Blind River

Schedule C Municipal Class Environmental Assessment

Environmental Study Report (ESR) - Schedule C Municipal Class Environmental Assessment for Blind River WTP New Raw Water Intake and Low Lift Pumping Station

FINAL

Friday, December 12, 2025

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Engineering for **people**

The Town of Blind River

Environmental Study Report

Schedule C Municipal Class Environmental Assessment for Blind River WTP New Raw Water Intake and Low Lift Pumping Station

Project no T001592B | File no 081

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1 Introduction

1.1 Background

The Blind River Water Treatment Plant (WTP) is a direct filtration plant with a rated capacity of 6,000 m^3/d providing drinking water to the Town of Blind River (the Town). The WTP currently treats an average of 1,100 m^3/d and historically has a maximum daily demand of approximately 1,600 m^3/d.

The system is classified as a Large Municipal Residential System with the treatment plant as a Class 3 Subsystem and the distribution system as Class 1. Both systems are operated by the Public Utilities Commission Services Inc. (PUC). The WTP draws raw water from a well field located along the east shoreline of Blind River on Riverside Drive, which is classified as Groundwater Under the Direct Influence of surface water (GUDI).

The GUDI wells are assumed to be recharged from Blind River with a dam and a generation station located upstream of well field. Blind River passes to the north of the Town and well field and drains into the North Channel of Lake Huron. A controlled channel outlet also drains from the main river through the town to the North Channel.

The existing GUDI wells have a history of deterioration with continued decline of both yield and water quality. The wells are influenced by seasonal variation and elevated concentrations of organics, turbidity, and colour. It was noted in the Automated Drinking Water Well Waste Reduction System Study (Shelby Environmental Services Ltd. & Kresin Engineering Corporation, 2015), that both turbidity and colour were most noticeable upon initial well pumping and are problematic for consistent operation of the WTP.

In light of these issues, the Town initiated a Schedule C Municipal Class Environmental Assessment (Class EA) study to identify a solution to address the raw water quality and quantity concerns associated with the existing GUDI wells. TULLOCH Engineering Inc. and CIMA Canada Inc. (CIMA+) were retained by the Town to complete this Class EA.

1.2 Objectives of the Class EA Study

The primary goal of this Class EA Study was to:

- Identify the preferred source of raw water which addresses quality concerns associated with the existing GUDI wells and recommend an alternative solution which ensures a safe and reliable source of raw water to the Blind River WTP.

To support the primary goal of the Class EA study, the following objectives have been developed:

- Complete a comprehensive examination of alternative water supply solutions and select a preliminary preferred solution with consideration given to a broad range of criteria including water quality, natural environmental, socio-cultural, technical and operational, and financial considerations.
- Provide meaningful consultation with all affected and interested parties.
- Document the study process in compliance with all phases of the Municipal Class EA planning process.

1.3 Objectives of the Environmental Study Report (ESR)

This ESR describes the planning and decision-making process followed during the Class EA Study for the Blind River WTP Raw Water Intake and Low Lift Pumping Station (LLPS). The ESR describes the following:

- Problem/Opportunity Statement
- Existing conditions of the study area
- Water supply alternative solutions considered
- Design concepts considered in the study
- Evaluation methodology and evaluation criteria used to assess the different water supply alternatives and alternative design concepts
- Preferred water supply solution and its associated anticipated potential impacts, proposed mitigation measures and proposed implementation plan
- Details of the public and agency consultation process.

The Municipal Class EA process provides an opportunity for members of the public, interest groups and review agencies to review the ESR during a 30-day review period. The 30-day review period gives individuals additional opportunities to raise additional concerns regarding the project with the Town. Any outstanding concerns are to be addressed directly to the Town.

In addition, a request may be made to the Ministry of the Environment, Conservation and Parks (MECP) for an order requiring a higher level of study (i.e., requiring an individual/comprehensive EA approval before being able to proceed), or that conditions be imposed (e.g., require further studies), only on the grounds that the requested order may prevent, mitigate, or remedy adverse impacts on constitutionally protected Indigenous and treaty rights. The request, also known as a Section 16 Order, must be submitted in writing to the Minister of the Environment, Conservation and Parks, and

should be submitted to the Director of the Environmental Assessment Branch and the Town.

Provided that no additional concerns or Section 16 Order requests are received within the 30-day review period, the project will proceed through the detailed design and construction phases as outlined in this ESR.

1.4 Report Outline

This report was prepared to meet the requirements of the Ontario Municipal Engineers Association (MEA) Municipal Class EA Planning Process (February 2024) (Municipal Engineers Association, 2024). This report combines all phases of the planning process under one cover and includes steps that are considered essential for meeting the requirements of the Environmental Assessment Act (EAA). The report includes the following sections:

- **Section 1: Introduction** – Provides background information leading to the initiation of this study, provides the objectives of both the Class EA Study and the ESR, and describes the format of this report.
- **Section 2: Municipal Class Environmental Assessment Process** – Provides a summary description of the framework and activities to be completed to meet the Municipal Class EA process requirements related specifically to the Blind River WTP Raw Water New Intake and LLPS Class EA study.
- **Section 3: Public and Agency Consultation Process** – Describes the consultation program with the public and agencies, and public engagement activities.
- **Section 4: Study Area Overview –** Outlines the study area location and provides a brief overview of the main characteristics of the study area.
- **Section 5: Existing Conditions** – Presents a description of the existing conditions of the of the project study area.
- **Section 6: Design Criteria** – Presents the design criteria for water servicing and design considerations for the raw water intake and LLPS.
- **Section 7: Class EA Phase 1 – Identification of Problem/Opportunity Statement** – Presents the problem/opportunity statement for this Class EA Study
- **Section 8: Class EA Evaluation Methodology** – Presents the evaluation methodology used for the Blind River WTP Raw Water New Intake and LLPS Class EA study to select the preliminary water supply solution.
- **Section 9: Class EA Phase 2 – Identification and Evaluation of Alternative Water Supply Solutions** – Presents a comprehensive review of water servicing

strategies by providing information on a long list of alternatives and identifies a short list of feasible alternatives based on a set of must-meet criteria.

- **Section 10: Class EA Phase 3 – Development and Evaluation of Alternative Design Concepts** – Presents a comprehensive review of alternative design concepts developed and evaluated based on the detailed evaluation methodology.
- **Section 11: Field Investigations** – Presents the findings and recommendations of all the relevant studies that were completed as part of this EA Study.
- **Section 12: Preferred Alternative Design Concept** – Describes the recommended design concept, provides the details of associated permits and approvals needed prior to start of construction and an implementation schedule of the preferred solution design concept.
- **Section 13: Proposed Mitigation of Potential Impacts and Monitoring** – Summarizes the proposed mitigation measures to be undertaken to minimize potential impacts expected because of implementation of proposed works.
- **Section 14: Class EA Phase 4 - Class EA Report Conclusions and Recommendations** – Summarizes the need for the project, the main activities undertaken as part of this Class EA study, the public and agency consultation project, the recommended solution and the overall implications of the implementation of the preferred alternative solution.
- **Section 15: References** – Lists the key sources of information and reports that were used and consulted during the Class EA study process and in the preparation of the Environmental Study Report.

2 Municipal Class Environmental Assessment Process

This section provides an overview of the Municipal Class EA process, and the steps involved in bringing a municipal infrastructure project to the design and construction phases.

2.1 Municipal Class Environmental Assessment

This project was completed under the Class EA process developed by the Municipal Engineers Association for Municipal Water and Wastewater Projects (Municipal Engineers Association, 2024). The Municipal Class Environmental Assessment process must be followed by proponents of municipal infrastructure projects to meet the requirements of the Environmental Assessment Act (EA Act). All municipal infrastructure and new water supply projects in Ontario are subject to the Municipal Class EA process.

The Municipal Class EA was created to ensure that all aspects of the environment are considered during the planning and construction phases of a project. The Class EA process outlines the steps that must be followed to satisfy the EA requirements for water, wastewater and road projects.

The five phases of the Municipal Class EA process are as follows:

- Phase 1: Identification of the problem or opportunity
- Phase 2: Identification of alternative solutions to the problem or opportunity and their respective impacts to the environment. Evaluation of alternative solutions and selection of a preferred solution considering public, Indigenous community and review agency input.
- Phase 3: Examine alternative methods of implementing the preferred solution, based upon the existing environment, public, Indigenous Community and review agency input, anticipated environmental effects and methods of minimizing negative effects and maximizing positive effects.
- Phase 4: Documentation of the planning, rationale, design, and consultation process in an Environmental Study Report (ESR). The ESR must be available to the public and review agencies.
- Phase 5: Implementation of the preferred alternative design concept and monitoring for environmental provisions and mitigation measures.

Public and agency consultation is an important part of the Class EA planning process. Gaining input from individuals and groups can help identify project concerns early, and

to find ways to address concerns wherever possible. Public consultation is carried out at key stages of the Class EA process to allow time to review and provide input related to the project.

Projects subject to the Class EA process are classified into three possible “schedules” (or categories), depending on the degree of expected impacts:

- **Exempt Projects**, formerly Schedule A and A+ projects, represent minor operational and maintenance activities and are approved without the need of further assessment.
- **Eligible for Screening to Exempt** projects may qualify for exemption through a screening process or proceed with the applicable Schedule B or C process. Projects that are eligible for screening are identified in Appendix 1 of the MCEA document (February 2024) and are commonly subject to the Archaeological Screening Process (ASP). The ASP involves three key steps: assessing the project area for archaeological resources by completing relevant checklists, determining the impact on identified resources through archaeological assessments, and mitigating any identified negative impacts. The project is exempt only if mitigation measures are implemented, and all documentation and notifications are completed.
- **Schedule B** projects require screening of alternatives for their environmental impacts and Phases 1 and 2 of the planning process must be completed. A Class EA report, also referred to as a Project File Report, consistent with Phase 4 of the Class EA process must be completed subsequent to completion of Phase 2 and filed for public review.
- **Schedule C** projects must satisfy all five phases of the Class EA planning process. These projects have the potential for greater environmental impacts. Phase 3 involves the assessment of alternative methods of carrying out the project, as well as public consultation on the preferred design concept. Phase 4 includes the preparation of an Environmental Study Report (ESR) that is filed for public review.

2.2 Blind River WTP New Raw Water Intake and LLPS Class Environmental Assessment Process

This Class EA was carried out as a Schedule C study. As such, all five phases of the Class EA project as described above were required to be completed. Phases 1 through 3 have all been carried out to date, with the completion of this ESR satisfying the requirements for Phase 4. Review agencies and the public were consulted at several points in this project to solicit input and comments.

This ESR will be placed on the public record for at least thirty (30) calendar days for review by the public. Agencies and the public will be notified through the issuance of a “Notice of Study Completion”. The Notice of Completion will advise that interested persons may provide written comments to the project team within the review period and all comments and concerns should be sent directly to the Proponent. In addition, if there are outstanding concerns regarding potential adverse impacts to constitutionally protected Aboriginal and treaty rights, Section 16 Order requests on those matters should be addressed in writing to the Minister of Environment, Conservation and Parks (MECP) and the Director of Environmental Assessment Branch. The Town cannot proceed with the project until at least 30 days after the end of the comment period provided for in the Notice of Completion.

If no significant issues arise during the review period which cannot be resolved in consultation with the Town, and no Section 16 Order requests are received, the project will be considered approved and may proceed to implementation (Phase 5). Detailed design and necessary testing and approvals will be completed prior to construction.

2.2.1 Project Team Members

A project team was established to guide the planning decisions that drove the Blind River WTP Raw Water Intake and LLPS Class EA Study. Key members of the Project Team are:

- Kathryn Scott, Town of Blind River
- Chris Zagar, Town of Blind River
- Chris Kirby, TULLOCH
- Thomas Kowpak, CIMA+
- Caroline Alepin, CIMA+
- Kathleen Farrow, CIMA+

2.3 Information on Section 16 Order Requests

Under the Class EA planning process, there is an opportunity for the Minister or delegate to review the status of a project. A request may be made to the MECP for an order requiring a higher level of study (i.e., requiring an individual/comprehensive EA approval before being able to proceed), or that conditions be imposed (e.g., require further studies), only on the grounds that the requested order may prevent, mitigate, or remedy adverse impacts on constitutionally protected Indigenous and treaty rights. Requests on other grounds will not be considered. Requests should include the requester contact information and full name for the ministry.

Requests should specify what kind of order is being requested (request for additional conditions or a request for an individual/comprehensive environmental assessment), how an order may prevent, mitigate, or remedy those potential adverse impacts, and any information in support of the statements in the request. This will ensure that the ministry is able to efficiently begin reviewing the request. The requests should also be sent to the Proponent by mail or email.

The request should be sent in writing or by email to:

Minister of the Environment, Conservation and Parks
Ministry of Environment, Conservation and Parks
777 Bay Street, 5th Floor
Toronto ON M7A 2J3
minister.mecp@ontario.ca

and,

Director, Environmental Assessment Branch
Ministry of Environment, Conservation and Parks
135 St. Clair Ave. W, 1st Floor
Toronto ON, M4V 1P5
EABDirector@ontario.ca

Other comments and concerns about the proposed works related to the preferred recommended water servicing alternative or the Class EA study should be dealt directly with the Town. Interested persons may provide written comments to the project team, within the established review period.

3 Public and Agency Consultation Process

A Communication and Consultation Program was implemented to manage public relations between the community and the Project Team. The project team firmly believed that the quality of decisions made regarding the preferred alternative solution for implementation of new raw water source and required infrastructure would be improved by soliciting and acting on input from the Indigenous Communities, Stakeholders, and members of the public. Key objectives of the Communication and Consultation Program were to:

- Inform Indigenous Communities, Stakeholders, and the public of the project
- Offer educational information regarding the project
- Facilitate and communicate opportunities for public input.
- Obtain input on project components at key decision-making points
- Meet or exceed the consultation requirements of the Class EA process
- Tailor the consultation and communication program to the specific needs of Indigenous Communities, Stakeholder groups, and interested members of the public, while meeting and exceeding the consultation requirements of the Class EA process

3.1 Public Consultation, Communication Strategies, and Tactics

The public consultation and communication program included strategies to ensure that local residents, business owners and other interested parties were informed about the project activities. The Municipal Engineers Association Class EA document outlines mandatory and discretionary consultation contact points with the public and agencies. In order to communicate the project progress and goals and to solicit proper feedback and insight throughout the process, the following communication and consultation activities were undertaken:

- **Project Contact List:** A project contact list was developed to create a record of Indigenous Communities, technical review agencies, and other key stakeholders contacted as part of this study. Members of the public were also added to this contact list upon request. Individuals on the list were contacted at appropriate stages of the study to inform them of key meetings and events (such as Public Information Centres). The Project Contact List can be found in **Appendix A**.
- **Notice of Study Commencement & PIC 1:** The Notice of Study Commencement and Public Information Centre (PIC) 1 was issued on November

23, 2023. It outlined the purpose and justification for the study to Indigenous Communities, key stakeholders, and members of the public that may be affected and/or interested in the project. It also invited all interested parties to participate in PIC 1. This Notice was sent to contacts on the project contact list, placed on the Town’s webpage, and published in local newspapers. A copy can be found in **Appendix B**.

- **Public Information Center 1 (PIC 1)** was held on December 05, 2023. The purpose of this PIC was to introduce the study to the public, including the problem and opportunity statement, the preliminary screening process and selected alternative solution (construction of a new Lake Based Raw Water Intake and low-lift pumping station), the alternative design concepts and the evaluation process, the preliminary preferred design concept, and the anticipated impacts (and associated mitigation measures) for the preliminary preferred design concept. The public was also invited to provide feedback and input for the team to incorporate in the ESR.
- **Notice of PIC 2:** The Notice of PIC 2 was issued on October 3, 2024. It outlined the preferred solution to meet the long-term water needs of the Town to Indigenous Communities, key stakeholders, and members of the public that may be affected and/or interested in the project and invited all interested parties to participate in PIC 2. This Notice was sent to contacts on the project contact list, placed on the Town’s webpage, and published in local newspapers. A copy can be found in **Appendix B**.
- **Public Information Center 2 (PIC 2)** was held on October 17, 2024. The purpose of this PIC was to review the project background, outline progress to date, provide information about the upcoming construction activities (including the estimate construction schedule), solicit public feedback, and respond to questions.
- **Notice of Study Completion:** A Notice of Study Completion has been prepared to inform the public of the commencement of the 30-day comment period and the opportunities to provide additional comments before obtaining approval. Following the submission of this ESR, a copy of the Notice will be sent out to the interested members of the public, Indigenous Communities, and other stakeholders identified in the project mailing list. This Notice will also be placed on the Town’s webpage and issued in local newspapers. A copy of the Notice of Study Completion is included in **Appendix B**.

3.2 Indigenous Communities

Our approach to Indigenous engagement reflected our recognition of Indigenous peoples as rightsholders and was therefore guided by the ethos that we provide the means necessary for Indigenous Communities to participate on their own terms, understand and identify issues of concern within the project, and identify any potential impact to treaty and/or traditional rights that must be addressed. The following Indigenous Communities were consulted during this Class EA study to determine their interest and desired level of communication:

- Métis Nation of Ontario
- Mississauga First Nation
- Serpent River First Nation
- Sheshegwaning First Nation
- Zhiibaahaasing First Nation

These Indigenous communities were informed of the scope of the project early on to illuminate any issues/concerns with regards to the project impacting their lands and livelihood beforehand. The first notice went out to the groups listed above on January 25, 2023. A copy of this notice is included as **Appendix C** Public notices and invitations to the project PICs were also distributed to the communities noted above via email, and by mail.

In addition to those listed above, the following Indigenous communities were contacted by Archaeological Research Associates Ltd. on behalf of the project team, and invited to participate in the Stage 1, Stage 2, and Marine Archaeological Studies (described in Sections 11.8 and 11.9) undertaken as part of this Class EA:

- Atikameksheng Anishnaabek
- Aundeck Omni Kaning
- Garden River First Nation
- M’Chigeeng First Nation
- Sagamok First Nation
- Sheguiandah First Nation
- Thessalon First Nation
- Whitefish River First Nation
- Wiikwemkoong Unceded Territory

The records of Indigenous engagement for these archaeological studies have been included in **Appendix C**.

3.3 Stakeholders

Various groups of stakeholders which were considered to have an interest in the Blind River WTP Raw Water Intake and LLPS Class EA Study were identified. Key stakeholder groups are outlined below:

- **Residents:** this included residents that live within the immediate vicinity of the preferred site for development. Residents who live closest to the study area may have greater concerns about the project.
- **Business Owners and Operators:** Including those who employ members of the community, work in the community and provide goods and services to the community.
- **Review agencies:** Provincial ministries and agencies (such as the MECP), Federal Government departments and agencies, local area municipalities, district and planning boards, emergency services (fire, police, health), school boards, and local associations.

  The Blind River Town Council will be reviewing all work completed as part of this project, and is made up of the following councillors:

  - Mayor Sally Hagman
  - Deputy Mayor Paula Summers
  - Councillor Betty Ann Dunbar
  - Councillor Jim Dunbar
  - Councillor Jennifer Posteraro
  - Councillor Dan Middaugh
  - Councillor Katie Whitlock

3.4 Summary of Public Issues, Comments and Concerns

Members of the public were encouraged to review the PIC material and provide feedback/comments, enabling project team members to explain the main activities and findings up to this point.

3.5 Agency Consultation

Consultation with government review agencies is a necessary and important component of the Class EA process. In conformance with the consultation for this Class EA Study,

the Town ensured that appropriate review agencies were informed and given a chance to contribute during the study. This section outlines the agency consultation component of the study.

3.5.1 Ministry of the Environment, Conservation and Parks (MECP)

Consultation with the Ontario Ministry of the Environment, Conservation and Parks (MECP) was undertaken as part of the Blind River WTP Raw Water Intake and LLPS Class EA Study. Email correspondence was received from the MECP on April 16, 2024, in response to the Notice of Study Commencement, with the following major comments:

- Proponent to identify the source protection area and should document how the proximity of all options under consideration may impact the sources of drinking water and any delineated vulnerable areas.
- Proponent to address climate change in the context of mitigation and adaptation based on a guidance document released by the MECP to support proponents in including climate change in environmental assessments.
- Delegated the procedural aspects of rights-based consultation of Aboriginal communities to the proponent, listed the communities who have been identified as potentially affected by the proposed project, identified sources of information related to Aboriginal consultation and the Ontario Environmental Assessment Act, and attached a document “A Proponent’s Introduction to the Delegation of Procedural Aspects of consultation with Aboriginal Communities” for further information.
- Proponent to consider impacts to local air quality, dust and noise, ecosystem, species at risk, surface water, groundwater, contaminated sites, servicing, utilities and facilities. Proponent to implement mitigation and control measures to protect the existing environment and opportunities for rehabilitation and enhancement of any impacted areas.
- Proponent to include the full stakeholder distribution/consultation list.
- Requirements regarding the Class EA Process.
- A copy of the letter received from the MECP is included in **Appendix D**.

4 Study Area Overview

This section provides an overview of the main features, characteristics and existing conditions of the study area delineated for the Blind River WTP Raw Water Intake and LLPS Class EA study.

4.1 Study Area Location and Site Features

For this Class EA Study, a Project Study Area was defined to capture potential suitable locations for the Blind River WTP raw water intake and LLPS. The limits of the Project Study Area is shown below in **Figure 1.**

Figure 1: Project Study Area

A review of the Town of Blind River Official Plan (OP) indicated the presence of important natural heritage features within the Project Study Area, as well as specific policies and requirements applicable to these features, as follows:

- Natural Heritage Features, Schedule C, showed the presence of natural areas (Walleye Migration Route) within the project study area. As per the Town's OP, development or site alteration within or adjacent to these areas would only be

permitted if an Environmental Impact Assessment (EIA) demonstrated that the proposed works would not cause any adverse environmental impacts to the integrity and ecological functions of the areas.

5 Existing Conditions

5.1 Existing Water Supply Source

The Blind River WTP is supplied by groundwater wells in a well field located along the east shoreline of the Blind River, on Riverside Drive. The wells are classified as being groundwater under the direct influence of surface water (GUDI) and have a combined Permit-To-Take Water (PTTW) capacity of 66.9 L/s (5,785 m^3/d). A copy of the PTTW (3410-BV7S4M) and latest Drinking Water Works Permit (DWWP) is included in **Appendix E**.

Currently, five of the eight municipal wells (Wells #5, #6, #7, #8, and #9) are in service and are confirmed GUDI wells. All operating wells are connected to a 400mm common raw water transmission main to the WTP. In general, each wellhouse is equipped with well pumps, associated process piping, and a Programmable Logic Control (PLC). Wellhouse #9, also known as the Control Building, is the largest wellhouse and houses a diesel generator that supplies power to all five wellhouses in the event of a power outage.

The existing GUDI wells have a history of deterioration with continued yield decline and poor water quality. The wells have elevated levels of contaminants of manganese, iron, colour, organic carbon, turbidity and hydrogen sulfide and have undergone multiple rehabilitation attempts over the years. Due to the poor water quality causing increased filter loading, backwash volumes as high as 30% are being reported, whereas typical water treatment plants report 5% to 10%.

Annual reporting and discussions with operations have also noted that lower-than-normal distribution pressure is a common complaint by the community.

5.2 Blind River WTP

The five active GUDI wells provide raw water supply to the Blind River WTP. Upon entry to the WTP, the raw water supply is adjusted for alkalinity and pH. A coagulant is then added and rapidly mixed into the water before it undergoes flocculation. The treatment system then employs direct, dual media filtration and granular activated carbon (GAC) filtration. Sodium hypochlorite is used for primary disinfection, with sufficient concentration-contact time to meet CT requirements provided by a baffled, below-grade clearwell. The minimum log removal/inactivation credits are achieved by both filtration and chlorine contact.

The facility adds hydrofluorosilicic acid for fluoridation, potassium hydroxide for distribution corrosion control and pH adjustment, and sodium hypochlorite for final trim

disinfection if required before the water enters the distribution system. The finished water is then pumped to the distribution system that includes a standpipe storage tank.

The Blind River WTP is rated for a maximum treated water flow of 6000m^3/day, while the Blind River standpipe has a usable storage volume of approximately 560m^3.

5.3 Lake Huron

Lake Huron is located within the Great Lakes and has a surface area of 59,600km. It has a southwest to northwest orientation, a maximum length of more than 332km, and an average width of approximately 295km. Historical water level data obtained from the Lake Huron Coastal Centre was used to provide an indication of historical lake water level variations (Lake Huron Coastal Centre, 2021). **Table 1** shows the historical low and high lake water levels in Lake Huron.

Table 1: Historical Water Levels in Lake Huron

Conditions	Water Level (m)[1]
High Water Level (HWL)	177.50
Low Water Level (LWL)	175.57

Notes:
1. Based on Historical Water Levels (Lake Huron Coastal Centre, 2021)

6 Design Criteria

6.1 Population and Water Demand Projections

The Town has seen a decline in population over the last five Census periods (**Figure 2**) based on the latest Census information from Statistics Canada. The population of the Town has decreased by 1.4% between 2016 to 2021 (an average decline of 0.4% annually).

As noted, the Drinking Water System (DWS) supplies drinking water to part of the population, approximately 2,500 residents.

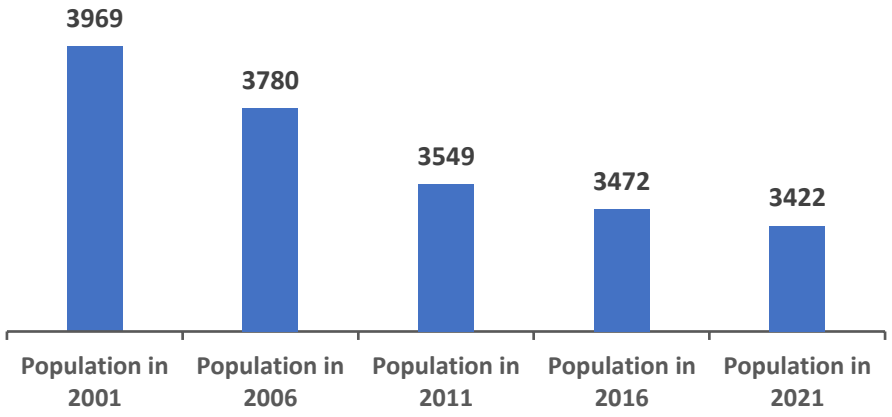

Figure 2: Population Trends in the Town of Blind River (2001 – 2021)

CIMA+ analyzed historical raw and treated water flow data between 2018 to 2022. It was found that the demands have been relatively stable year-over-year showing a slight downward trend in demand. The plant typically treated an average 1,000 m^3/d and had a maximum daily demand of approximately 1,600 m^3/d. The plant is operating at approximately only 27% of its current rated capacity. **Table 2** presents historical average and maximum water demands, and average water consumption rates based on the blended serviced population.

Table 2: 5-year Historical Water Demands and Average Consumption Rates 2018-2022

Year	Blind River Population[1]	Population Serviced by Blind River DWS [2]	Average Blended Consumption (L/c/d)[3]	Average Flow (m^3/d)	Maximum Flow (m^3/d)	Max Day Factor
2018	3,452	2,522	404	1,020	1,210	1.19
2019	3,442	2,515	406	1,020	1,620	1.59
2020	3,432	2,507	387	970	1,670	1.72
2021	3,422	2,500	416	1,040	1,640	1.58
2022	3,412	2,500	412	1,030	1,560	1.51
5-yr Average	**3,432**	**2,509**	**405**	**1,016**	**1,540**	**1.46**
5-yr Maximum	**3,452**	**2,522**	**416**	**1,040**	**1,670**	**1.72**

Notes:

1. 2021 population from 2021 Census. Population from 2017-2020 and 2022 interpolated from 2016 and 2021 population obtained from Census.
2. Current serviced population (2021) is 2,500. Serviced population from 2018 to 2021 estimated as a similar ratio of total population as in 2022.
3. This represents a blended consumption rate, including ICI usage – Industrial, Commercial and Institutional (schools).

The blended average consumption rate (residential; and industrial, commercial, and institutional (ICI) demands) was observed to be relatively high compared to current provincial averages. This is potentially attributed to non-accounted for water (losses in the network). Reported non-revenue water losses include >30% waste to backwashing efforts and water being used to carry out the distribution flushing program efforts to provide artificial demand and reduce the water age in the pipe network to establish chlorine residuals and reduce disinfection byproducts. This is expected to decrease with the introduction of the new source water.

6.2 Intake and LLPS Design Considerations

6.2.1 Recommended Water Demand Design Basis

Based on a review of historical population and water demands, the following water demand design basis was proposed for the future Blind River DWS.

Average Consumption Rate

Based on the 5-year historical review period (2018-2022), it was recommended to adopt an average consumption rate of 405 L/c/d design basis for potential population growth.

The recommended average consumption rate of 405 L/c/d is within the MECP Design Guidelines (270 to 450 L/c/d)

Maximum Day Factor

Per the MECP Design Guidelines for Drinking Water Systems (Ministry of the Environment, Conservation and Parks, 2008), the Maximum Day Factor (MDF) (found by dividing a system's maximum daily demand by its average daily demand) is recommended to be 2.25 for systems with a population within the range of the serviced population by the Blind River DWS (2,001 to 3,000 people). However, per **Table 2**, the maximum MDF over the 5-year historical review period (2018-2022) for the Blind River DWS was found to be 1.72.

As such, it was recommended to adopt a maximum day factor of 2.0, in between the 5-year historical maximum value observed (1.72) and the recommended MECP Design Guideline (2.25) for buildout, to provide a conservative estimate of future water demands.

6.2.2 Raw Water Requirements Design Basis - Intake and LLPS Sizing

The MECP Design Guidelines for Drinking Water Systems recommends designing water treatment plants for a 20-year period (Ministry of the Environment, Conservation and Parks, 2008). For raw water intakes, which carry significant construction cost and for which the cost of the work is not substantially dependent on the size, a design period of 40+ years is recommended.

The intake and LLPS need to be sized to supply sufficient raw water to meet the future treated water demands as well as requirements for backwash and other WTP process usage. It is expected that the current treatment of direct filtration will be adequate to treat the new water source. The new water source will require less frequent backwashing and overall volume than the current GUDI wells. For design purposes of the new raw water intake and LLPS, an additional 12% of the maximum daily demand (MDD) treated water flow was adopted, based on typical maximum water usage for direct filtration and conventional treatment plants (for backwashing and other process usage).

6.2.2.1 Design Intent

It is intended to design the LLPS building with a capacity of 3400 m^3/d with the capability of being upgraded, in the future, to match the current WTP rated capacity of 6,000 m^3/d.

