bq/L	0.49	-	<0.04	<0.01	<0.01	<0.01	<0.01	0.01
Thorium-230	Bq/L	0.65	-	<0.07	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.60	-	<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	59	35	73	79	75	83.3
Beryllium (dissolved)	µg/L	-	67	<0.50	<0.01	<0.01	<0.01	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	155	94	138	164	155	163
Cadmium (dissolved)	µg/L	5	2.7	<0.10	0.02	0.004	0.003	0.005	0.006
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	<0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	8.8	3.2	8.3	8.7	7.9	8.4
Selenium (dissolved)	µg/L	10	63	<2.0	0.1	<0.1	0.1	0.06	0.07
Silver (dissolved)	µg/L	-	1.5	<0.10	<0.05	<0.05	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	1.5	0.6	1.3	1.2	1.24	1.33
Zinc (dissolved)	µg/L	-	1 100	<5	23	<2	<2	<2	2
Additional Parameters									
pH	-	-	-	8.25	7.96	8.21	8.16	8.14	8.14

Note:

- Annual averages are based on semi-annual (2) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available.
- WC-LTWMF-MW-06 was installed in 2017 to replace damaged well WC-OW9-75.

Table 137: Port Hope Long-Term Waste Management Facility Groundwater Well WC-MW1-02

WC-MW1-02									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.5 [46]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	-	-	-	-	**<9.00**	4.96
Arsenic (dissolved)	µg/L	25	1900	-	-	-	-	1.2	2.0
Cobalt (dissolved)	µg/L	-	66	-	-	-	-	0.110	0.130
Copper (dissolved)	µg/L	1000	87	-	-	-	-	1.2	2.0
Lead (dissolved)	µg/L	10	25	-	-	-	-	0.50	0.90
Nickel (dissolved)	µg/L	-	490	-	-	-	-	0.6	1.0
Uranium (dissolved)	µg/L	20	420	-	-	-	-	0.270	0.370
Radium-226	Bq/L	0.49	-	-	-	-	-	<0.01	0.01
Thorium-230	Bq/L	0.65	-	-	-	-	-	<0.02	0.02
Thorium-232	Bq/L	0.60	-	-	-	-	-	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	-	-	-	-	58	60
Beryllium (dissolved)	µg/L	-	67	-	-	-	-	0.039	0.070
Boron (dissolved)	µg/L	5000	45 000	-	-	-	-	246	262
Cadmium (dissolved)	µg/L	5	2.7	-	-	-	-	0.017	0.030
Mercury (dissolved)	µg/L	1	0.29	-	-	-	-	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	-	-	-	-	1.9	1.9
Selenium (dissolved)	µg/L	10	63	-	-	-	-	0.22	0.40
Silver (dissolved)	µg/L	-	1.5	-	-	-	-	0.28	0.50
Vanadium (dissolved)	µg/L	-	250	-	-	-	-	0.21	0.21
Zinc (dissolved)	µg/L	-	1 100	-	-	-	-	11	20
Additional Parameters									
pH	-	-	-	-	-	-	-	8.04	8.08

Note:

- Annual averages are based on semi-annual (2) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available.
- No monitoring data from 2019-2022 due to well damage. Well repaired in 2023.

Table 138: Port Hope Long-Term Waste Management Facility Groundwater Well WC-MW1-03

WC-MW1-03									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.5 [46]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	1.2	0.9	1.0	1.1	2.4	3.7
Cobalt (dissolved)	µg/L	-	66	<0.50	0.15	0.43	1.66	1.212	1.734
Copper (dissolved)	µg/L	1000	87	<1.0	0.4	0.4	0.2	<0.2	0.2
Lead (dissolved)	µg/L	10	25	<0.50	0.02	<0.09	<0.09	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	<1.0	0.6	1.1	5.0	2.0	3.1
Uranium (dissolved)	µg/L	20	420	4.9	5.6	5.1	5.8	5.08	5.38
Radium-226	Bq/L	0.49	-	<0.04	0.01	<0.01	<0.01	<0.01	0.01
Thorium-230	Bq/L	0.65	-	<0.07	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.60	-	<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	160	140	166	182	186	218
Beryllium (dissolved)	µg/L	-	67	<0.50	<0.01	<0.01	<0.01	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	29	24	25	25	28	32
Cadmium (dissolved)	µg/L	5	2.7	<0.10	0.005	<0.003	0.005	0.003	0.003
Mercury (dissolved)	µg/L	1	0.29	<0.10	0.01	<0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	3.7	10.0	3.2	4.0	3.15	3.40
Selenium (dissolved)	µg/L	10	63	<2.0	0.045	0.070	<0.040	0.100	0.150
Silver (dissolved)	µg/L	-	1.5	<0.10	<0.05	<0.05	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	1.0	1.2	0.2	0.2	0.23	0.24
Zinc (dissolved)	µg/L	-	1 100	<5	3	2	<2	<2	2
Additional Parameters									
pH	-	-	-	7.70	7.52	7.24	7.34	7.56	7.56

Note:

- Annual averages are based on semi-annual (2) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available.

Table 139: Port Hope Long-Term Waste Management Facility Groundwater Well WC-MW3A-11R

WC-MW3A-11R									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.5 [46]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	4.95	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	<1.0	1.4	<0.2	1.5	<0.2	0.2
Cobalt (dissolved)	µg/L	-	66	<0.50	0.04	0.07	0.11	0.12	0.129
Copper (dissolved)	µg/L	1000	87	<1.0	1.1	<0.2	0.3	0.2	0.2
Lead (dissolved)	µg/L	10	25	<0.50	0.06	<0.09	<0.09	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	<1.0	0.6	0.2	1.0	0.25	0.30
Uranium (dissolved)	µg/L	20	420	<0.1	0.017	0.010	0.007	0.004	0.005
Radium-226	Bq/L	0.49	-	0.07	0.02	0.07	0.07	0.05	0.06
Thorium-230	Bq/L	0.65	-	<0.07	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.60	-	<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	**2650**	**3060**	**3180**	**4415**	**3165**	**3870**
Beryllium (dissolved)	µg/L	-	67	<0.50	0.04	<0.01	<0.01	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	455	453	434	422	382	427
Cadmium (dissolved)	µg/L	5	2.7	<0.10	0.02	<0.003	0.006	<0.003	0.003
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	<0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	<0.5	0.5	0.2	0.2	0.11	0.18
Selenium (dissolved)	µg/L	10	63	<2.0	0.2	0.1	0.1	0.08	0.11
Silver (dissolved)	µg/L	-	1.5	<0.10	0.28	<0.05	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	<0.5	0.2	0.2	0.2	0.21	0.21
Zinc (dissolved)	µg/L	-	1 100	<5	11	4	3	2	2
Additional Parameters									
pH	-	-	-	7.65	7.64	7.45	7.48	7.48	7.63

Note:

- Annual averages are based on semi-annual (2) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available.

Table 140: Port Hope Long-Term Waste Management Facility Groundwater Well WC-MW3B-02

WC-MW3B-02									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.5 [46]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	1.6	1.1	<0.90	0.90	1.1	1.2
Arsenic (dissolved)	µg/L	25	1900	1.4	1.4	1.2	2.3	1.4	1.8
Cobalt (dissolved)	µg/L	-	66	<0.50	0.04	0.11	1.44	0.217	0.236
Copper (dissolved)	µg/L	1000	87	3.6	0.4	0.2	3.4	2.4	4.0
Lead (dissolved)	µg/L	10	25	<0.50	0.02	0.13	1.67	0.19	0.28
Nickel (dissolved)	µg/L	-	490	1.1	0.2	0.2	2.4	0.4	0.5
Uranium (dissolved)	µg/L	20	420	0.71	0.31	0.32	1.5	0.590	0.683
Radium-226	Bq/L	0.49	-	<0.04	<0.01	0.01	0.01	0.01	0.01
Thorium-230	Bq/L	0.65	-	<0.07	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.60	-	<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	34	30	30	317	39	44
Beryllium (dissolved)	µg/L	-	67	<0.50	<0.01	0.01	0.07	0.012	0.016
Boron (dissolved)	µg/L	5000	45 000	110	100	91	129	95	96
Cadmium (dissolved)	µg/L	5	2.7	<0.10	0.01	0.01	0.07	0.004	0.005
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	<0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	13	6	7	9.3	8.33	8.75
Selenium (dissolved)	µg/L	10	63	<2.0	<0.04	<0.04	0.05	<0.04	0.04
Silver (dissolved)	µg/L	-	1.5	<0.10	<0.05	<0.05	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	1.5	0.2	0.5	4.9	1.64	1.78
Zinc (dissolved)	µg/L	-	1 100	5	3	<2	65	3	3
Additional Parameters									
pH	-	-	-	8.29	8.36	8.33	8.46	8.36	837

Note:

- Annual averages are based on semi-annual (2) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available.

Table 141: Port Hope Long-Term Waste Management Facility Groundwater Well WC-MW3C-02

WC-MW3C-02									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.5 [46]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	0.55	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	3.0	4.3	2.9	5.2	6.9	7.0
Cobalt (dissolved)	µg/L	-	66	<0.50	0.07	0.15	0.47	0.388	0.484
Copper (dissolved)	µg/L	1000	87	<1.0	0.3	0.9	1.6	<0.2	0.2
Lead (dissolved)	µg/L	10	25	<0.50	<0.01	<0.09	0.76	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	<1.0	0.2	0.7	1.8	1.3	1.6
Uranium (dissolved)	µg/L	20	420	1.67	2.16	2.55	2.9	1.62	1.67
Radium-226	Bq/L	0.49	-	<0.040	0.025	0.010	0.02	<0.01	0.01
Thorium-230	Bq/L	0.65	-	<0.070	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.60	-	<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	95	116	179	358	178	194
Beryllium (dissolved)	µg/L	-	67	<0.50	0.07	0.15	0.47	0.388	0.484
Boron (dissolved)	µg/L	5000	45 000	38	44	40	58	46	50
Cadmium (dissolved)	µg/L	5	2.7	<0.10	<0.003	0.005	0.031	<0.003	0.003
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	<0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	11.6	6.7	3.9	2.5	1.97	2.04
Selenium (dissolved)	µg/L	10	63	<2.0	0.06	0.05	0.07	0.06	0.06
Silver (dissolved)	µg/L	-	1.5	<0.10	<0.05	<0.05	<0.05	<0.05	<0.05
Vanadium (dissolved)	µg/L	-	250	1.7	1.0	1.4	1.9	0.17	0.23
Zinc (dissolved)	µg/L	-	1 100	<5	3	<2	55	3	4
Additional Parameters									
pH	-	-	-	8.21	7.95	7.93	7.33	7.27	7.36

Note:

- Annual averages are based on semi-annual (2) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available.

Table 142: Port Hope Long-Term Waste Management Facility Groundwater Well WC-MW3C-02

WC-MW3C-02									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.5 [46]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	0.55	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	3.0	4.3	2.9	5.2	6.9	7.0
Cobalt (dissolved)	µg/L	-	66	<0.50	0.07	0.15	0.47	0.388	0.484
Copper (dissolved)	µg/L	1000	87	<1.0	0.3	0.9	1.6	<0.2	0.2
Lead (dissolved)	µg/L	10	25	<0.50	<0.01	<0.09	0.76	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	<1.0	0.2	0.7	1.8	1.3	1.6
Uranium (dissolved)	µg/L	20	420	1.67	2.16	2.55	2.9	1.62	1.67
Radium-226	Bq/L	0.49	-	<0.040	0.025	0.010	0.02	<0.01	0.01
Thorium-230	Bq/L	0.65	-	<0.070	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.60	-	<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	95	116	179	358	178	194
Beryllium (dissolved)	µg/L	-	67	<0.50	0.07	0.15	0.47	0.388	0.484
Boron (dissolved)	µg/L	5000	45 000	38	44	40	58	46	50
Cadmium (dissolved)	µg/L	5	2.7	<0.10	<0.003	0.005	0.031	<0.003	0.003
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	<0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	11.6	6.7	3.9	2.5	1.97	2.04
Selenium (dissolved)	µg/L	10	63	<2.0	0.06	0.05	0.07	0.06	0.06
Silver (dissolved)	µg/L	-	1.5	<0.10	<0.05	<0.05	<0.05	<0.05	<0.05
Vanadium (dissolved)	µg/L	-	250	1.7	1.0	1.4	1.9	0.17	0.23
Zinc (dissolved)	µg/L	-	1 100	<5	3	<2	55	3	4
Additional Parameters									
pH	-	-	-	8.21	7.95	7.93	7.33	7.27	7.36

Note:

- Annual averages are based on semi-annual (2) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- - indicates no data is available.

Table 143: Port Hope Long-Term Waste Management Facility Groundwater Well WC-MW4A-02

WC-MW4A-02									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.5 [46]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	6.1	5.5	5.2	5.3	5.2	5.7
Cobalt (dissolved)	µg/L	-	66	<0.50	0.03	0.03	0.06	0.021	0.022
Copper (dissolved)	µg/L	1000	87	<1.0	<0.2	<0.2	<0.2	<0.2	0.2
Lead (dissolved)	µg/L	10	25	<0.50	0.03	<0.09	0.16	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	1.1	0.1	<0.1	0.3	0.1	0.1
Uranium (dissolved)	µg/L	20	420	2.7	0.8	0.5	0.4	0.331	0.376
Radium-226	Bq/L	0.49	-	<0.04	0.01	<0.01	0.02	0.02	0.02
Thorium-230	Bq/L	0.65	-	<0.07	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.60	-	<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	88	97	99	207	103	104
Beryllium (dissolved)	µg/L	-	67	<0.50	<0.01	<0.01	<0.01	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	18	20	20	35	22	25
Cadmium (dissolved)	µg/L	5	2.7	<0.10	0.005	<0.003	0.033	<0.003	0.003
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.05	<0.05	0.06	<0.05	0.05
Molybdenum (dissolved)	µg/L	-	9 200	2.6	1.5	1.9	1.6	1.6	1.7
Selenium (dissolved)	µg/L	10	63	<2.0	<0.04	<0.04	<0.04	<0.04	0.04
Silver (dissolved)	µg/L	-	1.5	<0.10	<0.05	<0.05	0.06	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	<0.50	0.06	0.04	0.17	0.03	0.03
Zinc (dissolved)	µg/L	-	1 100	<5	3	<2	46	<2	2
Additional Parameters									
pH	-	-	-	8.07	7.96	8.10	8.02	7.89	7.91

Note:

- Annual averages are based on semi-annual (2) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available.

Table 144: Port Hope Long-Term Waste Management Facility Groundwater Well WC-MW4B-02

WC-MW4B-02									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.5 [46]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	1.1	1.0	1.1	1.4	1.2	1.5
Cobalt (dissolved)	µg/L	-	66	<0.50	0.34	0.02	0.02	0.105	0.142
Copper (dissolved)	µg/L	1000	87	<1.0	0.4	0.4	0.3	0.6	0.9
Lead (dissolved)	µg/L	10	25	<0.50	0.02	<0.09	<0.09	0.13	0.16
Nickel (dissolved)	µg/L	-	490	<1.0	0.8	0.3	0.3	0.5	0.5
Uranium (dissolved)	µg/L	20	420	1.6	3.1	1.2	1.2	1.0	1.1
Radium-226	Bq/L	0.49	-	<0.04	<0.01	0.01	<0.01	<0.01	0.01
Thorium-230	Bq/L	0.65	-	<0.07	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.60	-	<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	105	141	130	139	159	158
Beryllium (dissolved)	µg/L	-	67	<0.50	<0.01	<0.01	<0.01	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	24	30	22	23	25	26
Cadmium (dissolved)	µg/L	5	2.7	<0.10	0.01	0.01	0.01	0.006	0.006
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	<0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	13	8	11	9.5	12.7	15.8
Selenium (dissolved)	µg/L	10	63	<2.0	0.1	<0.04	<0.04	0.05	0.05
Silver (dissolved)	µg/L	-	1.5	<0.10	<0.05	<0.05	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	0.60	0.54	0.95	1.01	0.93	1.01
Zinc (dissolved)	µg/L	-	1 100	<5	3	<2	<2	<2	2
Additional Parameters									
pH	-	-	-	8.05	8.03	8.03	7.90	7.90	8.02

Note:

- Annual averages are based on semi-annual (2) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available.

Table 145: Port Hope Long-Term Waste Management Facility Groundwater Well WC-OW1-87

WC-OW1-87									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.5 [46]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	<1.0	0.8	0.9	1.2	4.2	7.1
Cobalt (dissolved)	µg/L	-	66	0.51	0.45	0.72	0.72	33.7	**66.3**
Copper (dissolved)	µg/L	1000	87	1.8	0.3	0.4	0.3	12.7	23.9
Lead (dissolved)	µg/L	10	25	<0.50	0.02	<0.09	<0.09	3.58	6.59
Nickel (dissolved)	µg/L	-	490	<1.0	0.6	1.2	1.5	48.2	93.1
Uranium (dissolved)	µg/L	20	420	5.0	3.8	3.9	2.8	3.3	3.6
Radium-226	Bq/L	0.49	-	<0.04	<0.01	<0.01	<0.01	0.02	0.02
Thorium-230	Bq/L	0.65	-	<0.07	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.60	-	<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	84	89	104	114	170	212
Beryllium (dissolved)	µg/L	-	67	<0.50	<0.01	<0.01	0.01	0.015	0.022
Boron (dissolved)	µg/L	5000	45 000	15	16	15	14	14	14
Cadmium (dissolved)	µg/L	5	2.7	<0.10	0.004	0.006	0.012	0.285	0.555
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	<0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	<0.50	0.35	0.39	0.40	0.35	0.36
Selenium (dissolved)	µg/L	10	63	<2.0	<0.04	<0.05	0.12	1.22	2.40
Silver (dissolved)	µg/L	-	1.5	<0.10	<0.05	<0.05	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	<0.50	0.11	0.12	0.12	0.63	0.86
Zinc (dissolved)	µg/L	-	1 100	5	2	3	<2	59	113
Additional Parameters									
pH	-	-	-	7.82	7.58	7.43	7.43	7.44	7.60

Note:

- Annual averages are based on semi-annual (2) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available.

Table 146: Port Hope Long-Term Waste Management Facility Groundwater Well WC-OW2A-75 and WC-OW2A-19

WC-OW2A-75/WC-OW2A-19									
Parameter	**Unit of Measure**	**Criteria**		**Annual Average**					**Maximum**
		Table A2.5 [46]	**Table 3 [47]**	**2019**	**2020**	**2021**	**2022**	**2023**	**2023**
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	<1.0	0.6	0.7	0.4	1.5	1.6
Cobalt (dissolved)	µg/L	-	66	0.97	0.41	0.53	0.44	0.078	0.078
Copper (dissolved)	µg/L	1000	87	<1.0	0.5	0.4	0.3	<0.2	0.2
Lead (dissolved)	µg/L	10	25	<0.50	0.03	0.08	<0.09	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	1.5	0.7	0.9	0.9	0.2	0.2
Uranium (dissolved)	µg/L	20	420	4.1	2.7	5.6	5.5	0.09	0.097
Radium-226	Bq/L	0.49	-	<0.04	0.01	<0.01	<0.01	<0.01	0.01
Thorium-230	Bq/L	0.65	-	<0.07	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.60	-	<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	135	146	117	99	29	30.7
Beryllium (dissolved)	µg/L	-	67	<0.50	<0.01	<0.01	<0.01	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	11	11	11	15	7	7
Cadmium (dissolved)	µg/L	5	2.7	<0.10	<0.003	0.011	0.005	0.006	0.008
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	<0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	0.68	0.39	0.30	0.59	11.10	11.30
Selenium (dissolved)	µg/L	10	63	<2.0	0.1	0.1	0.1	0.10	0.13
Silver (dissolved)	µg/L	-	1.5	<0.10	<0.05	<0.05	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	<0.50	0.21	0.30	0.18	0.09	0.10
Zinc (dissolved)	µg/L	-	1 100	<0.10	<0.02	<0.02	<0.02	<0.02	0.02
Additional Parameters									
pH	-	-	-	7.76	7.50	7.42	7.37	7.56	7.59

Note:

- Annual averages are based on semi-annual (2) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- - indicates no data is available.

Table 147: Port Hope Long-Term Waste Management Facility Groundwater Well WC-OW2-87 and WC-OW2-19

WC-OW2-87/WC-OW2-19									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.5 [46]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	1.4	4.5	1.8	1.3	0.4	0.4
Cobalt (dissolved)	µg/L	-	66	<0.50	0.06	0.07	0.07	0.67	0.69
Copper (dissolved)	µg/L	1000	87	<1.0	<0.2	0.3	<0.2	<0.2	0.2
Lead (dissolved)	µg/L	10	25	<0.50	0.02	0.06	<0.09	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	<1.0	0.2	0.2	0.3	1.0	1.1
Uranium (dissolved)	µg/L	20	420	0.14	0.13	0.10	0.09	6.21	6.58
Radium-226	Bq/L	0.49	-	<0.04	<0.01	<0.01	<0.01	<0.01	0.01
Thorium-230	Bq/L	0.65	-	<0.07	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.60	-	<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	27	25	26	26	110	125
Beryllium (dissolved)	µg/L	-	67	<0.50	<0.01	<0.01	<0.01	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	<10	9	9	9	10	11
Cadmium (dissolved)	µg/L	5	2.7	<0.10	<0.003	0.028	0.006	<0.003	<0.003
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	<0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	8.2	9.5	11.6	13.4	0.29	0.39
Selenium (dissolved)	µg/L	10	63	<2.0	0.1	0.1	0.1	0.06	0.07
Silver (dissolved)	µg/L	-	1.5	<0.10	<0.05	<0.05	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	<0.50	0.08	0.07	0.08	0.22	0.25
Zinc (dissolved)	µg/L	-	1 100	<5	<2	5	<2	<2	2
Additional Parameters									
pH	-	-	-	7.77	7.66	7.42	7.58	7.45	7.56

Note:

- Annual averages are based on semi-annual (2) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available.
- WC-OW2-87 was decommissioned in 2017. Reinstallation took place in 2019 May as WC-OW2-19.

Table 148: Port Hope Long-Term Waste Management Facility Groundwater Well WC-OW3-79

WC-OW3-79									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.5 [46]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	3.2	3.8	3.7	4.0	3.4	3.6
Cobalt (dissolved)	µg/L	-	66	<0.50	0.01	0.01	0.01	0.012	0.017
Copper (dissolved)	µg/L	1000	87	<1.0	0.4	<0.2	<0.2	<0.2	0.2
Lead (dissolved)	µg/L	10	25	<0.50	0.04	0.05	<0.09	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	<1.0	<0.1	1.0	<0.1	<0.1	0.1
Uranium (dissolved)	µg/L	20	420	<0.1	0.04	0.04	0.04	0.06	0.07
Radium-226	Bq/L	0.49	-	<0.04	<0.01	<0.01	<0.01	<0.01	0.01
Thorium-230	Bq/L	0.65	-	<0.07	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.60	-	<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	140	135	138	148	150	153
Beryllium (dissolved)	µg/L	-	67	<0.50	<0.01	<0.01	<0.01	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	19	20	20	21	33	45
Cadmium (dissolved)	µg/L	5	2.7	<0.10	0.004	0.008	0.003	<0.003	0.003
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	<0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	1.2	1.2	1.1	1.3	1.2	1.2
Selenium (dissolved)	µg/L	10	63	<2.0	<0.04	<0.04	<0.04	<0.04	0.04
Silver (dissolved)	µg/L	-	1.5	<0.10	<0.05	<0.05	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	<0.50	0.02	0.07	0.02	0.02	0.03
Zinc (dissolved)	µg/L	-	1 100	<5	4	2	<2	<2	2
Additional Parameters									
pH	-	-	-	8.06	8.17	7.97	8.01	7.93	7.94

Note:

- Annual averages are based on semi-annual (2) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available.

Table 149: Port Hope Long-Term Waste Management Facility Groundwater Well WC-OW3-87

WC-OW3-87									
Parameter	**Unit of Measure**	**Criteria**		**Annual Average**					**Maximum**
		Table A2.5 [46]	**Table 3 [47]**	**2019**	**2020**	**2021**	**2022**	**2023**	**2023**
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	4.2	5.1	5.0	5.7	5.7	5.7
Cobalt (dissolved)	µg/L	-	66	<0.05	0.02	0.03	0.03	0.03	0.03
Copper (dissolved)	µg/L	1000	87	2.1	0.2	<0.2	<0.2	<0.2	0.2
Lead (dissolved)	µg/L	10	25	<0.50	0.01	<0.09	<0.09	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	<1.0	0.2	0.2	0.2	0.1	0.1
Uranium (dissolved)	µg/L	20	420	0.30	0.15	0.68	0.09	0.08	0.086
Radium-226	Bq/L	0.49	-	<0.04	0.01	0.01	<0.01	<0.01	0.01
Thorium-230	Bq/L	0.65	-	<0.07	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.60	-	<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	165	160	160	174	174	185
Beryllium (dissolved)	µg/L	-	67	<0.50	<0.01	<0.01	<0.01	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	11	12	14	13	11	11
Cadmium (dissolved)	µg/L	5	2.7	<0.10	0.004	<0.003	<0.003	0.004	0.004
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	<0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	<0.5	0.2	0.4	0.5	0.28	0.31
Selenium (dissolved)	µg/L	10	63	<2.0	<0.04	0.1	<0.04	<0.04	0.04
Silver (dissolved)	µg/L	-	1.5	<0.10	<0.05	<0.05	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	<0.50	0.07	0.13	0.10	0.03	0.03
Zinc (dissolved)	µg/L	-	1 100	<5	3	3	2	<2	2
Additional Parameters									
pH	-	-	-	8.10	7.99	7.87	7.86	7.80	7.87

Note:

- Annual averages are based on semi-annual (2) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available.

Table 150: Port Hope Long-Term Waste Management Facility Groundwater Well WC-OW4-79

WC-OW4-79									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.5 [46]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	<1.0	0.7	0.8	0.6	0.5	0.5
Cobalt (dissolved)	µg/L	-	66	<0.50	0.10	0.19	0.15	0.19	0.20
Copper (dissolved)	µg/L	1000	87	<1.0	0.4	0.3	0.2	2.0	2.7
Lead (dissolved)	µg/L	10	25	<0.50	0.02	0.20	<0.09	0.52	0.94
Nickel (dissolved)	µg/L	-	490	<1.0	0.3	0.6	1.1	2.1	2.2
Uranium (dissolved)	µg/L	20	420	0.18	0.09	0.08	0.09	0.21	0.24
Radium-226	Bq/L	0.49	-	<0.04	<0.01	<0.01	<0.01	<0.01	0.01
Thorium-230	Bq/L	0.65	-	<0.07	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.60	-	<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	91	74	112	110	109	111
Beryllium (dissolved)	µg/L	-	67	<0.50	<0.01	<0.02	<0.01	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	22	42	31	34	25	25
Cadmium (dissolved)	µg/L	5	2.7	<0.10	<0.003	<0.003	0.014	<0.003	0.003
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	<0.01	0.05	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	2.0	1.1	1.1	1.2	1.1	1.17
Selenium (dissolved)	µg/L	10	63	<2.0	<0.04	<0.04	0.09	<0.04	0.04
Silver (dissolved)	µg/L	-	1.5	<0.10	<0.05	<0.05	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	<0.50	0.90	0.02	0.01	<0.01	0.01
Zinc (dissolved)	µg/L	-	1 100	<5	12	14	9	11	13
Additional Parameters									
pH	-	-	-	8.17	7.99	7.66	7.65	7.65	7.69

Note:

- Annual averages are based on semi-annual (2) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available.

Table 151: Port Hope Long-Term Waste Management Facility Groundwater Well WC-OW5-79 and WC-OW5-19

WC-OW5-79/WC-OW5-19									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.5 [46]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.70	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	2.8	3.4	3.1	2.7	4.5	4.5
Cobalt (dissolved)	µg/L	-	66	<0.51	0.35	0.43	0.35	0.47	0.49
Copper (dissolved)	µg/L	1000	87	<1.0	<0.2	<0.6	<0.2	<0.2	0.2
Lead (dissolved)	µg/L	10	25	<0.50	0.01	<0.26	<0.09	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	<1.0	0.8	0.9	0.9	1.2	1.2
Uranium (dissolved)	µg/L	20	420	1.23	0.11	0.67	0.06	0.07	0.09
Radium-226	Bq/L	0.49	-	<0.04	<0.01	<0.03	<0.01	0.01	0.01
Thorium-230	Bq/L	0.65	-	<0.07	<0.02	<0.05	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.60	-	<0.06	<0.02	<0.04	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	29	24	26	21	23	23
Beryllium (dissolved)	µg/L	-	67	<0.50	<0.01	0.25	<0.01	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	22	18	20	18	16	17
Cadmium (dissolved)	µg/L	5	2.7	<0.10	<0.003	<0.052	<0.003	0.003	0.003
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	<0.06	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	1.8	0.6	1.2	1.3	0.9	1.1
Selenium (dissolved)	µg/L	10	63	<2.0	0.3	1.13	0.2	0.21	0.21
Silver (dissolved)	µg/L	-	1.5	<0.10	<0.05	<0.08	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	<0.50	0.20	0.35	0.16	0.22	0.22
Zinc (dissolved)	µg/L	-	1 100	<5	<2	<4	<2	<2	2
Additional Parameters									
pH	-	-	-	7.44	7010	7.32	7.32	7.08	7.11

Note:

- Annual averages are based on semi-annual (2) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available.
- WC-OW5-79 was decommissioned in 2017. Reinstallation took place in 2019 May as WC-OW5-19.

Table 152: Port Hope Long-Term Waste Management Facility Groundwater Well WC-OW10-75

WC-OW10-75									
Parameter	**Unit of Measure**	**Criteria**		**Annual Average**					**Maximum**
		Table A2.5 [46]	**Table 3 [47]**	**2019**	**2020**	**2021**	**2022**	**2023**	**2023**
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	2.6	2.8	2.8	3.1	3.2	3.3
Cobalt (dissolved)	µg/L	-	66	<0.50	0.01	0.03	0.03	0.03	0.04
Copper (dissolved)	µg/L	1000	87	<1.0	<0.2	0.2	<0.2	0.2	0.2
Lead (dissolved)	µg/L	10	25	<0.50	0.02	0.07	<0.09	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	<1.0	<0.1	1.5	<0.1	<0.1	0.1
Uranium (dissolved)	µg/L	20	420	<0.10	0.03	0.03	0.03	0.03	0.035
Radium-226	Bq/L	0.49	-	<0.40	0.015	0.01	<0.02	<0.01	0.01
Thorium-230	Bq/L	0.65	-	<0.07	<0.07	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.60	-	<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	135	154	154	163	168	170
Beryllium (dissolved)	µg/L	-	67	<0.50	<0.01	<0.01	0.02	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	16	12	13	14	15	16
Cadmium (dissolved)	µg/L	5	2.7	<0.10	<0.003	0.018	0.013	0.011	0.018
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	<0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	0.85	0.75	0.98	0.90	0.86	0.88
Selenium (dissolved)	µg/L	10	63	<2.0	<0.04	<0.04	0.15	0.10	0.16
Silver (dissolved)	µg/L	-	1.5	<0.10	<0.05	<0.05	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	<0.50	<0.01	0.07	0.04	0.05	0.07
Zinc (dissolved)	µg/L	-	1 100	<5	<2	3	<2	<2	2
Additional Parameters									
pH	-	-	-	8.05	8.01	8.00	7.94	8.02	8.11

Note:

- Annual averages are based on semi-annual (2) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available.

Table 153: Port Hope Long-Term Waste Management Facility Groundwater Well WC-OW25-76

WC-OW25-76									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.5 [46]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	<1.0	0.8	0.7	0.8	0.7	0.7
Cobalt (dissolved)	µg/L	-	66	<0.50	0.097	0.042	0.041	0.030	0.030
Copper (dissolved)	µg/L	1000	87	<1.0	0.3	<0.2	0.6	0.5	0.5
Lead (dissolved)	µg/L	10	25	<0.50	0.07	0.01	<0.09	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	<1.0	0.3	<0.1	0.1	0.2	0.2
Uranium (dissolved)	µg/L	20	420	0.14	0.14	0.13	0.12	0.14	0.14
Radium-226	Bq/L	0.49	-	<0.04	0.01	<0.01	<0.01	0.03	0.04
Thorium-230	Bq/L	0.65	-	<0.07	<0.02	<0.02	<0.02	0.04	0.06
Thorium-232	Bq/L	0.60	-	<0.06	<0.02	<0.02	<0.02	0.04	0.06
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	35	69.5	35.3	31	38	38
Beryllium (dissolved)	µg/L	-	67	<0.50	<0.007	<0.007	0.009	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	63	41	61	54	56	56
Cadmium (dissolved)	µg/L	5	2.7	<0.10	<0.003	0.005	0.012	<0.003	0.003
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	-	-	-	-
Molybdenum (dissolved)	µg/L	-	9 200	1.7	1.35	1.23	1.2	1.0	1.0
Selenium (dissolved)	µg/L	10	63	<2.0	<0.04	0.05	0.05	<0.04	0.04
Silver (dissolved)	µg/L	-	1.5	<0.10	<0.05	<0.05	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	3.2	0.88	1.47	1.4	1.35	1.35
Zinc (dissolved)	µg/L	-	1 100	<5	10	2	5	<2	2
Additional Parameters									
pH	-	-	-	8.19	7.75	-	-	-	-

Note:

- Annual averages are based on semi-annual (2) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available.

Table 154: Port Hope Long-Term Waste Management Facility Groundwater Well WC-OW27-76

WC-OW27-76									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.5 [46]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	<1.0	0.4	0.4	0.4	0.4	0.4
Cobalt (dissolved)	µg/L	-	66	<0.50	0.05	0.07	0.07	0.13	0.16
Copper (dissolved)	µg/L	1000	87	<1.0	0.3	0.3	0.3	<0.2	0.2
Lead (dissolved)	µg/L	10	25	<0.50	0.02	0.09	0.20	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	1.2	0.5	0.5	0.4	0.4	0.4
Uranium (dissolved)	µg/L	20	420	0.13	0.14	0.13	0.13	0.131	0.149
Radium-226	Bq/L	0.49	-	<0.04	0.01	<0.01	0.01	0.02	0.02
Thorium-230	Bq/L	0.65	-	<0.07	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.60	-	<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	155	158	156	172	205	217
Beryllium (dissolved)	µg/L	-	67	<0.50	<0.01	<0.01	<0.01	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	40	39	45	40	28	43
Cadmium (dissolved)	µg/L	5	2.7	<0.10	0.01	0.005	0.015	<0.003	0.003
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	<0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	0.51	0.52	0.48	0.60	0.27	0.39
Selenium (dissolved)	µg/L	10	63	<2.0	<0.04	<0.04	0.08	<0.04	0.04
Silver (dissolved)	µg/L	-	1.5	<0.10	<0.05	<0.05	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	<0.50	0.56	0.42	0.49	0.57	0.62
Zinc (dissolved)	µg/L	-	1 100	<5	2	6	<2	<2	2
Additional Parameters									
pH	-	-	-	8.04	7.81	7.62	7.57	7.63	7.68

Note:

- Annual averages are based on semi-annual (2) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available.

Table 155: Port Hope Long-Term Waste Management Facility Groundwater Well WC-OW28-76

WC-OW28-76									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.5 [46]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	<1.0	0.6	0.5	0.5	0.4	0.4
Cobalt (dissolved)	µg/L	-	66	<0.50	0.03	0.03	0.06	0.06	0.09
Copper (dissolved)	µg/L	1000	87	<1.0	0.	1.2	0.6	0.2	0.2
Lead (dissolved)	µg/L	10	25	<0.50	0.05	0.04	<0.09	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	<1.0	0.4	1.0	5.5	0.2	0.2
Uranium (dissolved)	µg/L	20	420	0.16	0.17	0.19	0.18	0.16	0.17
Radium-226	Bq/L	0.49	-	<0.04	0.01	<0.01	<0.01	<0.01	0.01
Thorium-230	Bq/L	0.65	-	<0.07	<0.02	<0.02	<0.02	0.04	0.05
Thorium-232	Bq/L	0.60	-	<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	73	81	101	93	184	209
Beryllium (dissolved)	µg/L	-	67	<0.50	<0.01	<0.01	0.01	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	80	93	80	70	28	42
Cadmium (dissolved)	µg/L	5	2.7	<0.10	0.005	<0.003	0.007	<0.003	0.003
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	-	-	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	1.6	1.2	1.2	1.3	0.30	0.52
Selenium (dissolved)	µg/L	10	63	<2.0	<0.04	<0.04	0.09	<0.04	0.04
Silver (dissolved)	µg/L	-	1.5	<0.10	<0.05	<0.05	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	2.76	0.84	0.64	0.80	0.37	0.51
Zinc (dissolved)	µg/L	-	1 100	<5	4	<2	<2	<2	2
Additional Parameters									
pH	-	-	-	8.19	8.10	-	-	7.83	7.89

Note:

- Annual averages are based on semi-annual (2) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- - indicates no data is available.

Table 156: Port Hope Long-Term Waste Management Facility Groundwater Well WC-OW33-76

WC-OW33-76									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.5 [46]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	<1.0	1.2	0.6	1.2	3.3	3.5
Cobalt (dissolved)	µg/L	-	66	<0.50	0.12	0.24	0.18	0.14	0.22
Copper (dissolved)	µg/L	1000	87	<1.0	0.5	0.4	0.3	0.3	0.3
Lead (dissolved)	µg/L	10	25	<0.50	0.16	<0.09	<0.09	0.17	0.20
Nickel (dissolved)	µg/L	-	490	<1.0	0.3	0.6	7.7	0.2	0.2
Uranium (dissolved)	µg/L	20	420	2.0	1.5	3.4	2.9	1.9	1.9
Radium-226	Bq/L	0.49	-	<0.04	0.01	<0.01	<0.01	<0.01	0.01
Thorium-230	Bq/L	0.65	-	<0.07	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.60	-	<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	77	76	87	90	94	96
Beryllium (dissolved)	µg/L	-	67	<0.50	0.01	<0.01	<0.01	0.01	0.02
Boron (dissolved)	µg/L	5000	45 000	43	92	38	38	46	50
Cadmium (dissolved)	µg/L	5	2.7	<0.10	<0.003	0.003	<0.003	0.004	0.004
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	<0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	3.0	7.9	3.4	3.3	3.7	4.0
Selenium (dissolved)	µg/L	10	63	<2.0	0.06	<0.04	0.06	0.07	0.08
Silver (dissolved)	µg/L	-	1.5	<0.10	<0.05	<0.05	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	<0.50	0.88	0.02	0.10	0.37	0.59
Zinc (dissolved)	µg/L	-	1 100	<5	<2	<2	<2	<2	2
Additional Parameters									
pH	-	-	-	7.63	7.36	7.60	7.50	7.78	7.85

Note:

- Annual averages are based on semi-annual (2) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available.

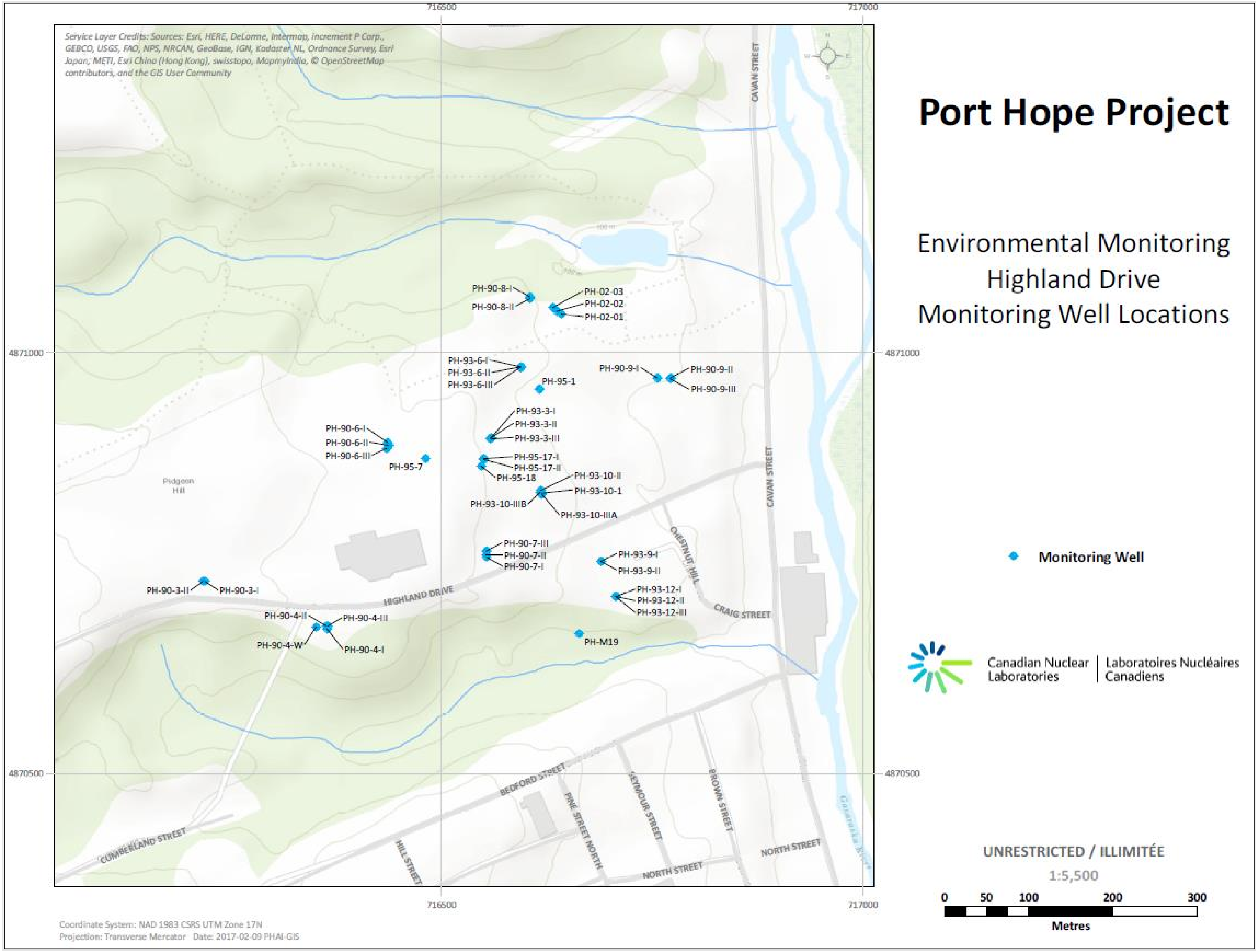


Figure 24: Port Hope Project Highland Drive Groundwater Monitoring Well Locations

Table 157: Highland Drive Groundwater Well PH-02-01

PH-02-01									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.5 [46]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	<1.0	0.2	<0.2	<0.2	<0.2	0.2
Cobalt (dissolved)	µg/L	-	66	<0.50	0.05	0.06	0.08	0.047	0.064
Copper (dissolved)	µg/L	1000	87	1.3	1.6	1.1	1.4	1.2	1.3
Lead (dissolved)	µg/L	10	25	<0.50	0.02	0.05	<0.09	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	<1.0	0.3	0.2	0.3	0.3	0.4
Uranium (dissolved)	µg/L	20	420	<3.4	2.9	3.0	3.1	3.22	3.22
Radium-226	Bq/L	0.49	-	<0.04	0.02	0.01	0.01	<0.01	0.01
Thorium-230	Bq/L	0.65	-	<0.07	<0.02	<0.02	0.02	<0.02	0.02
Thorium-232	Bq/L	0.6	-	<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	24	22	33	35	24	31
Beryllium (dissolved)	µg/L	-	67	<0.50	<0.01	<0.01	<0.01	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	27	25	25	21	18	19
Cadmium (dissolved)	µg/L	5	2.7	<0.1	<0.003	<0.003	<0.003	0.003	0.003
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	<0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	0.50	0.44	0.40	0.43	0.49	0.64
Selenium (dissolved)	µg/L	10	63	<2.0	0.6	0.4	0.5	0.75	0.77
Silver (dissolved)	µg/L	-	1.5	<0.1	<0.1	<0.1	<0.1	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	<0.50	0.31	0.35	0.44	0.29	0.35
Zinc (dissolved)	µg/L	-	1 100	<5.0	<2.0	2.5	<2.0	<2	2

Note:

- Annual averages are based on two (2) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- - indicates no data is available.

Table 158: Highland Drive Groundwater Well PH-02-02

PH-02-02									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.5 [46]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	<1.0	0.3	<0.2	0.6	<0.2	0.2
Cobalt (dissolved)	µg/L	-	66	<0.50	0.13	0.10	0.16	0.095	0.098
Copper (dissolved)	µg/L	1000	87	1.6	1.8	1.4	2.8	1.5	1.5
Lead (dissolved)	µg/L	10	25	<0.50	<0.05	0.05	<0.09	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	<1.0	0.8	0.3	0.9	0.5	0.6
Uranium (dissolved)	µg/L	20	420	2.2	2.1	2.9	3.0	2.60	3.31
Radium-226	Bq/L	0.49	-	<0.04	<0.01	0.01	0.02	<0.01	0.01
Thorium-230	Bq/L	0.65	-	<0.07	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.6	-	<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	37	33	48	49	60	72
Beryllium (dissolved)	µg/L	-	67	<0.50	<0.01	<0.01	0.03	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	34	32	30	35	28	36
Cadmium (dissolved)	µg/L	5	2.7	<0.1	0.005	0.004	0.077	0.003	0.003
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	<0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	<0.50	0.28	0.46	0.78	0.40	0.52
Selenium (dissolved)	µg/L	10	63	<2.0	0.3	0.3	1.2	0.57	0.70
Silver (dissolved)	µg/L	-	1.5	<0.1	<0.1	<0.1	<0.1	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	<0.50	0.43	0.37	0.38	0.34	0.42
Zinc (dissolved)	µg/L	-	1 100	<5.0	<2.0	<2.0	<2.0	<2	2

Note:

- Annual averages are based on two (2) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available.