The building, intake, screen wells and low lift wells will be designed to accommodate WTP treated water flows up to 6,000 m^3/d which requires a raw water flowrate of approximately 6,800 m^3/d.

The proposed design intent is as follows:

- The low lift pumps will be sized for the current adopted design flow (**Table 3** below). In the event of additional growth, one (1) additional pump can be installed per low lift well, for a total of two (2) additional pumps.
- Twin watermain(s) from LLPS to WTP will be sized for the current design flow with each watermain capable of handling 3,400 m^3/d.

6.2.2.2 Design Basis

The sizing of the new low lift pumps will be based on several design considerations as listed in **Table 3**.

Table 3: Blind River DWS Design Considerations

Parameter	Value (m3/d)	Assumptions/Notes
Current Maximum Day Demand (Q1)	1,700	Historical Maximum Day Demand (MDD, 2018-2022, rounded). Blended (residential, and ICI)
Residential Max Day Demand from Town growth over 20-year period (Q2)	100	Population forecast: 2.6% growth assumed in first 20 years; 90 residents at average consumption rate and max day factor (405 L/c/d and 2.0), (rounded).
Estimated MDD from unaccounted developments over 20-yr (Q3)	500	Estimate unaccounted residential and ICI demands over a twenty (20) year period.
Total Estimated MDD	**2,300**	**Sum of Q1 + Q2 + Q3 (Treated Water demand)**
Backwash requirements and other process & plant usage	300	approx.12% of the adopted Max Day Demand (conservative for direct filtration plants)
Total Estimated Raw Water Demand 20-yr basis	**2,600**	**Including backwash, sampling and flushing**
Adopted Design Basis 20-yr Low Lift Pumps – Raw water flowrate	**3,400**	**Equivalent to 50% of LLPS capacity and plant rated capacity (treated water flowrate)** **Pumps to be equipped with VFDs**

7 Class EA Phase 1 – Identification of Problem/Opportunity Statement

Phase 1 of the Municipal Class EA planning process requires the proponent of an undertaking to first document factors leading to the conclusion that the improvement is needed, and to develop a clear statement of the problem/opportunity to be investigated.

The Problem / Opportunity statement for the Blind River WTP Raw Water Intake and LLPS Class EA Study was defined as follows:

> ***A preferred raw water supply solution is required to ensure a safe, reliable and improved quality source of water to the Blind River WTP.***

The current problematic GUDI well source also causes increased filter loading and operation limitations at the Blind River WTP.

Water supply alternative solutions were developed and evaluated based on their ability to meet the above Problem / Opportunity Statement.

8 Class EA Evaluation Methodology

A two-step evaluation approach was developed to guide the evaluation of alternative solutions for this project within the Schedule "C" Class EA planning process. These steps consisted of:

1) Identification of feasible alternative solutions through a preliminary screening process (corresponding to Phase 2, "Identification of Alternative Solutions", of the Class EA).
2) Identification of the preferred solution, through a detailed comparative evaluation of potential alternative concepts developed for the feasible alternative solutions (corresponding to Phase 3, "Development and Evaluation of Alternative Design Concepts", of the Class EA).

8.1 Overview of Evaluation Methodology

The proposed evaluation approach comprised the following major sequential steps:

1) Development of a long list of available alternative water servicing solutions.
2) Preliminary screening of alternative solutions based on a set of must-meet screening criteria.
3) Identification of a short-list of "feasible" water servicing solutions.
4) Detailed evaluation of the short-listed water servicing solutions using a multi-criteria decision analysis based on water quality, environmental, social, technical, and economic considerations, grouped in categories, and scored comparatively using performance scales.
5) Identification and recommendation of the preliminary preferred water servicing solution for the Blind River WTP.

A general schematic of the evaluation methodology is outlined in **Figure 3** and described in more detail in subsequent sections.

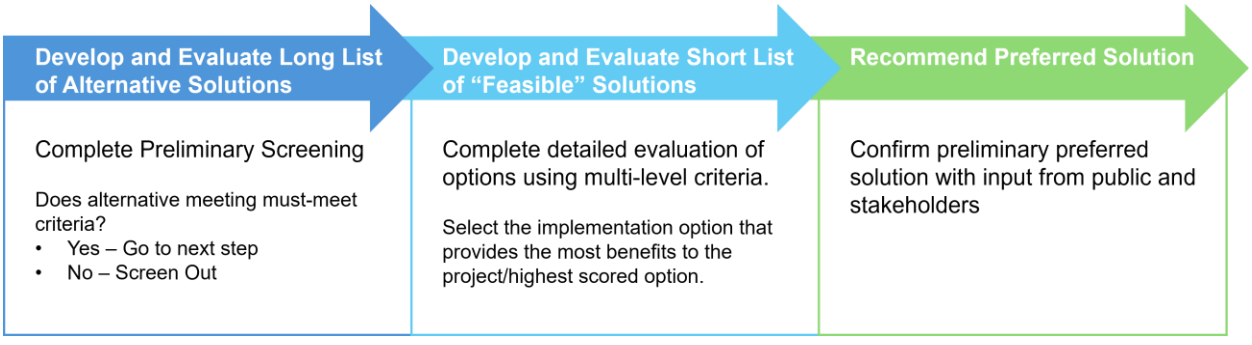

Figure 3: Overview of Evaluation Approach

8.2 Preliminary Screening

A list of available alternative water supply solutions was initially developed to include potential supply servicing scenarios, including the Status Quo, to reflect the current supply conditions at the Blind River WTP. Each water supply alternative solution was assessed against a set of preliminary screening criteria with the purpose of narrowing down the list to only those that were considered "feasible" and eliminating alternatives that were unrealistic from further analysis and consideration. The preliminary screening step helped to avoid the need to carry an unrealistic or clearly inferior water supply alternative through the next steps of the evaluation process which included further development of the alternative, determination of probable costs, and a detailed comparative assessment.

Preliminary screening was accomplished by applying the "must-meet" criteria shown in **Table 4.** Must-meet criteria were established to capture key objectives established for this project. The "must-meet" criteria were considered in a "yes/no" or "pass/fail" basis. Alternative water supply solutions must pass all "must-meet" criteria to be short-listed or carried forward through the next step in the evaluation process.

Table 4: Preliminary "Must-Meet" Screening Criteria

Must Meet Criteria	Description
Compliance Criteria	• Does the water supply alternative solution have the ability to meet the objectives of the Problem/Opportunity statement and comply with the Town's needs?
Technical Criteria	• Can the alternative provide reliable and adequate service for the existing population? • Does the associated infrastructure contribute to the overall long-term operability and efficiency of the Drinking Water System?

8.3 Detailed Evaluation

The short-listed alternative solutions were then further developed into potential alternative design concepts. These design concepts were then subjected to a detailed comparative evaluation using a weighting and ranking system that enabled a systematic and rational comparison of the options, and identification of the preliminary preferred solution. A detailed evaluation methodology was used as a basis to compare key features of each alternative concepts, relative to each other, and their ability to perform under each evaluation criterion.

A multi-criteria evaluation methodology that focuses on a set of natural environmental, socio-cultural, technical and operational, and economic considerations grouped in categories was proposed to be used to assess potential alternative concepts. Main categories were further broken down into detailed evaluation criteria, representing specific aspects within the category.

Options were scored comparatively using an evaluation matrix and a scoring rationale. An evaluation matrix was prepared to reflect the specific advantages and disadvantages that each alternative concept offered for each criterion under consideration. For each alternative concept under consideration, detailed information was gathered and used to provide a relative score that accounted for the following:

- Risks and/or potential impacts for each criterion
- Available approaches to mitigate risks and/or impacts
- Scoring rationale, based on degree of risk and/or mitigation required

A weighted scoring method was proposed for this Class EA study. The weighted scoring method is a form of multi-criterion analysis that involves identification of all the attributes that are relevant to the project, the allocation of weights to each of them reflect their relative importance, and the allocation of scores to each option to reflect how it performs in relation to each criterion. The result is a single weighted score for each option, which is used to indicate and compare the overall performance of the options in non-monetary terms. Due to the character of this project and the possible options under consideration, the use of a weighted scoring method was recommended to weight the criteria according to the relative importance of priority of the criteria.

Lastly, a sensitivity analysis was performed on the decision-making model to check that the results would not change if changes to the weighting factors were made. This effectively verified that any decisions made were robust and defensible.

8.3.1 Weighting Factors

Preliminary weighting factors were assigned to the main criteria categories to reflect the degree of importance of each category within the overall evaluation scheme. Preliminary proposed weights for the primary criteria categories are:

- Water Quality – 20%
- Natural Environmental – 15%
- Socio-Cultural – 15%
- Technical and Operational – 30%
- Economic – 20%

Among the primary criteria, the technical and operational criteria was weighed the highest (30%), due to the expected challenges to be encountered during construction of the new intake pipeline and LLPS and during commissioning and operation of the new system. The natural environmental and socio-cultural criteria were weighed lower (15%), since significant long-term impacts are not anticipated due to the siting of new infrastructure. Mainly short-term disruption to local users due to construction activities are expected, which can be minimized through implementation of mitigation measures.

Weighting factors were confirmed with input from the Town. They were also presented to the public at the Public Information Centre for feedback and confirmation. No comments to the evaluation methodology, criteria or weighting factors were received.

8.3.2 Detailed Evaluation Criteria, Rationale and Indicators

Secondary criteria or sub-criteria were identified within each primary criterion, as shown in **Table 5**. The sub-criteria were intended to represent specific aspects and considerations of the category being evaluated, and most relevant to this project.

Table 5: Evaluation Criteria and Indicators

Criteria (Weighting factor %)	Indicators (What information is used in the evaluation?)
Water Quality (20%)	
Raw Water Quality	• Concentration of water quality parameters for each potential intake location such as pH, turbidity, dissolved oxygen, dissolved organic carbon, total suspended solids, total dissolved solids, total phosphorus, total coliforms, E. *coli*.
Risk to Contaminants	• Potential vulnerability/risk of new intake to contaminants based on intake depth, distance from shore, proximity to potential sources of contaminants such as creek discharges, storm outfalls, drainage ditches, etc.)
Capacity Requirements	• Ability to meet flow and system pressure demands

Criteria (Weighting factor %)	Indicators (What information is used in the evaluation?)
Natural Environmental (15%)	
Natural Heritage Features	• Potential impacts to existing natural environment, including terrestrial and aquatic habitats and species of concern, wildlife and wildlife habitats, sensitive features, areas of natural and scientific interest, etc.
Climate Change	• Potential vulnerability/resilience to changing climatic conditions. Potential impact on climatic conditions during construction and project implementation.
Source Water Protection	• Potential impact on source water protection areas and compliance with source water protection policies.
Socio-Cultural (15%)	
Public Health and Safety	• Potential risk to public and operations staff health and safety related to water quality, and construction and operation of new intake pipeline and structure.
Long-term Impacts	• Potential long-term impact on adjacent residents and local users from siting of new infrastructure. (i.e. noise, aesthetics, land use)
Short-term Impacts	• Potential short-term disruption to local residents, businesses, commercial and recreational activities due to construction (i.e., noise, dust, vibration, visual, access, parking, road and beach areas closures)
Technical and Operational (30%)	
Ease of Implementation	• Potential level of complexity during construction, conflicts with existing infrastructure, ability to facilitate construction with uninterrupted supply of water and within a reasonable timeframe.
Operational Complexity	• Relative added complexity to existing operational practices resulting from construction and operation of new infrastructure. • Technical and operational ability to continually meet objectives of improving the current performance limiting factors
Construction Duration	• Duration of project construction and potential for staging and phased construction.
Regulatory Approvals	• Number and complexity of permits/approvals needed for project construction.

Criteria (Weighting factor %)	Indicators (What information is used in the evaluation?)
Property Acquisition	• Need for land acquisition and availability of property, including temporary and permanent easements.
Economic (20%)	
Construction Cost	• Relative scale of construction costs at various intake and LLPS locations. Ability to meet the budget constraints and objectives.
Operational Cost	• Operational Costs – Long term projection of increased savings or expenditures during operation
Future Cost	• Economic benefit/detriment to future installations (elevated tanks, booster stations etc.)

8.3.3 Scoring Approach Rationale

Alternative concepts developed for the short-listed alternative solutions were assessed relative to each other, against all criteria/sub-criteria shown in **Table 5**.

The evaluation of the options was carried out using the Reasoned Argument Method, comparing differences in impacts and establishing a clear rationale for the selection of the alternative concept that provided the most overall benefits to this project. The performance of each alternative design concept against the various sub-criteria was assessed and assigned a preliminary score relative to the potential net impact, which intended to reflect the impact that remained, or was predicted to remain, after mitigation measures were in place. Options were assessed and scored on a 1 to 5 basis with higher scores (5) given to better performing options. The proposed scoring approach is summarized in **Table 6**.

Table 6: Overall Scoring Approach

Score	Description
5	Potential impacts are negligible, no mitigation is required.
4	Potential impacts are minor and can be easily mitigated through implementation of standard mitigation measures.
3	Potential impacts are moderate and implementation of a number of mitigation measures are required to reduce/eliminate the risks.
2	Potential impacts are major, and implementation of extensive mitigation measures are required to reduce/eliminate the risks.

Score	Description
1	Potential impacts are significant, with limited mitigation available to adequately reduce/eliminate the risks.

8.4 Selection of Preferred Recommended Alternative Concept

Individual scores assigned to each alternative concept were totaled, with consideration to the relative weighting factor of each primary criteria category. The alternative concept with the highest final score was considered to provide the most overall benefits to this project and thus, was selected as the preliminary preferred water supply solution for recommendation.

8.5 Sensitivity Analysis

The evaluation approach was subjected to a sensitivity analysis to examine how changing the criteria weights affected the scoring results. This analysis helped to assess the impacts of significant changes to the weighting of the evaluation criteria and establish whether the alternative with the original highest benefits score remained the preferred option once criteria weighting factors were changed.

9 Class EA Phase 2 – Identification and Evaluation of Alternative Water Supply Solutions

9.1 Identification of Alternative Solutions

In accordance with Phase 2 of the Municipal Class EA process, a long list of potential alternative solutions to address the Problem/Opportunity Statement for the Blind River WTP Raw Water Intake and LLPS Class EA study, was developed. The following alternative solutions were considered:

- Option 1 - Do Nothing
- Option 2 - Reduce Water Consumption
- Option 3 - Lake Based Raw Water Intake
- Option 4 - River Based Raw Water Intake
- Option 5 - Well Based Raw Water Intake

A general description of each alternative solution is as follows:

9.1.1 Option 1 - Do Nothing

The "Do Nothing" alternative involves no improvements or changes to the existing system to address the identified problem (deficiency) or opportunity. Under this alternative, the existing water supply well field would continue to supply the Blind River WTP as usual.

The "Do Nothing" alternative does not address the current concerns including the poor raw water quality, progressively lower yields, above industry average backwash water volumes at the Blind River WTP and lower than normal distribution pressures.

9.1.2 Option 2 - Reduce Water Consumption

The "Reduce Water Consumption" option would require water to be drawn from the current GUDI wells, and treated and supplied by the Blind River WTP, but at a reduced capacity. With less flow and demand from the wells, it was assumed that the raw water quality supplied to the Blind River WTP would improve. This in turn would reduce the backwash water volume needed to clean the filters and be able to provide more treated water for the Blind River's distribution system.

However, during peak demands, the Blind River WTP may not be able to supply sufficient flow or pressure to the distribution system. This could raise the potential of low pressure and health hazards problems developing within the distribution system. When pressure becomes low or negative, contaminants from nearby ditches, cross

connections, poor quality housing plumbing have the potential to be drawn into the water distribution network.

The “Reduce Water Consumption” option does not address the current concerns including the poor raw water quality, nor the increasing operational and maintenance requirements associated with it.

9.1.3 Option 3 - Lake Based Raw Water Intake

The “Lake Based Raw Water Intake” alternative represents a scenario where the existing raw water supply source for the Blind River WTP would be abandoned and a separate water supply source from the Lake Huron via a new raw water intake and LLPS to deliver raw water to the Blind River WTP for treatment and distribution.

Four potential sites for the new intake pipe were considered for the “Lake Based Raw Water Intake” alternative, as shown in **Figure 4**.

Figure 4: Map of Town of Blind River with marked potential lake intakes

9.1.3.1 Option 3A

Option 3A is located south of the Town of Blind River would require a new raw watermain construction and a LLPS as shown below in **Figure 5**. Three potential locations to construct a LLPS were identified. LLP1 could be built at the Blind River WTP, with a raw water (RW) main running east along Murray Street and south along Cobden Avenue to the shoreline to connect with the intake pipe extending into the lake.

Alternatively, LLP2 or LLP3 could be built along the shoreline, with the intake extending directly from the LLPS into the lake. LLP2 would be connected to the WTP via Murray Street and Cobden Road, while LLP3 would follow the same path, with an additional segment along Causley Street. The water depth at this site location varies from 2.7 to 3.0 metres.

Figure 5: Option 3A - Potential Lake Intake Site 1

9.1.3.2 Option 3B

Option 3B is located south of Town of Blind River and east of location 3A would require a new raw watermain construction and a LLPS as shown below in **Figure 6**. The LLPS could potentially be built at the Blind River WTP or at a closer location to the shoreline, marked as LLP1 and LLP2 respectively in **Figure 6**. The water depth at this site location varies from 2.4 to 3.0 metres.

Figure 6: Option 3B - Potential Lake Intake Site 2

9.1.3.3 Option 3C

Option 3C is located at the south of the peninsula would require new raw watermain construction and a LLPS as seen in **Figure 7**. There are two potential LLPS sites that can be built; at the WTP or further upstream, at the Caribou Point peninsula. The Town currently owns a property at the peninsula that can be the potential location of a new LLPS, marked LLP2 in **Figure 7**. From that location, a new lake intake can be built and extended from the peninsula shoreline. Water depth at this intake site is the deepest (3.7 to 4.3 metres), compared to the other three options.

Figure 7: Option 3C - Potential Lake Intake Site 3

9.1.3.4 Option 3D

Option 3D is located the farthest away from the WTP, per **Figure 8**, and was anticipated to be the costliest option. As shown in **Figure 8,** this option had two potential sites for the LLPS construction; at the WTP, or on the shoreline close to where the intake would extend out to the. Water depth at this location can vary from 2.1 to 2.4 m.

Figure 8: Option 3D - Potential Lake Intake Site 4

9.1.4 Option 4 - River Based Raw Water Intake

The “River Based Raw Water Intake” alternative represents a scenario where the existing raw water supply source for the Blind River WTP would be abandoned and a new river-based raw water intake and LLPS would supply raw water to the Blind River WTP for treatment and distribution.

Two potential sites for the new intake line were considered for the “River Based Raw Water Intake” alternative, as shown below in **Figure 9**.

Figure 9: Map of Town of Blind River and Potential River Intake Sites

9.1.4.1 Option 4A

Option 4A would require construction of a new intake structure along the shoreline and would be connected to the Blind River WTP through one of two possible routes: an entirely new watermain connection, or a reuse of the existing well field watermain (with a new watermain connection between the new intake structure and the end of the existing water). The details of Option 4A are shown in **Figure 10** below. The river is on average 1 metre deep at this location. The construction of a river-based intake is expected to pose higher risks to water quality compared to the construction of a lake-based intake, while providing minimal cost savings.

Figure 10: Option 4A - Potential River Intake Site 1

9.1.4.2 Option 4B

Option 4B would require construction of an intake, connected from the shoreline extending out to the river as shown in **Figure 11** below. The approximate depth would be 1.2 meters (deeper than the 4A river site but still considered shallow). This option exhibits the same challenges as Option 4A, but has the added benefit of not requiring construction of raw watermains or a new LLPS building (as the existing well buildings would be reused). However, as with Option 4A, the construction of a river-based intake is expected to pose higher risks to water quality compared to the construction of a lake-based intake, while providing minimal cost savings.

Figure 11: Option 4B - Potential River Intake Site 2

9.1.5 Option 5 - Well Based Raw Water Source

The “Well Based Raw Water Source” alternative represents a scenario where the existing raw water supply source for the Blind River WTP would be abandoned and a new well field location would be selected as water supply source for further treatment at the Blind River WTP and distribution.

Three potential sites for the new well field were considered for the “Well Based Raw Water Source” alternative, as shown below in **Figure 12**.

Figure 12: Map of Town of Blind River with marked Potential Well Fields

9.1.5.1 Option 5A

Option 5A would a new well field immediately adjacent to the current well field. Shallow wells would be drilled to draw in water from the river, and the ground would act as primary filtration. This site’s proximity to the existing well field would permit the reuse of the existing raw watermain, minimizing the amount of new watermain which would need to be constructed. However, this proximity also makes it likely that water quality would be similar to the existing GUDI wells..

9.1.5.2 Option 5B

Option 5B would locate a new well field northeast of the existing Blind River WTP. A hydrogeological survey would be required to find a specifical location in this area for a new well field, following which further hydrogeological investigation would be required to determine the potential yield and confirm groundwater quality. This option would potentially require the drilling and testing of multiple sites before an acceptable well is found.

9.1.5.3 Option 5C

The well field site for Option 5C would be located on the shoreline south of the Town.. Similar to Option 5A, this site would be include the drilling of shallow wells, using the ground for primary filtration. This option would required testing to find a suitable site,

and a new well field in this location would require a new raw watermain to be constructed to connect to the Blind River WTP.

9.2 Preliminary Screening of Alternative Water Solutions

9.2.1 Preliminary Screening

A preliminary screening of the alternative water solutions described in Section 9.1 was carried out in accordance with the methodology described in Section 8.2.

Alternative solutions that did not meet the "must-meet criteria" in the preliminary screening were not considered a feasible solution for the Class EA study and were recommended to be eliminated from further consideration in the study. Alternative solutions that met all "must-meet criteria" were short-listed and recommended to move forward for a more detailed examination. The results of the preliminary screening are tabulated in **Table 7**.

Table 7: Preliminary Screening Results

Options	Compliance Criteria (Can the alternative meet objectives of the Problem / Opportunity statement and comply with the Town's needs?)	Technical Criteria (Can the alternative provide an adequate LOS for the existing population?)	Technical Criteria (Does the associated infrastructure contribute to the overall long term operability and efficiency of the DWS?)	Short Listed (Yes/No)
1 – Do nothing	No	No	No	No
2 – Reduce Water Volume	Yes	No	No	No
3A – Lake Site 1	Yes	Yes	Yes	**Yes**
3B – Lake Site 2	Yes	Yes	Yes	**Yes**
3C- Lake Site 3	Yes	Yes	Yes	**Yes**
3D - Lake site 4	Yes	Yes	Yes	**Yes**
4A - River Site 1	Yes	Yes	No	No

Options	Compliance Criteria (Can the alternative meet objectives of the Problem / Opportunity statement and comply with the Town's needs?)	Technical Criteria (Can the alternative provide an adequate LOS for the existing population?)	Technical Criteria (Does the associated infrastructure contribute to the overall long term operability and efficiency of the DWS?)	Short Listed (Yes/No)
4B - River Site 2	Yes	Yes	No	No
5A – Well Site 1	Yes	Yes	No	No
5B – Well Site 2	Yes	Yes	Yes (if suitable wells can be found)	No
5C – Well Site 3	Yes	Yes	No	No

9.2.2 Preliminary Screening Summary

As shown in **Table 7**, the preliminary screening results show that Options 1, 2, 4, and 5 do not meet the preliminary screening criteria, and are therefore eliminated from further evaluation.

Based on results of preliminary screening, one alternative water supply solution met all the preliminary screening criteria and was short-listed to be explored in more detail.

- Lake Based Raw Water Intake (Options 3A to 3D)

This option was identified to be the most viable option to provide replacement raw water supply of equal/to higher quality to provide relatability and continued supply of raw water supply to the Town of Blind River WTP.

10 Class EA Phase 3 – Development and Evaluation of Alternative Design Concepts

10.1 Overview

Intake implementation options evaluated as part of this Class EA study, are further described in the following sections. The options are consistent with the intake alignments and intake structure locations outlined in Section 9.1.3 of this memorandum. Key differentiators for each option in terms of natural environment, socio-cultural, and technical considerations are briefly summarized in this section, as well as the estimates of probable costs. The non-financial evaluation was completed first and then a financial cost-benefit analysis was assessed. Detailed aspects and considerations of each option and the rationale used to assign individual scores is described in detail in the Evaluation Matrix found in **Appendix F**.

Major considerations, common to all four (4) Intake site options include:

- Open-cut marine trench in the lake bottom and dredging along the entire pipe alignment will impact aquatic habitats and species. In-water construction works will be sequenced to occur outside of aquatic life spawning windows, in accordance with the construction sequencing plan.
- Consultation with Transportation Canada will be required to ensure compliance with the Canadian Navigable Waters Act and ensure in-water works do not interfere with navigation.
- Consultation with the MECP to ensure compliance with the Endangered Species Act and SARA.
- Source water protection vulnerabilities have been assessed to reflect new intake location. Blind River does not fall within a Conservation Area.
- Moderate short-term construction disruptions to local residents in the immediate surrounding area such as noise, dust and vibration resulting from bedrock drilling and blasting will be experienced during the short in-water construction period.
- Permits and approvals will need to be secured from different review agencies, such as, MECP, MNR, DFO and Transport Canada, prior to construction.

10.2 Identification of Alternative Design Concepts (Intake and LLPS)

10.2.1 Option 3A

Option 3A extends approximately 500m into Lake Huron and terminates at the intake crib located at an approximate lakebed depth of 2.7-3.0 m. Should water levels begin to decrease as a result of climate change, this depth is expected to provide an adequate buffer to ensure water servicing can continue. The potential impact of climate change and mitigation measures will be reviewed in detail as part of the design phase for this project.

Option 3A will connect to the LLPS at the preferred location also identified by this analysis. Connection of the new LLPS to the WTP will be staged to minimize interruptions to operations and provide protection of the existing well system.

Compared to the other alternatives, this intake location is the closest in proximity to the local public Marina, and the outfall of Blind River (the River) which accepts some industrial discharges, including the WWTP outfall. There was initial concern that the water source may also be affected by nearby residential outfalls. However, the results of the comprehensive Source Water Quality Study (outlined in Section 11.11**)**, showed no indication of influence from these perceived risks and subsequently, source-impacted water quality concerns are not expected.

10.2.1.1 Option A1 (3A & LLP1)

Building the LLPS at the existing WTP site, as shown in **Figure 13**, has benefits and drawbacks including:

- Proximity for operations will ease workforce requirements and increase convenience for security, access and maintenance.
- Land is assumed to be owned and occupied by the Town.
- Building construction is limited to the inland area and not near the shoreline.
- Construction interruptions associated with LLP1 will not be as impactful to residents and wildlife habitats.
- Assuming the horizonal rise is ~16m, distance from the shoreline to the WTP is 300m and drawing water is not as efficient as pushing it, the LLP1 option will require boring a deep lift shaft and presumably tunnel boring the entire distance to the shoreline, which will increase costs projected for this option.

Note: All options implementing the LLP1 location option (A1, B1, C1, D1) assume the same benefits and drawbacks shown above excluding:

- The run of pipe for Option A1 extends the least distance, resulting in lower capital costs.

Under this option, the intake pipe runs for a distance of approximately 800m.

Figure 13: Proposed Tunnel Boring Trajectory for Option A1 (3A & LLP1)

10.2.1.2 Option A2 (3A & LLP2)

Constructing the LLPS near the shoreline, as shown in **Figure 14**, has benefits and drawbacks including:

- Short-term construction will disrupt shoreline recreation and occupation.
- More apt to cause affect on the nearby private residential water use.
- Operator and maintenance access limited as there is a single roadway to the proposed area and shared access with several private properties and beaches.
- The water source may be affected by residential outfalls.
- Building setbacks and permit requirements will be more stringent.
- It is assumed that the land must be procured and zoned appropriately.

Under this option, the intake pipe runs for a distance of approximately 950m

Figure 14: Proposed Open-Trench Trajectory for Option A2 (3A+LLP2A)

10.2.1.3 Option A3 (3A & LLP3)

Constructing the LLPS on the Wastewater Treatment Plant property, as shown in **Figure 15**, has benefits and drawbacks including:

- Eliminates land acquisition process as land is owned by the Town.
- Increases permit and approval requirements for proximity between Wastewater and a Drinking Water source. This may increase construction & operational/ monitoring requirements.
- Allows for Operational crossover and will reduce workforce impact.
- Longer pipe run, increased capital costs.

Under this option, the intake pipe runs for a distance of approximately 1000m.

Figure 15: Proposed Open-Trench Trajectory for Option A3 (3A+LLP3)

10.2.2 Option 3B

Option 3B extends approximately 500m into Lake Huron and terminates at the intake crib located at an approximate lakebed depth of 2.4-3.0 m. Should water levels begin to decrease as a result of climate change, this depth is expected to provide an adequate buffer to ensure water servicing can continue. The potential impact of climate change and mitigation measures will be reviewed in detail as part of the design phase for this project.

Connection of the new LLPS to the Water Treatment Plant (WTP) will be staged to minimize interruptions to operations and provide protection of the existing well system. This option has added protection from current fluctuations by Henrietta Peninsulas to the west and Caribou Point Peninsula to the east. It is not expected to be directly impacted by recreation, tributary influent or industrial outfalls by reason of distance.

The in-land portion of the intake pipeline for this option will traverse a private laneway. This will be assumed to require land acquisition, zoning, permits and possibly and

easement or right of way agreement. The water source may be affected by nearby residential outfalls.

The intake pipe trajectory traverses established natural areas that serve as habitats for wildlife. Tree removal may be required.

10.2.2.1 Option B1 (3B & LLP1)

Constructing the LLPS near the existing WTP as described in Option B1, shown in **Figure 16**, assumes the same benefits and drawbacks as outlined in Section 10.2.1.1 with the addition of:

- Longer pipe run, increased capital costs.
- Avoids traversing the private laneway.

Under this option, the intake pipe runs for a distance of approximately 1,100m.

Figure 16: Proposed Tunnel Boring Trajectory for Option B1 (3B+LLP1)

10.2.2.2 Option B2 (3B & LLP2)

Constructing the LLPS near the shoreline, as shown in **Figure 17**, has benefits and drawbacks including:

- Short-term construction will disrupt shoreline recreation and occupation.
- Operator and maintenance access limited as there is a single roadway to the proposed area and shared access with a private property and beach.
- Building setbacks and permit requirements will be more stringent.
- It is assumed that the land must be procured and zoned appropriately.

Under this option, the intake pipe runs for a distance of approximately 1,150m.