Table 159: Highland Drive Groundwater Well PH-02-03

PH-02-03									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.5 [46]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	<1.0	<0.2	<0.2	<0.2	<0.2	0.2
Cobalt (dissolved)	µg/L	-	66	<0.50	0.13	0.21	0.22	0.233	0.290
Copper (dissolved)	µg/L	1000	87	1.7	1.5	1.6	2.6	1.8	1.9
Lead (dissolved)	µg/L	10	25	<0.50	<0.01	0.05	<0.09	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	<1.0	0.7	0.5	0.7	0.6	0.6
Uranium (dissolved)	µg/L	20	420	13.5	10.5	14.1	13.9	17.9	18.3
Radium-226	Bq/L	0.49	-	<0.04	0.01	<0.01	<0.01	<0.01	0.01
Thorium-230	Bq/L	0.65	-	<0.07	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.6	-	<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	23	20	28	29	38	39
Beryllium (dissolved)	µg/L	-	67	<0.50	<0.01	<0.01	<0.01	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	30	22	23	20	31	50
Cadmium (dissolved)	µg/L	5	2.7	<0.1	<0.003	0.003	0.006	0.005	0.007
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	<0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	<0.50	0.23	0.30	0.41	0.42	0.63
Selenium (dissolved)	µg/L	10	63	<2.0	0.1	0.1	0.1	0.21	0.34
Silver (dissolved)	µg/L	-	1.5	<0.1	<0.1	<0.1	<0.1	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	<0.50	0.16	0.21	0.24	0.21	0.21
Zinc (dissolved)	µg/L	-	1 100	<5.0	<2.0	<2.0	<2.0	<2	2

Note:

- Annual averages are based on two (2) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available.

Table 160: Highland Drive Groundwater Well PH-90-3-I

PH-90-3-I									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.5 [46]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	<1.0	<0.2	<0.2	<0.2	0.3	0.3
Cobalt (dissolved)	µg/L	-	66	<0.50	0.17	0.09	0.12	0.127	0.135
Copper (dissolved)	µg/L	1000	87	<1.0	0.4	<0.2	0.4	<0.2	0.2
Lead (dissolved)	µg/L	10	25	<0.50	0.04	0.05	<0.09	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	<1.0	<0.1	0.1	0.1	<0.1	0.1
Uranium (dissolved)	µg/L	20	420	1.7	2.0	1.9	1.7	1.83	1.88
Radium-226	Bq/L	0.49	-	<0.04	<0.01	0.01	0.02	0.01	0.01
Thorium-230	Bq/L	0.65	-	<0.07	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.6	-	<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	275	287	309	272	257	262
Beryllium (dissolved)	µg/L	-	67	<0.50	<0.01	<0.01	0.01	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	15	13	13	23	20	23
Cadmium (dissolved)	µg/L	5	2.7	<0.1	<0.003	<0.003	0.006	<0.003	0.003
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	<0.50	0.41	0.35	0.38	0.42	0.49
Selenium (dissolved)	µg/L	10	63	<2.0	0.3	0.3	0.4	0.42	0.49
Silver (dissolved)	µg/L	-	1.5	<0.1	<0.1	<0.1	<0.1	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	<0.50	0.21	0.22	0.22	0.32	0.33
Zinc (dissolved)	µg/L	-	1 100	<5.0	4.0	<2.0	<2.0	<2	2

Note:

- Annual averages are based on two (2) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available.

Table 161: Highland Drive Groundwater Well PH-90-4-III

PH-90-4-III									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.5 [46]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	7.3	8.1	12.0	8.8	6.5	7.5
Cobalt (dissolved)	µg/L	-	66	15	16.7	28.6	23.1	12.1	14.8
Copper (dissolved)	µg/L	1000	87	<1.0	1.7	0.3	0.4	7.2	13.6
Lead (dissolved)	µg/L	10	25	<0.50	<0.01	<0.06	<0.09	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	4.3	5.8	9.2	6.3	5.7	6.4
Uranium (dissolved)	µg/L	20	420	**30**	**40**	**67**	**51**	**36**	**36**
Radium-226	Bq/L	0.49	-	<0.04	0.03	0.05	0.04	0.04	0.05
Thorium-230	Bq/L	0.65	-	<0.07	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.6	-	<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	305	352	530	710	466	640
Beryllium (dissolved)	µg/L	-	67	<0.50	0.012	0.008	0.008	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	300	501	2085	949	144	185
Cadmium (dissolved)	µg/L	5	2.7	<0.1	0.007	0.009	0.005	<0.003	0.003
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	<0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	<0.50	0.36	0.35	0.28	0.30	0.36
Selenium (dissolved)	µg/L	10	63	<2.0	0.21	0.13	0.10	0.27	0.28
Silver (dissolved)	µg/L	-	1.5	<0.1	<0.05	<0.05	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	<0.50	0.39	0.42	0.36	0.35	0.49
Zinc (dissolved)	µg/L	-	1 100	<5.0	3	2	<2	3	3

Note:

- Annual averages are based on two (2) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available.

Table 162: Highland Drive Groundwater Well PH-90-7-III

PH-90-7-III									
Parameter	**Unit of Measure**	**Criteria**		**Annual Average**					**Maximum**
		Table A2.5 [46]	**Table 3 [47]**	**2019**	**2020**	**2021**	**2022**	**2023**	**2023**
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	1.45	0.95	<0.90	<0.90	1.00	1.10
Arsenic (dissolved)	µg/L	25	1900	**32**	**51**	**28**	25	**27.0**	**43.4**
Cobalt (dissolved)	µg/L	-	66	1.60	1.57	3.22	4.42	1.63	2.02
Copper (dissolved)	µg/L	1000	87	<1.0	0.5	0.7	0.6	1.4	1.8
Lead (dissolved)	µg/L	10	25	<0.50	0.02	<0.09	<0.09	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	1.2	0.9	1.3	1.1	0.9	1.0
Uranium (dissolved)	µg/L	20	420	15	**24**	15	**21**	**26**	**33**
Radium-226	Bq/L	0.49	-	0.04	0.05	0.04	0.06	0.04	0.06
Thorium-230	Bq/L	0.65	-	<0.07	0.05	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.6	-	<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	135	109	108	112	69	94
Beryllium (dissolved)	µg/L	-	67	<0.50	<0.01	<0.01	0.03	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	19	17	36	65	16	25
Cadmium (dissolved)	µg/L	5	2.7	<0.1	0.004	0.015	0.010	0.016	0.028
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	<0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	<0.50	0.19	0.15	0.29	0.37	0.39
Selenium (dissolved)	µg/L	10	63	<2.0	0.1	0.1	0.0	0.08	0.10
Silver (dissolved)	µg/L	-	1.5	<0.1	<0.1	<0.1	<0.1	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	1.34	0.90	0.32	0.43	0.62	0.77
Zinc (dissolved)	µg/L	-	1 100	<5.0	3.0	2.0	<2.0	<2	2

Note:

- Annual averages are based on two (2) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available.

Table 163: Highland Drive Groundwater Well PH-90-8-I

PH-90-8-I									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.5 [46]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.5	<0.9	<0.9	<0.9	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	<1.0	2.7	0.5	0.4	0.4	0.4
Cobalt (dissolved)	µg/L	-	66	<0.5	0.2	0.3	0.3	0.306	0.315
Copper (dissolved)	µg/L	1000	87	<1.0	0.4	<0.2	0.5	0.4	0.5
Lead (dissolved)	µg/L	10	25	<0.50	<0.01	0.05	<0.09	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	<1.0	0.4	0.4	0.9	1.0	1.2
Uranium (dissolved)	µg/L	20	420	**27**	**36**	**38**	**34**	**36**	**37**
Radium-226	Bq/L	0.49	-	<0.040	0.020	0.015	0.015	0.02	0.02
Thorium-230	Bq/L	0.65	-	<0.070	<0.020	<0.020	<0.020	<0.02	0.02
Thorium-232	Bq/L	0.6	-	<0.060	<0.020	<0.020	<0.020	<0.020	0.020
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	520	451	458	436	366	389
Beryllium (dissolved)	µg/L	-	67	<0.50	<0.01	<0.01	<0.01	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	27	29	40	42	39	40
Cadmium (dissolved)	µg/L	5	2.7	<0.1	<0.0	<0.0	0.0	<0.003	0.003
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	<0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	0.57	0.51	0.89	0.60	0.53	0.54
Selenium (dissolved)	µg/L	10	63	<2.0	<0.0	0.0	<0.0	0.08	0.10
Silver (dissolved)	µg/L	-	1.5	<0.1	<0.1	<0.1	<0.1	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	<0.50	0.12	0.27	0.11	0.09	0.10
Zinc (dissolved)	µg/L	-	1 100	<5.0	3.0	<2.0	<2.0	<2	2

Note:

- Annual averages are based on two (2) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- - indicates no data is available.

Table 164: Highland Drive Groundwater Well PH-90-8-II

PH-90-8-II									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.5 [46]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	<1.0	<0.2	0.2	<0.2	<0.2	0.2
Cobalt (dissolved)	µg/L	-	66	<0.50	0.16	0.11	0.12	0.081	0.102
Copper (dissolved)	µg/L	1000	87	<1.0	0.8	0.4	0.7	0.6	0.6
Lead (dissolved)	µg/L	10	25	<0.50	<0.01	0.05	<0.09	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	<1.0	0.3	0.2	0.4	0.3	0.5
Uranium (dissolved)	µg/L	20	420	5	5	17	16	3	3.5
Radium-226	Bq/L	0.49	-	<0.040	<0.010	<0.010	<0.010	0.02	0.02
Thorium-230	Bq/L	0.65	-	<0.070	<0.020	<0.020	<0.020	<0.02	0.02
Thorium-232	Bq/L	0.6	-	<0.060	<0.020	<0.020	<0.020	<0.020	0.020
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	63	70	74	76	81	94
Beryllium (dissolved)	µg/L	-	67	<0.50	<0.01	<0.01	<0.01	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	44	44	38	40	33	36
Cadmium (dissolved)	µg/L	5	2.7	<0.1	<0.0	<0.0	<0.0	<0.003	0.003
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	<0.50	0.07	0.30	0.09	0.05	0.06
Selenium (dissolved)	µg/L	10	63	<2.0	0.5	0.5	0.4	0.41	0.43
Silver (dissolved)	µg/L	-	1.5	<0.1	<0.1	<0.1	<0.1	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	<0.50	0.18	0.39	0.37	0.33	0.45
Zinc (dissolved)	µg/L	-	1 100	<5.0	3.0	<2.0	<2.0	<2	2

Note:

- Annual averages are based on two (2) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- - indicates no data is available.

Table 165: Highland Drive Groundwater Well PH-90-9-III

PH-90-9-III									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.5 [46]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	<1.0	<0.2	0.4	0.3	<0.2	0.2
Cobalt (dissolved)	µg/L	-	66	<0.50	0.04	0.17	0.18	0.051	0.061
Copper (dissolved)	µg/L	1000	87	<1.0	0.5	0.5	0.3	0.4	0.4
Lead (dissolved)	µg/L	10	25	<0.50	0.05	0.06	<0.09	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	<1.0	<0.1	0.3	0.3	0.15	0.2
Uranium (dissolved)	µg/L	20	420	2.8	2.9	3.0	3.3	3	3.870
Radium-226	Bq/L	0.49	-	<0.040	<0.010	<0.010	<0.010	<0.01	0.01
Thorium-230	Bq/L	0.65	-	<0.070	<0.020	<0.020	<0.020	<0.02	0.02
Thorium-232	Bq/L	0.6	-	<0.060	<0.020	<0.020	<0.020	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	60	58	62	64	57	58.2
Beryllium (dissolved)	µg/L	-	67	<0.50	<0.01	<0.01	<0.01	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	20	18	23	66	19	20
Cadmium (dissolved)	µg/L	5	2.7	<0.1	0.0	0.0	<0.0	<0.003	0.003
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	<0.50	0.14	0.21	0.18	0.18	0.19
Selenium (dissolved)	µg/L	10	63	<2.0	0.2	0.2	0.2	0.17	0.18
Silver (dissolved)	µg/L	-	1.5	<0.1	<0.1	<0.1	<0.1	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	<0.50	0.36	0.41	0.29	0.32	0.32
Zinc (dissolved)	µg/L	-	1 100	<5.0	4.0	2.0	<2.0	<2	2

Note:

- Annual averages are based on two (2) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- - indicates no data is available.

Table 166: Highland Drive Groundwater Well PH-93-3-III

PH-93-3-III									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.5 [46]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	<1.0	<0.2	<0.2	<0.2	0.2	0.2
Cobalt (dissolved)	µg/L	-	66	<0.50	0.18	0.10	0.13	0.114	0.131
Copper (dissolved)	µg/L	1000	87	<1.0	0.5	0.6	0.7	1.5	1.7
Lead (dissolved)	µg/L	10	25	<0.50	<0.01	<0.09	<0.09	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	<1.0	0.1	0.3	0.3	0.30	0.40
Uranium (dissolved)	µg/L	20	420	9	9	**37**	**30**	**41**	**44**
Radium-226	Bq/L	0.49	-	<0.040	<0.010	<0.010	-	<0.02	0.02
Thorium-230	Bq/L	0.65	-	<0.070	<0.020	<0.020	-	<0.02	0.01
Thorium-232	Bq/L	0.6	-	<0.060	<0.020	<0.020	-	<0.020	0.020
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	45	52	49	51	60	71
Beryllium (dissolved)	µg/L	-	67	<0.50	<0.01	<0.01	<0.01	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	250	243	71	201	102	176
Cadmium (dissolved)	µg/L	5	2.7	<0.1	<0.0	<0.0	<0.0	<0.003	0.003
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	<0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	<0.50	0.06	0.14	0.10	0.11	0.13
Selenium (dissolved)	µg/L	10	63	<2.0	0.4	0.3	0.5	0.54	0.57
Silver (dissolved)	µg/L	-	1.5	<0.1	<0.1	<0.1	<0.1	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	0.56	0.53	0.73	0.72	0.89	0.92
Zinc (dissolved)	µg/L	-	1 100	<5	<2	<2	<2	<2	2

Note:

- Annual averages are based on two (2) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available.

Table 167: Highland Drive Groundwater Well PH-93-6-I

PH-93-6-I									
Parameter	**Unit of Measure**	**Criteria**		**Annual Average**					**Maximum**
		Table A2.5 [46]	**Table 3 [47]**	**2019**	**2020**	**2021**	**2022**	**2023**	**2023**
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	1.4	0.7	0.5	1.1	1.2	1.6
Cobalt (dissolved)	µg/L	-	66	0.71	1.10	0.87	1.12	1.695	1.800
Copper (dissolved)	µg/L	1000	87	<1.0	0.8	0.8	1.3	0.6	0.7
Lead (dissolved)	µg/L	10	25	<0.50	0.02	0.05	<0.09	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	2.0	2.1	1.7	1.3	2.3	2.6
Uranium (dissolved)	µg/L	20	420	1.65	2.06	2.08	2.35	3.60	3.68
Radium-226	Bq/L	0.49	-	<0.040	0.020	<0.010	0.015	0.02	0.02
Thorium-230	Bq/L	0.65	-	<0.070	<0.020	<0.020	<0.020	<0.02	0.02
Thorium-232	Bq/L	0.6	-	<0.060	<0.020	<0.020	<0.020	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	320	334	381	177	340	368
Beryllium (dissolved)	µg/L	-	67	<0.50	0.01	<0.01	0.01	0.011	0.015
Boron (dissolved)	µg/L	5000	45 000	47	87	71	74	100	115
Cadmium (dissolved)	µg/L	5	2.7	<0.1	0.0	0.1	0.0	0.022	0.028
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	<0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	0.67	0.45	0.50	0.62	0.39	0.45
Selenium (dissolved)	µg/L	10	63	<2.0	0.4	0.4	0.3	0.52	0.53
Silver (dissolved)	µg/L	-	1.5	<0.1	<0.1	<0.1	<0.1	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	0.73	0.53	0.58	1.41	1.61	2.60
Zinc (dissolved)	µg/L	-	1 100	74	43	19	<2	7	7

Note:

- Annual averages are based on two (2) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available.

Table 168: Highland Drive Groundwater Well PH-93-6-II

PH-93-6-II									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.5 [46]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	<1.0	0.4	0.2	0.4	0.4	0.4
Cobalt (dissolved)	µg/L	-	66	1.00	0.38	0.60	0.54	0.675	0.778
Copper (dissolved)	µg/L	1000	87	2.6	1.0	1.0	1.6	1.8	2.2
Lead (dissolved)	µg/L	10	25	<0.50	0.02	0.05	<0.09	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	1.2	0.8	1.2	0.9	1.1	1.1
Uranium (dissolved)	µg/L	20	420	13	**36**	**59**	**21**	**32**	**35**
Radium-226	Bq/L	0.49	-	<0.040	<0.010	0.015	<0.010	<0.01	0.01
Thorium-230	Bq/L	0.65	-	<0.070	<0.020	<0.020	<0.020	<0.02	0.02
Thorium-232	Bq/L	0.6	-	<0.060	<0.020	<0.020	<0.020	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	58	50	82	45	49	50
Beryllium (dissolved)	µg/L	-	67	<0.50	0.01	<0.01	<0.01	0.009	0.010
Boron (dissolved)	µg/L	5000	45 000	26	45	49	46	43	45
Cadmium (dissolved)	µg/L	5	2.7	<0.1	0.005	0.004	0.007	0.007	0.010
Mercury (dissolved)	µg/L	1	0.29	<0.10	0.02	<0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	<0.50	0.13	0.14	0.14	0.21	0.50
Selenium (dissolved)	µg/L	10	63	<2.0	0.2	0.1	0.2	0.37	2.0
Silver (dissolved)	µg/L	-	1.5	<0.1	<0.1	<0.1	<0.1	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	<0.50	0.27	0.38	0.50	0.50	0.50
Zinc (dissolved)	µg/L	-	1 100	<5	3	4	4	4	5

Note:

- Annual averages are based on two (2) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available.

Table 169: Highland Drive Groundwater Well PH-93-9-I

PH-93-9-I									
Parameter	**Unit of Measure**	**Criteria**		**Annual Average**					**Maximum**
		Table A2.5 [46]	**Table 3 [47]**	**2019**	**2020**	**2021**	**2022**	**2023**	**2023**
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	1.4	0.6	0.6	0.4	0.6	0.7
Cobalt (dissolved)	µg/L	-	66	2.35	2.7	2.9	2.86	2.775	2.860
Copper (dissolved)	µg/L	1000	87	3.6	4.3	3.6	5.3	7.1	7.7
Lead (dissolved)	µg/L	10	25	<0.50	0.03	0.25	<0.09	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	7.7	8.9	8.5	7.2	7.4	7.6
Uranium (dissolved)	µg/L	20	420	**2200**	**2075**	**7150**	**9915**	**7390**	**8250**
Radium-226	Bq/L	0.49	-	<0.040	0.02	0.02	0.020	0.03	0.03
Thorium-230	Bq/L	0.65	-	<0.070	<0.02	<0.02	<0.020	<0.02	0.02
Thorium-232	Bq/L	0.6	-	<0.060	<0.020	<0.020	<0.020	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	180	166	222	249	236	241
Beryllium (dissolved)	µg/L	-	67	<0.50	<0.007	0.008	<0.01	0.019	0.031
Boron (dissolved)	µg/L	5000	45 000	1100	949	1285	1665	1335	1380
Cadmium (dissolved)	µg/L	5	2.7	<0.1	0.005	0.005	0.0	0.034	0.063
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	<0.50	0.24	0.25	0.20	0.21	0.23
Selenium (dissolved)	µg/L	10	63	<2.0	0.2	0.3	2.0	2.28	4.24
Silver (dissolved)	µg/L	-	1.5	<0.1	<0.05	<0.05	<0.1	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	<0.50	0.33	0.48	0.81	0.73	0.80
Zinc (dissolved)	µg/L	-	1 100	<17.0	5	3	<2	<2	2

Note:

- Annual averages are based on two (2) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available.

Table 170: Highland Drive Groundwater Well PH-93-9-II

PH-93-9-II									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.5 [46]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	<1.0	0.2	<0.2	0.3	<0.2	0.2
Cobalt (dissolved)	µg/L	-	66	<0.50	0.15	0.12	0.13	0.205	0.370
Copper (dissolved)	µg/L	1000	87	<1.0	0.6	0.5	0.5	0.4	0.4
Lead (dissolved)	µg/L	10	25	<0.50	0.02	0.05	<0.09	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	<1.0	<0.1	0.3	0.4	0.3	0.3
Uranium (dissolved)	µg/L	20	420	3	8	8	18	11	18.7
Radium-226	Bq/L	0.49	-	<0.040	<0.010	0.015	<0.010	<0.01	0.01
Thorium-230	Bq/L	0.65	-	<0.070	<0.020	<0.020	<0.020	<0.02	0.02
Thorium-232	Bq/L	0.6	-	<0.060	<0.020	<0.020	<0.020	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	29	46	53	51	50	72
Beryllium (dissolved)	µg/L	-	67	<0.50	0.01	<0.01	<0.01	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	12	35	747	99	23	33
Cadmium (dissolved)	µg/L	5	2.7	<0.1	0.0	0.0	0.0	0.014	0.014
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	0.02	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	<0.50	0.76	0.61	0.44	0.32	0.43
Selenium (dissolved)	µg/L	10	63	<2.0	0.8	0.7	0.8	0.79	0.86
Silver (dissolved)	µg/L	-	1.5	<0.1	<0.1	<0.1	<0.1	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	<0.50	0.35	0.27	0.48	0.35	0.48
Zinc (dissolved)	µg/L	-	1 100	8.5	3.5	3.0	5	4	4

Note:

- Annual averages are based on two (2) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- - indicates no data is available.

Table 171: Highland Drive Groundwater Well PH-93-10-I

PH-93-10-I									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.5 [46]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	18	24	21	**31**	**29**	**32**
Cobalt (dissolved)	µg/L	-	66	6.50	8.245	6.370	6.685	7.995	8.600
Copper (dissolved)	µg/L	1000	87	<1.0	2.2	0.5	0.3	0.4	0.4
Lead (dissolved)	µg/L	10	25	<0.50	0.31	0.06	<0.09	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	10.1	11.4	9.1	8.1	11.2	11.5
Uranium (dissolved)	µg/L	20	420	7	5	3	3	4	5.4
Radium-226	Bq/L	0.49	-	<0.040	0.03	0.02	0.03	0.02	0.02
Thorium-230	Bq/L	0.65	-	<0.070	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.6	-	<0.060	<0.020	<0.020	<0.020	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	500	623	494	564	571	575
Beryllium (dissolved)	µg/L	-	67	<0.50	0.019	<0.007	0.010	0.014	0.021
Boron (dissolved)	µg/L	5000	45 000	560	683	378	560	575	587
Cadmium (dissolved)	µg/L	5	2.7	<0.1	0.008	<0.003	0.004	0.035	0.066
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	<0.01	0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	0.64	0.73	0.70	0.70	0.62	0.64
Selenium (dissolved)	µg/L	10	63	<2.0	0.1	0.1	0.1	0.29	0.47
Silver (dissolved)	µg/L	-	1.5	<0.1	<0.05	<0.05	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	<0.50	1.49	0.43	0.41	0.56	0.57
Zinc (dissolved)	µg/L	-	1 100	<5.0	5	2	<2	<2	2

Note:

- Annual averages are based on two (2) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available.