Figure 17: Proposed Open Cut Trench Trajectory for Option B2 (3B+LLP2B)

10.2.3 Option 3C

Option 3C extends approximately 500m into Lake Huron and terminates at the intake crib located at an approximate lakebed depth of 3.7-4.3 m, the deepest of the evaluated locations. Should water levels begin to decrease as a result of climate change, this

depth is expected to provide an adequate buffer to ensure water servicing can continue. The potential impact of climate change and mitigation measures will be reviewed in detail as part of the design phase for this project. This option is the deepest of the evaluated locations and as such, is most likely to provide a higher quality and stable resource of raw water.

This option, although deepest and subsequently less vulnerable to water quality impact, requires a much longer pipe run and associated increased capital costs. Due to the extended length of this pipe the construction period is expected to be longer.

Connection of the new LLPS to the WTP will be staged to minimize interruptions to operations and provide protection of the existing well system.

Possible impact to boat traffic and potential navigation ways and may impede or limit activities during the in-water construction period.

This option is in open water and not protected by the cove or peninsulas. By reason of distance, it is not expected to be directly impacted by recreation, tributary influent or industrial outfalls.

The in-land portion of the intake pipeline for this option will traverse a predominantly vegetated area of old growth trees that serve as habitats for wildlife. Removal of trees will be required for open trench construction. Tunnel boring technology is an option to avoid major disturbance to the natural forested area.

There may be some shoreline activity limitations associated with this option, but the area is more remote and not used for recreational or industrial purposes at this time.

10.2.3.1 Option C1 (3C & LLP1)

Constructing the LLPS near the existing WTP as described in the C1 Option and shown in **Figure 18**, assumes the same benefits and drawbacks as outlined in Option A1 description, Section 10.2.1.1 with the addition of:

- Will require extensive inland preparation, approvals and permits.
- Limited access for pipeline maintenance.
- Significantly longer pipe run, increasing capital costs.
- More pristine source water from the deeper, more open waters.

Under this option, the intake pipe runs for a distance of approximately 1,750m.

Figure 18: Proposed Tunnel Boring Trajectory for Option C1 (3C+LLP1)

10.2.3.2 Option C2 (3C & LLP2)

LLP2B is located near the shoreline on Caribou Point Peninsula and to the Southeast of the existing WTP, as shown in **Figure 19**. Constructing the LLPS near the shoreline has benefits and drawbacks including:

- Travel time is more than a kilometer from the WTP.
- Much longer pipe run, increased capital costs.
- Long-term impacts are possible with the construction of the LLPS and open trench pipe installation in the forested region.
- Remote station with limited access for maintenance and operation. Will require a roadway.
- Electrical works, programable logic controllers and back up power generator feed lines required will be extensive. Redundancy is recommended.
- A utility supplied source of process water must be provided in from the WTP.
- Security implications related to remote and distal location.

- Procurement and zoning are assumed to be required.
- More pristine source water from the deeper, more open waters

Under this option, the intake pipe runs for a distance of approximately 1,800m.

Figure 19: Proposed Open Cut Trench Trajectory for Option C2 (3C+LLP2C)

10.2.4 Option 3D

Option 3D extends approximately 500m into Lake Huron and terminates at the intake crib located at an approximate lakebed depth of 2.1-2.4 m, providing a limited security buffer to the intake should water levels in Lake Huron start to decrease from potential extreme droughts, although not historically experienced. This option is the shallowest of the evaluated locations and is least likely to provide a good quality and stable resource of raw water.

This option, being the shallowest is subsequently more vulnerable to water quality impact, storm events and sediment infiltration.

This option requires a relatively longer pipe run and associated increased capital costs. Due to the extended length of this pipe the construction period is expected to be longer.

Connection of the new LLPS to the Water Treatment Plant (WTP) will be staged to minimize interruptions to operations and provide protection of the existing well system.

More remote section of water way and shoreline is less likely to impact boat traffic and navigation ways and less likely to impede or limit activities during the in-water construction period.

This option is protected by the cove and Caribou Point peninsula to the west. By reason of distance, it is not expected to be directly impacted by recreation, tributary influent, or industrial outfalls.

This option has a greater potential to be impacted by shoreline activity or seasonal temperature swings. Algal blooms and stagnant waters can be a risk to the water quality.

The in-land portion of the intake pipeline for this option will traverse a predominantly vegetated area of old growth trees that serve as habitats for wildlife. Removal of trees will be required for open trench construction. Tunnel boring technology is an option to avoid major disturbance to the natural forested area.

There maybe some shoreline activity limitations associated with this option, but the area is more remote and not known to be used for recreational or industrial purposes at this time.

10.2.4.1 Option D1 (3D & LLP1)

Constructing the LLPS near the existing WTP as described in the D1 Option and shown in **Figure 20**, assumes the same benefits and drawbacks as outlined in the A1 description, section 10.2.1.1 with the addition of:

- Most shallow and subsequently the most vulnerable source water option.
- Possibility of stagnant waters, algal blooms and shoreline activity impacts.
- Will require extensive inland preparation, approvals and permits.
- Limited access for pipeline maintenance.
- Significantly longer pipe run, increasing capital costs.

Under this option, the intake pipe runs for a distance of approximately 1,550m.

Figure 20: Proposed Tunnel Boring Trajectory for Option D1 (3D+LLP1)

10.2.4.2 Option D2 (3D & LLP2)

LLP2D is located near the shoreline in the cove to the Northeast of Caribou Point Peninsula and to the Southeast of the existing WTP as shown in **Figure 21**. Constructing the LLPS near the shoreline has benefits and drawbacks including:

- Less pristine water source expected from shallow depth
- Operational and maintenance travel time would be more than a kilometer from the WTP.
- Longer pipe run, increased capital costs.
- Long-term impacts are possible with the construction of the LLPS and open trench pipe installation in the forested region.
- Remote station with limited access for maintenance and operation. Will require a roadway.
- The electrical works, programable logic controllers and back up power generator feed lines required will be extensive. Redundancy is recommended.

- A utility supplied source of process water must be piped in from the WTP.
- Security implications related to remote and distal location.
- Procurement and zoning are assumed to be required.

Under this option, the intake pipe runs for a distance of approximately 1,650m.

Figure 21: Proposed Open Cut Trench Trajectory for Option D2 (3D+LLP2D)

10.3 Evaluation of Alternative Design Concepts

The detailed comparative evaluation of the nine (9) potential implementation options was completed in accordance with the evaluation methodology described in Section 8.3. The detailed evaluation matrices, describing the rationale and preliminary scoring assigned to each implementation option are included in **Appendix F**. Preliminary individual scores assigned for each option was reviewed and confirmed in collaboration with the project team.

Four (4) in-depth evaluations were performed:

1) A full assessment of the four (4) intake location options was carried out and assigned scoring based on the outlined criteria (outlined in Section 10.3.1).
2) A full analysis, of the same criteria, was performed on the five (5) proposed possible LLPS locations, including the nine (9) variations of intake and LLPS combinations (outlined in Section 10.3.2).
3) A comprehensive approximation of costs for each of the nine (9) options was completed (outlined in Section 10.3.3)
4) The nine (9) options were evaluated in a wholistic manner using the three (3) previous, individual evaluation scores, merging the assessments and summarizing overall suitability, costs and concerns (Outlined in Section 10.3.4).

The individual and combined evaluation matrices are attached in **Appendix F**.

10.3.1 Intake Location Evaluation

A summary of the overall total scores and preliminary ranking of the options for the (4) four alternative Intake locations, based on the information and scores assigned in the evaluation matrix, is provided in **Table 8**.

Based on this evaluation, **Option 3A** stands out as the preferred alternative, achieving both the highest score overall, and the highest score in 4 out 5 individual categories. The only category in which Option 3A does not achieve the highest score is that of Water Quality. However, even in this category Option 3A has a respectable 15.3 out of 20, not significantly lower than any option, and per the Source Water Quality Study (outlined in Section 11.11)**,** there are no major Water Quality concerns for this source.

Table 8: Evaluation Summary Results of Intake Location Alternatives

Criteria / Alternatives (Weighting factor, %)	3A	3B	3C	3D
Water Quality (20%)	15.3	17.5	18.9	16.0
Natural Environmental (15%)	13.5	12.5	11.0	11.7
Socio-Cultural (15%)	13.5	13.0	13.5	13.5
Technical and Operational (30%)	27.0	25.2	23.4	24.0
Economic (20%)	18.7	17.7	15.6	16.7
Total Score (out of max = 100% or 100 points)	**88.0**	**85.9**	**82.4**	**81.9**

10.3.2 LLPS Location Evaluation

A summary of the overall total scores and preliminary ranking of the options for the (9) alternative low lift pumping station (LLPS) locations, based on the information and scores assigned in the evaluation matrix, is provided below in **Table 9**.

Overall, no single LLPS option clearly stands out, although those located at the WTP site (A1, B1, C1, D1) or on the WWTP property (A3) tend to score higher than those located elsewhere (A2, B2, C2, D2).

Table 9: Evaluation Summary Results of LLPS Options

Criteria (Weighting factor, %)	A1 score	A2 score	A3 score	B1 score	B2 score	C1 score	C2 score	D1 score	D2 score
Water Quality (20%)	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Natural Environmental (15%)	14.8	13.9	14.8	14.7	13.5	13.2	12.2	13.5	12.5
Socio-Cultural (15%)	14.0	13.5	14.5	14.0	13.5	14.5	14.0	14.5	14.0
Technical and Operational (30%)	25.2	24.2	27.0	25.2	23.6	25.2	23.4	25.2	21.6

Criteria (Weighting factor, %)	A1 score	A2 score	A3 score	B1 score	B2 score	C1 score	C2 score	D1 score	D2 score
Economic (20%)	18.0	17.9	18.5	18.0	17.6	18.1	17.2	18.1	17.3
Total Score (out of max = 100% or 100 points)	**92.0**	**89.5**	**94.8**	**91.9**	**88.2**	**91.0**	**86.8**	**91.3**	**85.4**

10.3.3 Opinion of Probable Costs

An opinion of probable capital construction costs was developed for each option (intake and LLPS) and summarized in **Table 10**. Detailed cost estimates are provided in **Appendix G**.

The following general assumptions were made when developing the opinion of probable costs:

- Cost estimates are based on 2023 construction costs. Inflation and escalation for the actual expected prices at the time of construction cannot be accounted for at this time.
- Capital cost estimates include construction and installation of intake pipeline, intake structure, chlorination lines along the intake alignment, and all other components associated with the onshore connection of the new intake pipe to the WTP, as outlined in this memorandum.
- Cleanup and restoration efforts, as well as implementation of associated marine and environmental protection measures have been accounted for in the estimates.
- Estimates of probable capital costs provided by CIMA+ have been developed on a conceptual design level and based on prices and data in CIMA+'s possession, as well as previous experience from projects of similar nature and scope.
- In accordance with ASTM E 2516 (Standard Classification for Cost Estimate Classification System) the preliminary opinion of total project costs is anticipated to be within an accuracy range of -30% to +50%, based on a Class 4 estimate.
- Capital cost estimates include a 15% contingency. Cost estimates are preliminary only and based on assumed design parameters and assumed site conditions.

- The following costs have been excluded from the estimates:
    - All taxes (including the 13% HST).
    - Testing and inspection costs are excluded.
    - Costs for land acquisition or establishment of easements within the neighbouring property in relation to the preferred option; however, they remain a critical factor. Further consultation with the real estate department at the Town will be necessary to establish an accurate cost estimate.
    - Costs associated with a potential extension of the existing WWTP water lot, as the limits of the existing water lot were not available/not provided to CIMA+.
    - Additional operation and maintenance costs.

Additional installation/construction assumptions and considerations for the intake pipeline include:

- The intake pipeline will be marine trenched from the onshore to the offshore terminus at the intake structure, to avoid any ice conditions due to shallow water levels in Lake Huron.
- The trench will be excavated through the rock for a minimum depth of two (2) meters using a heavy excavator.
- No humps and hollows are expected within the proposed intake alignment options, and a uniform trench depth of 2m below the lakebed is assumed throughout the intake alignment.
- The excavated trench will be backfilled by imported granular material, with excavated material reused to provide a scour protection layer on top of the backfill layer over the crown of intake pipeline.
- Micro-tunneling (under ground pipe boring) specifications and estimates to be reviewed separately, if deemed viable, to ensure accuracy of costs and requirements.
- Costs presented below assumed for 500m of In-water intake pipe for all options.

Table 10: Opinion of Probable Costs (Intake and LLPS)

Implementation Option	Approximate Total Intake & Watermain Length	Capital Cost[1]	Lowest to Highest
Option A1	800 m	$9,847,000	**4**
Option A2	965 m	$8,757,000	**2**
Option A3	990 m	$8,105,000	**1**
Option B1	1110 m	$10,382,000	**7**
Option B2	1140 m	$9,059,000	**3**
Option C1	1765 m	$11,512,000	**9**
Option C2	1795 m	$10,189,000	**6**
Option D1	1565 m	$11,167,000	**8**
Option D2	1640 m	$9,921,000	**5**

Notes:
1. Capital cost estimates include a 15% contingency. Cost estimates are preliminary only and based on assumed design parameters and assumed site conditions**.**

10.3.4 Overall Evaluation Results

The overall results of this evaluation have been presented in **Table 11** below. The results from the evaluations of options for Intake and LLPS location configurations were combined and averaged, and the economic score was updated based on the opinions of probable cost provided in Section 10.3.3.

Table 11: Combined and Overall Evaluation Results

Criteria / Alternatives (Weighting factor, %)	A1 score	A2 score	A3 score	B1 score	B2 score	C1 score	C2 score	D1 score	D2 score
Water Quality (20%)	17.7	17.7	17.7	18.7	18.7	19.5	19.5	18.0	18.0

Criteria / Alternatives (Weighting factor, %)	A1 score	A2 score	A3 score	B1 score	B2 score	C1 score	C2 score	D1 score	D2 score
Natural Environmental (15%)	14.2	13.7	14.2	13.6	13.0	12.1	11.6	12.6	12.1
Socio-Cultural (15%)	13.8	13.5	14.0	13.5	13.3	14.0	13.8	14.0	13.8
Technical and Operational (30%)	26.1	25.6	27.0	25.2	24.4	24.3	23.4	24.6	22.8
Economic (20%)	18.1	18.6	19.3	17.7	18.3	17.0	17.1	17.3	17.5
Total Score (out of max = 100% or 100 points)	**89.8**	**89.1**	**92.1**	**88.8**	**87.7**	**86.9**	**85.4**	**86.5**	**84.1**
Ranking =	**2**	**3**	**1**	**4**	**5**	**6**	**8**	**7**	**9**

In **Table 11**, The combined weighted total scores of all nine options provided comparable results, with Option A3 identified as the best performing alternative, closely followed by Option A1.

In comparison to the other eight (8) alternative design concepts identified; Option A3 provided the following major advantages:

- No property acquisition required for the construction of new intake and LLPS
- Provides highest technical merits and lowest disruption during construction
- Allows for operational crossover with WWTP and will reduce workforce impact
- Lowest capital costs, as a result of:
    - The close proximity of the intake location A to the WTP, reducing the length of watermain required on-land over the other intake locations and resulting in lower construction costs.
    - The proximity of LLP3 to the WTP compared to LLP2 (resulting in a shorter required watermain distance and lower construction cost compared to Option A2).

- The relatively low elevation of the WWTP, eliminating the need to tunnel a deep (20m) shaft as is required for LLP1 (reducing costs compared to Option A1).

All the options using intake locations C and D scored comparably low, likely resulting from their relatively long distance from the WTP (greater than 1km away), with Option D2 scoring the least overall.

While the water quality scores for options with intake location A were somewhat lower than those for the other locations, there were no major water quality concerns with this option, as confirmed by the Source Water Quality Study (outlined in Section 11.11).

10.3.5 Sensitivity Analysis Results

Following the completion of the detailed evaluation, the results were subjected to a sensitivity analysis per the methodology outlined in Section 8.5 to confirm the preferred solution.

The sensitivity analysis was completed for five (5) additional scenarios, each with different weighting factors applied to the main categories reflecting different conditions from what was originally developed. A summary of the original weighting factors (Scenario 1), and those used in the sensitivity analysis scenarios (Scenarios 2 – 6) are shown in **Table 12** and the evaluation results (recomputed for each set of weights) are shown in **Table 13**.

Table 12: Evaluation Criteria Weights for Sensitivity Analysis

Criteria Category	Scenario 1 (Base Case)	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6
Water Quality	20	20	15	15	40	15
Natural Environment	15	20	40	15	15	15
Socio-Cultural	15	20	15	15	15	15
Technical and Operational	30	20	15	40	15	15
Economic	20	20	15	15	15	40
Total Weight (Points)	**100**	**100**	**100**	**100**	**100**	**100**

Table 13: Sensitivity Analysis Results

Alternative Concept	Scenario 1 (Base Case) Rank (Score)	Scenario 2 Rank (Score)	Scenario 3 Rank (Score)	Scenario 4 Rank (Score)	Scenario 5 Rank (Score)	Scenario 6 Rank (Score)
Option A1 (LLP1)	2 (89.8)	2 (90.4)	2 (91.4)	2 (89.6)	4 (89.9)	2 (90.5)
Option A2 (LLP2)	3 (89.1)	3 (89.6)	3 (90.0)	3 (88.6)	6 (89.3)	3 (90.5)
Option A3 (LLPS)	1 (92.1)	1 (92.5)	1 (92.9)	1 (91.9)	1 (91.4)	1 (93.4)
Option B1 (LLP1)	4 (88.8)	4 (89.4)	4 (89.7)	4 (88.1)	2 (90.5)	4 (89.2)
Option B2 (LLP2B)	5 (87.7)	5 (88.3)	5 (87.9)	5 (86.6)	5 (89.7)	5 (89.2)
Option C1 (LLP1)	6 (86.9)	6 (87.5)	7 (85.8)	7 (85.9)	3 (89.9)	7 (86.9)
Option C2 (LLP2C)	8 (85.4)	8 (86.0)	9 (83.8)	8 (84.0)	7 (88.8)	8 (85.9)
Option D1 (LLP1)	7 (86.5)	7 (87.2)	6 (86.4)	6 (85.9)	8 (87.9)	6 (87.1)
Option D2 (LLP2D)	9 (84.1)	9 (85.1)	8 (84.0)	9 (82.9)	9 (86.4)	9 (85.7)

The results of the sensitivity analysis, as shown in **Table 13**, suggest that under each of the scenarios, **Option A3** achieves the best score, which confirms its selection as the **preferred alternative design concept**.

11 Field Investigations

As part of the Class EA process, a series of field investigations were carried out to aid in selecting the preferred design concept and refining the conceptual design of the selected alternative. The results of these investigations will be used to inform the preliminary and detailed design.

11.1 Subsurface Utility Engineering (SUE)

The property on which the LLPS will be constructed is owned by the Town near the wastewater treatment plant (WWTP), with no other developments nearby. Locates were completed and have informed the location of the LLPS and the path selected for the intake pipe.

11.2 Topographical Study

As part of this Class EA, TULLOCH completed a topographical survey of the study area. This survey informed the conceptual design of the intake pipe and LLPS. The results of this survey have been included as **Appendix H**.

11.3 Geotechnical Investigation

A geotechnical investigation was completed by TULLOCH as part of this Class EA to evaluate subsurface conditions within the project site and provide recommendations. The full geotechnical investigation report has been provided in **Appendix I**, and a summary is provided below.

As part of this investigation, nine (9) geotechnical boreholes were drilled and three (3) environmental boreholes at the proposed LLPS site and along the proposed watermain alignment between the LLPS and the WTP. Soil from these boreholes was tested and used to inform the design of the LLPS and watermains.

Two geotechnical boreholes were drilled within the vicinity of the LLPS site – BH-23-01 (drilled near the shoreline) and BH-23-02 (drilled just south of Martin Street). Key findings from these boreholes include the following:

- There is a layer of topsoil approximately 0.2m – 0.4m thick, primarily composed of fine to coarse grained sand.
- There are cobbles and boulders underlying the topsoil at BH-23-01, and a deposit of fine to medium grained sand underlying the topsoil at BH-23-02.
- Bedrock in this area was found to generally consist of greywacke bedrock. It was first encountered at a depth of 0.81m in BH-23-02, and 3.55m in BH-23-01. The

shallow layers of bedrock (less than 3.55m for BH-23-01 and 0.81m for BH-23-02) were found to be of poor quality, which improved with greater depth.

The remainder of the boreholes were drilled along the watermain alignment. BH-23-03 was drilled between the Huron Central Railway and Causley street, while the remainder were drilled along Huron Avenue. Key findings from these boreholes include the following:

- There is a layer of topsoil approximately 0.2m – 0.4m thick, primarily composed of fine to coarse grained sand at BH-23-03. All other boreholes had a surface layer of asphalt from Huron Avenue, an average of 53mm thick and four to be in fair to poor condition.
- Subbase/road fill was encounter between the surface layer in all boreholes, consisting of primarily fine to coarse grained sand and gravel.
- A silty sand deposit was encountered below the fill layer at the north end of the area investigated, approximately 1.1m to 1.6m thick. At the northernmost borehole, an additional silt and sand deposit was encountered below this.

In addition to the findings above, the report completed by TULLOCH included recommendations for installation of the twin 300mm watermains connecting the LLPS to the WTP, including the trenchless installation of the watermains across Causley Street and the Huron Central Railway, and the open-cut installation of the watermains along Huron Avenue (as well as follow-up remedial actions).

Per applicable standards, the following are **requirements** associated with the **trenchless crossing** of the railway and Causley Street which must be met or exceeded:

- The following requirements apply to the crossing of the railway:
    - The bore must be installed at least 1.68m below the base of the railway
    - The watermain must be enclosed in a steel casing pipe which meets the following requirements:
        - At least 100mm greater in diameter than that of the watermain
        - Specified minimum yield strength of 241 MPa or greater
        - Installed with a protective coating, cathodically protected, or having a thickness of at least 1.6mm greater than the required thickness
    - The watermain and casing pipe must extend a minimum 25m distance from the centreline of the railway
- For the crossing of Causley Street (Highway 17), the minimum bore depth is 3.0m.

The report makes the following key findings with respect to the **trenchless portion** of the watermain installation:

- The preferred installation method was found to be horizontal directional drilling (HDD), as it is more economical and had superior constructability compared to jack-and-bore. Micro-tunnelling was also considered, but TULLOCH concluded that it was likely to be non-viable due to its high cost.
- The bore depth is recommended to be 4.0 to 6.0 metres below the existing ground surface, as this depth was found to have good quality greywacke bedrock at the site. This will also minimize ground settlement above the bore.
- There may be a poor quality rock zone between the Huron Central Railway and Causley Street.
- The conduit design will need to account for the stresses imposed by the Railway and Highway above.
- The contractor should be equipped with tooling systems that can handle the possibility of cobbles and boulders in addition to the medium to high strength bedrock encountered throughout the site

The report makes the following key findings with respect to the **open-cut installation** of the watermain along Huron Avenue and repaving of the avenue following installation:

- The estimated frost penetration depth at the site is 1.8 metres, and as such all servicing shall be situated at least 1.8m below the ground surface so as to provide adequate soil cover against frost heaving (or use insulation equivalent to a soil cover)
- The soils are classified as Type 3 soils above the groundwater table and Type 4 soils below the groundwater table.
- Groundwater control may be required during construction to maintain dry excavations. While the groundwater level was lower than the expected pavement structure during the investigation, seasonal variations in the water table should be expected.
- Due to the glacial original of the native soils, there is the possibility of encountering boulders and cobbles during excavation that were not identified in the geotechnical investigation.
- Soil corrosivity does not meet the threshold to require protective measures for subsurface infrastructure.

11.4 Hydrogeological Investigation

A hydrogeological investigation was completed by CIMA+ as part of this Class EA to characterize the existing hydrogeological conditions at the Project Site to inform the detailed design of the LLPS for the Project. The full investigation report has been provided in **Appendix J**, and a summary is provided below.

This hydrogeological investigation was undertaken to assess construction dewatering needs and associated permitting requirements; determine groundwater mitigation, monitoring, and contingency plans as needed; and inform recommendations for additional studies and/or assessments to support permitting and construction. Activities completed as part of this investigation included:

- A desktop review of publicly available information.
- Drilling of test and monitoring wells, along with subsequent pumping and response tests.
- Groundwater sampling and testing.
- Completion of a dewatering assessment.

This investigation found that, no impacts to local water users or the municipal water supply are expected as a result of this project. Additionally, no source water projection measures have been developed within proximity of the project site. The potential impacts of dewatering activities will be mitigated through the development of a Water Taking and Discharge Plan (as required by EASR (Environmental Activity and Sector Registry) registration). A geotechnical assessment of potential settlement as a result of dewatering is not anticipated to be required.

In addition to the Development of a Water Taking and Discharge Plan, it is recommended that measures to mitigate impact to the environment during dewatering discharge, including but not limited to:

- Erosion and sediment control.
- Stormwater management.
- Development of a spill containment and response plan.
- Proper storage and management of excavated soils for reuse and/or off-site disposal.

It is also recommended that a monitoring program be developed in advance of the construction dewatering activities in consideration of the anticipate EASR registration and associated Water Taking and Discharge Plan. The monitoring program should

consider Project specific dewatering practices, the discharge location, and available intact monitoring wells.

11.5 Bathymetric Survey

As part of this Class EA, TULLOCH completed a bathymetric survey of the in-water portion of the study area. This survey informed the conceptual design of the intake. The results of this survey have been included as **Appendix K**.

The bathymetric survey will inform the design of the in-water portion of the new raw water intake and intake structure.

11.6 Source Water Vulnerability and Threats Assessment

A source water vulnerability and threats assessment report was completed by BluMetric as part of this Class EA study. This report details the methodology and findings of the vulnerability, issues evaluation and threats assessment of the proposed intake. It has been included as **Appendix L** and is summarized below.

The report provides a delineation of intake protection zones (IPZ) 1 and 2 for the proposed new intake and assesses the vulnerability of each based on the characteristics of the surrounding area, and the characteristics of the water source. The report finds that the IPZ-1 and IPZ-2 were found to have vulnerability scores of 6.0 and 5.4, respectively. Based on these scores, potential drinking water threats within each zone were identified. In addition, the level of uncertainty within the study’s conclusions was quantified. The area that includes the Town of Blind River and the North Channel of Lake Huron does not fall under the regulation of a Conservation Authority, however, the IPZ assessment was determined necessary to provide information to facility operations and emergency response personnel in the event of a spill or other potential threat to the water supply. It will be used to prepare emergency response plans, provide intake security and inform the public of respectful practices to ensure the intake and water supply are not compromised.

11.7 Natural Environment Investigation

A natural environment investigation was completed by TULLOCH as part of this Class EA to review all natural environmental constraints associated with the construction of the intake, LLPS, and watermain connection to the WTP, and identify measures to reduce or mitigate environmental impacts. The memo documenting the findings of this investigation have been included as **Appendix M.**

This investigation occurred in two stages. The first phase consistent of a background records review. This included a desktop review of natural heritage records for the Site and its general vicinity (i.e., whether the site includes Natural Heritage Systems, Significant Wetlands, etc.). The second phase consisted of field investigations (i.e., visual investigations, water sampling, sediment sampling, etc.) to assess the existing environmental conditions at the Site (including the presence/potential for natural heritage features), and to validate the findings of the background review.

This investigation indicated the following potential impacts:

- Water quality may be impacted by sediment or other worksite contaminants entering the watercourse during construction. Water quality is regulated by the MECP and Department of Fisheries and Oceans (DFO).
- The site contains candidate *Significant Wildlife Habitat for Turtle Nesting* per the Ministry of Natural Resources (MNR), and construction may impact suitable habitat for the Northern Map Turtle.
- Most bird species in the local nesting zone are considered migratory and thus receive protection under the federal *Migratory Birds Convention Act*.
- In-water construction may impact fish and fish habitat, which are protected by the DFO.

To mitigate these impacts, several measures were recommended, including (but not limited to):

- Setting works back from the water (30m from the high-water mark)
- Minimizing and controlling erosion and sedimentation along the shoreline and in-water
- Minimizing the removal of vegetation
- Avoiding disturbance of woody vegetation during bird nesting periods
- Performing a turtle nesting sweep prior to starting work.
- Preventing contamination and spills at the worksite.
- Removing project refuse following work completion.
- Isolating in-water works from the surrounding environment
- Avoiding in-water construction during fish spawning and migration periods

The findings and proposed mitigation measures from this memo will be used to inform the detailed design and construction plan for this Project.

11.8 Stage 1 & 2 Archaeological Assessments

Stage 1 and 2 Archaeological Assessments were undertaken by Archaeological Research Associates Ltd. (ARA), as part of this Class EA study, to evaluate the archaeological potential of the study area. Reports documenting the findings of these assessments have been provided in **Appendix N**.

The Stage 1 archaeological assessment consisted of a desktop evaluation, with the purpose of identifying areas of archeological potential within the study area. Areas of no archeological potential were recommended for photo-documentation, while those with archeological potential were recommended for Stage 2 assessment. In addition, the Stage 1 assessment recommended the completion of a separate Marine Archaeological Study to assess potential in-water archeological features, as it was found that the North Channel of Lake Huron had archaeological potential. This study was completed and is outlined in Section 11.9.

The Stage 2 Archaeological Assessment included visual inspection, with judgemental test pit surveying used where appropriate. This assessment did not result in the identification of any archaeological materials, and it is recommended that no further assessment be required within the study area.

11.9 Marine Archaeological Study

A Marine Archaeological Study was completed by ARA as part of this Class EA to evaluate the potential impacts of this project on marine archeological features. The full investigation report has been provided in **Appendix O**, and a summary is provided below.

As part of this study, a desktop review of background information and an onsite field investigation were undertaken. The field investigation included sidescan and magnetometer surveys of the in-water portion of the study area.

There were eight targets of possible significance located within the study area, several of which were part of a series of log boom cribs associated with Blind River’s historical timber/lumber industry. Three of these targets were located within the proposed intake corridor. These targets were as follows:

- Target “S4”, an accumulation of cut logs approximately 40 m in length and 20 m wide, likely the waterlogged and submerged remains of an abandoned log raft/boom.
- Target “S5”, a large triple crib structure approximately 15 m in length, 6 m in width, and 2.5 m in height.

- Target “S8”, a rock pile approximately 10 m in diameter and 2.5 m in height, with logs associated which indicate this may be a partially destroyed crib.

In response to these findings, the intake route was updated to provide a minimum 5 m buffer from these targets. No additional mitigation measure is recommended for the update course of the intake. Refer to the full report for the definition of the Target locations.