Table 172: Highland Drive Groundwater Well PH-93-10-II

PH-93-10-II									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.5 [46]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	<1.0	0.6	0.6	0.6	0.6	0.6
Cobalt (dissolved)	µg/L	-	66	3.15	2.71	3.13	3.165	2.83	3.26
Copper (dissolved)	µg/L	1000	87	4.5	7.5	7.7	6.8	5.8	6.1
Lead (dissolved)	µg/L	10	25	<0.50	0.02	0.06	<0.09	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	6.6	7.0	8.7	8.2	7.4	8.1
Uranium (dissolved)	µg/L	20	420	**5450**	**4970**	**6650**	**5635**	**6955**	**8590**
Radium-226	Bq/L	0.49	-	<0.040	0.02	<0.02	0.02	0.02	0.02
Thorium-230	Bq/L	0.65	-	<0.070	<0.02	<0.02	<0.02	<0.02	0.20
Thorium-232	Bq/L	0.6	-	<0.060	<0.020	<0.020	<0.020	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	175	168	207	183	180	198
Beryllium (dissolved)	µg/L	-	67	<0.50	<0.007	<0.007	0.008	0.019	0.031
Boron (dissolved)	µg/L	5000	45 000	2850	3290	3980	3265	2840	3180
Cadmium (dissolved)	µg/L	5	2.7	<0.1	0.005	0.004	0.005	0.032	0.061
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	<0.50	0.17	0.21	0.16	0.19	0.20
Selenium (dissolved)	µg/L	10	63	<2.0	0.5	0.3	0.3	0.44	0.57
Silver (dissolved)	µg/L	-	1.5	<0.1	<0.05	<0.05	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	0.72	0.87	0.74	0.71	0.78	0.82
Zinc (dissolved)	µg/L	-	1 100	<5	<2	<2	2	<2	2

Note:

- Annual averages are based on two (2) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available.

Table 173: Highland Drive Groundwater Well PH-93-12-II

PH-93-12-II									
Parameter	**Unit of Measure**	**Criteria**		**Annual Average**					**Maximum**
		Table A2.5 [46]	**Table 3 [47]**	**2019**	**2020**	**2021**	**2022**	**2023**	**2023**
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	<1.0	0.3	1.1	0.3	0.3	0.4
Cobalt (dissolved)	µg/L	-	66	0.65	0.77	0.80	0.648	0.79	1.04
Copper (dissolved)	µg/L	1000	87	1.5	3.4	1.7	1.7	2.1	2.5
Lead (dissolved)	µg/L	10	25	<0.50	0.09	0.46	<0.09	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	2.2	2.4	2.6	2.1	2.5	3.4
Uranium (dissolved)	µg/L	20	420	**3450**	**3330**	**3680**	**2970**	**3975**	**5370**
Radium-226	Bq/L	0.49	-	<0.040	0.01	0.02	<0.02	0.02	0.02
Thorium-230	Bq/L	0.65	-	<0.070	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.6	-	<0.060	<0.020	<0.020	<0.020	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	165	193	214	179	192	231
Beryllium (dissolved)	µg/L	-	67	<0.50	0.008	<0.007	<0.007	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	785	779	729	840	1020	1210
Cadmium (dissolved)	µg/L	5	2.7	<0.1	0.012	0.017	<0.003	0.003	0.003
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	<0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	<0.50	0.15	0.27	0.14	0.07	0.09
Selenium (dissolved)	µg/L	10	63	<2.0	0.2	0.3	0.3	0.26	0.32
Silver (dissolved)	µg/L	-	1.5	<0.1	<0.05	0.28	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	<0.50	0.61	0.47	0.44	0.43	0.45
Zinc (dissolved)	µg/L	-	1 100	<12.0	8	13	<2	<2	2

Note:

- Annual averages are based on two (2) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available.

Table 174: Highland Drive Groundwater Well PH-95-17-I

PH-95-17-I									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.5 [46]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	<1.0	0.4	0.6	0.6	1.3	2.0
Cobalt (dissolved)	µg/L	-	66	4.55	3.95	4.48	5.86	5.35	5.73
Copper (dissolved)	µg/L	1000	87	2.2	2.5	2.8	2.6	3.7	6.3
Lead (dissolved)	µg/L	10	25	<0.50	<0.01	<0.06	<0.09	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	5.3	4.7	5.4	6.3	6.5	7.2
Uranium (dissolved)	µg/L	20	420	**6150**	**9735**	**12500**	**12950**	**11450**	**12200**
Radium-226	Bq/L	0.49	-	<0.040	0.03	0.03	0.03	0.02	0.02
Thorium-230	Bq/L	0.65	-	<0.070	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.6	-	<0.060	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	240	191	233	266	257	274
Beryllium (dissolved)	µg/L	-	67	<0.50	0.011	0.020	0.019	0.009	0.011
Boron (dissolved)	µg/L	5000	45 000	1500	1340	1630	2765	2890	3660
Cadmium (dissolved)	µg/L	5	2.7	<0.1	0.009	0.035	0.029	0.005	0.006
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	<0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	0.65	0.51	0.64	0.94	0.82	0.83
Selenium (dissolved)	µg/L	10	63	<2.0	0.2	0.4	2.3	3.30	6.04
Silver (dissolved)	µg/L	-	1.5	<0.1	<0.05	<0.05	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	<0.50	0.50	0.62	0.61	0.80	0.80
Zinc (dissolved)	µg/L	-	1 100	<5.0	5	6	2	2	2

Note:

- Annual averages are based on two (2) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available.

Table 175: Highland Drive Groundwater Well PH-95-17-II

PH-95-17-II									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.5 [46]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (dissolved)	µg/L	25	1900	1.9	2.4	1.6	1.0	2.1	3.4
Cobalt (dissolved)	µg/L	-	66	4.10	4.90	3.37	1.65	2.92	3.94
Copper (dissolved)	µg/L	1000	87	<1.0	1.3	1.1	1.9	2.5	4.2
Lead (dissolved)	µg/L	10	25	<0.50	<0.01	0.05	<0.09	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	4.8	4.9	1.9	1.1	2.9	4.6
Uranium (dissolved)	µg/L	20	420	**31**	**99**	5	4	4	7
Radium-226	Bq/L	0.49	-	<0.040	0.02	0.02	<0.01	<0.01	0.01
Thorium-230	Bq/L	0.65	-	<0.070	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.6	-	<0.060	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	225	192	137	86	119	163
Beryllium (dissolved)	µg/L	-	67	<0.50	0.009	<0.007	0.010	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	1350	1150	648	414	1193	1860
Cadmium (dissolved)	µg/L	5	2.7	<0.1	0.008	0.007	0.026	0.008	0.013
Mercury (dissolved)	µg/L	1	0.29	<0.10	0.01	<0.01	<0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	<0.50	0.18	0.58	0.11	0.11	0.13
Selenium (dissolved)	µg/L	10	63	<2.0	0.2	0.2	0.5	0.44	0.61
Silver (dissolved)	µg/L	-	1.5	<0.1	<0.05	<0.05	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	0.79	1.09	1.00	0.75	0.82	0.90
Zinc (dissolved)	µg/L	-	1 100	<5.0	<2	<2	<2	<2	2

Note:

- Annual averages are based on two (2) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available.

Table 176: Highland Drive Groundwater Well PH-M-19

PH-M-19									
Parameter	Unit of Measure	Criteria		Annual Average					Maximum
		Table A2.5 [46]	Table 3 [47]	2019	2020	2021	2022	2023	2023
Primary COPC									
Antimony (dissolved)	µg/L	6	20 000	3.20	2.70	3.70	3.50	3.80	3.80
Arsenic (dissolved)	µg/L	25	1900	**310**	**379**	**355**	**331.5**	**335**	**423**
Cobalt (dissolved)	µg/L	-	66	<0.50	0.11	0.12	0.11	0.236	0.336
Copper (dissolved)	µg/L	1000	87	<1.0	0.6	0.5	0.5	0.5	0.7
Lead (dissolved)	µg/L	10	25	<0.50	0.03	0.05	0.09	<0.09	0.09
Nickel (dissolved)	µg/L	-	490	<1.0	0.3	0.2	0.2	0.3	0.3
Uranium (dissolved)	µg/L	20	420	**225**	**187**	**204**	**158**	**220**	**258**
Radium-226	Bq/L	0.49	-	<0.040	<0.01	<0.01	<0.01	0.01	0.01
Thorium-230	Bq/L	0.65	-	<0.070	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	0.6	-	<0.060	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (dissolved)	µg/L	1000	29 000	50	48	56	46	40	43
Beryllium (dissolved)	µg/L	-	67	<0.50	0.017	<0.007	<0.007	<0.007	0.007
Boron (dissolved)	µg/L	5000	45 000	31	33	27	68	25	27
Cadmium (dissolved)	µg/L	5	2.7	<0.1	0.004	0.007	0.005	0.005	0.006
Mercury (dissolved)	µg/L	1	0.29	<0.10	<0.01	<0.01	0.01	<0.01	0.01
Molybdenum (dissolved)	µg/L	-	9 200	0.73	0.91	0.86	0.88	1.03	1.32
Selenium (dissolved)	µg/L	10	63	<2.0	1.5	1.4	1.1	1.87	2.09
Silver (dissolved)	µg/L	-	1.5	<0.1	<0.05	<0.05	<0.05	<0.05	0.05
Vanadium (dissolved)	µg/L	-	250	4.10	5.19	5.38	4.23	3.18	3.60
Zinc (dissolved)	µg/L	-	1 100	<5.0	<2	<2	<2	3	3

Note:

- Annual averages are based on two (2) samples (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no data is available.

Table 177: Port Granby Long-Term Waste Management Facility Soil Monitoring – Location 1 (PG-LTWMF-SS-01)

PG-LTWMF-SS-01						
Parameter						
Primary COPC	**Unit of Measure**	**2019**	**2020**	**2021**	**2022**	**2023**
Antimony	µg/g	<0.2	<0.8	<0.8	<0.8	<0.80
Arsenic	µg/g	1.1	1.4	1.7	1.6	1.6
Cobalt	µg/g	1.8	2.3	2.1	2.3	2.1
Copper	µg/g	3.2	4.6	4.4	4.5	4.4
Lead	µg/g	5.8	7.4	7.0	7.6	7.3
Nickel	µg/g	3.8	4.9	4.3	4.7	4.0
Radium-226	Bq/g	<0.05	0.05	<0.05	<0.04	<0.05
Thorium-230	Bq/g	<0.40	0.05	<0.30	<0.30	<0.20
Thorium-232	Bq/g	<0.30	0.01	0.01	0.010	0.012
Uranium	µg/g	0.60	0.70	0.78	0.66	0.65
Secondary COPC						
Barium	µg/g	19	24	26	25	23
Beryllium	µg/g	0.21	0.23	0.23	0.24	0.23
Water Soluble Boron	µg/g	0.44	<0.50	<0.50	<0.50	<0.50
Boron	µg/g	<5	2	2	2	3
Cadmium	µg/g	0.11	0.23	0.19	0.22	0.20
Mercury	µg/g	<0.05	<0.05	<0.05	<0.05	<0.05
Molybdenum	µg/g	<0.50	0.20	0.20	0.20	1.30
Selenium	µg/g	<0.5	<0.7	<0.7	<0.7	0.20
Silver	µg/g	<0.20	0.06	<0.05	<0.05	<0.05
Vanadium	µg/g	20	18	16	19	17

Note:

- Averages are based on annual (1) sampling results (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.

Table 178: Port Granby Long-Term Waste Management Facility Soil Monitoring– Location 2 (PG-LTWMF-SS-02)

PG-LTWMF-SS-02						
Parameter	**Unit of Measure**					
Primary COPC		**2019**	**2020**	**2021**	**2022**	**2023**
Antimony	µg/g	<0.2	<0.8	<0.8	<0.8	<0.8
Arsenic	µg/g	1.7	2.3	2.9	2.9	2.5
Cobalt	µg/g	3.0	4.3	3.8	4.6	4.0
Copper	µg/g	5.0	9.2	8.3	9.1	8.1
Lead	µg/g	8.0	11	12	13	10
Nickel	µg/g	5.7	8.6	7.3	8.9	7.1
Radium-226	Bq/g	<0.05	0.06	0.06	<0.05	0.06
Thorium-230	Bq/g	<0.40	0.08	0.20	<0.10	<0.20
Thorium-232	Bq/g	<0.30	0.01	0.01	0.013	0.013
Uranium	µg/g	0.50	0.44	0.53	0.48	0.60
Secondary COPC						
Barium	µg/g	37	54	55	62	52
Beryllium	µg/g	0.25	0.32	0.31	0.34	0.31
Water Soluble Boron	µg/g	0.67	<0.50	<0.50	<0.50	<0.50
Boron	µg/g	<5	5	6	6	5
Cadmium	µg/g	0.13	0.24	0.22	0.23	0.18
Mercury	µg/g	<0.05	<0.05	<0.05	<0.05	<0.05
Molybdenum	µg/g	<0.50	0.20	0.20	0.20	0.20
Selenium	µg/g	<0.5	<0.7	<0.7	<0.7	0.2
Silver	µg/g	<0.20	<0.05	<0.05	<0.05	<0.05
Vanadium	µg/g	20	20	19	22	19

Note:

- Averages are based on annual (1) sampling results (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.

Table 179: Port Granby Long-Term Waste Management Facility Soil Monitoring– Location 3 (PG-LTWMF-SS-03)

PG-LTWMF-SS-03						
Parameter	**Unit of Measure**					
Primary COPC		**2019**	**2020**	**2021**	**2022**	**2023**
Antimony	µg/g	<0.2	<0.8	<0.8	<0.8	<0.8
Arsenic	µg/g	2.0	1.7	2.1	2.3	2.3
Cobalt	µg/g	3.1	3.2	2.8	3.8	3.6
Copper	µg/g	8.5	9.2	8.6	11.0	10.0
Lead	µg/g	27	17	20	23	26
Nickel	µg/g	5.7	6.1	5.3	7.3	6.2
Radium-226	Bq/g	<0.05	0.05	<0.03	0.07	<0.05
Thorium-230	Bq/g	<0.40	0.06	<0.20	<0.30	<0.30
Thorium-232	Bq/g	<0.30	0.01	0.01	0.011	0.011
Uranium	µg/g	0.66	0.60	0.59	0.67	0.69
Secondary COPC						
Barium	µg/g	42	42	44	53	50
Beryllium	µg/g	0.29	0.26	0.25	0.32	0.29
Water Soluble Boron	µg/g	0.87	<0.50	<0.50	<0.50	<0.50
Boron	µg/g	<5	3	3	3	4
Cadmium	µg/g	0.25	0.28	0.25	0.30	0.25
Mercury	µg/g	<0.05	<0.05	<0.05	<0.05	<0.05
Molybdenum	µg/g	<0.50	0.30	0.30	0.40	0.80
Selenium	µg/g	<0.5	<0.7	<0.7	<0.7	0.2
Silver	µg/g	0.48	<0.05	<0.05	<0.05	<0.05
Vanadium	µg/g	21	17	16	20	18

Note:

- Averages are based on annual (1) sampling results (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.

Table 180: Port Granby Long-Term Waste Management Facility Soil Monitoring– Location 4 (PG-LTWMF-SS-04)

PG-LTWMF-SS-04						
Parameter	**Unit of Measure**					
Primary COPC		**2019**	**2020**	**2021**	**2022**	**2023**
Antimony	µg/g	<0.2	<0.8	<0.8	<0.8	<0.8
Arsenic	µg/g	2.2	1.7	2.1	2.1	2.3
Cobalt	µg/g	3.1	3.2	2.8	3.8	3.6
Copper	µg/g	8.5	9.2	8.6	11.0	10.0
Lead	µg/g	27	17	20	23	26
Nickel	µg/g	5.7	6.1	5.3	7.3	6.2
Radium-226	Bq/g	<0.05	0.06	0.06	0.04	0.09
Thorium-230	Bq/g	<0.40	0.08	<0.10	<0.40	<0.30
Thorium-232	Bq/g	<0.30	0.01	0.01	0.011	0.009
Uranium	µg/g	3.0	0.61	0.66	0.62	0.88
Secondary COPC						
Barium	µg/g	28	28	32	34	32
Beryllium	µg/g	0.23	0.21	0.23	0.26	0.24
Water Soluble Boron	µg/g	0.57	<0.50	<0.50	<0.50	<0.50
Boron	µg/g	<5	2	3	3	4
Cadmium	µg/g	0.17	0.19	0.19	0.20	0.18
Mercury	µg/g	<0.05	<0.05	<0.05	<0.05	<0.05
Molybdenum	µg/g	<0.50	0.20	0.20	0.30	0.20
Selenium	µg/g	<0.5	<0.7	<0.7	<0.7	0.2
Silver	µg/g	<0.02	<0.05	<0.05	<0.05	<0.05
Vanadium	µg/g	21	14	13	17	13

Note:

- Averages are based on annual (1) sampling results (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.

Table 181: Port Granby Long-Term Waste Management Facility Soil Monitoring– Location 5

PG-LTWMF-SS-05						
Parameter	**Unit of Measure**					
Primary COPC		**2019**	**2020**	**2021**	**2022**	**2023**
Antimony	µg/g	<0.2	<0.8	<0.8	<0.8	<0.8
Arsenic	µg/g	3.8	4.7	4.9	5.1	4.8
Cobalt	µg/g	2.5	3.7	3.0	3.6	2.9
Copper	µg/g	3.4	5.8	4.7	5.6	4.6
Lead	µg/g	8.8	12	10	12	10
Nickel	µg/g	4.2	5.7	4.7	5.7	4.2
Radium-226	Bq/g	0.09	0.06	0.06	0.14	<0.07
Thorium-230	Bq/g	<0.40	0.08	0.40	<0.40	<0.40
Thorium-232	Bq/g	<0.30	0.02	0.02	0.016	0.010
Uranium	µg/g	0.66	0.80	0.80	0.79	0.81
Secondary COPC						
Barium	µg/g	18	27	23	28	19
Beryllium	µg/g	<0.20	0.20	0.18	0.21	0.17
Water Soluble Boron	µg/g	0.54	<0.50	<0.50	<0.50	<0.50
Boron	µg/g	<5	3	3	3	3
Cadmium	µg/g	0.11	0.17	0.15	0.18	0.12
Mercury	µg/g	<0.05	<0.05	<0.05	<0.05	0.06
Molybdenum	µg/g	<0.50	0.20	0.10	0.20	0.20
Selenium	µg/g	<0.5	<0.7	<0.7	<0.7	0.1
Silver	µg/g	<0.20	0.08	0.06	0.07	<0.05
Vanadium	µg/g	15	14	13	16	13

Note:

- Averages are based on annual (1) sampling results (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.

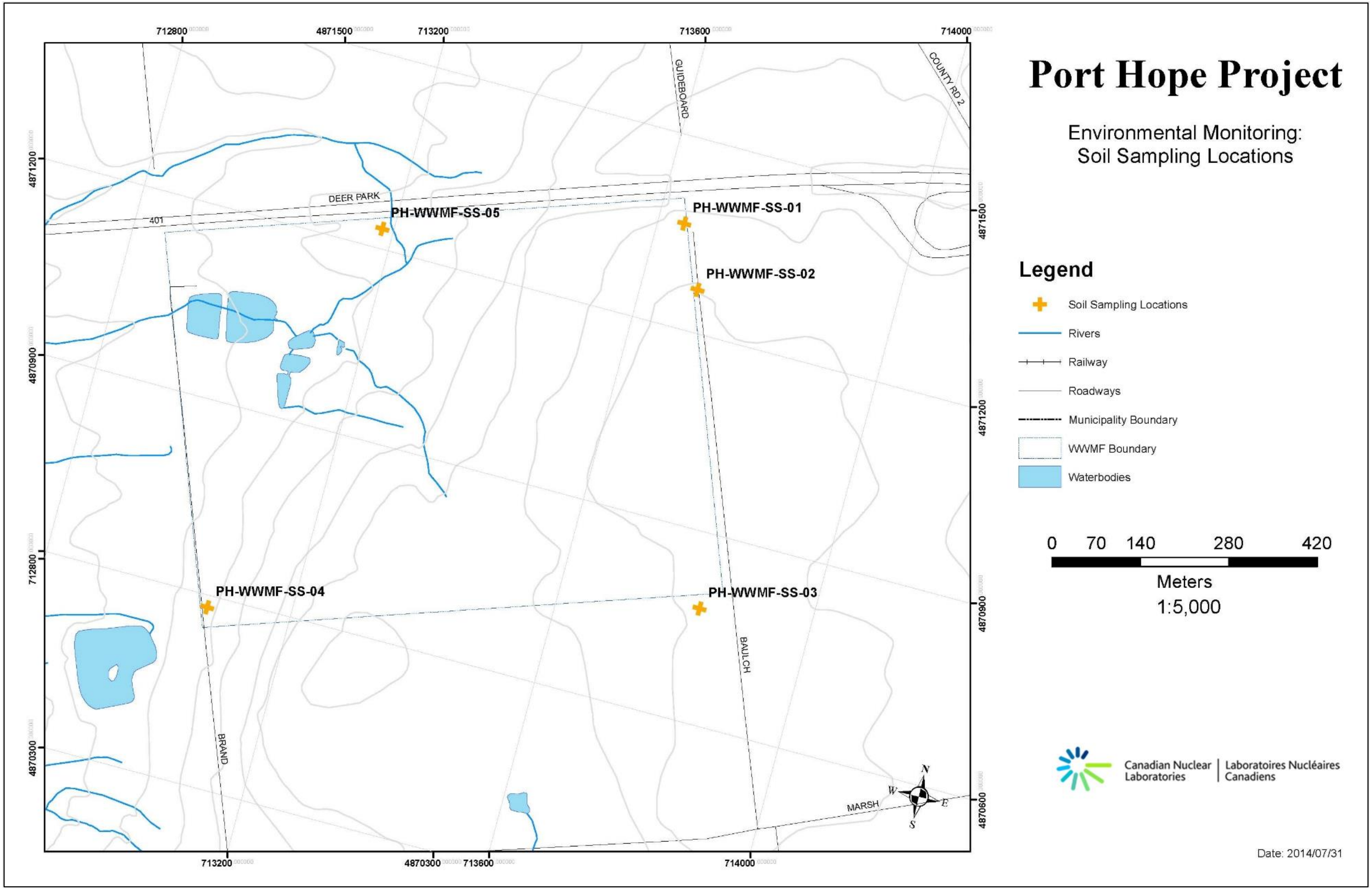


Figure 25: Port Hope Long-Term Waste Management Facility Soil Sampling Locations

Table 182: Port Hope Long-Term Waste Management Facility Soil Monitoring – Location 1 (PH-WWMF-SS-01)

PH-WWMF-SS-01						
Parameter	**Unit of Measure**					
Primary COPC		**2019**	**2020**	**2021**	**2022**	**2023**
Antimony	µg/g	<0.20	<0.80	<0.80	<0.80	<0.80
Arsenic	µg/g	4.1	4.8	5.3	4.6	6.5
Cobalt	µg/g	6.7	8.2	6.6	7.4	6.6
Copper	µg/g	11	18	12	13	13
Lead	µg/g	20	23	21	22	25
Nickel	µg/g	9.1	12	9.0	10.0	8.8
Radium-226	Bq/g	3.4	4.1	4.0	4.1	4.3
Thorium-230	Bq/g	0.06	0.10	0.19	<0.09	0.20
Thorium-232	Bq/g	<0.40	<0.40	<0.40	<0.40	<0.30
Uranium	µg/g	<0.30	0.02	0.02	0.02	0.02
Secondary COPC						
Barium	µg/g	53	66	55	62	51
Beryllium	µg/g	0.45	0.40	0.37	0.41	0.38
Water Soluble Boron	µg/g	0.54	<0.50	<0.50	1.40	<0.50
Boron	µg/g	6.4	5.0	5.0	6.0	5.0
Cadmium	µg/g	0.31	0.49	0.42	0.99	0.77
Mercury	µg/g	<0.05	0.06	0.05	0.06	0.05
Molybdenum	µg/g	<0.50	0.60	0.40	0.50	0.40
Selenium	µg/g	<0.50	<0.70	<0.70	<0.70	0.40
Silver	µg/g	0.25	0.47	0.48	0.52	0.64
Vanadium	µg/g	27	23	19	23	18
Zinc	µg/g	310	80	120	140	87

Note:

- Averages are based on annual (1) sampling results (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.