11.10 Cultural Heritage Study

A Cultural Heritage Study was completed by ARA as part of this Class EA to identify and evaluate built heritage resources (BHR) and cultural heritage landscapes (CHL) within and adjacent to the study area that may be impacted as part of construction of the intake and LLPS. The full investigation report has been provided in **Appendix P**, and a summary has been provided below.

The Cultural Heritage study included:

- A desktop review of the historical context of the study area
- Consultation with Town staff regarding heritage matters in the study area
- Identification of any designated or recognized properties within and adjacent to the study area.
- On-site inspection and creation of an inventory of all properties with potential BHRs and CHLs within and adjacent to the study area.
- Evaluation of potential project impacts.
- Suggested strategies for the future conservation of identified BHRs and/or CHLs.

This study identified two CHLs within the study area. Of these, one (the North Channel of Lake Huron, referred to as CHL-1) has the potential to be directly or indirectly impacted by construction of the preferred alternative. As such, it was recommended that during subsequent planning and design phases, the CHL be avoided where possible. During construction, it is recommended that:

- Staging areas be located away from portions of CHL-1 not under construction.
- Construction fencing should be erected along the periphery of the study area wherever feasible.
- Locations along the shoreline which are damaged be restored as close as possible to the as-found condition.

For the other CHL (the Canadian Pacific Railway, referred to as CHL-2) identified by this study, no direct or indirect impacts were anticipated. As such no mitigation measures were recommended regarding this CHL.

The study also notes that public consultation may result in additional BHR and/or CHLs being identified.

11.11 Source Water Quality Study

A Sampling Plan and Source Water Quality Study was completed to confirm the viability of the raw water quality at the preferred intake location. For the assessment of raw water quality, water samples have been collected from several sampling locations in the vicinity of the proposed intake alignment (refer to Treatability Study, **Appendix Q**).

The Lake Huron water quality was evaluated using the criteria as set out by the Ontario Drinking Water Standards, O. Regulation 169/03 (Government of Ontario, 2025) of the Safe Drinking Water Act, the Guidelines for Canadian Drinking Water Quality (Health Canada, 2025) and the Ontario Design Guidelines for Drinking-Water Systems (Ministry of the Environment, Conservation and Parks, 2008). The comprehensive sampling program was completed over 1 year, providing water quality data representative of all season and various conditions on the lake Additional sampling and pilot testing will prior to commissioning of the new source water intake, and beyond, to ensure a compliant transition and to optimize the WTP using the new source water.

A Treatability Study was completed to assess the ability of the existing treatment train and systems at the Blind River WTP to provide adequate treatment of the new raw water source, at the WTP’s rated capacity. The study confirmed suitability and provided evidence to support minor operational updates that may be required to treat the new source water.

In general, the proposed new source of water is visibly clear to the bottom of the lakebed with low turbidity, solids, organic content, bacterial colonies and colour. This is relatively soft water with low mineral content, suggesting an unsupportive environment for invasive mussel growth. The levels of calcium and magnesium are low to borderline for mussel affiliation.

The water has a high dissolved oxygen which is characteristically good for aquatic life but could catalyze corrosive reactions in the infrastructure. However, considering its neutral to basic pH, low salinity and low electrical conductivity, corrosion should not be of major concern.

As the character composition of the new source (lake) is slightly different from the present source (groundwater), some minor operational process adjustments are

expected to be required to provide optimized treatment of the new source as outlined in the Study.

A transition plan is underway to facilitate the conversion of water sources at the treatment plant from the existing GUDI wells (groundwater) to Lake Huron (surface water) and minimize impacts in the distribution system at the time of commissioning.

12 Preferred Alternative Design Concept

12.1 Overview

Per the results of the detailed evaluation process, Option A3 is the preferred design concept to provide a secure, reliable and adequate supply of source water to the Blind River WTP and meet the requirements for improved raw water quality.

The results of the detailed evaluation were presented to the public for input. The recommended preliminary preferred water supply solution was confirmed (there were no objections received from the public or agencies).

Option A3 is comprised of the following major infrastructure components:

- Construction of an approximately 410m long intake pipe into Lake Huron, terminating at an intake crib at an approximate average lakebed depth of 2.7 - 3.0m.
- Construction of a new LLPS at the Blind River WWTP site.
- Construction of twin raw watermains to connect the LLPS to the WTP, mostly by open-cut construction.

The intake alignment and intake structure location for Option A3 is outlined in Section 10.2.1.3. The exact intake alignment and location of the intake will be determined during the detailed design stage based on the results of the Bathymetric Survey (included as **Appendix K**). Other supporting studies (as described in Section 11), will also inform the detailed design of the intake, LLPS, and watermain connection to the WTP.

12.2 Permits and Approvals

Permits and approvals anticipated to be required in association with the proposed works are listed in **Table 14**. Consultation with the agencies listed in **Table 14** will occur as part of the detailed design process.

Table 14: Required Permits and Approvals

Approval Agency	Permit/Approval Required
Ministry of the Environment, Conservation and Parks (MECP)	• Amendment to Drinking Water Works Permit (DWWP) • Amendment to Municipal Drinking Water License (MDWL) • Amendment to Permit To Take Water (PTTW) for new water source • Temporary PTTW for construction dewatering if greater than 400,000 L/day (potentially required) • Completion of Information Gathering Form (IGF)
Ministry of Natural Resources (MNR)	• Work Permit subject to construction timeframe limitations for in-water works • Species at Risk (SAR) permit (potentially required, based on IGF)
Department of Fisheries and Oceans (DFO)	• Permit to Take Fish by Means other than Fishing (potentially required, depending on construction technique and blasting requirements)
Transport Canada	• Approval under the Navigable Water Act for in-water works
Town of Blind River	• Building Permit
Electrical Safety Authority (ESA)	• Approval for emergency standby generator
Technical Standards and Safety Authority (TSSA)	• Required approvals to be confirmed

12.3 Implementation Schedule

The proposed schedule for the tender and construction of the new intake and LLPS is presented in Error! Reference source not found.. There are items (such as the motor control centre (MCC) and standby generator) which are expected to have long lead times. To optimize the project schedule, the recommended approach includes pre-purchase/pre-selection of long-lead items.

Table 15: Project Schedule

Project Milestone	Schedule
Preliminary Design	March 2024
Detailed Design Completion	December 2025
Tender Period[1]	January – February 2026
Tender Award	End-March 2026
Procurement of Long Lead Items	February – April 2026
Mobilization	Mid-April – May 2026
Construction and Commissioning	
LLPS	May 2026 – September 2027
Raw Water Intake (permissible in-water construction window)	July – August 2026
Commissioning	September 2027

[1] Tender period includes 2 weeks holiday break

13 Proposed Mitigation of Potential Impacts and Monitoring

The following section provides a description of some of the potential impacts on key criteria anticipated as a result of the implementation of the preferred water supply solution, as outlined in this report, as well as some mitigation measures proposed to minimize or avoid such anticipated impacts.

Implementation of the proposed new intake and LLPS (Option A3) is expected to have some impacts on the existing natural and socio-cultural environment. Construction timing is critical to this project from a technical and water delivery perspective, mainly to mitigate the potential impacts to terrestrial, wildlife and aquatic habitats that have been identified within the project study area. Short-term construction impacts such as noise, dust, vibration and restrictions to recreational uses will be felt mainly by the immediate local residents.

In general, public health and safety is a priority to the Town and as such, all design and construction related to the new intake will adhere to strict safety guidelines and all applicable codes and standards. All construction work must be carried out in accordance with the Occupational Health and Safety Act (OHSA) and other local regulations. Specific mitigation measures, as described below, are recommended for implementation to reduce anticipated potential impacts.

13.1 Socio-Cultural

Based on the nature of the proposed works, potential impacts to the socio-cultural environment are anticipated to be of short-term duration and resulting from construction works only. Long-term effects related to the operation and/or maintenance of the new intake pipeline or intake structure are not anticipated. Since no navigational routes are currently present within the potential in water construction limits, navigation is not expected to be impacted; however, all in water works will need to comply with the Canadian Navigable Waters Act to ensure they do not interfere with navigation in case there is revision to in-water construction limits.

The following mitigation measures will be taken to mitigate anticipated short and long-term impacts to the adjacent residents:

- Temporary fencing will be used around the construction areas (inland) to minimize noise, dust, mud and visual impacts.
- Construction of the project will be carried out in accordance with Town of Blind River By-law No. 21-24, which restricts noise due to construction activities

between 7:00pm and 7:00am any day of the week, as well as all day on Sundays and statutory holidays.

- Construction equipment will be appropriately maintained to ensure that any exhaust emissions meet industry standards.
- Property owners adjacent to where construction activities will take place will be notified in advance and provided with Town’s contact information should they encounter any problems during construction.
- Mitigating factors will be considered during any on-site works to ensure public safety while minimizing impacts to local residents. Any possible efforts will be made to protect private property from public use.
- The condition of local road infrastructure will be considered, and damage caused as a result of the Project will be remediated prior to project completion.

13.2 Climate Change

The intake structure for the preferred intake alternative, Alternative 3A, would be located at an approximate lakebed depth of at least 2.9m, which will provide a security buffer to the intake should water levels in Lake Huron start to decrease from potential extreme droughts, although not historically experienced.

Lower than historical water levels due to climate change will be considered as part of detailed design to ensure a security buffer.

Marine construction for the intake pipeline will include a top layer of scour protection to ensure pipeline protection from potential extreme climatic conditions, such as strong wave actions and storms. Excavated rock material from lake bottom is expected to be used to backfill the remainder of the trench and return lake bottom to its original contours, which will eliminate / reduce the need to transport and dispose excavated material offsite.

13.3 Source Water Protection

As part of the source water vulnerability and threats assessment completed by BluMetric (included as Appendix L), Intake Protection Zones (IPZs) were delineated for the proposed new intake in accordance with the *2021 Technical Rules* under the *Clean Water Act*.

As it is proposed to draw water from a Great Lake (Lake Huron), the proposed intake is considered Class A. As such the IPZ-1 was delineated using a fixed 1000m radius. Where this radius intersected land, a 120m setback was used instead. The IPZ-2 was delineated using hydraulic modelling, and was based on three components:

- The in-water component, consisting of the area within Lake Huron where contaminants could reach the intake within two hours
- The channel and dam reservoir component, consisting of the channel and reservoir upstream of the Blind River Dam that could carry contaminants to the intake with two hours.
- The upland component, consisting of the transport pathways (such as stormwater networks) with the potential to carry contaminants to the intake.

Per the source water vulnerability and threats assessment report, no conditions resulting in drinking water threats were identified in the IPZs of the proposed intake.

13.4 Construction Related Impacts

13.4.1 Noise and Vibration

Potential noise and vibration effects are anticipated in connection with bedrock drilling and blasting during the short in-water construction period, construction traffic and construction equipment. Noise resulting from operation of the new intake is not expected to differ from the existing intake operation conditions. The proposed mitigation measures include the following:

- Construction noise can be minimized by the use of construction walls or fencing around the construction areas.
- Construction of the project to be carried out in accordance with the municipal noise requirements. Construction equipment will be operated according to the applicable Town of Blind River’s Noise Control By-Law, which imposes limitations and restrictions for operation of construction equipment between certain hours.
- Ensuring all vehicles and construction equipment are equipped with effective muffling devices and are operated in a fashion to minimize noise in the project area.
- Throughout the construction period, the Town will ensure the contractors undertake measures to reduce noise disturbances as much as possible.

13.4.2 Dust/Mud

Bedrock drilling and blasting during the short in-water construction period and some construction traffic on Martin Street could create additional dust and mud. There are no anticipated concerns regarding dust and mud during normal intake operation. The proposed mitigation measures include the following:

- Dust control measures such as the application of water onshore to be implemented as required.
- The Town will ensure that the contractor maintain public roadways clean and free of mud on a consistent basis.
- Siltation curtains for in-water construction

13.4.3 Limitations to Recreational Activities

Construction of a 410 m long in-water intake pipe should not largely impact boat traffic and potential navigation ways but may impede or limit recreational activities on the adjacent private beaches during the in-water construction window.

The disturbance due to in-water construction work will be limited by minimizing the extent of disturbance wherever possible through coordination of project related planning, including design, staging and scheduling.

The top of the intake structure will be located approximately 2m below the low water level of the lake. To avoid potential conflicts with boat traffic in the area, buoys will be placed around the intake structure. Significant impacts to boat traffic are not expected following construction of the intake.

13.5 Disturbance to Natural Environmental Features

In-land installation of intake pipe for the preferred alternative will traverse vegetation communities, which support terrestrial and wildlife habitats. Potential impacts can be mitigated by minimizing tree removal, avoiding construction in their habitat or through application of timing windows for tree clearing activities and breeding, if needed.

In-water works will fall in the vicinity of fish spawning locations. Open-cut marine trench in the lake bottom will be dredged along the entire pipe alignment from the shoreline out to the offshore intake structure position that will impact aquatic habitats and species. Available mitigation measures include implementation of timing windows, setbacks and erosion and sediment control measures.

The Ministry of Natural Resources (MNR) restricts works occurring in-water during the spawning periods and other critical life stages of local fish species (Fisheries and Oceans Canada, 2013). As such, the in-water construction window will be set based on the restricted activity timing windows for locally spawning fish species. These restricted timing windows vary depending on the species of fish and the MNR Region in which the works will occur. The timing windows for the Northeast Region (where the Town is located) are provided in

Table 16: MNR Northeast Region Restricted Activity Timing Windows

Species	Timing Window
Spring Spawning Species	
Walleye	April 1 to June 20
Northern Pike	April 1 to June 15
Lake Sturgeon	May 1 to July 15
Muskellunge	May 15 to July 15
Large/Smallmouth Bass	May 15 to July 15
Rainbow Trout	April 1 to June 15
Other Spring Spawning Species	April 1 to June 15
Fall Spawning Species	
Lake Trout	September 1 to May 31
Brook Trout	September 1 to June 15
Pacific Salmon	September 1 to June 15
Lake Whitefish	September 15 to May 15
Lake Herring	October 1 to May 31
Other Fall Spawning Species	September 1 to June 15

Per the MNR, each of the species in Table 16, with the exception of Brook Trout, are present in the local fisheries zone (Ministry of Natural Resources, 2024). Since the timing windows for all local species must be combined, the restricted window for in-water works is therefore September 1 to July 15. This leaves a construction window of 47 days, from July 16 to August 31, to complete all in-water works.

Potential for impacts to suitable habitat occurring within the study area will need to be reviewed at detailed design to confirm the need for compliance with the Endangered Species Act, should any species at risk are anticipated to be impacted

Staging and laydown areas will most likely be confined away from the beach and lake shore to minimize impacts to habitats along the shoreline.

An Erosion and Sediment Control Plan will be developed and implemented prior to start of construction to effectively isolate the extent of construction related activities and mitigate the potential for silt and sediment entry into surface water features and adjacent lands.

13.6 Disturbance to Archaeological Features

Based on the Stage 1 and 2 archeological studies (included as Appendix N), no archaeological impacts, on-land or in-water, are anticipated as a result of the potential construction disturbance activities associated with the Project within the project area. Should the project boundary be revised and extend beyond the study area limits,

additional archaeological assessment may be required due to the potential for submerged archaeological resources located in the surrounding vicinity of the current study area. Further to that, if any deeply buried archaeological resources are identified during ground disturbance activity associated with the proposed developments in the Study Area, ground disturbance activities should be immediately halted and the Archaeology Division of the Culture Programs Unit of the Ministry of Heritage, Sports, Tourism and Culture Industries be notified.

13.7 Disturbance to Cultural Heritage Features

Based on the cultural heritage study (included as Appendix P) disturbance to cultural heritage features will occur as a result of construction activities associated with the Project. The Project includes the construction of an intake pipe into the North Channel of Lake Huron, a cultural heritage landscape (CHL), representing a direct impact to the CHL during the design/construction process. The Project will include excavation or trenching into the North Channel, resulting in soil grading, and necessitating the use of heavy machinery. There are also potential indirect impacts through the removal of vegetation on the shoreline.

Proposed methods to mitigate disruption to the North Channel include the following:

- Locating storage and construction staging areas within the study area away from the portions of the North Channel not under construction, where possible.
- Construction fencing will be erected along the periphery of the study area to ensure the landscape is not further damaged by any construction machinery or vehicles, where necessary and feasible.
- Landscaping of the shoreline post-construction with native tree species wherever tree removal/damage occurs.
- Regrading of the landscape post-construction restore damaged areas as close as possible to an as-found condition.

13.8 Disturbance to Navigation

Lake Huron is considered to be a Navigable Water under the Canadian Navigable Waters Act, and construction in and on the lake is regulated under the Navigation Protection Program (Transport Canada, 2025). As such, approval from Transport Canada will be required prior to commencing construction of the intake pipe and structure. In addition, while intakes meeting certain criteria are classified as “Minor Works” – eligible for registration in lieu of the full approval process – the Blind River intake does not meet these criteria due to the shallow lake depth in this location.

(Transport Canada, 2025). The approval from Transport Canada is being sought under the design phase, and it will set terms and conditions for the construction and ongoing operation of the intake.

It is assumed that as part of this approval, Transport Canada will require the placement of buoys around the intake structure to ensure vessels navigating Lake Huron do not contact the intake structure.

13.9 Public Consultation

Public and agency input was sought at key stages of the Class EA process. Two in-person PICs were held, the first on December 05, 2023, and the second on October 17, 2024. The PIC boards were available on the project webpage.

No public concerns were raised by local public or any agencies during the first PIC. No other comments were received regarding the recommended water supply option for the project following the PIC. During the second PIC, a variety of questions and concerns were raised by members of the public and addressed by members of the project team. Examples of these questions (and the team’s responses) included the following

- Are there provisions for Blue-green algae?
    - The team explained the HAB protocol (MECP), the screening systems in place, the IPZ warning system with SAC and the coagulation and filtration removal processes in place to provide a multibarrier system.
- Will the existing wells be used as a backup source?
    - The team explained that this is not feasible due to chemistry concerns from mixing water sources, and due to the fouling, which quickly occurs when the wells are offline.
- Why not drill new wells instead?
    - The team explained that new wells would not ensure a better source of water or condition of sediment in the long-term.
- Why weren’t the source water quality issues addressed sooner?
    - The team explained that the construction of the treatment plant was completed in response to the poor source water quality, and that the Town had decided to continue using the wells for the time being.
- Are there water quality concerns related to the nearby WWTP?
    - The team showed the audience the hydraulic path of the WWTP outfall, which does not pass near the proposed intake, explained that the treatment systems at the WTP can handle the increased requirements

from the WWTP, and noted that in the event of a bypass event or other extraordinary condition, the WWTP would communicate the event to the WTP, and the intake could be temporarily shutdown with the Town switched to operating using stored water.

- How will the intake be protected from ice & mussels?
    - The team explained the protection cage design, and the screening and blowback systems to protect from frazil ice and mussel buildup.
- How long can the standpipe support the water demands of the Town?
    - The team explained that at average flow, the Town can run from storage for about 36-40 hours.
- A concern was raised about the two 90° elbows in the proposed watermain near the LLPS in the conceptual alignment (e.g., potential for water hammer, higher chance of breakage), and it was suggested that the team consider an alignment which runs on an angle, and eliminates these elbows.
    - This suggested was passed on to the design team.

Communication with any interested residents/stakeholders will continue during the design and construction of this project. The Town will continue to inform and provide updates as the project progresses. A dedicated contact person from the Town will be available to respond to any immediate issues or concerns that may come up before or during construction.

14 Class EA Phase 4 - Class EA Report Conclusions and Recommendations

This Class EA study identified a preferred design concept for a new source of raw water to supply the Blind River WTP and address raw water quality concerns with the existing GUDI wells, in compliance with the Municipal Class EA process requirements for Schedule C projects.

The initial phase of this study identified that a preferred raw water supply solution is required to ensure a safe, reliable and suitable source of water to the Blind River WTP (without causing capacity limitations) of improved quality. .Phase 2 of this study evaluated a number of alternative solutions and identified the construction of a new lake-based raw water intake (and associated LLPS) – drawing raw water from Lake Huron – as the preferred solution. This solution was refined into several alternative design concepts as part of Phase 3 of the EA, which were evaluated based on the following criteria:

This EA considered the following criteria to select the most appropriate design concept:

- Water Quality
- Natural Environmental Factors
- Socio-Cultural Factors
- Technical and Operational Considerations
- Economic Considerations

The design concept selected following this evaluation consists of an intake extending to approximately 410 m into Lake Huron with an approximate average lakebed depth of 2.7-3.0 m. This intake pipe would connect to a low lift pumping station, located on the shoreline of Lake Huron on the property of the existing Blind River WWTP. A new watermain, following local road alignments, would connect the LLPS to the existing Blind River WTP.

Per Section 10.3.3, opinions of probable cost were developed (in 2023) to a Class 4 level of accuracy (-30% to +50%) for each alternative. The opinion of probable cost for the preferred alternative was $8,105,000.

Public and agency input was sought at key stages of the Class EA process to provide the public with opportunities to comment on the project. Through the consultation process, the preferred design concept and ESR sought to practically and responsibly address public and regulatory agency concerns associated with the preferred design concept.

A number of field investigations were carried out as part of this study to evaluate natural, technical, archaeological, and cultural heritage conditions. The findings of these studies informed the evaluation process and supported the development of appropriate impact mitigation measures to include for the project’s implementation.

During on-land construction, socio-cultural impacts to the local community and disturbance to the natural environment and cultural heritage features are expected to occur. Methods to mitigate these impacts include:

- Temporary fencing around the project area to minimize noise, dust, mud, and visual impacts, and to ensure the landscape is not further damaged by construction activities.
- Limiting construction to hours permitted under the Town of Blind River noise bylaw.
- Locating storage and construction staging areas away from portions of Lake Huron not under construction to prevent unnecessary disruption of the Lake.
- Rehabilitation of the local environment following construction, to return it as closely as possible to its initial state.
- Rehabilitation of local roadways following construction to mitigate long term impacts on residents’ mobility.

Construction of marine components will be implemented within the in-water construction window and necessary mitigation measures to protect aquatic habitats and species, as well as marine archeological features. Specific mitigation measures and timing windows will be confirmed, during the detailed design stage, and in consultation with the appropriate regulatory agencies including DFO, MECP, and MNRF.

The Consultant will provide site inspection and contract administration throughout the construction phases of the project. The site inspector will ensure that the Contractor is building the works as per the contractual drawings and specifications, as well as maintaining the necessary environmental protection measures. Construction progress meetings will be held regularly to monitor the progress of the project and address any issues that may arise during the construction phases.

It is recommended that the Town proceed with the detailed design and construction of the preferred water supply solution, as outlined in this ESR, subject to receiving the necessary approvals. This ESR is being filed for a 30-day public comment period. Provided that no major objections or Section 16 Orders are received during the comment period, the project will proceed through the detailed design and construction phases as outlined in this ESR.

15 References

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A

Appendix A: Project Contact List

Project Title:	Blind River WTP New Raw Water Intake and LLPS - Class EA and Detailed Design		
Client:	The Town of Blind River		
Project No.:	T001592B		
Task:	Project Contact List		
Prepared By:	Elliot De Angelis	Date:	14-Oct-25
Reviewed by:		Revision Date:	
Revision No. :	0		

Name	Title	Department	Organization	Street Address	City	Province	Postal Code	Phone	Email	Notes
Indigenous Communities										
Robert Alan Chiblow	Chief		Mississauga First Nation	PO Box 1299	Blind River	Ontario	P0P 1B0	(705) 356-1621	stacyb@mississaugi.com	Contacted by the Town
Brent Bissaillion	Chief		Serpent River First Nation	PO Box 14, 195 Village Road	Cutler	Ontario	P0P 1B0	(705) 844-2418	rpelletier@srfnedc.com	Contacted by the Town
Alana Elise Endanawas	Chief		Sheshegwaning First Nation	1079A Sheshegwaning Road	Sheshegwaning	Ontario	P0P 1X0	(705) 283-3292	kchi-naaknigewin@sheshegwaning.org	Contacted by the Town
Irene Joanne Kells	Chief		Zhiibaahaasing First Nation	36 Sagon Road	Zhiibaahaasing	Ontario	P0P 1X0	(705) 283-3963	zhiiband@manitoulin.net	Contacted by the Town
Lands, Resources and Consultations Branch - Ottawa Head Office			Métis Nation of Ontario	Suite 1100-66 Slater Street	Ottawa	Ontario	K1P 5H1	(613) 798-1488	consultations@metisnation.org	Contacted by the Town
Ministries and Agencies										
EA Notification Mailbox, North Region			Ministry of the Environment, Conservation and Parks						eanotification.nregion@ontario	Contacted by Project Team (CIMA+)
Kady Kaurin	Environmental Resource Planner & EA Coordinator	Environmental Assessment Service - Project Review	Ministry of the Environment, Conservation and Parks	7th Flr, 135 St Clair Ave W	Toronto	Ontario	M4V 1P5	(437) 244-9402	Kady.Kaurin2@ontario.ca	Contacted by Project Team (CIMA+)
Jace Dominey	Environmental Compliance Officer	Sault Ste Marie Area Office	Ministry of the Environment, Conservation and Parks	Suite 110, 70 Foster Dr	Sault Ste Marie	Ontario	P6A 6V4	(705) 257-9419	jace.dominey@ontario.ca	Contacted by Project Team (CIMA+)
Kristy Mitchell	Water Compliance Officer	Sault Ste Marie Area Office	Ministry of the Environment, Conservation and Parks	Suite 110, 70 Foster Dr	Sault Ste Marie	Ontario	P6A 6V4	(705) 297-1043	kristy.mitchell@ontario.ca	Contacted by Project Team (CIMA+)
Jamie Filman	Senior Water Engineer	Municipal Water & Wastewater Permissions	Ministry of the Environment, Conservation and Parks	135 St Clair Ave W	Toronto	Ontario	M4V 1P5	(437) 248-4362	jamie.filman@ontario.ca	Contacted by Project Team (CIMA+)
Marnie Managhan	Supervisor	Sudbury Area Office	Ministry of the Environment, Conservation and Parks	4th Floor, 933 Ramsay Lake Rd	Sudbury	Ontario	P3E 6B5	(705) 929-7193	marnie.managhan@ontario.ca	Contacted by Project Team (CIMA+)
Parise Drolet	Water Compliance Officer	Sudbury Area Office	Ministry of the Environment, Conservation and Parks	4th Floor, 933 Ramsay Lake Rd	Sudbury	Ontario	P3E 6B5	(705) 618-1262	parise.drolet@ontario.ca	Contacted by Project Team (CIMA+)
Cheryl Widdifield	Integrated Resource Management Technical Specialist	Sault Ste Marie Office	Ministry of Natural Resources and Forestry	64 Church St	Sault Ste Marie	Ontario	P6A 3H3	(249) 622-2365	cheryl.widdifield@ontario.ca	Contacted by Project Team (TULLOCH) for natural heritage background review and under ice drilling permit
Dylan McKenzie	Fisheries Protection Biologist	Ecosystems Management	Fisheries and Oceans Canada	501 University Cr	Winnipeg	Manitoba	R3T 2N6	(431) 371-1870	Dylan.McKenzie@dfo-mpo.gc.ca	Contacted by Project Team (TULLOCH) for guidance regarding in-water works
Sheeva Makhaie	Fisheries Protection Biologist	Ecosystems Management	Fisheries and Oceans Canada	867 Lakeshore Rd	Burlington	Ontario	L7R 4A6		DFO.OPHabitat.MPO@dfo-mpo.gc.ca	Contacted by Project Team (TULLOCH) for under ice drilling permit
Kathryn Scott	CAO/Clerk		Town of Blind River	11 Hudson St	Blind River	Ontario	P0R 1B0	(705) 356-2251 ext. 213		Contacted by Project Team (TULLOCH) for Building Permit
Utilities										
Stephen Salt	Supervising Distribution Engineering Technician	Hydro One – Manitoulin/Algoma OPS	Hydro One						stephen.salt@hydroone.com	Contacted by Project Team (CIMA+)
Carlo Patitucci	Metering Technician	Algoma / Manitoulin	Hydro One					(705) 849-3756	carlo.patitucci@hydroone.com	Contacted by Project Team (CIMA+)

B

Appendix B: Project Notices

Class Environmental Assessment Study

NOTICE OF STUDY COMMENCEMENT AND PUBLIC INFORMATION CENTRE

BLIND RIVER WATER TREATMENT PLANT NEW RAW WATER INTAKE AND LOW LIFT PUMPING STATION

Background

Blind River Water Treatment Plant (WTP) provides drinking water to the Town of Blind River serving a population of 2,500 people. The WTP source water consists of five (5) groundwater under direct influence of surface water (GUDI) wells. A well field capacity evaluation completed in 2006 indicated declining water yields and progressively worsening water quality. Also, the raw water supply is inadequate to support the current population water demands.

Class EA Study Process

A Class Environmental Assessment (Class EA) study is being initiated to plan for the implementation of a new raw water intake and low lift pumping station to supply raw water to the Blind River WTP with improved raw water quality and sufficient capacity to meet the long-term water needs of the serviced area.

The Class EA study is being conducted according to the requirements of a Schedule 'C' projects of the Municipal Class Environmental Assessment document (amended in 2023). The purpose of the study is to identify the preferred raw water supply solution that addresses raw water quality concerns with the existing GUDI wells and ensures a safe and reliable source of water to the Blind River WTP, while minimizing impacts on the natural and socio-cultural environments, and has regards to technical and financial implications.

Public Information Centre (PIC)

Public consultation is critical to the success of the study. We welcome your comments, and we will provide opportunities for your input throughout the study. The upcoming PIC session is scheduled for:

Date: Tuesday, December 05th, 2023
Time: 4:00 pm to 8:00 pm
Location: Blind River Town Hall, 11 Hudson St. Blind River

The purpose of the PIC is to introduce the project, the preliminary results of activities completed to-date, to solicit feedback on the information presented, and to respond to questions. Staff members from the Town of Blind River and the consulting teams, TULLOCH and CIMA+, will be available to provide details on the project and discuss your comments. Further details on the upcoming PIC will be provided on the project webpage at:

https://www.blindriver.ca/Modules/News/en

Please contact either of the project team members below if you have questions or comments, wish to obtain more information on the project, or would like to be included on the Project Contact List.

Katie Scott
Town of Blind River
katie.scott@blindriver.ca

Chris Kirby
TULLOCH
chris.kirby@tulloch.ca

Thomas Rapley
CIMA+
thomas.rapley@cima.ca

If you require any accommodations for a disability to attend and participate in meetings or events, please let us know in advance so that arrangements can be made in a timely manner. Please contact the Accessibility Advisory Coordinator at phone # or email if available

This notice was first issued on November 23, 2023.

Class Environmental Assessment Study

NOTICE OF PUBLIC INFORMATION CENTRE # 2

BLIND RIVER WATER TREATMENT PLANT NEW RAW WATER INTAKE AND LOW LIFT PUMPING STATION

Background

The Blind River Water Treatment Plant (WTP) provides drinking water to the Town of Blind River serving a population of 2,500 people. The WTP source water consists of five (5) groundwater wells under direct influence of surface water (GUDI). A well field capacity evaluation completed in 2006 indicated declining groundwater yields and progressively worsening water quality. Further, the current raw water supply is inadequate to support water demands.

Class EA Study Process

A Class Environmental Assessment (Class EA) study is being conducted according to the requirements of Schedule 'C' projects under the Municipal Class Environmental Assessment document (MCEA, amended in 2023). The purpose of the study is to identify the preferred raw water supply solution that addresses raw water quality concerns with the existing GUDI wells and ensures a safe and reliable source of water to the Blind River WTP, while minimizing impacts to the natural and socio-cultural environments, and has regards to technical and financial implications.

The preferred solution to meet the long-term water needs of the Town, consists of a new lake-based water source (Lake Huron), as presented during the first PIC held December 5, 2023. The preferred implementation alternative includes a raw water intake and Low Lift Pump Station (LLPS; to supply source water to the WTP) at the locations illustrated on this figure. This alternative presents the most benefits from a water quality, technical and economic perspective while carrying minimum impacts to the natural and socio-cultural surroundings.

Public Information Centre (PIC)

The project is currently in the design phase. A second PIC is being held to inform the public of activities completed to date and planned construction works in Lake Huron and at the LLPS site.

Public consultation is critical to the success of the study. We welcome your comments, and we will provide opportunities for your input throughout the study. The upcoming PIC session is scheduled for:

Date: Thursday, October 17th, 2024
Time: 1:00 pm to 3:00 pm (Session 1), 4:00 pm to 6:00 pm (Session 2)
Location: Blind River Town Hall, 11 Hudson St. Blind River

The purpose of the PIC is to provide the project background and results to date, to solicit feedback, and to respond to questions. Staff members from the Town of Blind River and the consulting teams, TULLOCH and CIMA+, will be available to provide details on the project and discuss your comments. Further details on the upcoming PIC will be provided on the project webpage at:

https://www.blindriver.ca/Modules/News/en

Please contact either of the project team members below if you have questions or comments, wish to obtain more information about the project, or would like to be included on the Project Contact List.

Katie Scott	**Chris Kirby**	**Kathleen Farrow**
Town of Blind River	**TULLOCH**	**CIMA+**
katie.scott@blindriver.ca	**chris.kirby@tulloch.ca**	**kathleen.farrow@cima.ca**

If you require any accommodations for a disability to attend and participate in meetings or events, please let us know in advance so that arrangements can be made in a timely manner. Please contact the Clerk's Department at 705-356-2251 ext. 210 or email pam.walsh@blindriver.ca.

This notice was first issued on October 03, 2024.

Blind River

Class Environmental Assessment Study

NOTICE OF STUDY COMPLETION

BLIND RIVER WATER TREATMENT PLANT

NEW RAW WATER INTAKE AND LOW LIFT PUMPING STATION

Background

The Blind River Water Treatment Plant (WTP) provides drinking water to the Town of Blind River serving a population of approximately 2,500 people. The WTP source water consists of five (5) Groundwater wells Under Direct Influence of surface water (GUDI). A well field capacity evaluation completed in 2006 indicated declining water yields and progressively declining water quality. Additionally, the raw water supply is inadequate to support the current population water demands.

Class EA Study Process

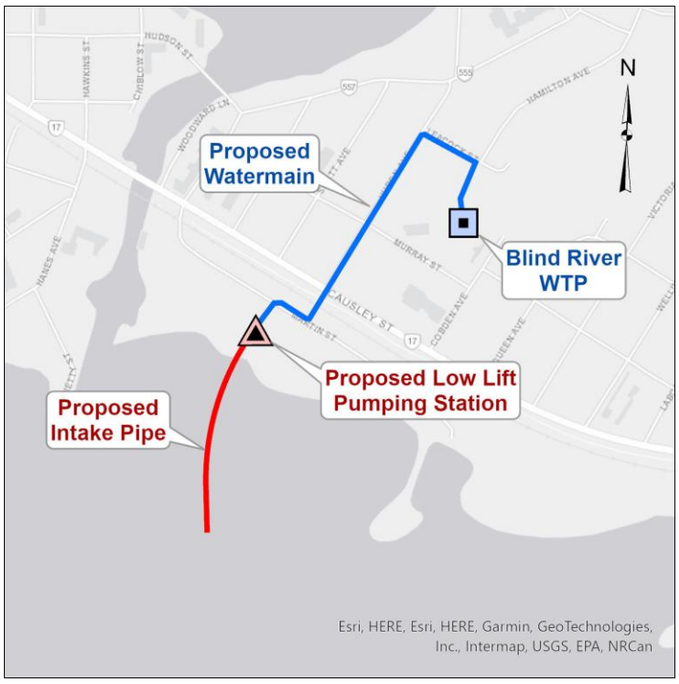
The Town of Blind River has completed a Municipal Class Environmental Assessment (Class EA) to identify a new source of raw water to supply the Town and establish a preferred design concept to convey raw water from this new source to the Blind River WTP. A new source of raw water is required to address the declining water quality and yields associated with the Town's existing GUDI wells.

This Class EA study has been conducted in accordance with the requirements of a Schedule 'C' project under the *Municipal Class Environmental Assessment* (amended in 2024), and it included a comprehensive assessment of alternative raw water supply solutions which could ensure a reliable and high-quality source of water to the Blind River WTP.

The Class EA study has identified the preferred recommended solution, which includes the following works:

- Construction of a lake-based raw water intake, extending approximately 350m into Lake Huron
- Construction of a low lift pumping station on the shore of Lake Huron
- Construction of a watermain along Huron Avenue and Berthelot Street to connect the low lift pumping station to the WTP

A map of the approximate locations for the works is shown to the right. The preferred solution was selected to minimize impacts on the natural environment and the community, balanced with technical and economic considerations.



Approximate locations of proposed works

Your Opinion Matters

An Environmental Study Report (ESR) has been prepared to document the planning and decision-making process, as well as consultation efforts, followed in the Class EA Study. By this notice, the ESR is being placed on the public record for a 30-calendar day comment period from START DATE to END DATE. The ESR will be available for public review on the Town's website at LINK.

Interested persons may provide written comments to our project team on or before END DATE. All comments and concerns should be sent directly to the Town Project Manager by mail or e-mail.

Blind River

Environmental Assessment Study

The Town of Blind River supports the full inclusion of all persons with disabilities in accordance with the *Ontario Human Rights Code* and the *Accessibility for Ontarians with Disabilities Act, 2005*. If you require any accommodations to provide comments or feedback for this study, please contact the Project Manager. All requests must be received within the comment period.

Katie Scott
Project Manager
Town of Blind River
11 Hudson Street,
Blind River, ON P0R 1B0
katie.scott@blindriver.ca

In addition, a request may be made to the MECP for an Order requiring a higher level of study (i.e., requiring an individual/comprehensive EA approval before being able to proceed), or that conditions be imposed (e.g., require further studies), only on the grounds that the requested order may prevent, mitigate, or remedy adverse impacts on constitutionally protected Indigenous and treaty rights. Requests on other grounds will not be considered. Requests should include the requester contact information and full name for the Ministry.

Requests should specify what kind of order is being requested (request for additional conditions or a request for an individual/comprehensive environmental assessment), how an order may prevent, mitigate, or remedy those potential adverse impacts, and any information in support of the statements in the request. This will ensure that the Ministry is able to efficiently begin reviewing the request.

The Section 16 Order request should be sent to the Minister of Environment, Conservation and Parks **and** the Director of Environmental Assessment Branch. You can submit your request by mail, email or hand delivered to:

Minister of the Environment, Conservation and Parks
Ministry of Environment, Conservation and Parks
777 Bay Street, 5th Floor
Toronto ON M7A 2J3
minister.mecp@ontario.ca

and,

Director, Environmental Assessment Branch
Ministry of Environment, Conservation and Parks
135 St. Clair Ave. W, 1st Floor
Toronto ON, M4V 1P5
EABDirector@ontario.ca

Requests should also be copied to the Town of Blind River's Project Manager, Katie Scott, by mail or by e-mail. Please visit the ministry's website for more information on requests for orders under Section 16 of the *Environmental Assessment Act* at: https://www.ontario.ca/page/class-environmental-assessments-part-ii-order.

This notice was first issued on START DATE.

C

Appendix C: Indigenous Consultation

Blind River

OFFICE OF THE CAO/CLERK
Bureau du DPA (dirigeant principal de l'Administration) / commis

January 25, 2023

MNO Lands, Resources and Consultations Branch Ottawa Head Office
Métis Nation of Ontario
Suite 1100-66 Slater Street
Ottawa, Ontario K1P 5H1

Subject: Blind River Alternate Drinking Water Supply Source Project

Dear MNO Lands, Resources and Consultations Branch

I am writing to notify you that the Town of Blind River is under consideration for financial support under Infrastructure Canada's (INFC) Investing in Canada Infrastructure Program (ICIP) for the Blind River Alternate Drinking Water Supply Source Project. I am also writing to provide you with information on the proposed project and to provide you with the opportunity to convey any issues or concerns regarding possible impacts to Aboriginal rights or title or any other concerns that the Métis Nation of Ontario may have with regard to this project.

This project will involve replacing the existing failing GUDI Well Field (5 wells) with a new lake intake source. The existing water treatment plant is designed for lake intake with direct filtration system, however a new intake has never been brought online. The project will include a new intake cribbing and screening, new intake line and associated components, a new low lift station with instrumentation, scada system upgrades and decommissioning of the existing well field.

Prior to proceeding with this project, we would like to know if MNO Lands, Resources and Consultations Branch have any questions or concerns regarding impacts to Aboriginal rights or title or if there any other concerns with regard to the proposed project. Should you require additional information on the proposed project, please contact Kathryn Scott, CAO/Clerk, by telephone at 705 356 2251 ext. 213 or by email at Katie.Scott@blindriver.ca.

Although we would appreciate a response by February 28, 2023 if you view the current timeline as insufficient, we encourage you to notify us in order to

establish a mutually agreed upon timeframe. We are flexible in our consultation approach and recognize the individual capacity of Indigenous communities to engage in consultation. Kathryn Scott, CAO/Clerk, by telephone at 705 356 2251 ext. 213 or by email at Katie.Scott@blindriver.ca. I would like to thank you in advance for your consideration to this request and look forward to hearing back from you.

Sincerely yours

Kathryn Scott

Kathryn Scott, CAO/Clerk
Town of Blind River

cc: Taslema Khan

Blind River

OFFICE OF THE CAO/CLERK
Bureau du DPA (dirigeant principal de l'Administration) / commis

January 25, 2023

Chief Irene Kells
Zhiibaahaasing First Nation
36 Sagon Road
Zhiibaahaasing, Ontario P0P 1X0

Subject: Blind River Alternate Drinking Water Supply Source Project

Dear Chief Irene Kells

I am writing to notify you that the Town of Blind River is under consideration for financial support under Infrastructure Canada's (INFC) Investing in Canada Infrastructure Program (ICIP) for the Blind River Alternate Drinking Water Supply Source Project. I am also writing to provide you with information on the proposed project and to provide you with the opportunity to convey any issues or concerns regarding possible impacts to Aboriginal rights or title or any other concerns that the Zhiibaahaasing First Nation may have with regard to this project.

This project will involve replacing the existing failing GUDI Well Field (5 wells) with a new lake intake source. The existing water treatment plant is designed for lake intake with direct filtration system, however a new intake has never been brought online. The project will include a new intake cribbing and screening, new intake line and associated components, a new low lift station with instrumentation, scada system upgrades and decommissioning of the existing well field.

Prior to proceeding with this project, we would like to know if Chief Irene Kells have any questions or concerns regarding impacts to Aboriginal rights or title or if there any other concerns with regard to the proposed project. Should you require additional information on the proposed project, please contact Kathryn Scott, CAO/Clerk, by telephone at 705 356 2251 ext. 213 or by email at Katie.Scott@blindriver.ca.

Although we would appreciate a response by February 28, 2023 if you view the current timeline as insufficient, we encourage you to notify us in order to

establish a mutually agreed upon timeframe. We are flexible in our consultation approach and recognize the individual capacity of Indigenous communities to engage in consultation. Kathryn Scott, CAO/Clerk, by telephone at 705 356 2251 ext. 213 or by email at Katie.Scott@blindriver.ca. I would like to thank you in advance for your consideration to this request and look forward to hearing back from you.

Sincerely yours

Kathryn Scott

Kathryn Scott, CAO/Clerk
Town of Blind River

cc: Taslema Khan

Blind River

OFFICE OF THE CAO/CLERK
Bureau du DPA (dirigeant principal de l'Administration) / commis

January 25, 2023

Chief Alana Endanawas
Sheshegwaning First Nation
1079A Sheshegwaning Road
Sheshegwaning, Ontario P0P 1X0

Subject: Blind River Alternate Drinking Water Supply Source Project

Dear Chief Alana Endanawas

I am writing to notify you that the Town of Blind River is under consideration for financial support under Infrastructure Canada's (INFC) Investing in Canada Infrastructure Program (ICIP) for the Blind River Alternate Drinking Water Supply Source Project. I am also writing to provide you with information on the proposed project and to provide you with the opportunity to convey any issues or concerns regarding possible impacts to Aboriginal rights or title or any other concerns that the Sheshegwaning First Nation may have with regard to this project.

This project will involve replacing the existing failing GUDI Well Field (5 wells) with a new lake intake source. The existing water treatment plant is designed for lake intake with direct filtration system, however a new intake has never been brought online. The project will include a new intake cribbing and screening, new intake line and associated components, a new low lift station with instrumentation, scada system upgrades and decommissioning of the existing well field.

Prior to proceeding with this project, we would like to know if Chief Alana Endanawas have any questions or concerns regarding impacts to Aboriginal rights or title or if there any other concerns with regard to the proposed project. Should you require additional information on the proposed project, please contact Kathryn Scott, CAO/Clerk, by telephone at 705 356 2251 ext. 213 or by email at Katie.Scott@blindriver.ca.

Although we would appreciate a response by February 28, 2023 if you view the current timeline as insufficient, we encourage you to notify us in order to

establish a mutually agreed upon timeframe. We are flexible in our consultation approach and recognize the individual capacity of Indigenous communities to engage in consultation. Kathryn Scott, CAO/Clerk, by telephone at 705 356 2251 ext. 213 or by email at Katie.Scott@blindriver.ca. I would like to thank you in advance for your consideration to this request and look forward to hearing back from you.

Sincerely yours

Kathryn Scott

Kathryn Scott, CAO/Clerk
Town of Blind River

cc: Taslema Khan

Blind River

OFFICE OF THE CAO/CLERK
Bureau du DPA (dirigeant principal de l'Administration) / commis

January 25, 2023

Chief Brent Bissaillion
Serpent River First Nation
PO Box 14, 195 Village Road
Cutler, Ontario P0P 1B0

Subject: Blind River Alternate Drinking Water Supply Source Project

Dear Chief Brent Bissaillion

I am writing to notify you that the Town of Blind River is under consideration for financial support under Infrastructure Canada's (INFC) Investing in Canada Infrastructure Program (ICIP) for the Blind River Alternate Drinking Water Supply Source Project. I am also writing to provide you with information on the proposed project and to provide you with the opportunity to convey any issues or concerns regarding possible impacts to Aboriginal rights or title or any other concerns that the Serpent River First Nation may have with regard to this project.

This project will involve replacing the existing failing GUDI Well Field (5 wells) with a new lake intake source. The existing water treatment plant is designed for lake intake with direct filtration system, however a new intake has never been brought online. The project will include a new intake cribbing and screening, new intake line and associated components, a new low lift station with instrumentation, scada system upgrades and decommissioning of the existing well field. 1200

Prior to proceeding with this project, we would like to know if Chief Brent Bissaillion have any questions or concerns regarding impacts to Aboriginal rights or title or if there any other concerns with regard to the proposed project. Should you require additional information on the proposed project, please contact Kathryn Scott, CAO/Clerk, by telephone at 705 356 2251 ext. 213 or by email at Katie.Scott@blindriver.ca.

Although we would appreciate a response by February 28, 2023 if you view the current timeline as insufficient, we encourage you to notify us in order to

establish a mutually agreed upon timeframe. We are flexible in our consultation approach and recognize the individual capacity of Indigenous communities to engage in consultation. Kathryn Scott, CAO/Clerk, by telephone at 705 356 2251 ext. 213 or by email at Katie.Scott@blindriver.ca. I would like to thank you in advance for your consideration to this request and look forward to hearing back from you.

Sincerely yours

Kathryn Scott

Kathryn Scott, CAO/Clerk
Town of Blind River

cc: Taslema Khan

Blind River

OFFICE OF THE CAO/CLERK
Bureau du DPA (dirigeant principal de l'Administration) / commis

January 25, 2023

Chief Robert Chiblow
Mississauga First Nation
PO Box 1299
Blind River, Ontario P0R 1B0

Subject: Blind River Alternate Drinking Water Supply Source Project

Dear Chief Robert Chiblow

I am writing to notify you that the Town of Blind River is under consideration for financial support under Infrastructure Canada's (INFC) Investing in Canada Infrastructure Program (ICIP) for the Blind River Alternate Drinking Water Supply Source Project. I am also writing to provide you with information on the proposed project and to provide you with the opportunity to convey any issues or concerns regarding possible impacts to Aboriginal rights or title or any other concerns that the Mississauga First Nation may have with regard to this project.

This project will involve replacing the existing failing GUDI Well Field (5 wells) with a new lake intake source. The existing water treatment plant is designed for lake intake with direct filtration system, however a new intake has never been brought online. The project will include a new intake cribbing and screening, new intake line and associated components, a new low lift station with instrumentation, scada system upgrades and decommissioning of the existing well field.

Prior to proceeding with this project, we would like to know if Chief Robert Chiblow have any questions or concerns regarding impacts to Aboriginal rights or title or if there any other concerns with regard to the proposed project. Should you require additional information on the proposed project, please contact Kathryn Scott, CAO/Clerk, by telephone at 705 356 2251 ext. 213 or by email at Katie.Scott@blindriver.ca.

Although we would appreciate a response by February 28, 2023 if you view the current timeline as insufficient, we encourage you to notify us in order to

establish a mutually agreed upon timeframe. We are flexible in our consultation approach and recognize the individual capacity of Indigenous communities to engage in consultation. Kathryn Scott, CAO/Clerk, by telephone at 705 356 2251 ext. 213 or by email at Katie.Scott@blindriver.ca. I would like to thank you in advance for your consideration to this request and look forward to hearing back from you.

Sincerely yours

Kathryn Scott

Kathryn Scott, CAO/Clerk
Town of Blind River

cc: Taslema Khan

Annex 1: Contact Information for Indigenous Groups (ICIP 62986)

Mississauga First Nation

Chief Robert Alan Chiblow
PO Box 1299
Blind River, Ontario P0R 1B0
(705) 356-1621

stacyb@mississaugi.com ✓

Official Website: Mississauga First Nation - Home (mississaugi.com)

Serpent River First Nation

Chief Brent Bissaillion
PO Box 14, 195 Village Road
Cutler, Ontario P0P 1B0
(705) 844-2418

rpelletier@srfnedc.com ✓ (for their economic development department)

Official Website: Home - Serpent River First Nation (serpentriverfn.com)

Sheshegwaning First Nation

Chief Alana Elise Endanawas
1079A Sheshegwaning Road
Sheshegwaning, Ontario P0P 1X0
(705) 283-3292

kchi-naaknigewin@sheshegwaning.org ✓

Official Website: N/A

Zhiibaahaasing First Nation

Chief Irene Joanne Kells
36 Sagon Road
Zhiibaahaasing, Ontario P0P 1X0
(705) 283-3963

zhiiband@manitoulin.net ✓

ARCHAEOLOGY | HERITAGE | OUTREACH | CONSERVATION

Stage 1 Archaeological Assessment
Blind River Raw Water Intake and Low Lift Pumping Station
Class Environmental Assessment
Town of Blind River
Lot 5 and 6, Range B and Mining Location A
Geographic Township of Cobden
Lot 13, Concession 1
Geographic Township of Striker
District of Algoma, Ontario

Prepared for
Town of Blind River
c/o
Nisha Jha, EIT, M.Sc.
CIMA+
500-5935 Airport Road
Mississauga, ON L4V 1W5
Tel: (905) 695-1005 ext. 5766
Email: Nisha.Jha@cima.ca

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C. Ramsoomair
MCM Licence #P1106
PIF #P1106-0038-2024
ARA File #2023-0571

14/06/2024

Record of Indigenous Engagement

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1.0 RECORD OF INDIGENOUS ENGAGEMENT

1.1 Summary of Events

The identification of Indigenous engagement contacts was based on knowledge about treaty areas and traditional territories. Subsequent to approval from the proponent, the following groups were contacted to determine whether they had an interest in participating in the project:

- Atikameksheng Anishnawbek;
- Aundeck Omni Kaning;
- Garden River First Nation;
- M'Chigeeng First Nation;
- Métis Nation of Ontario;
- Mississaugi First Nation;
- Sagamok First Nation;
- Serpent River First Nation;
- Sheguiandah First Nation;
- Sheshegwaning First Nation;
- Thessalon First Nation;
- Whitefish River First Nation;
- Wiikwemkoong Unceeded Territory; and
- Zhiibaahaasing First Nation.

Archaeological Research Associates Ltd. (ARA) engaged with each of these groups over the course of the investigation. In keeping with the requirements set out in Section 7.6.2 of the 2011 *Standards and Guidelines for Consultant Archaeologists*, a description of ARA's involvement in the process is summarized below. The 2011 *Engaging Aboriginal Communities in Archaeology* draft technical bulletin was also consulted for guidance.

ARA's involvement in the engagement process consisted of the circulation of an invitation to participate and the distribution of the draft report for review and comment. A summary of engagement events appears in RoIE Table 1. It is ARA's understanding that each representative concurred with the strategies, methods and results of the investigation. Emails documenting critical information arising from the engagement process that affected fieldwork decisions, documentation, recommendations and/or the licensee's ability to comply with the conditions of their licence are reproduced in RoIE Appendix A–RoIE Appendix E.

RoIE Table 1: Summary of Engagement Events

Group	Date	Engagement Event	Nature
Atikameksheng Anishnawbek *Contact: Reception*	26-Jan-24	Project introduction and invitation to participate circulated.	Email
	12-Feb-24	Follow up inquiry made regarding project notification.	Email
	15-Feb-24	Follow up inquiry made regarding project notification. No answer; voicemail left.	Phone
	12-Mar-24	Circulation of the draft report for review and comment.	Email
	01-Apr-24	Follow up inquiry made regarding status of report review.	Email
	10-Apr-24	Follow up inquiry made regarding status of report review. Message left with reception.	Phone
	-	No comments received.	-
Aundeck Omni Kaning *Contacts: L. Esquimaux, Reception*	18-May-22	Project introduction and invitation to participate circulated.	Email
	26-Jan-24	Project introduction and invitation to participate circulated.	Email
	12-Feb-24	Follow up inquiry made regarding project notification.	Email
	15-Feb-24	Follow up inquiry made regarding project notification. Message left with reception.	Phone
	12-Mar-24	Circulation of the draft report for review and comment.	Email
	01-Apr-24	Follow up inquiry made regarding status of report review.	Email
	10-Apr-24	Follow up inquiry made regarding status of report review. Directed to resubmit the report to the attention of L. Esquimaux.	Phone
	-	No comments received.	-
Garden River First Nation *Contacts: C. Nolan, R. Perrault*	26-Jan-24	Project introduction and invitation to participate circulated.	Email
	12-Feb-24	Follow up inquiry made regarding project notification.	Email
	15-Feb-24	Follow up inquiry made regarding project notification. Directed to C. Nolan.	Phone
	15-Feb-24	Project introduction and invitation resent to C. Nolan. C. Nolan confirmed interest in the project.	Email
	12-Mar-24	Circulation of the draft report for review and comment.	Email
	01-Apr-24	Follow up inquiry made regarding status of report review.	Email
	05-Apr-24	C. Nolan replied that GRFN had reviewed the report and had no questions or comments.	Email
M'Chigeeng First Nation *Contact: J. Secord*	26-Jan-24	Project introduction and invitation to participate circulated. J. Secord confirmed interest in the project.	Email
	12-Mar-24	Circulation of the draft report for review and comment.	Email
	01-Apr-24	Follow up inquiry made regarding status of report review.	Email
	03-Apr-24	J. Secord replied, asking when the Stage 2 archaeological assessment would begin. M. DeVries replied that ARA has not been contracted to complete the Stage 2 assessment, but that ARA would notify the proponent of M'Chigeeng's interest.	Email
Métis Nation of Ontario *Contact: General Consultation*	26-Jan-24	Project introduction and invitation to participate circulated.	Email
	12-Feb-24	Follow up inquiry made regarding project notification.	Email
	-	Métis Nation of Ontario has requested no follow up phone calls.	-
	12-Mar-24	Circulation of the draft report for review and comment.	Email
	01-Apr-24	Follow up inquiry made regarding status of report review.	Email
	04-Apr-24	E. Roy replied that the Regional Consultation Committee had no comments or questions about the report.	Email

Group	Date	Engagement Event	Nature
Mississauga First Nation *Contacts:* *S. Bissiallon,* *J. Cousineau*	26-Jan-24	Project introduction and invitation to participate circulated.	Email
	12-Feb-24	Follow up inquiry made regarding project notification.	Email
	15-Feb-24	Follow up inquiry made regarding project notification. No answer; voicemail left.	Phone
	16-Feb-24	J. Cousineau confirmed interest in the project and requested additional information about the project.	Email
	23-Feb-24	C. Ramsoomair provided J. Cousineau with more information about the project as requested.	Email
	12-Mar-24	Circulation of the draft report for review and comment.	Email
	25-Mar-24	J. Cousineau replied that Mississauga First Nation had reviewed the report and had some questions and comments, which were added to the draft report copy. J. Cousineau asked for more information to be added about the history of archaeological research in Northern Ontario and provided information on two community-known potential archaeological sites within 1 km of the study area.	Email
	18-Apr-24	C. Ramsoomair replied that the additional information had been added to the report as requested and asked if J. Cousineau had information about some of the sites which had been cited. J. Cousineau provided the information available to him.	Email
	7-May-24	C. Ramsoomair replied that the additional information had been added to the report. J. Cousineau shared knowledge about some unregistered archaeological sites and known to the Nation.	Email
	11-Jun-24	C. Ramsoomair confirmed that the additional information had been added to the report. J. Cousineau thanked C. Ramsoomair and said that he had no further questions or comments.	Email
Sagamok First Nation *Contact:* *A. Toulouse*	26-Jan-24	Project introduction and invitation to participate circulated.	Website Submission Form
	-	Unable to follow up via email.	-
	15-Feb-24	Follow up inquiry made regarding project notification. Directed to A. Toulouse.	Phone
	15-Feb-24	Project introduction and invitation resent to A. Toulouse.	Email
	12-Mar-24	Circulation of the draft report for review and comment.	Email
	01-Apr-24	Follow up inquiry made regarding status of report review.	Email
	10-Apr-24	Follow up inquiry made regarding status of report review. A. Toulouse replied that he had reviewed the report and had no questions or comments.	Phone
Serpent River First Nation *Contact:* *M. Brousseau*	26-Jan-24	Project introduction and invitation to participate circulated.	Email
	12-Feb-24	Follow up inquiry made regarding project notification. M. Brousseau confirmed receipt of the project notification.	Email
	12-Mar-24	Circulation of the draft report for review and comment.	Email
	01-Apr-24	Follow up inquiry made regarding status of report review.	Email
	10-Apr-24	Follow up inquiry made regarding status of report review. M. Brousseau confirmed receipt of the report, but stated that she was not aware of any questions or comments at this time.	Phone
	-	No comments received.	-
Sheguiandah First Nation *Contact:* *Chief J. Aguonie,* *Reception*	26-Jan-24	Project introduction and invitation to participate circulated.	Email
	12-Feb-24	Follow up inquiry made regarding project notification.	Email
	15-Feb-24	Follow up inquiry made regarding project notification. Chief J. Aguonie confirmed receipt of the project notification and said he had no questions or comments at this time.	Phone
	12-Mar-24	Circulation of the draft report for review and comment.	Email
	01-Apr-24	Follow up inquiry made regarding status of report review.	Email
	10-Apr-24	Follow up inquiry made regarding status of report review. No option to leave voicemail.	Phone
	-	No comments received.	-

Group	Date	Engagement Event	Nature
Sheshegwaning First Nation *Contacts: Kchi-Naaknigewin, Reception*	26-Jan-24	Project introduction and invitation to participate circulated.	Email
	12-Feb-24	Follow up inquiry made regarding project notification.	Email
	15-Feb-24	Follow up inquiry made regarding project notification. No answer; voicemail left.	Phone
	12-Mar-24	Circulation of the draft report for review and comment.	Email
	01-Apr-24	Follow up inquiry made regarding status of report review.	Email
	10-Apr-24	Follow up inquiry made regarding status of report review. No answer; voicemail left.	Phone
	-	No comments received.	-
Thessalon First Nation *Contacts: D. Bellerose, K. Naponse*	26-Jan-24	Project introduction and invitation to participate circulated.	Email
	12-Feb-24	Follow up inquiry made regarding project notification.	Email
	15-Feb-24	Follow up inquiry made regarding project notification. No answer; voicemail left.	Phone
	12-Mar-24	Circulation of the draft report for review and comment.	Email
	01-Apr-24	Follow up inquiry made regarding status of report review.	Email
	10-Apr-24	Follow up inquiry made regarding status of report review. D. Bellerose said he would try to submit comments as soon as possible.	Email
	-	No comments received.	-
Whitefish River First Nation *Contact: K. Migwanabi*	26-Jan-24	Project introduction and invitation to participate circulated.	Email
	12-Feb-24	Follow up inquiry made regarding project notification.	Email
	15-Feb-24	Follow up inquiry made regarding project notification. No answer; voicemail left.	Phone
	12-Mar-24	Circulation of the draft report for review and comment.	Email
	01-Apr-24	Follow up inquiry made regarding status of report review.	Email
	10-Apr-24	Follow up inquiry made regarding status of report review. No answer; voicemail left.	Phone
	-	No comments received.	-
Wiikwemkoong Unceded Territory *Contact: C. Chum*	26-Jan-24	Project introduction and invitation to participate circulated.	Email
	12-Feb-24	Follow up inquiry made regarding project notification.	Email
	15-Feb-24	Follow up inquiry made regarding project notification. Directed to C. Chum.	Phone
	15-Feb-24	Project introduction and invitation resent to C. Chum.	Email
	12-Mar-24	Circulation of the draft report for review and comment.	Email
	01-Apr-24	Follow up inquiry made regarding status of report review.	Email
	10-Apr-24	Follow up inquiry made regarding status of report review. C. Chum replied that she had reviewed the report and had no questions or comments.	Phone
Zhiibaahaasing First Nation *Contacts: B. Kells-Riberdy, Reception*	26-Jan-24	Project introduction and invitation to participate circulated.	Email
	12-Feb-24	Follow up inquiry made regarding project notification.	Email
	15-Feb-24	Follow up inquiry made regarding project notification. Message left with reception.	Phone
	12-Mar-24	Circulation of the draft report for review and comment.	Email
	01-Apr-24	Follow up inquiry made regarding status of report review.	Email
	10-Apr-24	Follow up inquiry made regarding status of report review. Directed to resubmit the report to the attention of B. Kells-Riberdy.	Phone
	-	No comments received.	-

ROIE APPENDICES

RoIE Appendix A: Garden River First Nation

megan.devries@araheritage.ca

From: craig.ramsoomair@araheritage.ca
Sent: April 5, 2024 12:43 PM
To: 'Cole Nolan'; megan.devries@araheritage.ca
Cc: 'Kait Kenel'; pam.walsh@blindriver.ca; katie.scott@blindriver.ca; nisha.jha@cima.ca; thomas.rapley@cima.ca; chris.kirby@tulloch.ca
Subject: RE: ARA Report Review - Blind River Raw Water Intake Stage 1 - GRFN

Thank you, Cole. We appreciate you taking the time to review the report.