Table 183: Port Hope Long-Term Waste Management Facility Soil Monitoring - Location 2 (PH-WWMF-SS-02)

PH-WWMF-SS-02						
Parameter	**Unit of Measure**					
Primary COPC		**2019**	**2020**	**2021**	**2022**	**2023**
Antimony	µg/g	<0.20	<0.80	<0.80	<0.80	<0.80
Arsenic	µg/g	3.8	3.5	3.7	3.2	4.0
Cobalt	µg/g	4.8	4.9	4.1	4.9	4.2
Copper	µg/g	7.5	7.9	7.0	7.9	10
Lead	µg/g	16	17	16	16	18
Nickel	µg/g	6.8	7.0	5.7	6.5	6.2
Radium-226	Bq/g	1.3	1.4	1.2	1.2	3.4
Thorium-230	Bq/g	<0.05	0.13	0.12	<0.07	<0.06
Thorium-232	Bq/g	<0.40	<0.08	<0.30	<0.30	<0.30
Uranium	µg/g	<0.30	0.01	0.01	0.01	0.02
Secondary COPC						
Barium	µg/g	39	40	38	42	44
Beryllium	µg/g	0.32	0.26	0.25	0.28	0.30
Water Soluble Boron	µg/g	0.70	<0.50	<0.50	<0.50	<0.50
Boron	µg/g	<5.0	3.0	3.0	4.0	4.0
Cadmium	µg/g	0.22	0.26	0.23	0.24	0.26
Mercury	µg/g	<0.05	0.05	<0.05	<0.05	0.06
Molybdenum	µg/g	<0.50	0.30	0.30	0.30	0.30
Selenium	µg/g	<0.50	<0.70	<0.70	<0.70	0.30
Silver	µg/g	<0.20	0.15	0.15	0.15	0.41
Vanadium	µg/g	24	19	14	20	15
Zinc	µg/g	44	44	35	42	51

Note:

- Averages are based on annual (1) sampling results (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.

Table 184: Port Hope Long-Term Waste Management Facility Soil Monitoring – Location 3 (PH-WWMF-SS-03)

PH-WWMF-SS-03						
Parameter	**Unit of Measure**					
Primary COPC		**2019**	**2020**	**2021**	**2022**	**2023**
Antimony	µg/g	<0.20	<0.80	<0.80	<0.80	<0.80
Arsenic	µg/g	3.8	3.4	3.7	2.9	4.1
Cobalt	µg/g	6.5	7.5	6.2	5.8	5.7
Copper	µg/g	13	14	12	11	11
Lead	µg/g	13	12	11	10	11
Nickel	µg/g	13	14	11	10	10.0
Radium-226	Bq/g	1.3	1.4	1.2	1.1	1.4
Thorium-230	Bq/g	<0.05	0.08	<0.05	0.20	<0.05
Thorium-232	Bq/g	<0.40	<0.20	<0.20	<0.30	<0.40
Uranium	µg/g	<0.30	0.02	0.02	0.02	0.02
Secondary COPC						
Barium	µg/g	98	100	94	77	85
Beryllium	µg/g	0.56	0.50	0.44	0.39	0.45
Water Soluble Boron	µg/g	0.59	<0.50	<0.50	<0.50	<0.50
Boron	µg/g	7.3	5.0	4.0	5.0	4.0
Cadmium	µg/g	0.23	0.28	0.21	0.19	0.23
Mercury	µg/g	<0.05	<0.05	<0.05	<0.05	<0.05
Molybdenum	µg/g	<0.50	0.40	0.30	0.30	0.30
Selenium	µg/g	<0.50	<0.70	<0.70	<0.70	0.40
Silver	µg/g	<0.20	0.08	0.06	0.05	0.07
Vanadium	µg/g	35	35	28	27	24
Zinc	µg/g	58	63	49	50	52

Note:

- Averages are based on annual (1) sampling results (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.

Table 185: Port Hope Long-Term Waste Management Facility Soil Monitoring – Location 4 (PH-WWMF-SS-04)

PH-WWMF-SS-04						
Parameter	**Unit of Measure**					
Primary COPC		**2019**	**2020**	**2021**	**2022**	**2023**
Antimony	µg/g	0.23	<0.80	<0.80	<0.80	<0.80
Arsenic	µg/g	1.4	2.5	2.9	2.4	2.7
Cobalt	µg/g	1.8	3.0	2.8	2.7	2.2
Copper	µg/g	4.1	6.7	5.8	5.5	4
Lead	µg/g	10	11	19	12	11
Nickel	µg/g	3.2	5.1	4.5	4.4	3.7
Radium-226	Bq/g	0.43	0.67	0.6	0.5	0.6
Thorium-230	Bq/g	<0.05	<0.04	0.09	<0.05	<0.04
Thorium-232	Bq/g	<0.40	<0.30	<0.30	<0.20	<0.30
Uranium	µg/g	<0.30	0.01	0.01	0.01	0.01
Secondary COPC						
Barium	µg/g	20	28	36	22	22
Beryllium	µg/g	<0.20	0.22	0.23	0.21	0.20
Water Soluble Boron	µg/g	0.58	<0.50	<0.50	<0.50	<0.50
Boron	µg/g	<5.0	4.0	3.0	4.0	3.0
Cadmium	µg/g	0.12	0.21	0.26	0.22	0.15
Mercury	µg/g	<0.05	<0.05	<0.05	<0.05	<0.05
Molybdenum	µg/g	<0.50	0.30	0.20	0.30	0.20
Selenium	µg/g	<0.50	<0.70	<0.70	<0.70	0.30
Silver	µg/g	<0.20	<0.05	<0.05	<0.05	<0.05
Vanadium	µg/g	15	15	11	13	11
Zinc	µg/g	550	260	99	74	110

Note:

- Averages are based on annual (1) sampling results (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.

Table 186: Port Hope Long-Term Waste Management Facility Soil Monitoring – Location 5 (PH-WWMF-SS-05)

PH-WWMF-SS-05						
Parameter	**Unit of Measure**					
Primary COPC		**2019**	**2020**	**2021**	**2022**	**2023**
Antimony	µg/g	<0.20	<0.80	<0.80	<0.80	<0.80
Arsenic	µg/g	30	2	19	20	27
Cobalt	µg/g	4.4	6.3	4.4	4.3	4.3
Copper	µg/g	9.6	14	9.7	9.6	10
Lead	µg/g	22	34	21	20	19
Nickel	µg/g	8.3	12	8.6	8.3	8.1
Radium-226	Bq/g	6.5	0.6	7.5	6.2	8.5
Thorium-230	Bq/g	<0.05	0.09	0.13	<0.06	<0.04
Thorium-232	Bq/g	<0.40	<0.20	<0.20	<0.30	<0.30
Uranium	µg/g	<0.30	0.02	0.02	0.01	0.02
Secondary COPC						
Barium	µg/g	69	81	78	62	69
Beryllium	µg/g	0.36	0.41	0.32	0.28	0.33
Water Soluble Boron	µg/g	0.46	<0.50	<0.50	<0.50	<0.50
Boron	µg/g	7.0	6.0	6.0	6.0	5.0
Cadmium	µg/g	0.19	0.26	0.17	0.18	0.17
Mercury	µg/g	<0.05	<0.05	<0.05	<0.05	<0.05
Molybdenum	µg/g	<0.50	0.40	0.30	0.40	0.30
Selenium	µg/g	<0.50	<0.70	<0.70	<0.70	0.40
Silver	µg/g	<0.20	<0.05	<0.05	<0.05	<0.05
Vanadium	µg/g	25	29	21	21	20
Zinc	µg/g	59	84	55	58	61

Note:

- Averages are based on annual (1) sampling results (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.

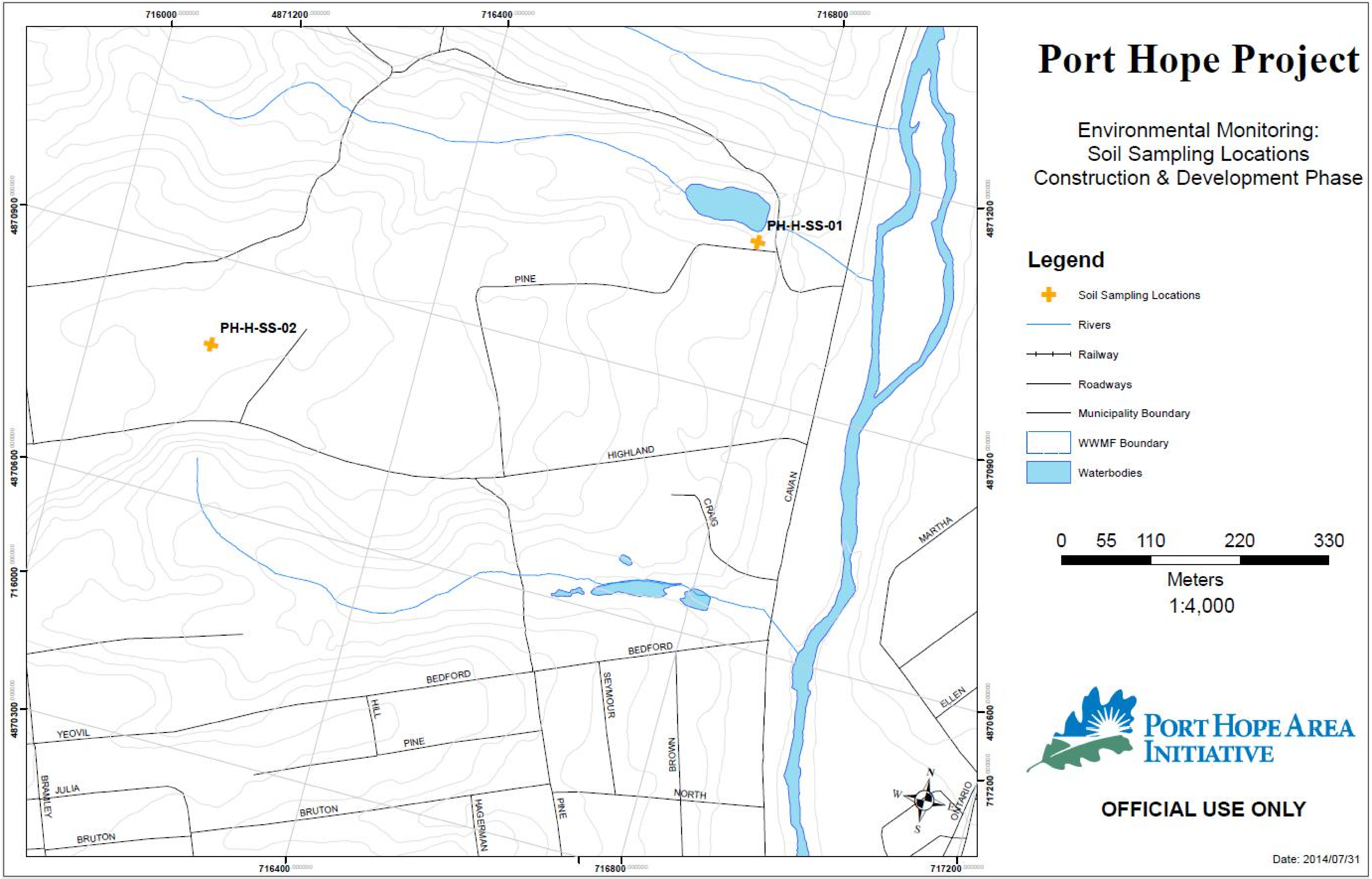


Figure 26: Port Hope Project Highland Drive Landfill Soil Sampling Locations

Table 187: Highland Drive Soil Monitoring– Location 1 (PH-H-SS-01)

PH-H-SS-01						
Parameter	**Unit of Measure**					
Primary COPC		**2019**	**2020**	**2021**	**2022**	**2023**
Antimony	µg/g	<0.20	<0.80	<0.80	<0.80	<0.80
Arsenic	µg/g	2.3	2.4	2.2	1.9	3.5
Cobalt	µg/g	7.0	8.9	6.0	6.5	6.5
Copper	µg/g	14	19	13	13	16
Lead	µg/g	14	14	8.9	9.3	14.0
Nickel	µg/g	13	18	12	12	13
Radium-226	Bq/g	0.70	0.89	0.60	0.57	0.73
Thorium-230	Bq/g	<0.05	0.08	<0.04	0.09	<0.04
Thorium-232	Bq/g	<0.40	0.07	<0.30	<0.30	<0.20
Uranium	µg/g	<0.30	0.02	0.02	0.02	0.02
Secondary COPC						
Barium	µg/g	110	140	95	95	110
Beryllium	µg/g	0.52	0.50	0.38	0.41	0.51
Water Soluble Boron	µg/g	0.30	<0.50	<0.50	<0.50	<0.50
Boron	µg/g	6.6	6.0	5.0	5.0	6.0
Cadmium	µg/g	0.19	0.22	0.15	0.18	0.19
Mercury	µg/g	<0.05	<0.05	<0.05	<0.05	<0.05
Molybdenum	µg/g	<0.50	0.40	0.30	0.40	0.40
Selenium	µg/g	<0.50	<0.70	<0.70	<0.70	0.50
Silver	µg/g	<0.20	0.07	0.06	0.07	0.05
Vanadium	µg/g	36	44	29	33	30
Zinc	µg/g	71	89	50	52	170

Note:

- Averages are based on annual (1) sampling results (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.

Table 188: Highland Drive Soil Monitoring– Location 2 (PH-H-SS-02)

PH-H-SS-02						
Parameter	**Unit of Measure**					
Primary COPC		**2019**	**2020**	**2021**	**2022**	**2023**
Antimony	µg/g	0.21	<0.80	<0.80	<0.80	<0.80
Arsenic	µg/g	3.2	4.2	4.0	2.9	4.4
Cobalt	µg/g	6.2	6.5	6.4	6.6	5.9
Copper	µg/g	13	15	15	16	14
Lead	µg/g	13	19	16	15	15
Nickel	µg/g	12	13	12	12	11
Radium-226	Bq/g	2.0	1.7	2.3	2.3	2.5
Thorium-230	Bq/g	<0.05	<0.03	<0.04	0.20	0.10
Thorium-232	Bq/g	<0.40	0.10	<0.30	<0.40	<0.30
Uranium	µg/g	<0.30	0.01	0.02	0.02	0.02
Secondary COPC						
Barium	µg/g	96	95	108	100	100
Beryllium	µg/g	0.45	0.38	0.42	0.38	0.45
Water Soluble Boron	µg/g	0.40	<0.50	<0.50	<0.50	<0.50
Boron	µg/g	6.5	5.0	5.0	5.0	5.0
Cadmium	µg/g	0.19	0.19	0.19	0.17	0.19
Mercury	µg/g	<0.05	<0.05	<0.05	<0.05	<0.05
Molybdenum	µg/g	<0.50	0.40	0.30	0.40	0.40
Selenium	µg/g	<0.50	<0.70	<0.70	<0.70	0.40
Silver	µg/g	<0.20	0.10	0.12	0.15	0.11
Vanadium	µg/g	33	31	30	32	27
Zinc	µg/g	49	54	49	54	74

Note:

- Averages are based on annual (1) sampling results (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.

C.3 Aquatic Environmental Monitoring

Table 189: Port Granby Project Surface Water Quality – Port Granby Creek (PGC-D)

PGC- D									
			Year	**2019**	**2020**	**2021**	**2022**	**2023**	**2023**
			Total No. of Samples	4	4	4	3	4	4
Parameter	**Unit of Measure**	**Criteria**		**Average**					**Maximum**
		PWQO [50]	**CWQG [52]**						
Primary COPC									
Antimony (total)	µg/L	20	-	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (total)	µg/L	100	5	<1.0	0.5	1.7	0.6	0.6	0.8
Cobalt (total)	µg/L	0.90	-	<0.50	0.080	0.174	0.091	0.123	0.211
Copper (total)	µg/L	5	-	<1.0	0.6	0.7	0.7	0.7	0.9
Lead (total)	µg/L	5	7	<0.50	0.08	0.12	0.11	0.23	0.42
Nickel (total)	µg/L	25	25	<1.0	0.3	3.6	0.4	0.4	0.6
Uranium (total)	µg/L	5	15	0.820	0.789	0.884	0.862	0.812	0.867
Radium-226	Bq/L	1	-	<0.04	0.01	<0.01	0.01	<0.01	0.01
Thorium-230	Bq/L	-	-	<0.07	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	-	-	<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (total)	µg/L	-	-	52.0	52.0	55.1	57.5	59.5	63.8
Beryllium (total)	µg/L	1100	-	<0.50	<0.50	0.008	0.021	0.011	0.019
Boron (total)	µg/L	200	1500	<13	12	12	13	15	19
Cadmium (total)	µg/L	0.20	0.09	<0.10	<0.10	0.005	0.014	0.007	0.012
Mercury (dissolved)	µg/L	0.20	0.026	<0.01	<0.01	<0.01	<0.01	<0.01	0.01
Molybdenum (total)	µg/L	40	73	0.53	0.55	0.46	0.84	0.52	0.77
Selenium (total)	µg/L	100	1	<2.0	<2.0	0.13	0.25	0.21	0.17
Silver (total)	µg/L	0.1	0.25	<0.10	<0.10	<0.05	<0.05	<0.05	0.05
Vanadium (total)	µg/L	6	-	1.09	1.01	0.76	0.93	0.77	1.82
Zinc (total)	µg/L	30	30	<5.0	<5.0	<2.0	2.0	<2.0	2.0

Note:

- Averages are based on quarterly (4) sampling results (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.

Table 190: Port Granby Project Surface Water Quality – Port Granby Creek (PGC-U)

PGC- U									
			Year	**2019**	**2020**	**2021**	**2022**	**2023**	**2023**
			Total No. of Samples	4	4	4	3	4	4
Parameter	**Unit of Measure**	**Criteria**		**Average**					**Maximum**
		PWQO [50]	**CWQG [52]**						
Primary COPC									
Antimony (total)	µg/L	20	-	<0.50	<0.50	<0.90	<0.90	<0.90	0.90
Arsenic (total)	µg/L	100	5	<1.0	0.5	1.7	0.6	0.5	0.7
Cobalt (total)	µg/L	0.90	-	<0.50	0.098	0.156	0.743	0.167	0.320
Copper (total)	µg/L	5	-	<1.0	0.6	0.7	0.7	0.8	1.1
Lead (total)	µg/L	5	7	<0.50	0.16	0.13	0.16	0.29	0.70
Nickel (total)	µg/L	25	25	<1.0	0.3	1.8	0.4	0.4	0.70
Uranium (total)	µg/L	5	15	0.765	0.748	0.826	0.787	0.808	0.915
Radium-226	Bq/L	1	-	<0.04	0.01	<0.01	<0.01	<0.01	0.01
Thorium-230	Bq/L	-	-	<0.07	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	-	-	<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (total)	µg/L	-	-	57.0	56.0	60.5	61.8	58.4	69
Beryllium (total)	µg/L	1100	-	<0.50	0.010	0.021	0.009	0.014	0.027
Boron (total)	µg/L	200	1500	13	13	12	15	13	16
Cadmium (total)	µg/L	0.20	0.09	<0.10	0.012	0.010	0.013	0.012	0.019
Mercury (dissolved)	µg/L	0.20	0.026	<0.01	<0.01	<0.01	<0.01	<0.01	0.01
Molybdenum (total)	µg/L	40	73	0.68	0.45	0.61	0.53	0.54	0.75
Selenium (total)	µg/L	100	1	<2.0	0.14	0.31	0.20	0.15	0.18
Silver (total)	µg/L	0.1	0.25	<0.10	<0.05	<0.05	<0.05	<0.05	0.05
Vanadium (total)	µg/L	6	-	1.14	0.92	1.07	1.01	1.28	1.88
Zinc (total)	µg/L	30	30	<5.0	3.8	2.5	<2.0	2.8	4.0

Note:

- Averages are based on quarterly (4) sampling results (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.

Table 191: Port Granby Project Storm Event Sampling – Port Granby Creek (PGC-D)

Parameter	Unit of Measure	Criteria		PGC-D					
Primary COPC		PWQO [50]	CWQG [52]	2023/06/12 9:30AM	2023/06/12 10:30AM	2023/06/12 11:30AM	2023/06/12 12:30PM	2023/06/12 1:30PM	2023/06/12 2:30PM
Antimony (total)	µg/L	20	-	<0.9	<0.9	<0.9	<0.9	<0.9	<0.9
Arsenic (total)	µg/L	100	5	0.8	0.7	1.0	1.2	2.7	1.8
Cobalt (total)	µg/L	0.9	-	0.2	0.1	0.5	0.6	**3.4**	**1.6**
Copper (total)	µg/L	5	-	0.9	0.8	1.6	1.7	**6.0**	3.4
Lead (total)	µg/L	5	7	0.35	0.16	1.23	1.33	**6.70**	3.14
Nickel (total)	µg/L	25	25	0.6	0.4	1.0	1.3	6.5	3.2
Uranium (total)	µg/L	5	15	0.824	0.805	0.724	0.749	0.958	0.850
Radium-226	Bq/L	1	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Thorium-230	Bq/L	-	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Thorium-232	Bq/L	-	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Secondary COPC									
Barium (total)	µg/L	-	-	64.5	59.9	63.6	63.6	128.0	91.6
Beryllium (total)	µg/L	1100	-	0.021	0.007	0.043	0.040	0.328	0.150
Boron (total)	µg/L	200	1500	13	12	12	13	17	15
Cadmium (total)	µg/L	0.2	0.09	0.014	0.009	0.023	0.039	0.178	0.091
Mercury (dissolved)	µg/L	0.2	0.026	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Molybdenum (total)	µg/L	40	73	0.74	0.69	0.67	2.77	2.31	2.39
Selenium (total)	µg/L	100	1	0.17	0.18	0.18	0.26	0.38	0.32
Silver (total)	µg/L	0.1	0.25	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Vanadium (total)	µg/L	6	-	1.65	1.18	2.67	3.28	**15.60**	**7.89**
Zinc (total)	µg/L	30	30	3	<2	8	7	**33**	18
Additional Parameters									
Staff Gauge	cm	-	-	0.5	0.5	0.5	0.6	0.7	1
Total Suspended Solids	mg/L	-	-	20	13	55	107	350	183

Note:

- Bold values indicate an exceedance of a criteria.
- < - indicates the result was less than the laboratory method detection limit.

Table 192: Port Granby Project Surface Water Quality –Lake Ontario Diffuser (PG-LO-D)

PG-LO- D									
			Year	**2019**	**2020**	**2021**	**2022**	**2023**	**2023**
			Total No. of Samples	3	2	3	3	3	3
Parameter	**Unit of Measure**	**Criteria**		**Average**					**Maximum**
		PWQO [50]	**CWQG [52]**						
Primary COPC									
Antimony (total)	µg/L	20	-	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (total)	µg/L	100	5	<1.0	0.9	0.8	0.9	0.8	0.8
Cobalt (total)	µg/L	0.90	-	<0.5	0.017	0.020	0.017	0.016	0.019
Copper (total)	µg/L	5	-	1.2	0.9	0.7	0.8	0.8	0.8
Lead (total)	µg/L	5	7	<0.5	0.03	<0.09	<0.09	<0.09	0.09
Nickel (total)	µg/L	25	25	<1.0	0.4	0.6	0.5	0.6	0.7
Uranium (total)	µg/L	5	15	0.36	0.332	0.369	0.414	1.475	3.660
Radium-226	Bq/L	1	-	<0.04	0.01	<0.01	<0.01	<0.01	0.01
Thorium-230	Bq/L	-	-	<0.07	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	-	-	<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (total)	µg/L	-	-	23.0	23.1	20.7	22.6	22.5	23.1
Beryllium (total)	µg/L	1100	-	<0.50	0.013	<0.007	<0.007	<0.007	0.007
Boron (total)	µg/L	200	1500	21	21	24	23	33	43
Cadmium (total)	µg/L	0.20	0.09	<0.10	<0.003	0.004	0.005	0.004	0.005
Mercury (dissolved)	µg/L	0.20	0.026	<0.01	<0.01	<0.01	0.02	<0.01	0.01
Molybdenum (total)	µg/L	40	73	1.2	1.22	1.22	1.17	1.25	1.30
Selenium (total)	µg/L	100	1	<2.0	0.14	0.14	0.11	0.16	0.19
Silver (total)	µg/L	0.1	0.25	<0.10	<0.05	<0.05	<0.05	<0.05	0.05
Vanadium (total)	µg/L	6	-	0.53	0.21	0.23	0.21	0.21	0.24
Zinc (total)	µg/L	30	30	<5	3	<2	<2	3	5

Note:

- Averages are based on quarterly (4) sampling results (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.