All the best,
Craig Ramsoomair, M.A. (He/him)
Division Manager – Environmental Assessments and Renewables
Archaeological Research Associates Ltd.
Hamilton Office: 205 Cannon St East, Hamilton, ON L8L 2A9
Kitchener Office: 465 Maple Ave- Unit 9, Kitchener, ON N2H 6N5
P 416.997.5180 | E craig.ramsoomair@araheritage.ca |www.araheritage.ca

Privileged to work within the treaty lands and traditional territories of the Indigenous peoples of Turtle Island.

From: Cole Nolan <colenolan@gardenriver.org>
Sent: Friday, April 5, 2024 10:31 AM
To: megan.devries@araheritage.ca
Cc: craig.ramsoomair@araheritage.ca; 'Kait Kenel' <kait.kenel@araheritage.ca>; pam.walsh@blindriver.ca; katie.scott@blindriver.ca; nisha.jha@cima.ca; thomas.rapley@cima.ca; chris.kirby@tulloch.ca
Subject: Re: ARA Report Review - Blind River Raw Water Intake Stage 1 - GRFN

Good morning,

I'd like to apologize for only just getting back to you at the last minute - I was travelling this week for work and unfortunately a few items on my to-do list got lost in the shuffle.

I was able to review the report provided and I am impressed with the quality of research. That being said from a historical/cultural perspective GRFN will defer to Mississauga First Nation as the site sits directly within their home and traditional territory.

Miigwetch for your time and consideration,

Cole Nolan

1

Get Outlook for iOS

From: megan.devries@araheritage.ca <megan.devries@araheritage.ca>
Sent: Monday, April 1, 2024 11:43:57 AM
To: Cole Nolan <colenolan@gardenriver.org>
Cc: craig.ramsoomair@araheritage.ca <craig.ramsoomair@araheritage.ca>; 'Kait Kenel' <kait.kenel@araheritage.ca>; pam.walsh@blindriver.ca <pam.walsh@blindriver.ca>; katie.scott@blindriver.ca <katie.scott@blindriver.ca>; nisha.jha@cima.ca <nisha.jha@cima.ca>; thomas.rapley@cima.ca <thomas.rapley@cima.ca>; chris.kirby@tulloch.ca <chris.kirby@tulloch.ca>
Subject: RE: ARA Report Review - Blind River Raw Water Intake Stage 1 - GRFN

You don't often get email from megan.devries@araheritage.ca. Learn why this is important

CAUTION: This email is from an external source. Do not click links or open attachments unless you recognize the sender and know the content is safe. When in doubt, contact IT department.

Good morning!

I hope you had a lovely long weekend!

I am writing to follow up on this report review request. If possible, we would appreciate receiving your comments by Friday, April 5.

Thank you!
Megan.

Megan DeVries, M.A. (she/her)
Indigenous Engagement Advisor
Archaeological Research Associates Ltd.
Hamilton Office: 205 Cannon St East, Hamilton, ON L8L 2A9
Kitchener Office: 465 Maple Ave – Unit 9, Kitchener, ON N2H 6N5
C 519.573.6546 | E megan.devries@araheritage.ca | www.araheritage.ca

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From: megan.devries@araheritage.ca <megan.devries@araheritage.ca>
Sent: Tuesday, March 12, 2024 9:38 AM
To: 'colenolan@gardenriver.org' <colenolan@gardenriver.org>
Cc: 'craig.ramsoomair@araheritage.ca' <craig.ramsoomair@araheritage.ca>; 'Kait Kenel' <kait.kenel@araheritage.ca>; 'pam.walsh@blindriver.ca' <pam.walsh@blindriver.ca>; 'katie.scott@blindriver.ca' <katie.scott@blindriver.ca>; 'nisha.jha@cima.ca' <nisha.jha@cima.ca>; 'thomas.rapley@cima.ca' <thomas.rapley@cima.ca>; 'chris.kirby@tulloch.ca' <chris.kirby@tulloch.ca>
Subject: ARA Report Review - Blind River Raw Water Intake Stage 1 - GRFN

Good morning,

2

Please find attached for your review the draft archaeological report entitled:

Stage 1 Archaeological Assessment
Blind River Raw Water Intake and Low Lift Pumping Station
Class Environmental Assessment
Town of Blind River
Lot 5 and 6, Range B and Mining Location A
Geographic Township of Cobden
Lot 13, Concession 1
Geographic Township of Striker
District of Algoma, Ontario

ARA Project #2023-0571

We are hoping to receive your comments regarding the draft report by March 29, 2024, prior to our submission to the MCM. Please advise if this timeframe is not achievable for your review.

Kind regards,
Megan.

Megan DeVries, M.A. (she/her)
Indigenous Engagement Advisor
Archaeological Research Associates Ltd.
Hamilton Office: 205 Cannon St East, Hamilton, ON L8L 2A9
Kitchener Office: 465 Maple Ave – Unit 9, Kitchener, ON N2H 6N5
C 519.573.6546 | E megan.devries@araheritage.ca | www.araheritage.ca

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3

RoIE Appendix B: M'Chigeeng First Nation Correspondence

megan.devries@araheritage.ca

From: megan.devries@araheritage.ca
Sent: April 3, 2024 9:42 AM
To: 'Joleen Secord'
Cc: 'craig.ramsoomair@araheritage.ca'; 'Kait Kenel'; 'pam.walsh@blindriver.ca'; 'katie.scott@blindriver.ca'; 'nisha.jha@cima.ca'; 'thomas.rapley@cima.ca'; 'chris.kirby@tulloch.ca'
Subject: RE: ARA Report Review - Blind River Raw Water Intake Stage 1 - M'Chigeeng

Hi Joleen,

ARA has not been contracted for the Stage 2, but we will forward your interest to CIMA and the Town of Blind River for if/when the Stage 2 does move forward. If ARA is contracted in the future for the Stage 2, we will be in touch with details.

Please let me know if you have any other questions!

Sincerely,
Megan.

Megan DeVries, M.A. (she/her)
Indigenous Engagement Advisor
Archaeological Research Associates Ltd.
Hamilton Office: 205 Cannon St East, Hamilton, ON L8L 2A9
Kitchener Office: 465 Maple Ave – Unit 9, Kitchener, ON N2H 6N5
C 519.573.6546 | E megan.devries@araheritage.ca | www.araheritage.ca

ARCHAEOLOGY | HERITAGE | OUTREACH | EDUCATION

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From: Joleen Secord <joleens@mchigeeng.ca>
Sent: Wednesday, April 3, 2024 9:05 AM
To: megan.devries@araheritage.ca
Cc: craig.ramsoomair@araheritage.ca; 'Kait Kenel' <kait.kenel@araheritage.ca>; pam.walsh@blindriver.ca; katie.scott@blindriver.ca; nisha.jha@cima.ca; thomas.rapley@cima.ca; chris.kirby@tulloch.ca
Subject: RE: ARA Report Review - Blind River Raw Water Intake Stage 1 - M'Chigeeng

Good morning,

When is the stage 2 expected to begin and how many will be on-site?
Who am I sending our monitor agreement contract to?

Joleen

1

From: megan.devries@araheritage.ca <megan.devries@araheritage.ca>
Sent: Monday, April 1, 2024 11:44 AM
To: Joleen Secord <joleens@mchigeeng.ca>
Cc: craig.ramsoomair@araheritage.ca; 'Kait Kenel' <kait.kenel@araheritage.ca>; pam.walsh@blindriver.ca; katie.scott@blindriver.ca; nisha.jha@cima.ca; thomas.rapley@cima.ca; chris.kirby@tulloch.ca
Subject: RE: ARA Report Review - Blind River Raw Water Intake Stage 1 - M'Chigeeng

> You don't often get email from megan.devries@araheritage.ca. Learn why this is important

Good morning!

I hope you had a lovely long weekend!

I am writing to follow up on this report review request. If possible, we would appreciate receiving your comments by Friday, April 5.

Thank you!
Megan.

Megan DeVries, M.A. (she/her)
Indigenous Engagement Advisor
Archaeological Research Associates Ltd.
Hamilton Office: 205 Cannon St East, Hamilton, ON L8L 2A9
Kitchener Office: 465 Maple Ave – Unit 9, Kitchener, ON N2H 6N5
C 519.573.6546 | E megan.devries@araheritage.ca | www.araheritage.ca

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From: megan.devries@araheritage.ca <megan.devries@araheritage.ca>
Sent: Tuesday, March 12, 2024 9:38 AM
To: 'Joleen Secord' <joleens@mchigeeng.ca>
Cc: 'craig.ramsoomair@araheritage.ca' <craig.ramsoomair@araheritage.ca>; 'Kait Kenel' <kait.kenel@araheritage.ca>; 'pam.walsh@blindriver.ca' <pam.walsh@blindriver.ca>; 'katie.scott@blindriver.ca' <katie.scott@blindriver.ca>; 'nisha.jha@cima.ca' <nisha.jha@cima.ca>; 'thomas.rapley@cima.ca' <thomas.rapley@cima.ca>; 'chris.kirby@tulloch.ca' <chris.kirby@tulloch.ca>
Subject: ARA Report Review - Blind River Raw Water Intake Stage 1 - M'Chigeeng

Good morning,

Please find attached for your review the draft archaeological report entitled:

Stage 1 Archaeological Assessment
Blind River Raw Water Intake and Low Lift Pumping Station
Class Environmental Assessment

2

Town of Blind River
Lot 5 and 6, Range B and Mining Location A
Geographic Township of Cobden
Lot 13, Concession 1
Geographic Township of Striker
District of Algoma, Ontario

ARA Project #2023-0571

We are hoping to receive your comments regarding the draft report by March 29, 2024, prior to our submission to the MCM. Please advise if this timeframe is not achievable for your review.

Kind regards,
Megan.

Megan DeVries, M.A. (she/her)
Indigenous Engagement Advisor
Archaeological Research Associates Ltd.
Hamilton Office: 205 Cannon St East, Hamilton, ON L8L 2A9
Kitchener Office: 465 Maple Ave – Unit 9, Kitchener, ON N2H 6N5
C 519.573.6546 | E megan.devries@araheritage.ca | www.araheritage.ca

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3

RoIE Appendix C: MNO Correspondence

megan.devries@araheritage.ca

From: Ethan Roy <EthanR@metisnation.org>
Sent: April 3, 2024 12:48 PM
To: megan.devries@araheritage.ca
Subject: RE: ARA Report Review - Blind River Raw Water Intake Stage 1 - MNO

Hi Megan,

I forwarded the report to the Regional Consultation Committee when we received it. Based on our internal procedures, no comments or concerns were raised about the report.

Thank you for keeping us apprised of the ongoing work.

Thanks,

Ethan Roy (he/him)
Consultation Advisor
Lands, Resources, and Consultations (LRC) Branch
Métis Nation of Ontario
Sault Ste. Marie, ON, Canada
Email: ethanr@metisnation.org
Phone: (705) 527 3612
www.metisnation.org

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Please consider the environment before printing this e-mail.

From: megan.devries@araheritage.ca <megan.devries@araheritage.ca>
Sent: April 1, 2024 11:44 AM
To: Consultations <Consultations@metisnation.org>
Cc: craig.ramsoomair@araheritage.ca; 'Kait Kenel' <kait.kenel@araheritage.ca>; pam.walsh@blindriver.ca; katie.scott@blindriver.ca; nisha.jha@cima.ca; thomas.rapley@cima.ca; chris.kirby@tulloch.ca
Subject: RE: ARA Report Review - Blind River Raw Water Intake Stage 1 - MNO

Good morning!

I hope you had a lovely long weekend!

I am writing to follow up on this report review request. If possible, we would appreciate receiving your comments by Friday, April 5.

Thank you!
Megan.

Megan DeVries, M.A. (she/her)
Indigenous Engagement Advisor

1

Archaeological Research Associates Ltd.
Hamilton Office: 205 Cannon St East, Hamilton, ON L8L 2A9
Kitchener Office: 465 Maple Ave – Unit 9, Kitchener, ON N2H 6N5
C 519.573.6546 | E megan.devries@araheritage.ca | www.araheritage.ca

ARCHAEOLOGY | HERITAGE | OUTREACH | EDUCATION

Privileged to work within the treaty lands and traditional territories of the Indigenous peoples of Turtle Island.

From: megan.devries@araheritage.ca <megan.devries@araheritage.ca>
Sent: Tuesday, March 12, 2024 9:37 AM
To: 'consultations@metisnation.org' <consultations@metisnation.org>
Cc: 'craig.ramsoomair@araheritage.ca' <craig.ramsoomair@araheritage.ca>; 'Kait Kenel' <kait.kenel@araheritage.ca>; 'pam.walsh@blindriver.ca' <pam.walsh@blindriver.ca>; 'katie.scott@blindriver.ca' <katie.scott@blindriver.ca>; 'nisha.jha@cima.ca' <nisha.jha@cima.ca>; 'thomas.rapley@cima.ca' <thomas.rapley@cima.ca>; 'chris.kirby@tulloch.ca' <chris.kirby@tulloch.ca>
Subject: ARA Report Review - Blind River Raw Water Intake Stage 1 - MNO

Good morning,

Please find attached for your review the draft archaeological report entitled:

Stage 1 Archaeological Assessment
Blind River Raw Water Intake and Low Lift Pumping Station
Class Environmental Assessment
Town of Blind River
Lot 5 and 6, Range B and Mining Location A
Geographic Township of Cobden
Lot 13, Concession 1
Geographic Township of Striker
District of Algoma, Ontario

ARA Project #2023-0571

We are hoping to receive your comments regarding the draft report by March 29, 2024, prior to our submission to the MCM. Please advise if this timeframe is not achievable for your review.

Kind regards,
Megan.

Megan DeVries, M.A. (she/her)
Indigenous Engagement Advisor
Archaeological Research Associates Ltd.
Hamilton Office: 205 Cannon St East, Hamilton, ON L8L 2A9
Kitchener Office: 465 Maple Ave – Unit 9, Kitchener, ON N2H 6N5
C 519.573.6546 | E megan.devries@araheritage.ca | www.araheritage.ca

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RoIE Appendix D: Mississaugi First Nation Correspondence

megan.devries@araheritage.ca

From: craig.ramsoomair@araheritage.ca
Sent: June 12, 2024 10:47 AM
To: 'Jake Cousineau'; megan.devries@araheritage.ca; 'Stacy Bissiallon'
Cc: 'Kait Kenel'
Subject: RE: ARA Report Review - Blind River Raw Water Intake Stage 1 - Mississauga

Thanks for your help with this, Jake. Hopefully, we will work together soon!

All the best,
Craig Ramsoomair, M. A (He/him)
Division Manager – Environmental Assessments and Renewables
Archaeological Research Associates Ltd.
Hamilton Office: 50 Nebo Road, Unit 1, Hamilton, ON L8W 2E3
Kitchener Office: 465 Maple Ave- Unit 9, Kitchener, ON N2H 6N5
C 416.997.5180 | E craig.ramsoomair@araheritage.ca | www.araheritage.ca

Privileged to work within the treaty lands and traditional territories of the Indigenous peoples of Turtle Island.

From: Jake Cousineau <jake@mississaugi.com>
Sent: Wednesday, June 12, 2024 9:36 AM
To: craig.ramsoomair@araheritage.ca; megan.devries@araheritage.ca; Stacy Bissiallon <stacyb@mississaugi.com>
Cc: 'Kait Kenel' <kait.kenel@araheritage.ca>
Subject: RE: ARA Report Review - Blind River Raw Water Intake Stage 1 - Mississauga

Hi Craig,

Thank you for taking the time to include my notes and comments. It is very much appreciated. I have no further comments.

Hope you have a good field season,

Jake Cousineau
Data Management Technician
Mississauga First Nation
705-356-1621 ext 2207

From: craig.ramsoomair@araheritage.ca <craig.ramsoomair@araheritage.ca>
Sent: Tuesday, June 11, 2024 2:46 PM
To: Jake Cousineau <jake@mississaugi.com>; megan.devries@araheritage.ca; Stacy Bissiallon

1

<stacyb@mississaugi.com>
Cc: 'Kait Kenel' <kait.kenel@araheritage.ca>
Subject: RE: ARA Report Review - Blind River Raw Water Intake Stage 1 - Mississauga

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Hi Jake,

Sorry for the delay, still getting caught up from my vacation. Here are those reports incorporated. I wouldn't necessarily consider this completely out of scope as we have done similar archaeological site surveys for other Northern Ontario reports where nearby archaeological information is sparser. Particularly since we are incorporating such a large area of the Town of Blind River, I'm more than happy to ensure these details are incorporated as it will help provide a signpost to further assessments in the area regarding the extensive work conducted in the Mississaugi Delta. Let me know if there is anything else I can do, otherwise, I'll move forward with the final steps for submission.

Thanks,
Craig Ramsoomair, M. A (He/him)
Division Manager – Environmental Assessments and Renewables
Archaeological Research Associates Ltd.
Hamilton Office: 50 Nebo Road, Unit 1, Hamilton, ON L8W 2E3
Kitchener Office: 465 Maple Ave- Unit 9, Kitchener, ON N2H 6N5
C 416.997.5180 | E craig.ramsoomair@araheritage.ca | www.araheritage.ca

Privileged to work within the treaty lands and traditional territories of the Indigenous peoples of Turtle Island.

From: Jake Cousineau <jake@mississaugi.com>
Sent: Wednesday, May 8, 2024 3:46 PM
To: craig.ramsoomair@araheritage.ca; megan.devries@araheritage.ca; Stacy Bissiallon <stacyb@mississaugi.com>
Cc: 'Kait Kenel' <kait.kenel@araheritage.ca>
Subject: RE: ARA Report Review - Blind River Raw Water Intake Stage 1 - Mississauga

Hi Craig,

Thanks for sharing that reference with me; it does sound a bit similar to the story of Battle Point!

So, sorry for not sharing this at the beginning. I wasn't expecting you to discuss the Mississaugi Delta site, the East Terrace site, and the Ilimitee works I thought it might be out of the scope of this project. I'm attaching two more reports of work that occurred during the construction of the golf course, essentially the sites were identified before the construction of the golf course (Brizinski and Wood), but stage 2 occurred after many of these sites were already disturbed or destroyed through the golf course

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construction(Dalla Bona 1999). Furthermore, none of these sites were registered with the Ministry even the mostly intact ones (I've heard this to be a common story with this company, so something to keep in mind when working around the Sault area). We were talking with the Ministry to get these sites registered but it would seem that they haven't made much progress on their side. Regardless these reports are important for demonstrating the cultural landscape that was in the delta area prior to the golf course and Cameco. Also, significant as it is the only written source acknowledging the burial/ceremonial mounds on the property (MFN has traditional knowledge that the area was used as burial site as well, but the Dalla Bona report is the only mentioned of the feature in the archaeological literature).

Thanks,

Jake Cousineau
Data Management Technician
Mississauga First Nation
705-356-1621 ext 2207

From: craig.ramsoomair@araheritage.ca <craig.ramsoomair@araheritage.ca>
Sent: Tuesday, May 7, 2024 1:07 PM
To: Jake Cousineau <jake@mississaugi.com>; megan.devries@araheritage.ca; Stacy Bissiallon <stacyb@mississaugi.com>
Cc: 'Kait Kenel' <kait.kenel@araheritage.ca>
Subject: RE: ARA Report Review - Blind River Raw Water Intake Stage 1 - Mississauga

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Hi Jake,

Sorry for the delay. With the warmer weather, I've been in and out of the office. I've added additional information on Lake Duborne and its connection to the Mississauga First Nation. Let me know if you would like additional information in the report. Otherwise, I'll begin finalizing it for submission. Please also see the attached reference I mentioned. It is from an older book but is still a useful reference regarding some of the 17th-century conflicts between the Anishinaabe and Haudenosaunee. It references a similar location and the leaving of a single person alive in the battle.

Thanks!
Craig Ramsoomair, M. A (He/him)
Division Manager – Environmental Assessments and Renewables
Archaeological Research Associates Ltd.
Vacation Alert: May 13th to 24th, 2024 (Inclusive)
Hamilton Office: 50 Nebo Road, Unit 1, Hamilton, ON L8W 2E3
Kitchener Office: 465 Maple Ave- Unit 9, Kitchener, ON N2H 6N5
C 416.997,5180 | E craig.ramsoomair@araheritage.ca | www.araheritage.ca

3

Privileged to work within the treaty lands and traditional territories of the Indigenous peoples of Turtle Island.

From: Jake Cousineau <jake@mississaugi.com>
Sent: Thursday, April 25, 2024 9:10 AM
To: craig.ramsoomair@araheritage.ca; megan.devries@araheritage.ca; Stacy Bissiallon <stacyb@mississaugi.com>
Cc: 'Kait Kenel' <kait.kenel@araheritage.ca>
Subject: RE: ARA Report Review - Blind River Raw Water Intake Stage 1 - Mississauga

Hi Craig,

I am unfamiliar with that account, but it would be interesting to know more about it.

I could put you in contact with Ashley from Timber Village Museum to see what information the town might have about Battle Point if you're interested.

Jake

From: craig.ramsoomair@araheritage.ca <craig.ramsoomair@araheritage.ca>
Sent: Wednesday, April 24, 2024 10:10 AM
To: Jake Cousineau <jake@mississaugi.com>; megan.devries@araheritage.ca; Stacy Bissiallon <stacyb@mississaugi.com>
Cc: 'Kait Kenel' <kait.kenel@araheritage.ca>
Subject: RE: ARA Report Review - Blind River Raw Water Intake Stage 1 - Mississauga

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Thanks for all of this additional information about the lands of the Mississauga First Nation. I haven't finalized the report submission quite yet, so I'll make sure to add this additional information! Would Battle Point be the same as the battle reported by Bacqueville de La Potherie, the French Royal Commissioner, as occurring in 1653? It also mentions leaving a single person alive.

Thanks,
Craig Ramsoomair, M. A (He/him)
Division Manager – Environmental Assessments and Renewables
Archaeological Research Associates Ltd.
Vacation Alert: May 13th to 24th, 2024 (Inclusive)
Hamilton Office: 50 Nebo Road, Unit 1, Hamilton, ON L8W 2E3
Kitchener Office: 465 Maple Ave- Unit 9, Kitchener, ON N2H 6N5
C 416.997,5180 | E craig.ramsoomair@araheritage.ca | www.araheritage.ca

4

Privileged to work within the treaty lands and traditional territories of the Indigenous peoples of Turtle Island.

From: Jake Cousineau <jake@mississaugi.com>
Sent: Friday, April 19, 2024 3:25 PM
To: craig.ramsoomair@araheritage.ca; megan.devries@araheritage.ca; Stacy Bissiallon <stacyb@mississaugi.com>
Cc: 'Kait Kenel' <kait.kenel@araheritage.ca>
Subject: RE: ARA Report Review - Blind River Raw Water Intake Stage 1 - Mississauga

Hi Craig,

Thanks for the information.

There's not much I can add to this, but I can provide more details about Lake Duborne, near CbHr-1 and 4. Just across the lake from CbHr-1 is Battle Point Peninsula, which is said to be a battle spot between the Mississaugi and the Haudenosaunee (I've attached two sources that mentioned it, see page 9 of the smoke signal for a Mississaugi version; the sault star give a bit more of the etymology of the name). I've heard about people finding arrowheads around Lake Duborne, especially near Battlepoint, but I have yet to see one. The outlet on the southeastern side of the lake also leads towards the pow-wow grounds, which is a traditional gathering area. I have heard of a petroglyph being somewhere on Lake Duborne, and we are hoping to confirm them this summer.

The town's museum, Timber Village Museum, also has two Indigenous ash baskets that were donated to them. They were found in an abandoned cabin on Battle Point peninsula; they were found approximately 50 years before their donation in the 1990s.

The possibility of two archaic sites near within a short trip of the pow-wow grounds demonstrates the significance of this area to MFN.

Also, on page 1 of the smoke signal issue I sent you, you will see an article on a biface found in town approximately 2 km from your study area.

For the report, if you want to see pictures of the ash baskets, archaic points or the biface, let me know.

Jake

From: craig.ramsoomair@araheritage.ca <craig.ramsoomair@araheritage.ca>
Sent: Friday, April 19, 2024 12:09 PM
To: Jake Cousineau <jake@mississaugi.com>; megan.devries@araheritage.ca; Stacy Bissiallon <stacyb@mississaugi.com>
Cc: 'Kait Kenel' <kait.kenel@araheritage.ca>
Subject: RE: ARA Report Review - Blind River Raw Water Intake Stage 1 - Mississauga

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Hi Jake,

I've attached what I have, partly to ensure their circulation. With Laurentian University closed, I was only able to obtain these digital copies using internet archives. The information I have is derived from the information on the Ontario Archaeological Sites Database (OASD).

CbHr-1 – Current recorded location is NW of Lake Duborne. OASD mentions a photograph from Laurentian University, but as that no longer exists, it left me at a dead end.

CbHr-2 – Said to have been identified prior to impacts by Eldorado Nuclear, but the Eldorado assessment attached has no record of it, and I am not aware of other Eldorado reports unless you have additional resources yourself. Again, the Eldorado assessment was Laurentian University based.

CbHr-4 – Northwest of CbHr-1. Documentation in "Conway, T. 1991. "Heritage Resource Assessment for MTO Project #5-87-00, Cataract River Bridge & Approaches, Cobden Township, Algoma District." I'm currently waiting to hear back from Rob von Bitter from the MCM as to if he is able to track it down. If he is, I can circulate it to you or I can start a deeper dive for the report.

Sorry I couldn't be more helpful, but I have attached PDFs of the OASD information if that helps. It has the GPS data.

Thanks,
Craig Ramsoomair, M. A (He/him)
Division Manager – Environmental Assessments and Renewables
Archaeological Research Associates Ltd.
Vacation Alert: May 13th to 24th, 2024 (Inclusive)
Hamilton Office: 50 Nebo Road, Unit 1, Hamilton, ON L8W 2E3
Kitchener Office: 465 Maple Ave- Unit 9, Kitchener, ON N2H 6N5
C 416.997,5180 | E craig.ramsoomair@araheritage.ca | www.araheritage.ca

Privileged to work within the treaty lands and traditional territories of the Indigenous peoples of Turtle Island.

From: Jake Cousineau <jake@mississaugi.com>
Sent: Thursday, April 18, 2024 4:28 PM
To: craig.ramsoomair@araheritage.ca; megan.devries@araheritage.ca; Stacy Bissiallon <stacyb@mississaugi.com>
Cc: 'Kait Kenel' <kait.kenel@araheritage.ca>; pam.walsh@blindriver.ca; katie.scott@blindriver.ca; nisha.jha@cima.ca; thomas.rapley@cima.ca; chris.kirby@tulloch.ca
Subject: RE: ARA Report Review - Blind River Raw Water Intake Stage 1 - Mississauga

Hi Craig,

Thank you for revising the reports; you have exceeded my expectations, which is much appreciated.

I have no additional comments.

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However, I do have a question:

On page 7, you mentioned the following sites: CbHr-1, CbHr-2, and CbHr-4. Would you be able to share the report/article that they were reported in or at least the documents' names? I don't believe I've seen these sites mentioned anywhere yet. It's interesting to find out that there are identified archaic sites in the area. Just last week, to my surprise, an Elder showed me an archaic-looking point; he said it had been found by someone near the river several years ago.

Thanks,

Jake Cousineau
Data Management Technician
Mississauga First Nation
(705)356-1621 ext. 2207

From: craig.ramsoomair@araheritage.ca <craig.ramsoomair@araheritage.ca>
Sent: Thursday, April 18, 2024 2:42 PM
To: Jake Cousineau <jake@mississaugi.com>; megan.devries@araheritage.ca; Stacy Bissiallon <stacyb@mississaugi.com>
Cc: 'Kait Kenel' <kait.kenel@araheritage.ca>; pam.walsh@blindriver.ca; katie.scott@blindriver.ca; nisha.jha@cima.ca; thomas.rapley@cima.ca; chris.kirby@tulloch.ca
Subject: RE: ARA Report Review - Blind River Raw Water Intake Stage 1 - Mississauga

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Hi Jake,

Thanks for your patience regarding the report edits. Some sources took me longer to locate than anticipated, but I believe I have addressed all of your comments. I will continue to track down additional information for incorporation into reports for any future work in the Blind River area.

Let me know if you have any additional comments.

Thanks,
Craig Ramsoomair, M.A. (He/him)
Division Manager – Environmental Assessments and Renewables
Archaeological Research Associates Ltd.
Vacation Alert: May 13th to 24th, 2024 (Inclusive)
Hamilton Office: 50 Nebo Road, Unit 1, Hamilton, ON L8W 2E3
Kitchener Office: 465 Maple Ave, Unit 9, Kitchener, ON N2H 6N5
P 416.997.5180 | E craig.ramsoomair@araheritage.ca |www.araheritage.ca

7

Privileged to work within the treaty lands and traditional territories of the Indigenous peoples of Turtle Island.