Table 193: Port Granby Project Surface Water Quality – Lake Ontario Diffuser (PG-LO-E)

PG-LO- E									
Year				2019	2020	2021	2022	2023	2023
Total No. of Samples				3	2	3	3	3	3
Parameter	Unit of Measure	Criteria		Average					Maximum
		PWQO [50]	CWQG [52]						
Primary COPC									
Antimony (total)	µg/L	20	-	<0.5	<0.9	<0.9	<0.9	<0.9	0.9
Arsenic (total)	µg/L	100	5	<1.0	0.9	0.8	0.9	0.8	0.9
Cobalt (total)	µg/L	0.90	-	<0.5	0.026	0.023	0.012	0.016	0.019
Copper (total)	µg/L	5	-	<1.0	0.9	0.8	1.1	0.9	1.1
Lead (total)	µg/L	5	7	<0.5	<0.01	<0.09	<0.09	<0.09	0.09
Nickel (total)	µg/L	25	25	<1.0	0.4	0.5	0.6	0.5	0.6
Uranium (total)	µg/L	5	15	0.35	0.335	0.345	0.412	0.815	1.680
Radium-226	Bq/L	1	-	<0.04	<0.01	0.01	<0.01	<0.01	0.01
Thorium-230	Bq/L	-	-	<0.07	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	-	-	<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (total)	µg/L	-	-	22.7	24.3	22.5	22.2	22.3	23.5
Beryllium (total)	µg/L	1100	-	<0.50	<0.007	<0.007	<0.007	<0.007	0.007
Boron (total)	µg/L	200	1500	19	20	17	22	27	31
Cadmium (total)	µg/L	0.20	0.09	<0.10	0.013	0.005	0.009	0.003	0.004
Mercury (dissolved)	µg/L	0.20	0.026	<0.01	<0.01	<0.01	<0.01	<0.01	0.01
Molybdenum (total)	µg/L	40	73	1.1	1.23	1.14	1.21	1.23	1.24
Selenium (total)	µg/L	100	1	<2.0	0.13	0.16	0.15	0.14	0.16
Silver (total)	µg/L	0.1	0.25	<0.10	<0.10	<0.05	<0.05	<0.05	0.05
Vanadium (total)	µg/L	6	-	<0.50	0.23	0.25	0.19	0.21	0.23
Zinc (total)	µg/L	30	30	<5	2	3	2	<2	2

Note:

- Averages are based on quarterly (4) sampling results (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.

Table 194: Port Granby Project Surface Water Quality –Lake Ontario Diffuser (PG-LO-W)

PG-LO- W									
Year				2019	2020	2021	2022	2023	2023
Total No. of Samples				3	2	3	3	3	3
Parameter	Unit of Measure	Criteria		Average					Maximum
		PWQO [50]	CWQG [52]						
Primary COPC									
Antimony (total)	µg/L	20	-	<0.5	<0.9	<0.9	<0.9	<0.9	0.9
Arsenic (total)	µg/L	100	5	<1.0	0.9	0.9	0.8	0.8	0.8
Cobalt (total)	µg/L	0.90	-	<0.5	0.020	0.028	0.017	0.013	0.016
Copper (total)	µg/L	5	-	1.4	0.9	0.9	1.2	0.8	0.9
Lead (total)	µg/L	5	7	<0.5	0.01	0.09	<0.09	<0.09	0.09
Nickel (total)	µg/L	25	25	<1.0	0.4	0.7	0.5	0.6	0.7
Uranium (total)	µg/L	5	15	0.35	0.325	0.350	0.396	0.992	2.220
Radium-226	Bq/L	1	-	<0.04	<0.01	0.01	<0.01	<0.01	0.01
Thorium-230	Bq/L	-	-	<0.07	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L	-	-	<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (total)	µg/L	-	-	22.3	24.4	22.2	22.7	22.3	23.1
Beryllium (total)	µg/L	1100	-	<0.50	<0.007	<0.007	<0.007	<0.007	0.007
Boron (total)	µg/L	200	1500	20	21	20	25	29	35
Cadmium (total)	µg/L	0.20	0.09	<0.10	0.006	0.005	0.006	<0.003	0.003
Mercury (dissolved)	µg/L	0.20	0.026	<0.01	<0.01	<0.01	<0.01	<0.01	0.01
Molybdenum (total)	µg/L	40	73	1.1	1.26	1.41	1.12	1.25	1.35
Selenium (total)	µg/L	100	1	<2.0	0.15	0.15	0.14	0.17	0.22
Silver (total)	µg/L	0.1	0.25	<0.10	<0.05	<0.05	<0.05	<0.05	0.05
Vanadium (total)	µg/L	6	-	0.50	0.23	0.25	0.20	0.21	0.22
Zinc (total)	µg/L	30	30	<5	2	2	<2	<2	2

Note:

- Averages are based on quarterly (4) sampling results (as available)
- Bold values indicate an exceedance of criteria
- < - indicates the result was less than the laboratory method detection limit.

Table 195: Port Granby Long-Term Waste Management Facility Drainage Water Quality - (PG-SW-1/DP1-02)

PG-SW-1/DP1-02									
			Year	2019	2020	2021	2022	2023	2023
Parameter	Unit of Measure	Criteria		Average					Maximum
		PWQO [50]	CWQG [52]						
Primary COPC									
Antimony (total)	µg/L	20	-	<0.50	<0.90	<0.90	<0.90	<0.90	0.90
Arsenic (total)	µg/L	100	5	5.9	1.2	1.2	0.6	0.8	1.0
Cobalt (total)	µg/L	0.9	-	0.8	0.1	0.1	0.04	0.05	0.05
Copper (total)	µg/L	5	-	2.0	0.3	0.3	0.5	<0.2	0.2
Lead (total)	µg/L	5	7	1.3	0.1	0.2	<0.09	0.10	0.11
Nickel (total)	µg/L	25	25	1.2	0.2	<0.1	0.1	0.2	0.2
Uranium (total)	µg/L	5	15	2.1	0.56	0.46	0.37	0.40	0.02
Radium-226	Bq/L	1	-	<0.04	<0.01	0.02	<0.01	0.02	0.02
Thorium-230	Bq/L	-	-	<0.07	<0.02	<0.02	<0.02	<0.02	0.56
Thorium-232	Bq/L	-	-	<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Barium (total)	µg/L	-	-	12	15	14	14.9	29.6	48.7
Beryllium (total)	µg/L	1100	-	<0.50	<0.007	<0.007	<0.007	<0.007	0.007
Boron (total)	µg/L	200	1500	11	10	7	9	11	12
Cadmium (total)	µg/L	0.2	0.09	<0.10	0.004	0.003	0.004	0.004	0.005
Mercury (dissolved)	µg/L	0.2	0.026	<0.010	<0.010	0.015	<0.010	<0.010	0.010
Molybdenum (total)	µg/L	40	73	<0.50	0.10	0.11	0.10	0.21	0.22
Selenium (total)	µg/L	100	1	<2.0	0.05	0.05	0.06	0.08	0.10
Silver (total)	µg/L	0.1	0.1	0.18	<0.05	<0.05	<0.05	<0.05	<0.05
Vanadium (total)	µg/L	6	-	1.13	0.17	0.14	0.06	0.15	0.19
Zinc (total)	µg/L	30	30	5.9	2.5	<2.0	2.5	<2.0	2.0

Note:

- Averages are based on semi-annual (2) sampling results (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.

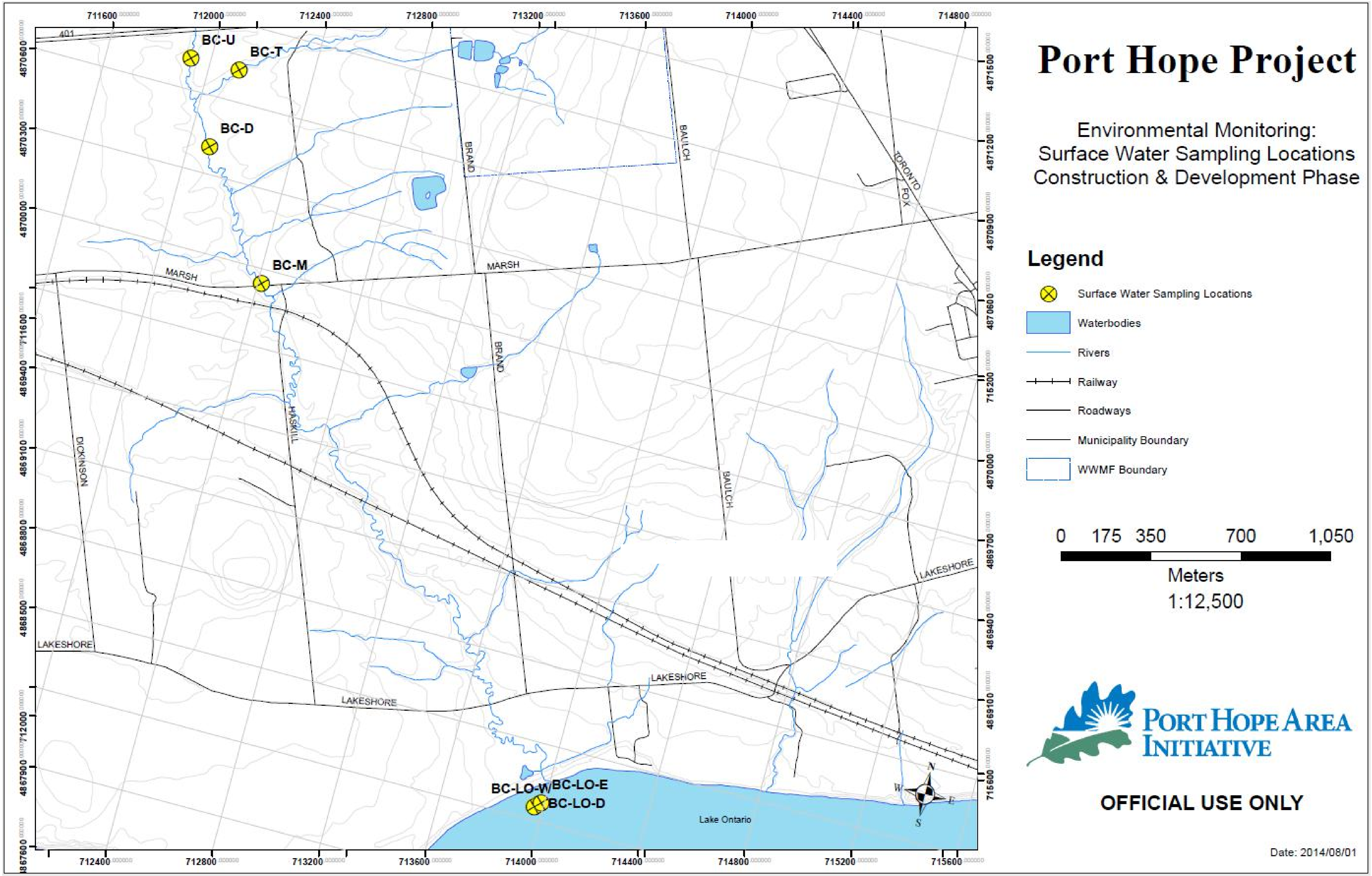


Figure 27: Port Hope Project Brand Creek and Lake Ontario Surface Water Sampling Locations

Table 196: Port Hope Long-Term Waste Management Facility Surface Water Quality - Brand Creek – Downstream (BC-D)

BC-D									
Parameter	**Unit of Measure**	**Criteria**		**2019**	**2020**	**2021**	**2022**	**2023**	**2023**
Primary COPC		**PWQO [50]**	**CWQG [52]**	**Average**					**Maximum**
Arsenic (total)	µg/L	100	5	1.4	1.6	2.0	1.5	1.3	2.5
Cobalt (total)	µg/L	0.9	-	<0.500	0.301	0.414	0.461	0.433	0.605
Copper (total)	µg/L	5	-	1.2	1.7	1.0	1.2	0.9	0.9
Lead (total)	µg/L	5	7	0.56	0.37	0.22	0.51	0.19	0.25
Uranium (total)	µg/L	5	15	1.60	2.02	3.24	1.59	2.15	2.96
Radium-226	Bq/L	1	-	<0.04	0.01	0.01	<0.01	0.01	0.01
Thorium-230	Bq/L	-	-	<0.07	<0.02	<0.02	<0.02	0.02	0.02
Thorium-232	Bq/L			<0.06	<0.02	<0.02	<0.02	0.02	0.02
Secondary COPC									
Boron (total)	µg/L	200	1500	12	14	22	19	12	14
Vanadium	µg/L	6	-	1.63	1.51	1.09	1.86	0.90	1.29
Zinc (total)	µg/L	30	30	5	5	3	5	2	3
Additional Parameters									
Total Aluminum (Al)	µg/L	-	-	480	434	194	653	190	2.5
Total Suspended Solids	mg/L	-	-	24	21	8	23	8	13
pH	-	6.5-8.5	6.5-9.0	8.14	8.07	7.96	8.24	8.02	8.06

Note:

- Bold values indicate an exceedance of criteria.
- Averages are based on quarterly (4) sampling results (as available).
- < - indicates the result was less than the laboratory method detection limit.

Table 197: Port Hope Long-Term Waste Management Facility Surface Water Quality – Brand Creek – Upstream (BC-U)

BC-U									
Parameter	**Unit of Measure**	**Criteria**		**2019**	**2020**	**2021**	**2022**	**2023**	**2023**
Primary COPC		**PWQO [50]**	**CWQG [52]**	**Average**					**Maximum**
Arsenic (total)	µg/L	100	5	1.7	2.0	<0.2	0.2	<0.2	0.2
Cobalt (total)	µg/L	0.9	-	**3.625**	0.444	0.074	0.152	0.088	0.096
Copper (total)	µg/L	5	-	**7.5**	1.9	0.6	1.8	0.8	0.9
Lead (total)	µg/L	5	7	**5.13**	0.43	0.08	0.26	0.10	0.10
Uranium (total)	µg/L	5	15	0.673	0.487	0.743	0.471	0.518	0.558
Radium-226	Bq/L	1	-	0.04	0.01	<0.01	<0.01	<0.01	0.01
Thorium-230	Bq/L	-	-	<0.07	<0.02	<0.02	<0.02	0.02	0.02
Thorium-232	Bq/L			<0.06	<0.02	<0.02	<0.02	0.02	0.02
Secondary COPC									
Boron (total)	µg/L	200	1500	17	16	24	21	11	11
Vanadium	µg/L	6	-	**13.06**	1.68	0.67	1.00	0.68	0.69
Zinc (total)	µg/L	30	30	**36**	5	2	4	2	2
Additional Parameters									
Total Aluminum (Al)	µg/L	-	-	6200	423	65	221	111	119
Total Suspended Solids	mg/L	-	-	165	16	3	15	7	7
pH	-	6.5-8.5	6.5-9.0	8.06	8.03	8.05	8.04	8.05	8.05

Note:

- Bold values indicate an exceedance of criteria.
- Averages are based on quarterly (4) sampling results (as available).
- < - indicates the result was less than the laboratory method detection limit.

Table 198: Port Hope Long-Term Waste Management Facility Surface Water Quality – Brand Creek – Marsh Road (BC-M)

BC-M									
Parameter	**Unit of Measure**	**Criteria**		**2019**	**2020**	**2021**	**2022**	**2023**	**2023**
Primary COPC		**PWQO [50]**	**CWQG [52]**	**Average**					**Maximum**
Arsenic (total)	µg/L	100	5	1.4	1.5	1.5	1.8	1.1	1.7
Cobalt (total)	µg/L	0.9	-	0.533	0.435	0.353	0.706	0.358	0.533
Copper (total)	µg/L	5	-	1.3	1.9	0.9	1.6	0.9	1.1
Lead (total)	µg/L	5	7	0.57	0.58	0.22	0.91	0.22	0.29
Uranium (total)	µg/L	5	15	1.98	2.22	3.22	1.92	1.95	2.98
Radium-226	Bq/L	1	-	<0.04	0.01	0.01	<0.01	<0.01	0.01
Thorium-230	Bq/L	-	-	<0.07	<0.02	<0.02	<0.02	0.02	0.02
Thorium-232	Bq/L			<0.06	<0.02	<0.02	<0.02	0.02	0.02
Secondary COPC									
Boron (total)	µg/L	200	1500	13	14	14	22	12	13
Vanadium	µg/L	6	-	2.10	2.00	1.13	2.62	1.10	1.62
Zinc (total)	µg/L	30	30	6	6	6	6	2	3
Additional Parameters									
Total Aluminum (Al)	µg/L	-	-	635	580	580	897	263	365
Total Suspended Solids	mg/L	-	-	32	45	45	21	41	150
pH	-	6.5-8.5	6.5-9.0	8.19	8.13	8.13	8.10	8.00	8.09

Note:

- Bold values indicate an exceedance of criteria.
- Averages are based on quarterly (4) sampling results (as available).
- < - indicates the result was less than the laboratory method detection limit.

Table 199: Port Hope Long-Term Waste Management Facility Surface Water Quality – Brand Creek – Tributary of Brand Creek (BC-T)

BC-T									
Parameter	**Unit of Measure**	**Criteria**		**2019**	**2020**	**2021**	**2022**	**2023**	**2023**
Primary COPC		**PWQO [50]**	**CWQG [52]**	**Average**					**Maximum**
Arsenic (total)	µg/L	100	5	3.3	3.5	3.1	2.8	3.1	4.1
Cobalt (total)	µg/L	0.9	-	<0.500	0.557	**1.393**	0.686	**1.781**	**2.730**
Copper (total)	µg/L	5	-	1.6	2.4	1.7	1.2	1.8	2.1
Lead (total)	µg/L	5	7	<0.50	0.68	0.48	0.29	0.38	0.49
Uranium (total)	µg/L	5	15	**6**	**5**	**10**	4	**7.91**	**11.2**
Radium-226	Bq/L	1	-	<0.04	0.01	<0.01	<0.01	<0.01	0.01
Thorium-230	Bq/L	-	-	<0.07	<0.02	<0.02	<0.02	0.02	0.02
Thorium-232	Bq/L			<0.06	<0.02	<0.02	<0.02	0.02	0.02
Secondary COPC									
Boron (total)	µg/L	200	1500	14	14	22	21	13	14
Vanadium	µg/L	6	-	1.12	2.26	1.33	1.15	1.07	1.69
Zinc (total)	µg/L	30	30	6	9	5	4	4	5
Additional Parameters									
Total Aluminum (Al)	µg/L	-	-	284	830	401	343	311	552
Total Suspended Solids	mg/L	-	-	27	31	23	44	17	29
pH	-	6.5-8.5	6.5-9.0	8.23	8.21	8.18	8.17	8.24	8.26

Note:

- Bold values indicate an exceedance of criteria
- Averages are based on quarterly (4) sampling results (as available).
- < - indicates the result was less than the laboratory method detection limit.

Table 200: Port Hope Long-Term Waste Management Facility Storm Event Sampling – Brand Creek Watershed (BC-M)

Parameter	Unit of Measure	Criteria		BC-M					
Primary COPC		**PWQO [50]**	**CWQG [52]**	**2023/02/09 8:30AM**	**2023/02/09 9:30AM**	**2023/02/09 10:30AM**	**2023/02/09 12:00PM**	**2023/02/09 1:00PM**	**2023/02/09 2:00PM**
Arsenic (total)	µg/L	100	5	0.8	0.8	0.9	1.2	3.3	3.9
Cobalt (total)	µg/L	0.9	-	0.589	0.527	0.691	**1.290**	**3.690**	**4.130**
Copper (total)	µg/L	5		1.3	1.1	1.5	3.9	**9.3**	**10.0**
Lead (total)	µg/L	5	7	0.46	0.33	0.59	1.67	**5.87**	**6.82**
Uranium (total)	µg/L	5	15	3.33	3.37	3.41	3.30	2.36	1.72
Radium-226	Bq/L	1	-	<0.01	0.01	0.01	0.03	<0.01	0.01
Thorium-230	Bq/L	-	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Thorium-232	Bq/L	-	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Secondary COPC									
Beryllium (total)	µg/L	1100	-	0.029	0.021	0.034	0.062	0.274	0.330
Boron (total)	µg/L	200	1500	11	11	10	12	14	13
Vanadium	µg/L	6	-	1.60	1.31	1.93	4.06	**14.0**	**16.4**
Zinc (total)	µg/L	30	30	4	4	6	29	**66**	**64**
Additional Parameters									
Aluminium (total)	µg/L	-	-	700	515	857	1910	7710	9640
Total Suspended Solids	mg/L	-	-	23	20	31	125	337	606
pH	-	-	-	8.06	8.02	8.04	7.87	7.73	7.63
Staff Gauge	cm	-	-	25	25	30	38	44	60

Note:

- Bold values indicate an exceedance of a criteria.
- < - indicates the result was less than the laboratory method detection limit.

Table 201: Port Hope Long-Term Waste Management Facility Surface Water – Lake Ontario Diffuser (BC-LO-D)

BC-LO-D									
			Year	2019	2020	2021	2022	2023	2023
Parameter	Unit of Measure		Total No. of Samples	3	2	3	3	3	3
		Criteria		Average					Maximum
Primary COPC		PWQO [50]	CWQG [52]						
Arsenic (total)	µg/L	100	5	<1.0	0.8	1.0	0.9	1.2	1.7
Cobalt (total)	µg/L	0.9	-	<0.500	0.062	0.079	0.024	0.035	0.058
Copper (total)	µg/L	5	-	<1.0	0.9	0.8	1.2	1.0	1.3
Lead (total)	µg/L	5	7	<0.50	0.09	0.11	<0.09	0.20	0.42
Uranium (total)	µg/L	5	15	0.377	0.351	0.451	0.412	1.581	3.940
Radium-226	Bq/L	1	-	<0.04	0.01	0.01	<0.01	0.01	0.02
Thorium-230	Bq/L	-	-	<0.07	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L			<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Boron (total)	µg/L	200	1500	23	20	38	24	24	26
Vanadium	µg/L	6	-	0.59	0.25	0.32	0.20	0.23	0.26
Zinc (total)	µg/L	30	30	<5.0	3.0	<2.0	2.7	<2.0	2.0
Additional Parameters									
Total Aluminum (Al)	µg/L	-	-	43	32	52	8	9	15
Total Suspended Solids	mg/L	-	-	2.0	3.0	8.0	2.7	2.0	2.0
pH	-	6.5-8.5	6.5-9.0	8.21	8.02	8.03	8.08	8.07	8.12

Note:

- Averages are based on quarterly (4) sampling results (as available).
- Bold values indicate an exceedance of criteria
- < - indicates the result was less than the laboratory method detection limit.

Table 202: Port Hope Long-Term Waste Management Facility Surface Water – Lake Ontario Diffuser – Outside Eastern Edge of Mixing Zone (BC-LO-E)

BC-LO-E									
			Year	2019	2020	2021	2022	2023	2023
Parameter	Unit of Measure		Total No. of Samples	3	2	3	3	3	3
		Criteria		Average					Maximum
Primary COPC		PWQO [50]	CWQG [52]						
Arsenic (total)	µg/L	100	5	<1.0	0.9	0.9	0.8	1.1	1.8
Cobalt (total)	µg/L	0.9	-	<0.500	0.059	0.040	0.011	0.046	0.077
Copper (total)	µg/L	5	-	1.0	1.0	0.8	0.9	1.2	1.9
Lead (total)	µg/L	5	7	<0.50	0.02	0.10	0.10	0.23	0.45
Uranium (total)	µg/L	5	15	0.380	0.381	0.374	0.407	1.657	4.160
Radium-226	Bq/L	1	-	<0.04	<0.01	0.01	0.01	0.02	0.02
Thorium-230	Bq/L	-	-	<0.07	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L			<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Boron (total)	µg/L	200	1500	22	22	33	23	23	24
Vanadium	µg/L	6	-	0.62	0.45	0.26	0.18	0.23	0.30
Zinc (total)	µg/L	30	30	<5.0	<2.0	2.3	<2.0	3.7	7.0
Additional Parameters									
Total Aluminum (Al)	µg/L	-	-	35	40	32	9	8	12
Total Suspended Solids	mg/L	-	-	1.7	3.5	18.3	2.7	<2.0	2.0
pH	-	6.5-8.5	6.5-9.0	8.21	8.06	8.03	8.16	8.08	8.19

Note:

- Averages are based on quarterly (4) sampling results (as available).
- Bold values indicate an exceedance of criteria
- < - indicates the result was less than the laboratory method detection limit.

Table 203: Port Hope Long-Term Waste Management Facility Surface Water – Lake Ontario Diffuser – Outside Western Edge of Mixing Zone (BC-LO-W)

BC-LO-W									
			Year	2019	2020	2021	2022	2023	2023
Parameter	Unit of Measure		Total No. of Samples	3	2	3	3	3	3
		Criteria		Average					Maximum
Primary COPC		PWQO [50]	CWQG [52]						
Arsenic (total)	µg/L	100	5	<1.0	0.9	0.8	0.7	1.0	1.6
Cobalt (total)	µg/L	0.9	-	<0.500	0.047	0.059	0.044	0.031	0.068
Copper (total)	µg/L	5	-	<1.0	1.1	0.9	0.7	1.0	1.3
Lead (total)	µg/L	5	7	<0.50	0.09	0.16	0.23	0.21	0.43
Uranium (total)	µg/L	5	15	0.380	0.353	0.359	0.517	1.576	3.950
Radium-226	Bq/L	1	-	<0.04	<0.01	<0.01	<0.01	0.01	0.02
Thorium-230	Bq/L	-	-	<0.07	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L			<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Boron (total)	µg/L	200	1500	23	20	35	27	23	24
Vanadium	µg/L	6	-	<0.59	0.31	0.39	0.44	0.21	0.26
Zinc (total)	µg/L	30	30	<5.0	2.5	2.3	<2.0	2.0	2.0
Additional Parameters									
Total Aluminum (Al)	µg/L	-	-	43	50	92	51	6	9
Total Suspended Solids	mg/L	-	-	1.7	3.0	6.3	2.0	2.7	4.0
pH	-	6.5-8.5	6.5-9.0	8.26	8.09	8.06	8.09	8.09	8.12

Note:

- Averages are based on quarterly (4) sampling results (as available).
- Bold values indicate an exceedance of criteria
- < - indicates the result was less than the laboratory method detection limit.

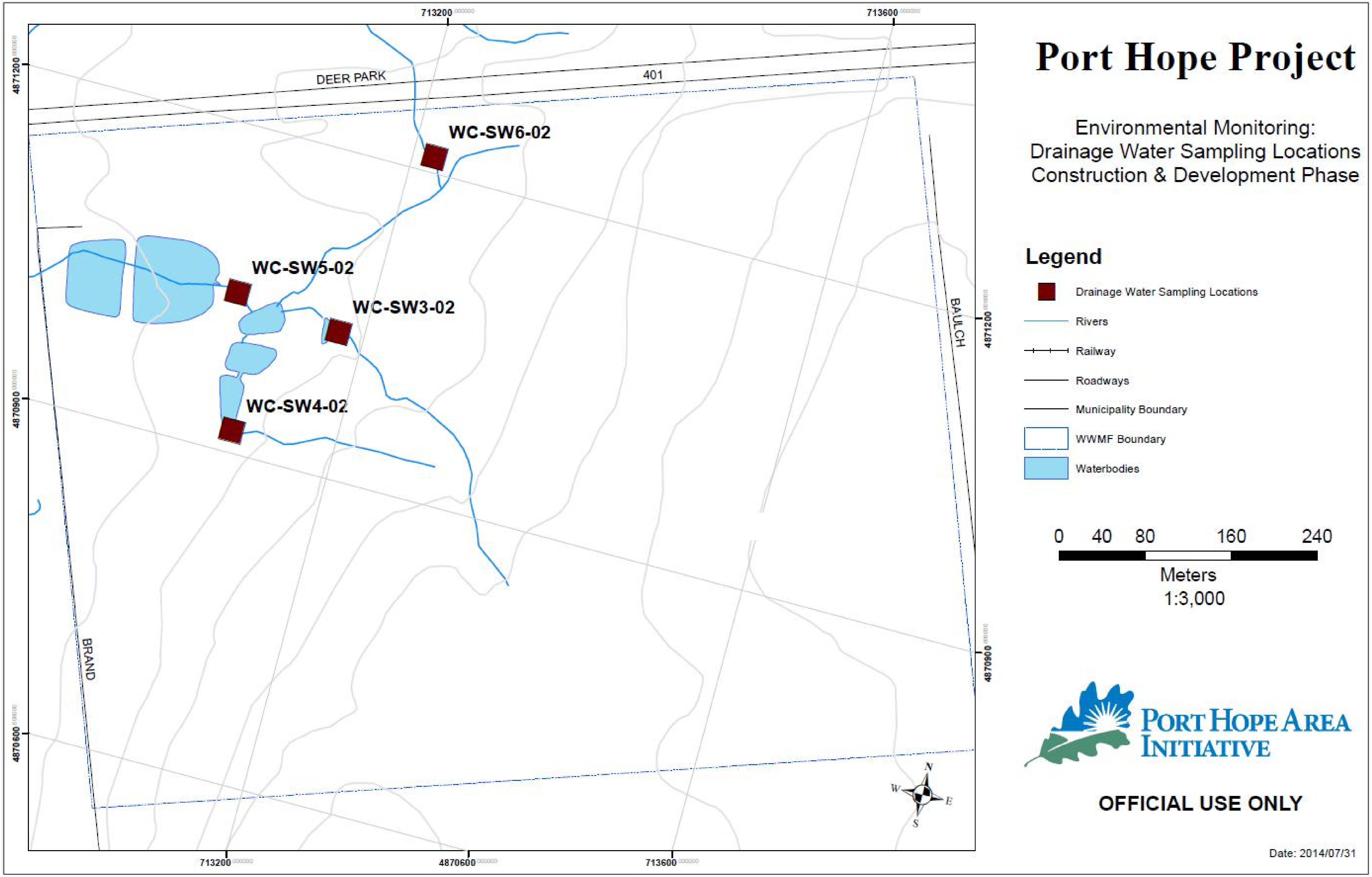


Figure 28: Port Hope Long-Term Waste Management Facility Drainage Water Sampling Locations

Table 204: Port Hope Long-Term Waste Management Facility Drainage Water Quality – Location 1 (WC-SW3-02)

WC-SW3-02									
Parameter	**Unit of Measure**	**Criteria**		**2019**	**2020**	**2021**	**2022**	**2023**	**2023**
Primary COPC		**PWQO [50]**	**CWQG [52]**	**Average**					**Maximum**
Arsenic (total)	µg/L	100	5	**335**	**430**	**1126**	**117**	**177**	**234**
Copper (total)	µg/L	5	-	2.9	**22.8**	**2224.1**	**184.0**	**106**	**211**
Lead (total)	µg/L	5	7	<0.5	4.6	**642**	**114**	**57**	**113**
Uranium (total)	µg/L	5	15	**445**	**528**	**1976**	**590**	**808**	**888**
Radium-226	Bq/L	1	-	0.16	0.08	0.19	0.33	0.08	0.15
Thorium-230	Bq/L	-	-	<0.07	<0.02	0.05	0.02	0.02	0.02
Thorium-232	Bq/L			<0.06	<0.02	0.06	<0.02	<0.02	0.06
Secondary COPC									
Boron (total)	µg/L	200	1500	51	63	123	158	**238**	**426**
Zinc (total)	µg/L	30	30	8	15	**362**	**93**	**71**	**140**
Additional Parameters									
Total Aluminum (Al)	µg/L	-	-	81	69	623	1398	534	804
Total Suspended Solids	mg/L	-	-	11	38	82	168	56	67
pH	-	6.5-8.5	6.5-9.0	8.07	8.10	7.95	7.81	7.91	7.97

Note:

- Averages are based on semi-annual (2) sampling results.
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.

Table 205: Port Hope Long-Term Waste Management Facility Drainage Water Quality – Location 3 (WC-SW5-02)

WC-SW5-02									
Parameter	**Unit of Measure**	**Criteria**		**2019**	**2020**	**2021**	**2022**	**2023**	**2023**
Primary COPC		**PWQO [50]**	**CWQG [52]**	**Average**					**Maximum**
Arsenic (total)	µg/L	100	5	**168**	**205**	**1020**	**169**	**111**	**121**
Copper (total)	µg/L	5	-	**18.4**	**61.5**	**1900.0**	**214.1**	**52**	**102**
Lead (total)	µg/L	5	7	1.49	**12.94**	**568.95**	**145.80**	**87**	**173**
Uranium (total)	µg/L	5	15	**246**	**388**	**1846**	**706**	**409**	**577**
Radium-226	Bq/L	1	-	0.36	0.12	0.17	0.23	0.07	0.12
Thorium-230	Bq/L	-	-	0.18	<0.02	0.06	<0.02	<0.02	0.02
Thorium-232	Bq/L			<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Boron (total)	µg/L	200	1500	63	58	120	149	132	**216**
Zinc (total)	µg/L	30	30	16	29	**329**	**87**	**117**	**174**
Additional Parameters									
Total Aluminum (Al)	µg/L	-	-	466	366	481	619	471	532
Total Suspended Solids	mg/L	-	-	31	16	59	45	23	36
pH	-	6.5-8.5	6.5-9.0	7.66	8.08	7.97	7.89	7.89	7.97

Note:

- Averages are based on semi-annual (2) sampling results.
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.

Table 206: Port Hope Long-Term Waste Management Facility Drainage Water Quality – Location 4 (WC-SW6-02)

WC-SW6-02									
Parameter	**Unit of Measure**	**Criteria**		**2019**	**2020**	**2021**	**2022**	**2023**	**2023**
Primary COPC		**PWQO [50]**	**CWQG [52]**	**Average**					**Maximum**
Arsenic (total)	µg/L	100	5	**83**	**43**	**63**	**14**	8	**10.2**
Copper (total)	µg/L	5	-	1.1	7.9	2.2	1.1	0.8	0.9
Lead (total)	µg/L	5	7	<0.50	2.11	0.74	0.22	0.12	0.14
Uranium (total)	µg/L	5	15	**75**	**66**	**325**	**49**	**28**	**35**
Radium-226	Bq/L	1	-	<0.04	0.01	0.02	0.02	<0.01	0.01
Thorium-230	Bq/L	-	-	<0.07	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L			<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Boron (total)	µg/L	200	1500	24	34	48	56	44	50
Zinc (total)	µg/L	30	30	<5	14	40	3	2	2
Additional Parameters									
Total Aluminum (Al)	µg/L	-	-	50	4780	554	634	121	164
Total Suspended Solids	mg/L	-	-	7	309	79	43	7	9
pH	-	6.5-8.5	6.5-9.0	8.01	7.93	8.02	8.03	7.90	8.15

Note:

- Averages are based on semi-annual (2) sampling results.
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.

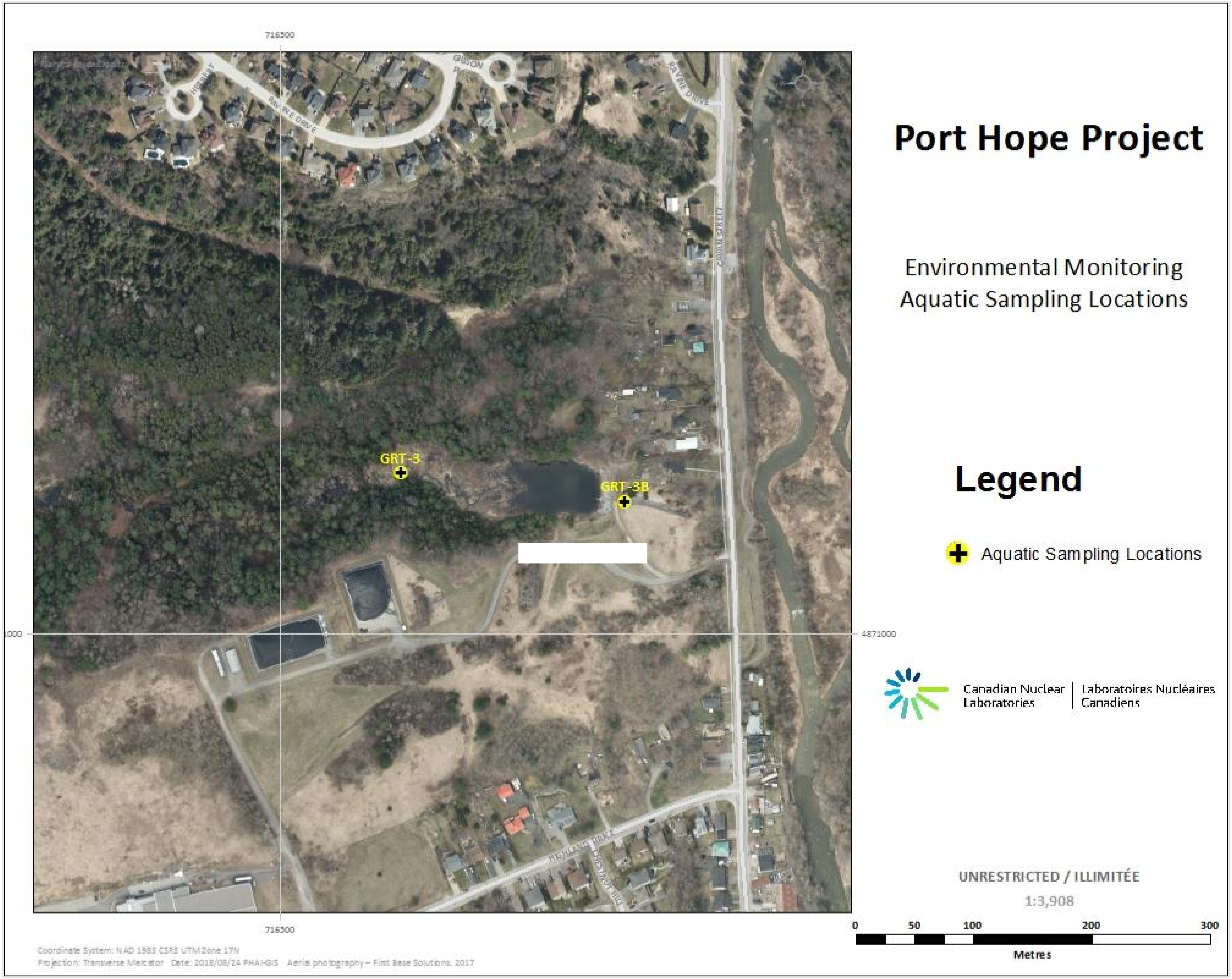


Figure 29: Port Hope Project Brewery Creek Aquatic Sampling Locations

Table 207: Port Hope Project Highland Drive Landfill Surface Water Quality – Brewery Creek – Upstream (GRT-3)

GRT-3									
Parameter	**Unit of Measure**	**Criteria**		**2019**	**2020**	**2021**	**2022**	**2023**	**2023**
Primary COPC		**PWQO [50]**	**CWQG [52]**	**Average**					**Maximum**
Arsenic (total)	µg/L	100	5	<1.0	0.4	0.4	0.3	0.3	0.3
Copper (total)	µg/L	5	-	<1.1	1.1	0.5	0.3	0.8	1.9
Lead (total)	µg/L	5	7	0.51	0.34	0.21	0.16	0.41	1.09
Uranium (total)	µg/L	5	15	1.03	0.99	1.07	1.03	1.01	1.12
Radium-226	Bq/L	1	-	<0.04	<0.01	0.02	<0.01	0.01	0.02
Thorium-230	Bq/L	-	-	<0.07	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L			<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Boron (total)	µg/L	200	1500	32	30	34	30	33	41
Zinc (total)	µg/L	30	30	<5	4	3	<2	2	3
Additional Parameters									
Total Aluminum (Al)	µg/L	-	-	68	111	27	43	31	36
Total Suspended Solids	mg/L	-	-	12	13	5	10	10	11
pH	-	6.5-8.5	6.5-9.0	8.21	8.24	8.20	8.23	8.18	8.23

Note:

- Averages are based on semi-annual (2) sampling results.
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.

Table 208: Port Hope Project Highland Drive Landfill Surface Water Quality – Brewery Creek – Downstream (GRT-3B)

GRT-3B									
Parameter	**Unit of Measure**	**Criteria**		**2019**	**2020**	**2021**	**2022**	**2023**	**2023**
Primary COPC		**PWQO [50]**	**CWQG [52]**	**Average**					**Maximum**
Arsenic (total)	µg/L	100	5	<1.0	0.4	0.4	0.3	0.3	0.3
Copper (total)	µg/L	5	-	<1.1	0.9	0.3	0.3	0.3	0.4
Lead (total)	µg/L	5	7	0.60	0.05	0.11	0.14	<0.09	0.10
Uranium (total)	µg/L	5	15	1.85	1.56	1.50	1.51	1.54	2.23
Radium-226	Bq/L	1	-	<0.04	0.01	0.01	<0.01	<0.01	0.01
Thorium-230	Bq/L	-	-	<0.07	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L			<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Boron (total)	µg/L	200	1500	35	35	35	32	36	44
Zinc (total)	µg/L	30	30	<5	3	2	<2	3	5
Additional Parameters									
Total Aluminum (Al)	µg/L	-	-	71	15	10	18	10	18
Total Suspended Solids	mg/L	-	-	6	2	2	3	2	2
pH	-	6.5-8.5	6.5-9.0	8.17	8.18	8.12	8.18	8.14	8.24

Note:

- Averages are based on semi-annual (2) sampling results.
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.

Figure 30: Port Hope Project Highland Drive South Creek Aquatic Sampling Locations

Table 209: Port Hope Project Highland Drive South Creek Surface Water Quality– Upstream (HC-U)

HC-U									
Parameter	**Unit of Measure**	**Criteria**		**2019**	**2020**	**2021**	**2022**	**2023**	**2023**
Primary COPC		**PWQO [50]**	**CWQG [52]**	**Average**					**Maximum**
Arsenic (total)	µg/L	100	5	2.9	3.9	4.5	3.0	3.2	4.4
Copper (total)	µg/L	5	-	<1.0	1.5	0.5	0.3	0.5	0.8
Lead (total)	µg/L	5	7	<0.50	0.18	0.38	0.17	0.44	0.94
Uranium (total)	µg/L	5	15	**8.8**	**8.7**	**9.1**	**9.0**	**9.4**	**11.1**
Radium-226	Bq/L	1	-	<0.04	0.01	0.02	0.02	0.01	0.01
Thorium-230	Bq/L	-	-	<0.07	0.03	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L			<0.06	<0.02	0.03	<0.02	<0.02	0.02
Secondary COPC									
Boron (total)	µg/L	200	1500	**433**	**462**	**397**	**454**	**401**	**489**
Zinc (total)	µg/L	30	30	5	4	5	30	5	9
Additional Parameters									
Total Aluminum (Al)	µg/L	-	-	34	27	34	56	69	148
Total Suspended Solids	mg/L	-	-	6	9	5	6	5	5
pH	-	6.5-8.5	6.5-9.0	8.17	8.05	8.03	7.99	8.02	8.07

Note:

- Averages are based on quarterly (4) sampling results (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.

Table 210: Port Hope Project Highland Drive South Creek Surface Water Quality– Downstream (HC-D)

HC-D									
Parameter	**Unit of Measure**	**Criteria**		**2019**	**2020**	**2021**	**2022**	**2023**	**2023**
Primary COPC		**PWQO [50]**	**CWQG [52]**	**Average**					**Maximum**
Arsenic (total)	µg/L	100	5	**8.4**	**8.0**	**7.1**	**6.9**	**7.3**	**8.8**
Copper (total)	µg/L	5	-	<1.0	1.1	0.3	0.4	0.4	0.5
Lead (total)	µg/L	5	7	<0.50	0.39	0.12	0.11	0.20	0.48
Uranium (total)	µg/L	5	15	**33.8**	**35.3**	**32.9**	**39.5**	**34.9**	**46.7**
Radium-226	Bq/L	1	-	<0.04	0.01	0.01	<0.01	<0.01	0.01
Thorium-230	Bq/L	-	-	<0.07	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L			<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Boron (total)	µg/L	200	1500	**458**	**484**	**438**	**485**	**436**	**496**
Zinc (total)	µg/L	30	30	5	3	5	3	4	6
Additional Parameters									
Total Aluminum (Al)	µg/L	-	-	40	31	6	11	23	56
Total Suspended Solids	mg/L	-	-	8	5	2	2	3	3
pH	-	6.5-8.5	6.5-9.0	8.19	8.17	8.17	8.13	8.14	8.17

Note:
- Averages are based on quarterly (4) sampling results (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.

Table 211: Port Hope Project Highland Drive South Creek Watershed Storm Event Sampling – (HC-D)

Parameter	Units of Measure	Criteria		HC-D					
Primary COPC		**PWQO [50]**	**CWQG [52]**	**2023/06/12 9:30AM**	**2023/06/12 10:30AM**	**2023/06/12 11:30AM**	**2023/06/12 12:30PM**	**2023/06/12 1:30PM**	**2023/06/12 2:30PM**
Arsenic (total)	µg/L	100	5	**7.6**	**8.2**	**8.5**	**8.4**	**8.7**	**8.8**
Copper (total)	µg/L	5	-	0.5	1.0	0.6	0.5	0.6	0.6
Lead (total)	µg/L	5	7	0.11	0.16	0.16	0.15	0.17	0.29
Uranium (total)	µg/L	5	15	**33.4**	**33.6**	**33.0**	**32.6**	**33.6**	**33.9**
Radium-226	Bq/L	1	-	<0.01	<0.01	0.01	0.01	0.02	<0.01
Thorium-230	Bq/L	-	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Thorium-232	Bq/L	-	-	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Secondary COPC									
Boron (total)	µg/L	200	1500	**467**	**440**	**480**	**472**	**495**	**491**
Zinc (total)	µg/L	30	30	2	2	2	<2	2	3
Additional Parameters									
Aluminium (total)	µg/L	-	-	10	15	17	15	19	32
Total Suspended Solids	mg/L	-	-	2	5	2	3	7	6
pH	-	-	-	8.12	8.13	8.12	8.12	8.13	8.14
Staff Gauge	cm	**-**	**-**	22	22	24	30	29	30

Note:

- Bold values indicate an exceedance of a criteria.
- < - indicates the result was less than the laboratory method detection limit.