From: Jake Cousineau <jake@mississaugi.com>
Sent: Monday, March 25, 2024 11:41 AM
To: megan.devries@araheritage.ca; Stacy Bissiallon <stacyb@mississaugi.com>
Cc: craig.ramsoomair@araheritage.ca; 'Kait Kenel' <kait.kenel@araheritage.ca>; pam.walsh@blindriver.ca; katie.scott@blindriver.ca; nisha.jha@cima.ca; thomas.rapley@cima.ca; chris.kirby@tulloch.ca
Subject: RE: ARA Report Review - Blind River Raw Water Intake Stage 1 - Mississauga

Hi Megan,

Please find attached to this email my comments for your Stage 1 report. I've left highlights and posted comments in the pdf for your consideration.

If you have any questions please do not hesitate to reach out.

Thank you,

Jake Cousineau, M.E.S.
Data Management Technician
Mississauga First Nation
(705)356-1621 ext. 2207

From: megan.devries@araheritage.ca <megan.devries@araheritage.ca>
Sent: Tuesday, March 12, 2024 9:37 AM
To: Jake Cousineau <jake@mississaugi.com>; Stacy Bissiallon <stacyb@mississaugi.com>
Cc: craig.ramsoomair@araheritage.ca; 'Kait Kenel' <kait.kenel@araheritage.ca>; pam.walsh@blindriver.ca; katie.scott@blindriver.ca; nisha.jha@cima.ca; thomas.rapley@cima.ca; chris.kirby@tulloch.ca
Subject: ARA Report Review - Blind River Raw Water Intake Stage 1 - Mississauga

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Good morning,

Please find attached for your review the draft archaeological report entitled:

Stage 1 Archaeological Assessment

8

Blind River Raw Water Intake and Low Lift Pumping Station
Class Environmental Assessment
Town of Blind River
Lot 5 and 6, Range B and Mining Location A
Geographic Township of Cobden
Lot 13, Concession 1
Geographic Township of Striker
District of Algoma, Ontario

ARA Project #2023-0571

We are hoping to receive your comments regarding the draft report by March 29, 2024, prior to our submission to the MCM. Please advise if this timeframe is not achievable for your review.

Kind regards,
Megan.

Megan DeVries, M.A. (she/her)
Indigenous Engagement Advisor
Archaeological Research Associates Ltd.
Hamilton Office: 205 Cannon St East, Hamilton, ON L8L 2A9
Kitchener Office: 465 Maple Ave – Unit 9, Kitchener, ON N2H 6N5
C 519.573.6546 | E megan.devries@araheritage.ca | www.araheritage.ca

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Privileged to work within the treaty lands and traditional territories of the Indigenous peoples of Turtle Island.

9

RoIE Appendix E: Sagamok Anishinawbek Correspondence

megan.devries@araheritage.ca

From: Allen Toulouse <toulouse_allen@sagamok.ca>
Sent: April 10, 2024 11:14 AM
To: megan.devries@araheritage.ca
Subject: Re: ARA Report Review - Blind River Raw Water Intake Stage 1 - SA

Aanii Megan!

Upon review of the report and accounting for the small footprint, Sagamok LRE sees no impediment to the progression of this project.
Should the archeological assessment progress to stage 2 our department would like to be incl. in the planning and field work.
Sagamok LRE Thanks you for your follow up.

cheers,
Allen Toulouse
Historical Researcher
Phone:705-865-1134 ext 238
Email: toulouse_allen@sagamok.ca

From: megan.devries@araheritage.ca <megan.devries@araheritage.ca>
Sent: Monday, April 1, 2024 11:43 AM
To: Allen Toulouse <toulouse_allen@sagamok.ca>
Cc: craig.ramsoomair@araheritage.ca <craig.ramsoomair@araheritage.ca>; 'Kait Kenel' <kait.kenel@araheritage.ca>; pam.walsh@blindriver.ca <pam.walsh@blindriver.ca>; katie.scott@blindriver.ca <katie.scott@blindriver.ca>; nisha.jha@cima.ca <nisha.jha@cima.ca>; thomas.rapley@cima.ca <thomas.rapley@cima.ca>; chris.kirby@tulloch.ca <chris.kirby@tulloch.ca>
Subject: RE: ARA Report Review - Blind River Raw Water Intake Stage 1 - SA

Good morning!

I hope you had a lovely long weekend!

I am writing to follow up on this report review request. If possible, we would appreciate receiving your comments by Friday, April 5.

Thank you!
Megan.

Megan DeVries, M.A. (she/her)
Indigenous Engagement Advisor
Archaeological Research Associates Ltd.
Hamilton Office: 205 Cannon St East, Hamilton, ON L8L 2A9
Kitchener Office: 465 Maple Ave – Unit 9, Kitchener, ON N2H 6N5
C 519.573.6546 | E megan.devries@araheritage.ca | www.araheritage.ca

1

ARCHAEOLOGY | HERITAGE | OUTREACH | EDUCATION

Privileged to work within the treaty lands and traditional territories of the Indigenous peoples of Turtle Island.

From: megan.devries@araheritage.ca <megan.devries@araheritage.ca>
Sent: Tuesday, March 12, 2024 9:37 AM
To: 'Allen Toulouse' <toulouse_allen@sagamok.ca>
Cc: 'craig.ramsoomair@araheritage.ca' <craig.ramsoomair@araheritage.ca>; 'Kait Kenel' <kait.kenel@araheritage.ca>; 'pam.walsh@blindriver.ca' <pam.walsh@blindriver.ca>; 'katie.scott@blindriver.ca' <katie.scott@blindriver.ca>; 'nisha.jha@cima.ca' <nisha.jha@cima.ca>; 'thomas.rapley@cima.ca' <thomas.rapley@cima.ca>; 'chris.kirby@tulloch.ca' <chris.kirby@tulloch.ca>
Subject: ARA Report Review - Blind River Raw Water Intake Stage 1 - SA

Good morning,

Please find attached for your review the draft archaeological report entitled:

Stage 1 Archaeological Assessment
Blind River Raw Water Intake and Low Lift Pumping Station
Class Environmental Assessment
Town of Blind River
Lot 5 and 6, Range B and Mining Location A
Geographic Township of Cobden
Lot 13, Concession 1
Geographic Township of Striker
District of Algoma, Ontario

ARA Project #2023-0571

We are hoping to receive your comments regarding the draft report by March 29, 2024, prior to our submission to the MCM. Please advise if this timeframe is not achievable for your review.

Kind regards,
Megan.

Megan DeVries, M.A. (she/her)
Indigenous Engagement Advisor
Archaeological Research Associates Ltd.
Hamilton Office: 205 Cannon St East, Hamilton, ON L8L 2A9
Kitchener Office: 465 Maple Ave – Unit 9, Kitchener, ON N2H 6N5
C 519.573.6546 | E megan.devries@araheritage.ca | www.araheritage.ca

ARCHAEOLOGY | HERITAGE | OUTREACH | EDUCATION

2

ARCHAEOLOGY | HERITAGE | OUTREACH | CONSERVATION

Stage 2 Archaeological Assessment
Blind River Raw Water Intake and Low Lift Pumping Station
Town of Blind River
Mining Location A
Geographic Township of Cobden
District of Algoma, Ontario

Prepared for
Town of Blind River
c/o
CIMA+
500-5935 Airport Road
Mississauga, ON L4V 1W5

Licensed under
P. Racher
MCM Licence #P007
PIF # P007-1631-2025
ARA File #2024-0141

23/07/2025

Record of Indigenous Engagement

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1.0 RECORD OF INDIGENOUS ENGAGEMENT

1.1 Summary of Events

The identification of Indigenous engagement contacts was based on knowledge about treaty areas and traditional territories. Subsequent to approval from the proponent, the following groups were contacted to determine whether they had an interest in participating in the project:

- Atikameksheng Anishnawbek (AA);
- Garden River First Nation (GRFN);
- M'Chigeeng First Nation (MFN);
- Metis Nation of Ontario (MNO);
- Mississaugi First Nation (MFN);
- Sagamok First Nation (SA);
- Serpent River First Nation (SRFN);
- Sheguindah First Nation (SFN);
- Sheshegwaning First Nation (SFN);
- Sucker Creek First Nation (AOK);
- Thessalon First Nation (TFN);
- Whitefish River First Nation (WRFN);
- Wiikwemikong Unceded Territory (WUT); and
- Zhiibaahaasing First Nation (ZFN).

Archaeological Research Associates Ltd. (ARA) engaged with each of these groups over the course of the investigation. In keeping with the requirements set out in Section 7.6.2 of the 2011 *Standards and Guidelines for Consultant Archaeologists*, a description of ARA's involvement in the process is summarized below. The 2011 *Engaging Aboriginal Communities in Archaeology* draft technical bulletin was also consulted for guidance.

ARA's involvement in the engagement process consisted of the circulation of an invitation to participate, conversations with the coordinators regarding the scheduling of fieldwork, on-site discussions with the field representatives and the distribution of the draft report for review and comment. A summary of engagement events appears in RoIE Table 1, and a breakdown of representative participation is presented in RoIE Table 2. It is ARA's understanding that the representative concurred with the strategies, methods and results of the investigation. Emails documenting critical information arising from the engagement process that affected fieldwork decisions, documentation, recommendations and/or the licensee's ability to comply with the conditions of their licence are reproduced in RoIE Appendix A.

RoIE Table 1: Summary of Engagement Events

Group	Date	Engagement Event	Nature
AA *Contacts: Reception*	01-Oct-24	Project introduction and invitation to participate circulated.	Email
	04-Oct-24	Follow up inquiry made regarding project notification.	Email
	08-Oct-24	Follow up inquiry made regarding project notification. Directed to Ross Assiniwe. No answer; no option to leave voicemail.	Phone
	09-Oct-24	Deployment details circulated for the following week.	Email

Group	Date	Engagement Event	Nature
	10-Oct-24	New fieldwork date circulated.	Email
	22-Apr-25	Circulation of the draft report for review and comment.	Email
	08-May-25	Follow up query regarding status of report review made.	Email
	16-May-25	Follow up query regarding status of report review made. No answer; no option to leave voicemail.	Phone
	-	Comments/No comments received.	-
GRFN *Contacts:* *C. Nolan*	01-Oct-24	Project introduction and invitation to participate circulated.	Email
	04-Oct-24	Follow up inquiry made regarding project notification. C. Nolan confirmed GRFN's interest in the project.	Email
	09-Oct-24	Deployment details circulated for the following week.	Email
	10-Oct-24	New fieldwork date circulated.	Email
	22-Apr-25	Circulation of the draft report for review and comment.	Email
	08-May-25	Follow up query regarding status of report review made.	Email
	16-May-25	Follow up query regarding status of report review made. No answer; voicemail left.	Phone
	-	Comments/No comments received.	-

Group	Date	Engagement Event	Nature
MFN *Contacts: J. Secord*	01-Oct-24	Project introduction and invitation to participate circulated. J. Secord confirmed M'Chigeegn's interest in the project.	Email
	09-Oct-24	Deployment details circulated for the following week.	Email
	10-Oct-24	New fieldwork date circulated.	Email
	22-Apr-25	Circulation of the draft report for review and comment.	Email
	08-May-25	Follow up query regarding status of report review made.	Email
	16-May-25	Follow up query regarding status of report review made. No answer; no option to leave voicemail.	Phone
	-	Comments/No comments received.	-
MNO *Contacts: General Consultations*	01-Oct-24	Project introduction and invitation to participate circulated.	Email
	04-Oct-24	Follow up inquiry made regarding project notification.	Email
	-	MNO has requested no follow up phone calls.	
	09-Oct-24	Deployment details circulated for the following week.	Email
	10-Oct-24	New fieldwork date circulated.	Email
	22-Apr-25	Circulation of the draft report for review and comment.	Email
	08-May-25	Follow up query regarding status of report review made.	Email
	-	MNO has requested no follow up phone calls.	-
	-	Comments/No comments received.	-
MFN *Contacts: J. Cousineau*	01-Oct-24	Project introduction and invitation to participate circulated.	Email
	04-Oct-24	Follow up inquiry made regarding project notification. J. Cousineau confirmed MFN's interest in the project.	Email
	09-Oct-24	Deployment details sent for fieldwork the following week. J. Cousineau responded that the proposed fieldwork dates were not suitable for MFN, given the short notice, and asked ARA to reschedule. M. DeVries sent a new fieldwork date proposal for J. Cousineau's consideration; J. Cousineau confirmed fieldwork could proceed on the new fieldwork date.	Email
	10-Oct-24	New fieldwork date circulated.	Email
	22-Apr-25	Circulation of the draft report for review and comment.	Email
	08-May-25	Follow up query regarding status of report review made.	Email
	16-May-25	Follow up query regarding status of report review made. No answer, no option to leave voicemail.	Phone
	19-Jun-25	Follow up query regarding status of report review made.	Email
	19-Jun-25	J. Cousineau confirmed MFN had reviewed the report and had no comments or concerns.	Email
SA *Contacts A. Toulouse:*	01-Oct-24	Project introduction and invitation to participate circulated.	Email
	04-Oct-24	Follow up inquiry made regarding project notification.	Email
	08-Oct-24	Follow up inquiry made regarding project notification. Directed to Ross Assiniwe. No answer; no option to leave voicemail.	Phone
	09-Oct-24	Deployment details circulated for the following week.	Email
	10-Oct-24	New fieldwork date circulated.	Email
	22-Apr-25	Circulation of the draft report for review and comment.	Email
	08-May-25	Follow up query regarding status of report review made.	Email
	16-May-25	Follow up query regarding status of report review made. No answer; no option to leave voicemail.	Phone
	-	Comments/No comments received.	-
SRFN *Contacts: M. Brousseau*	01-Oct-24	Project introduction and invitation to participate circulated.	Email
	04-Oct-24	Follow up inquiry made regarding project notification.	Email
	08-Oct-24	Follow up inquiry made regarding project notification. Directed to Ross Assiniwe. No answer; no option to leave voicemail.	Phone
	09-Oct-24	Deployment details circulated for the following week.	Email
	10-Oct-24	New fieldwork date circulated.	Email
	22-Apr-25	Circulation of the draft report for review and comment.	Email
	08-May-25	Follow up query regarding status of report review made. M. Brousseau cc'd additional contacts for report review.	Email
	16-May-25	Follow up query regarding status of report review made. No answer; no option to leave voicemail.	Phone
	-	Comments/No comments received.	-
	01-Oct-24	Project introduction and invitation to participate circulated.	Email

Group	Date	Engagement Event	Nature
SFN *Contacts: Reception, A. Manitowabi*	04-Oct-24	Follow up inquiry made regarding project notification.	Email
	08-Oct-24	Follow up inquiry made regarding project notification. Directed to Ross Assiniwe. No answer; no option to leave voicemail.	Phone
	09-Oct-24	Deployment details circulated for the following week.	Email
	10-Oct-24	New fieldwork date circulated.	Email
	22-Apr-25	Circulation of the draft report for review and comment.	Email
	08-May-25	Follow up query regarding status of report review made. M. Brousseau cc'd additional contacts for report review.	Email
	16-May-25	Follow up query regarding status of report review made. No answer; voicemail left.	Phone
	-	Comments/No comments received.	-
SFN *Contacts: Reception, B. Endanawas, Kchi-Naaknigewin*	01-Oct-24	Project introduction and invitation to participate circulated.	Email
	04-Oct-24	Follow up inquiry made regarding project notification. B. Endanawas confirmed SFN's interest in the project and asked what participation would entail.	Email
	07-Oct-24	M. DeVries provided additional information about the project and the assessment, as well as information about what FNIC participation generally involves.	Phone
	09-Oct-24	Deployment details circulated for the following week.	Email
	10-Oct-24	New fieldwork date circulated.	Email
	22-Apr-25	Circulation of the draft report for review and comment.	Email
	08-May-25	Follow up query regarding status of report review made.	Email
	16-May-25	Follow up query regarding status of report review made. No answer; voicemail left.	Phone
	-	Comments/No comments received.	-
AOK *Contacts L. Esquimaux:*	01-Oct-24	Project introduction and invitation to participate circulated.	Email
	04-Oct-24	Follow up inquiry made regarding project notification.	Email
	08-Oct-24	Follow up inquiry made regarding project notification. Message left with Reception.	Phone
	09-Oct-24	Deployment details circulated for the following week.	Email
	10-Oct-24	New fieldwork date circulated.	Email
	22-Apr-25	Circulation of the draft report for review and comment.	Email
	08-May-25	Follow up query regarding status of report review made.	Email
	16-May-25	Follow up query regarding status of report review made. No answer; voicemail left.	Phone
	-	Comments/No comments received.	-
TFN *Contacts: D. Bellerose, K. Naponse*	01-Oct-24	Project introduction and invitation to participate circulated.	Email
	04-Oct-24	Follow up inquiry made regarding project notification.	Email
	08-Oct-24	Follow up inquiry made regarding project notification. No answer, no option to leave voicemail	Phone
	09-Oct-24	Deployment details circulated for the following week.	Email
	10-Oct-24	New fieldwork date circulated.	Email
	22-Apr-25	Circulation of the draft report for review and comment.	Email
	08-May-25	Follow up query regarding status of report review made.	Email
	16-May-25	Follow up query regarding status of report review made. No answer, no option to leave voicemail.	Phone
	-	Comments/No comments received.	-
WRFN *Contacts: Reception, K. Migwanabi*	01-Oct-24	Project introduction and invitation to participate circulated.	Email
	04-Oct-24	Follow up inquiry made regarding project notification.	Email
	08-Oct-24	Follow up inquiry made regarding project notification. K. Migwanabi confirmed WRFN's interest in the project.	Phone
	09-Oct-24	Deployment details circulated for the following week.	Email
	10-Oct-24	New fieldwork date circulated.	Email
	22-Apr-25	Circulation of the draft report for review and comment.	Email
	08-May-25	Follow up query regarding status of report review made.	Email
	16-May-25	Follow up query regarding status of report review made. No answer, voicemail left.	Phone
	-	Comments/No comments received.	-
	01-Oct-24	Project introduction and invitation to participate circulated.	Email

Group	Date	Engagement Event	Nature
WUT *Contacts C. Chum, K. Mejaki:*	04-Oct-24	Follow up inquiry made regarding project notification.	Email
	08-Oct-24	Follow up inquiry made regarding project notification. Message left with Reception.	Phone
	09-Oct-24	K. Mejaki identified herself as the new contact for WUT and asked for more information about the project and archaeological assessments. M. DeVries resent the Stage 1 report and the Stage 2 and marine project notification.	Email
	10-Oct-24	New fieldwork date circulated.	Email
	22-Apr-25	Circulation of the draft report for review and comment.	Email
	08-May-25	Follow up query regarding status of report review made.	Email
	16-May-25	Follow up query regarding status of report review made. No answer, voicemail left.	Phone
	-	Comments/No comments received.	-
ZFN *Contacts Reception, K. Mossup*	01-Oct-24	Project introduction and invitation to participate circulated.	Email
	04-Oct-24	Follow up inquiry made regarding project notification.	Email
	08-Oct-24	Follow up inquiry made regarding project notification. Directed to Kevin Mossup; proejct notification resent.	Phone
	09-Oct-24	Deployment details circulated for the following week.	Email
	10-Oct-24	New fieldwork date circulated.	Email
	22-Apr-25	Circulation of the draft report for review and comment.	Email
	08-May-25	Follow up query regarding status of report review made.	Email
	16-May-25	Follow up query regarding status of report review made. No answer; no option to leave voicemail.	Phone
	-	Comments/No comments received.	-

RoIE Table 2: Summary of Participating Representatives

Group	Representative	Participation
AA	None	N/A
GRFN	None	N/A
MFN	None	N/A
MNO	None	N/A
MFN	Z. Piche	October 22, 2024
SA	None	N/A
SRFN	None	N/A
SFN	None	N/A
SFN	None	N/A
AOK	None	N/A
TFN	None	N/A
WRFN	None	N/A
WUT	None	N/A
ZFN	None	N/A

ROIE APPENDICES

RoIE Appendix A: MFN Correspondence

kait.kenel@araheritage.ca

From: Jake Cousineau <jake@mississaugi.com>
Sent: June 19, 2025 3:57 PM
To: kait.kenel@araheritage.ca
Cc: chris.kirby@tulloch.ca; Elliot.DeAngelis@cima.ca; Caroline.Alepin@cima.ca; Thomas.Kowpak@cima.ca; 'Trevor Taylor'
Subject: RE: ARA Report Review - Blind River Raw Water Intake Stage 2 Marine - MFN

Hi Kait,

Sorry about the delay. Feel free to finalize this report. We have no issues with it.

Jake Cousineau
Data Management Technician
Mississauga First Nation

From: kait.kenel@araheritage.ca <kait.kenel@araheritage.ca>
Sent: Thursday, June 19, 2025 3:48 PM
To: Jake Cousineau <jake@mississaugi.com>
Cc: chris.kirby@tulloch.ca; Elliot.DeAngelis@cima.ca; Caroline.Alepin@cima.ca; Thomas.Kowpak@cima.ca; 'Trevor Taylor' <trevor.taylor@araheritage.ca>
Subject: RE: ARA Report Review - Blind River Raw Water Intake Stage 2 Marine - MFN

CAUTION: This email originated from outside of the organization. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Good afternoon Jake,

I wanted to follow up on this report review. Can you please advise if you will be reviewing these reports and if you have an estimate for how long you will need? Thank you!

Kind regards,
Kait

Kait Kenel M.A. (she/her)
Indigenous Engagement Advisor
Chair, DEI Committee
Archaeological Research Associates Ltd.
Hamilton Office: 50 Nebo Road, Unit 1, Hamilton, ON. L8W 2E3
Kitchener Office: 465 Maple Ave., Kitchener, ON. N2H 6N5
C 226.989.7259 | E kait.kenel@araheritage.ca | www.araheritage.ca

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ARCHAEOLOGY | HERITAGE | OUTREACH | CONSERVATION

Privileged to work within the treaty lands and traditional territories of the Indigenous peoples of Turtle Island.

Upcoming Holiday: ARA will be closed in observance of Canada Day on Tuesday, July 1st, 2025.

From: kait.kenel@araheritage.ca <kait.kenel@araheritage.ca>
Sent: May 8, 2025 1:19 PM
To: 'jake@mississaugi.com' <jake@mississaugi.com>
Cc: 'craig.ramsoomair@araheritage.ca' <craig.ramsoomair@araheritage.ca>; 'chris.kirby@tulloch.ca' <chris.kirby@tulloch.ca>; 'Elliot.DeAngelis@cima.ca' <Elliot.DeAngelis@cima.ca>; 'Caroline.Alepin@cima.ca' <Caroline.Alepin@cima.ca>; 'Thomas.Kowpak@cima.ca' <Thomas.Kowpak@cima.ca>
Subject: RE: ARA Report Review - Blind River Raw Water Intake Stage 2 Marine - MFN

Good afternoon!

I am writing to follow up on these report reviews. We would very much appreciate your comments by May 14, 2025, as we plan to proceed with report submission shortly thereafter. Thank you!

Kind regards,
Kait

Kait Kenel M.A. (she/her)
Indigenous Engagement Advisor
Chair, DEI Committee
Archaeological Research Associates Ltd.
Hamilton Office: 50 Nebo Road, Unit 1, Hamilton, ON. L8W 2E3
Kitchener Office: 465 Maple Ave., Kitchener, ON. N2H 6N5
C 226.989.7259 | E kait.kenel@araheritage.ca | www.araheritage.ca

ARCHAEOLOGY | HERITAGE | OUTREACH | CONSERVATION

Privileged to work within the treaty lands and traditional territories of the Indigenous peoples of Turtle Island.

From: kait.kenel@araheritage.ca <kait.kenel@araheritage.ca>
Sent: April 22, 2025 11:17 AM
To: 'jake@mississaugi.com' <jake@mississaugi.com>
Cc: 'craig.ramsoomair@araheritage.ca' <craig.ramsoomair@araheritage.ca>; 'chris.kirby@tulloch.ca' <chris.kirby@tulloch.ca>; 'Elliot.DeAngelis@cima.ca' <Elliot.DeAngelis@cima.ca>; 'Caroline.Alepin@cima.ca'

2

<Caroline.Alepin@cima.ca>; 'Thomas.Kowpak@cima.ca' <Thomas.Kowpak@cima.ca>
Subject: ARA Report Review - Blind River Raw Water Intake Stage 2 Marine - MFN

Good morning!

Please find attached the draft report for your review for the Stage 2 and Marine assessments for the *Blind River Raw Water Intake and Low Flow Pumping Station* (ARA Project #2024-0141 and 2024-0143).

We are hoping to receive your comments regarding the draft report by May 14, 2025, prior to our submission to the MCM. Please advise if this timeframe is not achievable for your review. Thank you!

Kind regards,
Kait

Kait Kenel M.A. (she/her)
Indigenous Engagement Advisor
Chair, DEI Committee
Archaeological Research Associates Ltd.
Hamilton Office: 50 Nebo Road, Unit 1, Hamilton, ON. L8W 2E3
Kitchener Office: 465 Maple Ave., Kitchener, ON. N2H 6N5
C 226.989.7259 | E kait.kenel@araheritage.ca | www.araheritage.ca

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D

Appendix D: Agency Consultation

Ministry of the Environment,
Conservation and Parks

Environmental Assessment Branch

7th Floor
135 St. Clair Avenue W
Toronto ON M4V 1P5
Tel.: 416 314-8001
Fax.: 416 314-8452

Ministère de l'Environnement, de la Protection de la nature et des Parcs

Direction des évaluations environnementales

7ème étage
135, avenue St. Clair Ouest
Toronto ON M4V 1P5
Tél. : 416 314-8001
Téléc. : 416 314-8452

October 9, 2025

Katie Scott
Project Manager
Town of Blind River
katie.scott@blindriver.ca

BY EMAIL ONLY

Re: **Municipal Class Environmental Assessment, Blind River WTP New Intake and LLPS**
Town of Blind River
Municipal Class Environmental Assessment, Schedule C
Acknowledgement of Notice of Commencement

Dear Katie Scott,

This letter is in response to the Notice of Commencement for the above noted project. The Ministry of the Environment, Conservation and Parks (MECP) acknowledges that the Town of Blind River (proponent) has indicated that the study is following the approved environmental planning process for a Schedule C project under the Municipal Class Environmental Assessment (Class EA).

The **updated (August 2022)** attached "Areas of Interest" document provides guidance regarding the ministry's interests with respect to the Class EA process. Please address all areas of interest in the EA documentation at an appropriate level for the EA study. Proponents who address all the applicable areas of interest can minimize potential delays to the project schedule. Information is provided at the end of the Areas of Interest document relating to the Notice of Completion**.**

The Crown has a legal duty to consult Aboriginal communities when it has knowledge, real or constructive, of the existence or potential existence of an Aboriginal or treaty right and contemplates conduct that may adversely impact that right. Before authorizing this project, the Crown must ensure that its duty to consult has been fulfilled, where such a duty is triggered. Although the duty to consult with Aboriginal peoples is a duty of the Crown, the Crown may delegate procedural aspects of this duty to project proponents while retaining oversight of the consultation process.

The proposed project may have the potential to affect Aboriginal or treaty rights protected under Section 35 of Canada's *Constitution Act* 1982. Where the Crown's duty to consult is triggered in relation to the proposed project**, the MECP is delegating the procedural aspects of rights-based consultation to the proponent through this letter.** The Crown intends to rely on the delegated consultation process in discharging its duty to consult and maintains the right to participate in the consultation process as it sees fit.

Based on information provided to date and the Crown`s preliminary assessment the proponent is required to consult with the following communities who have been identified as potentially affected by the proposed project:

- Mississauga First Nation
- Serpent River First Nation
- Thessalon First Nation
- Sagamok Anishnawbek First Nation
- Métis Nation of Ontario (Region 4) – Historical Sault Ste. Marie

Steps that the proponent may need to take in relation to Aboriginal consultation for the proposed project are outlined in the "Code of Practice for Consultation in Ontario's Environmental Assessment Process". Additional information related to Ontario's Environmental Assessment Act is available online at: www.ontario.ca/environmentalassessments.

Please also refer to the attached document "A Proponent's Introduction to the Delegation of Procedural Aspects of consultation with Aboriginal Communities" for further information, including the MECP's expectations for EA report documentation related to consultation with communities.

The proponent must contact the Director of Environmental Assessment Branch (EABDirector@ontario.ca) under the following circumstances after initial discussions with the communities identified by the MECP:

- Aboriginal or treaty rights impacts are identified to you by the communities;
- You have reason to believe that your proposed project may adversely affect an Aboriginal or treaty right;
- Consultation with Indigenous communities or other stakeholders has reached an

impasse; or
- A Section 16 Order request is expected based on impacts to Aboriginal or treaty rights

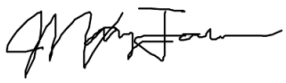
The MECP will then assess the extent of any Crown duty to consult for the circumstances and will consider whether additional steps should be taken, including what role you will be asked to play should additional steps and activities be required.

A draft of the report should be sent directly to me prior to the release of the final report through the issuance of the Notice of Completion, allowing a minimum of 30 days for the ministry's technical reviewers to provide comments on the draft report.

Please also ensure a copy of the Notice of Completion is sent to the ministry's Northern Region EA notification email account (eanotification.nregion@ontario.ca) after the draft report and Notice of Completion is reviewed and finalized.

Should you or any members of your project team have any questions regarding the material above, please contact me at kady.kaurin2@ontario.ca.

Sincerely,



Maya Jaceiwcz on behalf of Kady Kaurin
Regional Environmental Planner – Northern Region
Project Review Unit, Environmental Assessment Branch

Cc: Jason Scott, Manager, Sudbury District Office, MECP

Enclosed: Areas of Interest

Attached: Client's Guide to Preliminary Screening for Species at Risk

A Proponent's Introduction to the Delegation of Procedural Aspects of Consultation with Aboriginal Communities

AREAS OF INTEREST (v. August 2022)

It is suggested that you check off each section after you have considered / addressed it.