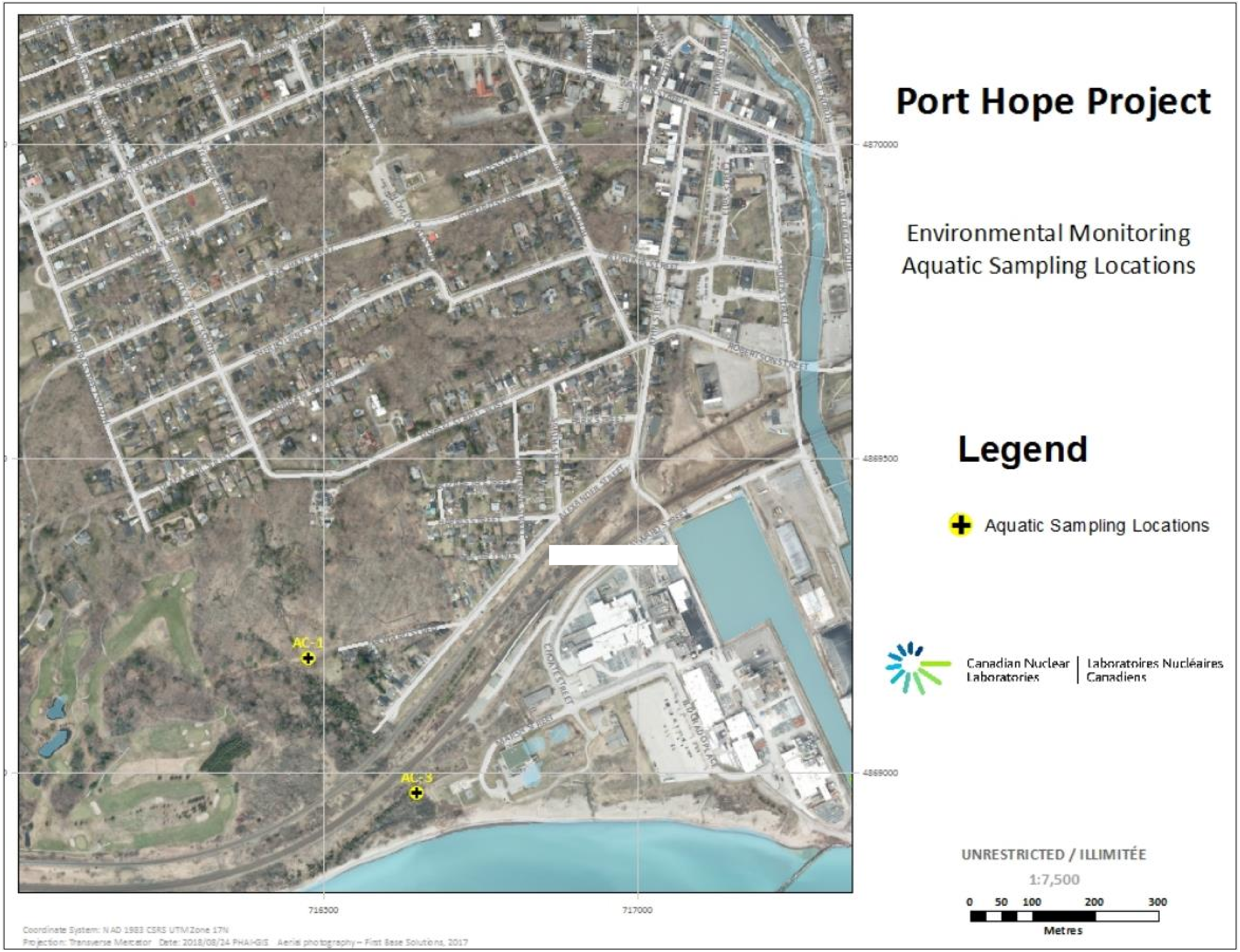


Figure 31: Port Hope Project Alexander Creek Aquatic Sampling Locations

Table 212: Alexander Creek Surface Water Quality – Upstream (AC-1)

Parameter	Unit of Measure	Criteria		AC-1					
				2019	2020	2021	2022	2023	2023
Primary COPC		PWQO [50]	CWQG [52]	Averages					Maximum
Copper (total)	µg/L	5	-	<1.0	1.4	0.6	0.6	2.6	**7.1**
Lead (total)	µg/L	5	7	0.69	0.69	0.40	0.40	3.08	**11.50**
Uranium (total)	µg/L	5	15	3.30	2.95	3.18	3.06	2.85	3.18
Radium-226	Bq/L	1	-	<0.04	0.01	0.01	0.02	0.01	0.04
Secondary COPC									
Vanadium (total)	µg/L	6	-	1.25	1.25	0.90	0.92	2.82	**8.24**
Zinc (total)	µg/L	30	30	5	4	3	2	10	**32**

Note:

- Averages are based on quarterly (4) sampling results (as available).
- Bold values indicate an exceedance of a criteria.
- < - indicates the result was less than the laboratory method detection limit.

Table 213: Alexander Creek Surface Water Quality – Downstream (AC-3)

Parameter	Unit of Measure	Criteria		AC-3					
				2019	2020	2021	2022	2023	2023
Primary COPC		**PWQO [50]**	**CWQG [52]**	**Average**					**Maximum**
Copper (total)	µg/L	5	-	1.7	1.7	0.9	0.6	0.8	1.0
Lead (total)	µg/L	5	7	0.99	1.17	0.77	0.61	0.49	0.89
Uranium (total)	µg/L	5	15	**8.78**	**7.03**	**6.26**	**6.21**	**7.14**	**8.74**
Radium-226	Bq/L	1	-	<0.04	0.02	0.02	0.02	0.01	0.02
Secondary COPC									
Vanadium (total)	µg/L	6	-	1.15	1.22	1.03	0.81	0.82	1.04
Zinc (total)	µg/L	30	30	6	7	5	4	4	6

Note:

- Averages are based on quarterly (4) sampling results (as available).
- Bold values indicate an exceedance of a criteria.
- < - indicates the result was less than the laboratory method detection limit.

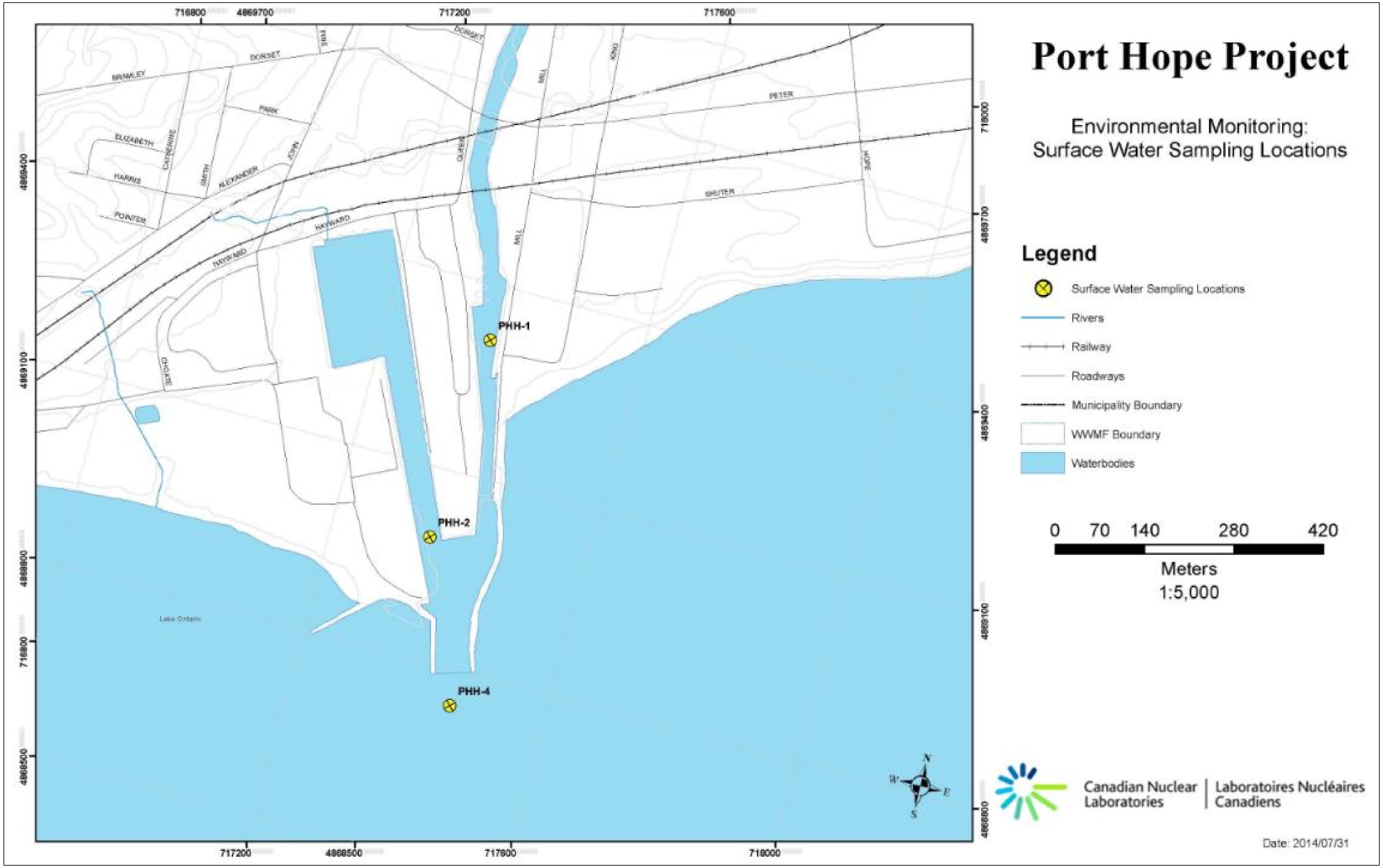


Figure 32: Port Hope Project Harbour Surface Water Sampling Locations

Table 214: Lake Ontario Port Hope Harbour Surface Water Quality – Location 1 (PHH-1)

PHH-1									
Parameter	**Unit of Measure**	**Criteria**		**2019**	**2020**	**2021**	**2022[1]**	**2023**	**2023**
Primary COPC		**PWQO [50]**	**CWQG [52]**	**Average**					**Maximum**
Arsenic (total)	µg/L	100	5	<1.0	0.7	0.5	-	0.4	0.5
Cobalt (total)	µg/L	0.9	-	<0.500	0.064	0.053	-	0.055	0.061
Copper (total)	µg/L	5	-	<1.0	0.8	0.4	-	0.5	0.8
Lead (total)	µg/L	5	7	<0.50	0.14	0.14	-	0.30	0.36
Uranium (total)	µg/L	5	15	0.74	0.78	0.77	-	0.86	1.07
Radium-226	Bq/L	1	-	<0.04	<0.01	<0.01	-	0.02	0.02
Thorium-230	Bq/L	-	-	<0.07	<0.02	<0.02	-	<0.02	0.02
Thorium-232	Bq/L			<0.06	<0.02	<0.02	-	<0.02	0.02
Secondary COPC									
Boron (total)	µg/L	200	1500	15	17	25	-	18	24
Zinc (total)	µg/L	30	30	<5	2	2	-	2	2
Additional Parameters									
Total Aluminum (Al)	µg/L	-	-	44	68	40	-	46	69
Total Suspended Solids	mg/L	-	-	2.7	4.0	4.0	-	9.0	20
pH	-	6.5-8.5	6.5-9.0	8.38	8.36	8.36	-	7.32	8.38

Note:

- Averages are based on quarterly (4) sampling results (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates data is not available.
- [1]Sampling was not completed in 2022 due to severe weather (2022 June).

Table 215: Lake Ontario Port Hope Harbour Surface Water Quality – Location 2 (PHH-2)

PHH-2									
Parameter	**Unit of Measure**	**Criteria**		**2019**	**2020**	**2021**	**2022**	**2023**	**2023**
Primary COPC		**PWQO [50]**	**CWQG [52]**	**Average**					**Maximum**
Arsenic (total)	µg/L	100	5	2.5	2.3	**8.4**	**54.0**	**17**	**44.2**
Cobalt (total)	µg/L	0.9	-	<0.500	0.129	0.315	**1.783**	0.449	**1.040**
Copper (total)	µg/L	5	-	<1.5	0.8	1.1	**5.2**	2.0	3.5
Lead (total)	µg/L	5	7	<0.50	0.35	4.63	**40.8**	**5.8**	**14.6**
Uranium (total)	µg/L	5	15	2.30	1.67	**35**	**112**	**60**	**152**
Radium-226	Bq/L	1	-	<0.04	0.03	0.07	0.37	0.15	0.35
Thorium-230	Bq/L	-	-	<0.07	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L			<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Boron (total)	µg/L	200	1500	20	18	39	28	20	27
Zinc (total)	µg/L	30	30	<5	3	<2	6	4	7
Additional Parameters									
Total Aluminum (Al)	µg/L	-	-	40	150	39	319	52	81
Total Suspended Solids	mg/L	-	-	4.0	5.0	6.0	4.0	5.0	4.0
pH	-	6.5-8.5	6.5-9.0	8.32	8.19	8.20	8.25	8.18	8.25

Note:

- Averages are based on quarterly (4) sampling results (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.

Table 216: Lake Ontario Port Hope Harbour Surface Water Quality – Location 3 (PHH-4)

PHH-4									
Parameter	**Unit of Measure**	**Criteria**		**2019**	**2020**	**2021**	**2022**	**2023**	**2023**
Primary COPC		**PWQO [50]**	**CWQG [52]**	**Average**					**Maximum**
Arsenic (total)	µg/L	100	5	1.0	0.9	0.8	3.3	1.0	1.5
Cobalt (total)	µg/L	0.9	-	<0.500	0.036	0.017	0.067	0.021	0.029
Copper (total)	µg/L	5	-	<1.1	0.9	0.8	1.1	0.8	1.0
Lead (total)	µg/L	5	7	<0.50	0.06	0.09	1.22	0.13	0.22
Uranium (total)	µg/L	5	15	0.45	0.40	0.39	**10**	1.36	3.26
Radium-226	Bq/L	1	-	<0.04	<0.01	<0.01	0.02	0.02	0.02
Thorium-230	Bq/L	-	-	<0.07	<0.02	<0.02	<0.02	<0.02	0.02
Thorium-232	Bq/L			<0.06	<0.02	<0.02	<0.02	<0.02	0.02
Secondary COPC									
Boron (total)	µg/L	200	1500	21	22	26	25	23	25
Zinc (total)	µg/L	30	30	<5	<2	<2	<2	3	4
Additional Parameters									
Total Aluminum (Al)	µg/L	-	-	76	45	24	16	4	5
Total Suspended Solids	mg/L	-	-	2.0	3.0	2.3	2.7	3.3	6
pH	-	6.5-8.5	6.5-9.0	8.31	8.15	8.04	8.15	8.09	8.29

Note:

- Averages are based on quarterly (4) sampling results (as available).
- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.

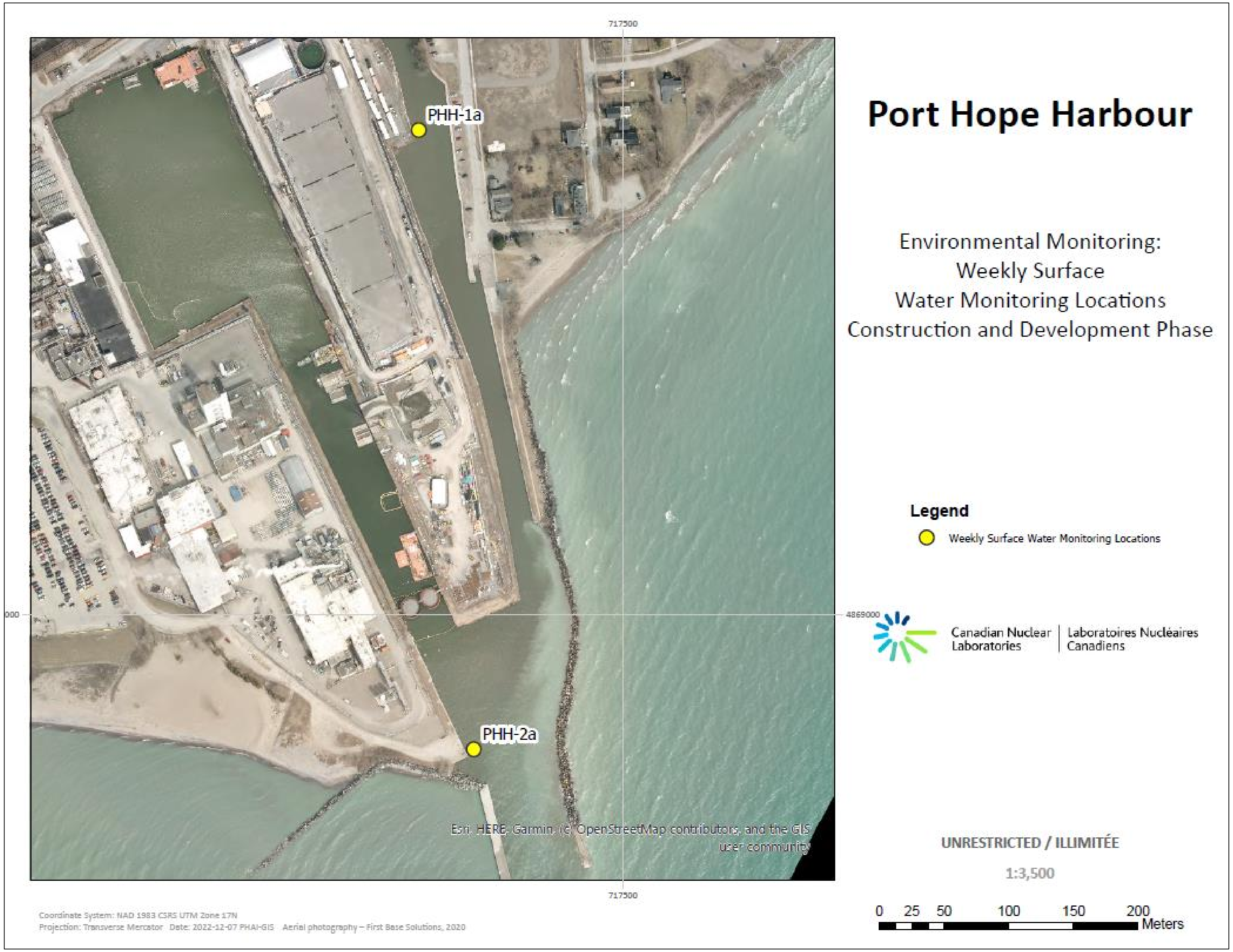


Figure 33: Port Hope Project Harbour Weekly Surface Water Monitoring Locations

Table 217: Lake Ontario Port Hope Harbour Surface Water Quality – During Dredging Activities (PHH-1a) – 2023

PHH-1a									
Total No. of Samples				9	13	13	12	47	47
Quarter and Year				January to March	April to June	July to September	October to December	2023	2023
Parameter	Unit of Measure	Criteria		Average					Maximum
Primary COPC		PWQO [50]	CWQG [52]						
Arsenic (total)	µg/L	100	5	0.5	0.7	0.6	0.4	0.6	2.0
Cobalt (total)	µg/L	0.9	-	0.6	0.1	0.1	0.01	0.02	**3.6**
Copper (total)	µg/L	5		1.2	0.7	0.6	0.5	0.7	3.0
Lead (total)	µg/L	5	7	0.87	0.32	0.29	0.56	0.48	2.84
Uranium (total)	µg/L	5	15	0.91	0.85	0.78	0.89	0.85	1.34
Radium-226	Bq/L	1	-	0.016	<0.005	<0.005	0.009	0.008	0.102
Secondary COPC									
Boron (total)	µg/L	200	1500	17	19	19	17	18	32
Zinc (total)	µg/L	30	30	5	3	2	3	3	13
Additional Parameters									
Aluminum (total)	µg/L	-	-	740	106	65	107	219	3010
Total Suspended Solids	mg/L	-	-	51	7	7	14	17	221

Note:

- Averages are based on weekly sampling results during dredging activities (as available).
- Bold values indicate an exceedance of a criteria.
- < - indicates the result was less than the laboratory method detection limit

Table 218: Lake Ontario Port Hope Harbour Surface Water Quality — During Dredging Activities (PHH-2a) – 2023

PHH-2a									
			Total No. of Samples	9	13	13	12	47	47
			Quarter and Year	**January to March**	**April to June**	**July to September**	**October to December**	**2023**	**2023**
Parameter	**Unit of Measure**	**Criteria**		**Average**					**Maximum**
Primary COPC		**PWQO[50]**	**CWQG[52]**						
Arsenic (total)	µg/L	100	5	**10.4**	**14.3**	**7.2**	4.1	**9.0**	**58.8**
Cobalt (total)	µg/L	0.9	-	0.7	0.4	0.2	0.2	0.4	**1.6**
Copper (total)	µg/L	5		2.1	1.3	1.1	0.6	1.2	3.7
Lead (total)	µg/L	5	7	**8.50**	4.71	2.11	1.36	3.86	**21.00**
Uranium (total)	µg/L	5	15	**41.25**	**43.91**	**12.61**	**50.08**	**36.32**	**168.00**
Radium-226	Bq/L	1	-	0.066	<0.080	<0.035	0.072	0.063	0.334
Secondary COPC									
Boron (total)	µg/L	200	1500	17	19	22	18	19	31
Zinc (total)	µg/L	30	30	6	2	2	2	3	13
Additional Parameters									
Aluminum (total)	µg/L	-	-	776	148	86	96	238	2720
Total Suspended Solids	mg/L	-	-	55	10	11	12	20	198

Note:

- Averages are based on weekly sampling results during dredging activities (as available).
- Bold values indicate an exceedance of a criteria.
- < - indicates the result was less than the laboratory method detection limit.

Figure 34: Temporary Storage Site Monitoring - Pine Street Extension Temporary Storage Site

Table 219: Summary of Surface Water Monitoring - Pine Street Extension Temporary Storage Site

Pine Street Extension Temporary Storage Site 2023 Quarterly														
Parameter	**Unit of Measure**	**Criteria**	**Pad-2 Composite (WCB, SCB)**				**Pad-2 East Catch Basin(ECB)**				**Pad-2 Sump (SW)**			
Primary COPC		**Investigation Threshold [59]**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
Radium-226	Bq/L	1.0	<0.005	<0.005	0.004	<0.005	<0.005	<0.005	0.02	0.01	<0.005	-	-	-
Arsenic (dissolved)	µg/L	100	0.3	1.1	1.0	0.6	0.2	0.6	0.6	0.5	0.4	-	-	-
Uranium (dissolved)	µg/L	100	1.26	1.05	3.77	1.65	0.389	0.46	2.9	3.94	2.83	-	-	-

Note:

- Bold values indicate an exceedance of criteria.
- < - indicates the result was less than the laboratory method detection limit.
- \- indicates no sample due to a dry location.
- Q1 – January to March
- Q2 – April to June
- Q3 – July to September
- Q4 – October to December