Planning and Policy

- Applicable plans and policies should be identified in the report, and the proponent should describe how the proposed project adheres to the relevant policies in these plans.
    - Projects located in MECP Central, Eastern or West Central Region may be subject to **A Place to Grow: Growth Plan for the Greater Golden Horseshoe (2020)**.
    - Projects located in MECP Central or Eastern Region may be subject to the **Oak Ridges Moraine Conservation Plan (2017)** or the **Lake Simcoe Protection Plan (2014)**.
    - Projects located in MECP Central, Southwest or West Central Region may be subject to the **Niagara Escarpment Plan (2017)**.
    - Projects located in MECP Central, Eastern, Southwest or West Central Region may be subject to the **Greenbelt Plan (2017)**.
    - Projects located in MECP Northern Region may be subject to the **Growth Plan for Northern Ontario (2011).**

- The **Provincial Policy Statement (2020)** contains policies that protect Ontario's natural heritage and water resources. Applicable policies should be referenced in the report, and the proponent should describe how the proposed project is consistent with these policies.

- In addition to the provincial planning and policy level, the report should also discuss the planning context at the municipal and federal levels, as appropriate.

Source Water Protection

The *Clean Water Act*, 2006 (CWA) aims to protect existing and future sources of drinking water. To achieve this, several types of vulnerable areas have been delineated around surface water intakes and wellheads for every municipal residential drinking water system that is located in a source protection area. These vulnerable areas are known as a Wellhead Protection Areas (WHPAs) and surface water Intake Protection Zones (IPZs). Other vulnerable areas that have been delineated under the CWA include Highly Vulnerable Aquifers (HVAs), Significant Groundwater Recharge Areas (SGRAs), Event-based modelling areas (EBAs), and Issues Contributing Areas (ICAs). Source protection plans have been developed that include policies to address existing and future risks to sources of municipal drinking water within these vulnerable areas.

Projects that are subject to the Environmental Assessment Act that fall under a Class EA, or one of the Regulations, have the potential to impact sources of drinking water if they occur in designated vulnerable areas or in the vicinity of other at-risk drinking water systems (i.e. systems that are not municipal residential systems). MEA Class EA projects may include

activities that, if located in a vulnerable area, could be a threat to sources of drinking water (i.e. have the potential to adversely affect the quality or quantity of drinking water sources) and the activity could therefore be subject to policies in a source protection plan. Where an activity poses a risk to drinking water, policies in the local source protection plan may impact how or where that activity is undertaken. Policies may prohibit certain activities, or they may require risk management measures for these activities. Municipal Official Plans, planning decisions, Class EA projects (where the project includes an activity that is a threat to drinking water) and prescribed instruments must conform with policies that address significant risks to drinking water and must have regard for policies that address moderate or low risks.

- In October 2015, the MEA Parent Class EA document was amended to include reference to the Clean Water Act (Section A.2.10.6) and indicates that proponents undertaking a Municipal Class EA project must identify early in their process whether a project is or could potentially be occurring with a vulnerable area. **Given this requirement, please include a section in the report on source water protection.**

    - The proponent should identify the source protection area and should clearly document how the proximity of the project to sources of drinking water (municipal or other) and any delineated vulnerable areas was considered and assessed. Specifically, the report should discuss whether or not the project is located in a vulnerable area and provide applicable details about the area.

    - If located in a vulnerable area, proponents should document whether any project activities are prescribed drinking water threats and thus pose a risk to drinking water (this should be consulted on with the appropriate Source Protection Authority). Where an activity poses a risk to drinking water, the proponent must document and discuss in the report how the project adheres to or has regard to applicable policies in the local source protection plan. This section should then be used to inform and be reflected in other sections of the report, such as the identification of net positive/negative effects of alternatives, mitigation measures, evaluation of alternatives etc.

- While most source protection plans focused on including policies for significant drinking water threats in the WHPAs and IPZs it should be noted that even though source protection plan policies may not apply in HVAs, these are areas where aquifers are sensitive and at risk to impacts and within these areas, activities may impact the quality of sources of drinking water for systems other than municipal residential systems.

- In order to determine if this project is occurring within a vulnerable area, proponents can use Source Protection Information Atlas, which is an online mapping tool available to the public. Note that various layers (including WHPAs, WHPA-Q1 and WHPA-Q2, IPZs, HVAs, SGRAs, EBAs, ICAs) can be turned on through the “Map Legend” bar on the left. The mapping tool will also provide a link to the appropriate source protection plan in order to identify what policies may be applicable in the vulnerable area.

- For further information on the maps or source protection plan policies which may relate to their project, proponents must contact the appropriate source protection authority. **Please consult with the local source protection authority to discuss potential impacts on drinking water. Please document the results of that consultation within the report and include all communication documents/correspondence.**

More Information

For more information on the *Clean Water Act*, source protection areas and plans, including specific information on the vulnerable areas and drinking water threats, please refer to Conservation Ontario's website where you will also find links to the local source protection plan/assessment report.

A list of the prescribed drinking water threats can be found in section 1.1 of Ontario Regulation 287/07 made under the *Clean Water Act*. In addition to prescribed drinking water threats, some source protection plans may include policies to address additional "local" threat activities, as approved by the MECP.

Climate Change

The document "Considering Climate Change in the Environmental Assessment Process" (Guide) is part of the Environmental Assessment program's Guides and Codes of Practice. The Guide sets out the MECP's expectation for considering climate change in the preparation, execution and documentation of environmental assessment studies and processes. The guide provides examples, approaches, resources, and references to assist proponents with consideration of climate change in EA. Proponents should review this Guide in detail.

- **The MECP expects proponents of Class EA projects to:**

    1. Consider during the assessment of alternative solutions and alternative designs, the following:
        a. the project's expected production of greenhouse gas emissions and impacts on carbon sinks (climate change mitigation); and
        b. resilience or vulnerability of the undertaking to changing climatic conditions (climate change adaptation).
    2. Include a discrete section in the report detailing how climate change was considered in the EA.

How climate change is considered can be qualitative or quantitative in nature and should be scaled to the project's level of environmental effect. In all instances, both a project's impacts on climate change (mitigation) and impacts of climate change on a project (adaptation) should be considered.

- The MECP has also prepared another guide to support provincial land use planning direction related to the completion of energy and emission plans. The "Community Emissions Reduction Planning: A Guide for Municipalities" document is designed to educate stakeholders on the municipal opportunities to reduce energy and greenhouse gas emissions, and to provide guidance on methods and techniques to incorporate consideration of energy and greenhouse gas emissions into municipal activities of all types. We encourage you to review the Guide for information.

Air Quality, Dust and Noise

- If there are sensitive receptors in the surrounding area of this project, a quantitative air quality/odour impact assessment will be useful to evaluate alternatives, determine impacts and identify appropriate mitigation measures. The scope of the assessment can be determined based on the potential effects of the proposed alternatives, and typically includes source and receptor characterization and a quantification of local air quality impacts on the sensitive receptors and the environment in the study area. The assessment will compare to all applicable standards or guidelines for all contaminants of concern. **Please contact this office for further consultation on the level of Air Quality Impact Assessment required for this project if not already advised.**

- If a quantitative Air Quality Impact Assessment is not required for the project, the MECP expects that the report contain a qualitative assessment which includes:

    - A discussion of local air quality including existing activities/sources that significantly impact local air quality and how the project may impact existing conditions;
    - A discussion of the nearby sensitive receptors and the project's potential air quality impacts on present and future sensitive receptors;
    - A discussion of local air quality impacts that could arise from this project during both construction and operation; and
    - A discussion of potential mitigation measures.

- As a common practice, "air quality" should be used an evaluation criterion for all road projects.

- Dust and noise control measures should be addressed and included in the construction plans to ensure that nearby residential and other sensitive land uses within the study area are not adversely affected during construction activities.

- The MECP recommends that non-chloride dust-suppressants be applied. For a comprehensive list of fugitive dust prevention and control measures that could be applied, refer to *Cheminfo Services Inc. Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities* report prepared for Environment Canada. March 2005.

- The report should consider the potential impacts of increased noise levels during the operation of the completed project. The proponent should explore all potential measures to mitigate significant noise impacts during the assessment of alternatives.

Ecosystem Protection and Restoration

- Any impacts to ecosystem form and function must be avoided where possible. The report should describe any proposed mitigation measures and how project planning will protect and enhance the local ecosystem.

- Natural heritage and hydrologic features should be identified and described in detail to assess potential impacts and to develop appropriate mitigation measures. The following sensitive environmental features may be located within or adjacent to the study area:
    - Key Natural Heritage Features: Habitat of endangered species and threatened species, fish habitat, wetlands, areas of natural and scientific interest (ANSIs), significant valleylands, significant woodlands; significant wildlife habitat (including habitat of special concern species); sand barrens, savannahs, and tallgrass prairies; and alvars.
    - Key Hydrologic Features: Permanent streams, intermittent streams, inland lakes and their littoral zones, seepage areas and springs, and wetlands.
    - Other natural heritage features and areas such as: vegetation communities, rare species of flora or fauna, Environmentally Sensitive Areas, Environmentally Sensitive Policy Areas, federal and provincial parks and conservation reserves, Greenland systems etc.

We recommend consulting with the Ministry of Natural Resources and Forestry (MNRF), Fisheries and Oceans Canada (DFO) and your local conservation authority to determine if special measures or additional studies will be necessary to preserve and protect these sensitive features. In addition, for projects located in Central Region you may consider the provisions of the Rouge Park Management Plan if applicable.

Species at Risk

- The Ministry of the Environment, Conservation and Parks has now assumed responsibility of Ontario's Species at Risk program. Information, standards, guidelines, reference materials and technical resources to assist you are found at https://www.ontario.ca/page/species-risk.

- The Client's Guide to Preliminary Screening for Species at Risk (Draft May 2019) has been attached to the covering email for your reference and use. Please review this document for next steps.

- For any questions related to subsequent permit requirements, please contact SAROntario@ontario.ca.

Surface Water

- The report must include enough information to demonstrate that there will be no negative impacts on the natural features or ecological functions of any watercourses within the study area. Measures should be included in the planning and design process to ensure that any impacts to watercourses from construction or operational activities (e.g. spills, erosion, pollution) are mitigated as part of the proposed undertaking.

- Additional stormwater runoff from new pavement can impact receiving watercourses and flood conditions. Quality and quantity control measures to treat stormwater runoff should be considered for all new impervious areas and, where possible, existing surfaces. The ministry's Stormwater Management Planning and Design Manual (2003) should be referenced in the report and utilized when designing stormwater control methods. **A Stormwater Management Plan should be prepared as part of the Class EA process** that includes:

    - Strategies to address potential water quantity and erosion impacts related to stormwater draining into streams or other sensitive environmental features, and to ensure that adequate (enhanced) water quality is maintained
    - Watershed information, drainage conditions, and other relevant background information
    - Future drainage conditions, stormwater management options, information on erosion and sediment control during construction, and other details of the proposed works
    - Information on maintenance and monitoring commitments.

- Ontario Regulation 60/08 under the *Ontario Water Resources Act* (OWRA) applies to the Lake Simcoe Basin, which encompasses Lake Simcoe and the lands from which surface water drains into Lake Simcoe. If a proposed sewage treatment plant is listed in Table 1 of the regulation, the report should describe how the proposed project and its mitigation measures are consistent with the requirements of this regulation and the OWRA.

- Any potential approval requirements for surface water taking or discharge should be identified in the report. A Permit to Take Water (PTTW) under the OWRA will be required for any water takings that exceed 50,000 L/day, except for certain water taking activities that have been prescribed by the Water Taking EASR Regulation – *O. Reg. 63/16*. These prescribed water-taking activities require registration in the EASR instead of a PTTW. Please review the Water Taking User Guide for EASR for more information. Additionally, an

Environmental Compliance Approval under the OWRA is required for municipal stormwater management works.

Groundwater

- The status of, and potential impacts to any well water supplies should be addressed. If the project involves groundwater takings or changes to drainage patterns, the quantity and quality of groundwater may be affected due to drawdown effects or the redirection of existing contamination flows. In addition, project activities may infringe on existing wells such that they must be reconstructed or sealed and abandoned. Appropriate information to define existing groundwater conditions should be included in the report.

- If the potential construction or decommissioning of water wells is identified as an issue, the report should refer to Ontario Regulation 903, Wells, under the OWRA.

- Potential impacts to groundwater-dependent natural features should be addressed. Any changes to groundwater flow or quality from groundwater taking may interfere with the ecological processes of streams, wetlands or other surficial features. In addition, discharging contaminated or high volumes of groundwater to these features may have direct impacts on their function. Any potential effects should be identified, and appropriate mitigation measures should be recommended. The level of detail required will be dependent on the significance of the potential impacts.

- Any potential approval requirements for groundwater taking or discharge should be identified in the report. A Permit to Take Water (PTTW) under the OWRA will be required for any water takings that exceed 50,000 L/day, with the exception of certain water taking activities that have been prescribed by the Water Taking EASR Regulation – *O. Reg. 63/16*. These prescribed water-taking activities require registration in the EASR instead of a PTTW. Please review the Water Taking User Guide for EASR for more information.

- Consultation with the railroad authorities is necessary wherever there is a plan to use construction dewatering in the vicinity of railroad lines or where the zone of influence of the construction dewatering potentially intercepts railroad lines.

Excess Materials Management

- In December 2019, MECP released a new regulation under the Environmental Protection Act, titled "On-Site and Excess Soil Management" (O. Reg. 406/19) to support improved management of excess construction soil. This regulation is a key step to support proper management of excess soils, ensuring valuable resources don't go to waste and to provide clear rules on managing and reusing excess soil. New risk-based standards referenced by

this regulation help to facilitate local beneficial reuse which in turn will reduce greenhouse gas emissions from soil transportation, while ensuring strong protection of human health and the environment. The new regulation is being phased in over time, with the first phase in effect on January 1, 2021. For more information, please visit https://www.ontario.ca/page/handling-excess-soil.

- The report should reference that activities involving the management of excess soil should be completed in accordance with O. Reg. 406/19 and the MECP's current guidance document titled "Management of Excess Soil – A Guide for Best Management Practices" (2014).

- All waste generated during construction must be disposed of in accordance with ministry requirements.

Contaminated Sites

- Any current or historical waste disposal sites should be identified in the report. The status of these sites should be determined to confirm whether approval pursuant to Section 46 of the EPA may be required for land uses on former disposal sites. We recommend referring to the MECP's D-4 guideline for land use considerations near landfills and dumps.
    - Resources available may include regional/local municipal official plans and data; provincial data on large landfill sites and small landfill sites; Environmental Compliance Approval information for waste disposal sites on Access Environment.

- Other known contaminated sites (local, provincial, federal) in the study area should also be identified in the report (Note – information on federal contaminated sites is found on the Government of Canada's website).

- The location of any underground storage tanks should be investigated in the report. Measures should be identified to ensure the integrity of these tanks and to ensure an appropriate response in the event of a spill. The ministry's Spills Action Centre must be contacted in such an event.

- Since the removal or movement of soils may be required, appropriate tests to determine contaminant levels from previous land uses or dumping should be undertaken. If the soils are contaminated, you must determine how and where they are to be disposed of, consistent with *Part XV.1 of the Environmental Protection Act* (EPA) and Ontario Regulation 153/04, Records of Site Condition, which details the new requirements related to site assessment and clean up. Please contact the appropriate MECP District Office for further consultation if contaminated sites are present.

Servicing, Utilities and Facilities

- The report should identify any above or underground utilities in the study area such as transmission lines, telephone/internet, oil/gas etc. The owners should be consulted to discuss impacts to this infrastructure, including potential spills.

- The report should identify any servicing infrastructure in the study area such as wastewater, water, stormwater that may potentially be impacted by the project.

- Any facility that releases emissions to the atmosphere, discharges contaminants to ground or surface water, provides potable water supplies, or stores, transports or disposes of waste must have an Environmental Compliance Approval (ECA) before it can operate lawfully. Please consult with MECP's Environmental Permissions Branch to determine whether a new or amended ECA will be required for any proposed infrastructure.

- We recommend referring to the ministry's environmental land use planning guides to ensure that any potential land use conflicts are considered when planning for any infrastructure or facilities related to wastewater, pipelines, landfills or industrial uses.

Mitigation and Monitoring

- Contractors must be made aware of all environmental considerations so that all environmental standards and commitments for both construction and operation are met. Mitigation measures should be clearly referenced in the report and regularly monitored during the construction stage of the project. In addition, we encourage proponents to conduct post-construction monitoring to ensure all mitigation measures have been effective and are functioning properly.

- Design and construction reports and plans should be based on a best management approach that centres on the prevention of impacts, protection of the existing environment, and opportunities for rehabilitation and enhancement of any impacted areas.

- The proponent's construction and post-construction monitoring plans must be documented in the report, as outlined in Section A.2.5 and A.4.1 of the MEA Class EA parent document.

Consultation

- The report must demonstrate how the consultation provisions of the Class EA have been fulfilled, including documentation of all stakeholder consultation efforts undertaken during the planning process. This includes a discussion in the report that identifies concerns that were raised and **describes how they have been addressed by the proponent** throughout

the planning process. The report should also include copies of comments submitted on the project by interested stakeholders, and the proponent's responses to these comments (as directed by the Class EA to include full documentation).

- Please include the full stakeholder distribution/consultation list in the documentation.

Class EA Process

- If this project is a Master Plan: there are several different approaches that can be used to conduct a Master Plan, examples of which are outlined in Appendix 4 of the Class EA. **The Master Plan should clearly indicate the selected approach for conducting the plan**, by identifying whether the levels of assessment, consultation and documentation are sufficient to fulfill the requirements for Schedule B or C projects. Please note that any Schedule B or C projects identified in the plan would be subject to Section 16 Order Requests under the Environmental Assessment Act, although the plan itself would not be. **Please include a description of the approach being undertaken (use Appendix 4 as a reference).**

- If this project is a Master Plan: Any identified projects should also include information on the MCEA schedule associated with the project.

- The report should provide clear and complete documentation of the planning process in order to allow for transparency in decision-making.

- The Class EA requires the consideration of the effects of each alternative on all aspects of the environment (including planning, natural, social, cultural, economic, technical). The report should include a level of detail (e.g. hydrogeological investigations, terrestrial and aquatic assessments, cultural heritage assessments) such that all potential impacts can be identified, and appropriate mitigation measures can be developed. Any supporting studies conducted during the Class EA process should be referenced and included as part of the report.

- Please include in the report a list of all subsequent permits or approvals that may be required for the implementation of the preferred alternative, including but not limited to, MECP's PTTW, EASR Registrations and ECAs, conservation authority permits, species at risk permits, MTO permits and approvals under the *Impact Assessment Act*, 2019.

- Ministry guidelines and other information related to the issues above are available at http://www.ontario.ca/environment-and-energy/environment-and-energy. We encourage you to review all the available guides and to reference any relevant information in the report.

Notice of Completion
Once the EA Report is finalized, the proponent must issue a Notice of Completion providing a minimum 30-day period during which documentation may be reviewed and comment and input can be submitted to the proponent. The Notice of Completion must be sent to the appropriate MECP Regional Office email address.

The public can request a higher level of assessment on a project if they are concerned about potential adverse impacts to constitutionally protected Aboriginal and treaty rights. In addition, the Minister may issue an order on his or her own initiative within a specified time period. The Director (of the Environmental Assessment Branch) will issue a Notice of Proposed Order to the proponent if the Minister is considering an order for the project within 30 days after the conclusion of the comment period on the Notice of Completion. At this time, the Director may request additional information from the proponent. Once the requested information has been received, the Minister will have 30 days within which to make a decision or impose conditions on your project.

Therefore, the proponent cannot proceed with the project until at least 30 days after the end of the comment period provided for in the Notice of Completion. Further, the proponent may not proceed after this time if:

- a Section 16 Order request has been submitted to the ministry regarding potential adverse impacts to constitutionally protected Aboriginal and treaty rights, or
- the Director has issued a Notice of Proposed order regarding the project.

Please ensure that the Notice of Completion advises that outstanding concerns are to be directed to the proponent for a response, and that in the event there are outstanding concerns regarding potential adverse impacts to constitutionally protected Aboriginal and treaty rights, Section 16 Order requests on those matters should be addressed in writing to:

Minister of the Environment, Conservation and Parks

777 Bay Street, 5th Floor
Toronto ON M7A 2J3
minister.mecp@ontario.ca

and

Director, Environmental Assessment Branch
Ministry of the Environment, Conservation and Parks
135 St. Clair Ave. W, 1st Floor
Toronto ON, M4V 1P5
EABDirector@ontario.ca

From: EA Notices to NRegion (MECP) <eanotification.nregion@ontario.ca>
Sent: Friday, April 26, 2024 8:58 AM
To: Caroline Alepin <Caroline.Alepin@cima.ca>
Cc: Kaurin, Kady (MECP) <Kady.Kaurin2@ontario.ca>
Subject: RE: TOWN OF BLIND RIVER, MEA Class EA, Blind River WTP New Intake & LLPS

EXTERNAL EMAIL

Dear Project Team,

Thank you for providing the Ministry of the Environment, Conservation and Parks with the Notice of Commencement for the Blind River WTP New Intake & LLPS in the Town of Blind River. Attached are proponent's guide to preliminary screening of species at risk, the acknowledgement for the proposed project and a copy of the Notice of Commencement. Please ensure continuous communication as required throughout the progress of the project.

Thank you,

Maya Jacewicz | Assistant Project Officer
Environmental Assessment and Permissions Division | Environmental Assessment Branch
Ontario Ministry of the Environment, Conservation and Parks
maya.jacewicz@ontario.ca

From: Caroline Alepin <Caroline.Alepin@cima.ca>
Sent: April 17, 2024 9:55 AM
To: EA Notices to NRegion (MECP) <eanotification.nregion@ontario.ca>
Cc: Kaurin, Kady (MECP) <Kady.Kaurin2@ontario.ca>; Dominey, Jace (MECP) <Jace.Dominey@ontario.ca>; Drolet, Parise (MECP) <Parise.Drolet@ontario.ca>; Nisha Jha <Nisha.Jha@cima.ca>
Subject: TOWN OF BLIND RIVER, MEA Class EA, Blind River WTP New Intake & LLPS

CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

MECP North Region – Class EA Branch
Notification via eanotification.nregion@ontario

Please find attached the Notice of Commencement for the Town of Blind River WTP New Intake and Low Lift Pumping Station Class EA, along with the material from the first Public Information Centre held last December.

The completed Streamlined EA Project information sheet in PDF format as requested is also attached.

Please find below project history and communications with Jace Dominey and Paris Drolet from the MECP Blind River and Sault-Saint-Marie area. There may have been a misunderstanding in the mode of communications. Apologies for the delay.

We trust all the information for this Class EA is in order.

I will be away on holidays for the next two weeks. Please contact Nisha Jha in the meantime if any questions or concerns.

Kind regards,
Caroline

From: Kaurin, Kady (MECP) <Kady.Kaurin2@ontario.ca>
Sent: Wednesday, April 17, 2024 09:57
To: Caroline Alepin <Caroline.Alepin@cima.ca>
Cc: Drolet, Parise (MECP) <Parise.Drolet@ontario.ca>; Dominey, Jace (MECP) <Jace.Dominey@ontario.ca>; Nisha Jha <Nisha.Jha@cima.ca>
Subject: RE: Blind River WTP New Intake & LLPS Class Environmental Assessment

Thank You, Caroline, no worries.

Kady Kaurin

From: Caroline Alepin <Caroline.Alepin@cima.ca>
Sent: April 17, 2024 9:12 AM
To: Kaurin, Kady (MECP) <Kady.Kaurin2@ontario.ca>
Cc: Drolet, Parise (MECP) <Parise.Drolet@ontario.ca>; Dominey, Jace (MECP) <Jace.Dominey@ontario.ca>; Nisha Jha <Nisha.Jha@cima.ca>
Subject: RE: Blind River WTP New Intake & LLPS Class Environmental Assessment

CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Good morning Kady,

We will submit the Notice of Commencement for the Blind River WTP Intake and LLPS Class EA via the **eanotification** email address and provide the completed form as requested.

As indicated, the Notice and background information was sent earlier in March to your MECP colleagues herein copied following our conversation. Apologies for the misunderstanding regarding the submission via the **eanotification** mailbox. We will complete it today.

Kind regards,
Caroline

From: Kaurin, Kady (MECP) <Kady.Kaurin2@ontario.ca>
Sent: Tuesday, April 16, 2024 2:46 PM
To: Caroline Alepin <Caroline.Alepin@cima.ca>
Cc: Drolet, Parise (MECP) <Parise.Drolet@ontario.ca>; Dominey, Jace (MECP) <Jace.Dominey@ontario.ca>
Subject: FW: Blind River WTP New Intake & LLPS Class Environmental Assessment

EXTERNAL EMAIL

Hello Caroline, I am an EA Coordinator for MECP, Environmental Assessment Branch. It has come to our attention that a Notice of Commencement for the Blind River WTP New Intake and LLPS Class EA was sent to the Drinking water and Environmental Compliance Division. Unfortunately, we did not receive it through our eanotification email inbox.

Please make sure to submit projects and reports to the eanotification.nregion@ontario.ca , so that we can review them accordingly. The instructions for doing so are below.

Submit notices for streamlined environmental assessments
As of May 1, 2018, proponents must follow the planning process set out in the approved class environmental assessments or streamlined environmental assessment processes and send their notices and completed project information form to the region where the project is located. If your project is located in more than one ministry region, you need to submit your notices to all appropriate regions. This is in addition to the existing notification requirements in each class environmental assessments and streamlined environmental assessment process.
To submit your notice, you need to do the following:

1. download and complete the project information form
2. the subject line of your email must include the project location, type of streamlined environmental assessment and project name, for example:
    - York Region, MEA Class EA, Elgin Mills Rd East (Bayview to Woodbine)
    - Durham Region, Electricity Screening Process, New Cogeneration Station
    - City of Ottawa, Waste Management Screening Process, Landfill Expansion Project
3. attach a copy of your project notice in PDF format and your completed project information form in Excel format to the email
4. send your email to the appropriate ministry regional office:
    - Central Region – eanotification.cregion@ontario.ca
    - Eastern Region – eanotification.eregion@ontario.ca
    - Northern Region – eanotification.nregion@ontario.ca
    - South West Region – eanotification.swregion@ontario.ca
    - West Central Region – eanotification.wcregion@ontario.ca

Instructions for submission of notices, and project information forms for undertakings following a streamlined environmental assessment process are provided at the following website: https://www.ontario.ca/page/preparing-environmental-assessments#streamline.

Thank You, if you have any questions, please feel free to contact me.

Kady Kaurin
Environmental Resource Planner/EA Coordinator | Ministry of the Environment, Conservation and Parks
Environmental Assessment Branch
kady.kaurin2@ontario.ca

From: Drolet, Parise (MECP) <Parise.Drolet@ontario.ca>
Sent: April 9, 2024 12:35 PM
To: Kaurin, Kady (MECP) <Kady.Kaurin2@ontario.ca>
Subject: FW: Blind River WTP New Intake & LLPS Class Environmental Assessment

Parise Drolet
705-618-1262

From: Caroline Alepin <Caroline.Alepin@cima.ca>
Sent: Monday, March 4, 2024 3:29 PM
To: Dominey, Jace (MECP) <Jace.Dominey@ontario.ca>; Mitchell, Kristy (MECP) <Kristy.Mitchell@ontario.ca>; Managhan, Marnie (MECP) <Marnie.Managhan@ontario.ca>; Drolet, Parise (MECP) <Parise.Drolet@ontario.ca>
Cc: Thomas Rapley <Thomas.Rapley@cima.ca>; Nisha Jha <Nisha.Jha@cima.ca>; Kathleen Farrow <Kathleen.Farrow@cima.ca>
Subject: Blind River WTP New Intake & LLPS Class Environmental Assessment

CAUTION -- EXTERNAL E-MAIL - Do not click links or open attachments unless you recognize the sender.

Attention:
Jace Dominey, Class Environmental Assessments - Blind River area
Marnie Managhan, Supervisor Sudbury & Sault Ste-Marie
Kristy Mitchell, Water Inspector Sault Ste-Marie
Parise Drolet, Water Compliance

Jace and Kristy,

Thank you for our discussion this morning regarding the Blind River new Intake and Low Lift Pumping Station Class Environmental Assessment. This study was initially commenced in 2020-2021 and was on hold for a few years, until restarted last year. CIMA+ and Tulloch Engineering are the Consultant Engineers representing the Town and have been in discussion with the MECP Environmental Permissions Branch - Drinking Water Approvals (Jamie Filman) over the course of the study to establish the requirements of replacing the current Blind River WTP source water (GUDI wells of deteriorating water quality) with surface water (Lake Huron). As mentioned a raw water quality sampling program was commenced last year and a Treatability Study is underway to support the change of source water at the direct filtration WTP .

As noted, a Public Information Centre was held on December 5, 2023 and there were no concerns from the public and stakeholders. The Notice of Commencement and presentation posters rom the Public Information Centre are attached for your reference. The Environmental Assessment Report (ESR) and preliminary design of the new intake (Lake Huron) and Low Lift Pumping Station are currently underway.

We are seeking comments from your MECP branch on this study. Please consult myself directly, Senior Process Engineer, or Thomas Rapley, Senior Project Manager with any concerns or if you would require additional information.

As mentioned this morning, I will keep you informed and provide you with a project update next month.

Kind regards,
Caroline

CAROLINE ALEPIN, PEng., MEng., GCBus
Sr Process Engineer, Water and Wastewater / Infrastructure

M 905 483 6024 **F** 905-695-0525
500–5935 Airport Road, Mississauga, ON L4V 1W5 CANADA

E

Appendix E: PTTW & DWWP

PERMIT TO TAKE WATER
Ground Water
NUMBER 3410-BV7S4M

Pursuant to Section 34.1 of the Ontario Water Resources Act, R.S.O. 1990 this Permit To Take Water is hereby issued to:

The Corporation of the Town of Blind River
11 Hudson St
Blind River, Ontario,
P0R 1B0

For the water taking from: Five drilled wells:
1)Well #5;
2)Well #6;
3)Well #7;
4)Well #8;
5)Well #9

Located at: 97 Huron Ave Lot 12 Reference Plan 2886 Geo. Twp. of Cobden
Blind River, District of Algoma

99 Huron Ave Lots 40 to 44 Reference Plan 180 Geo. Twp. of Cobden
Blind River, District of Algoma

101 Huron Ave Geo. Twp. of Cobden
Blind River, District of Algoma

1 Park St Reserve behind Lots 410-415 Reference Plan 487 Geo. Twp. of Cobden
Blind River, District of Algoma

87 Huron Ave Geo. Twp. of Cobden
Blind River, District of Algoma

For the purposes of this Permit, and the terms and conditions specified below, the following definitions apply:

DEFINITIONS

(a) "Director" means any person appointed in writing as a Director pursuant to section 5 of the

OWRA for the purposes of section 34.1, OWRA.

(b) "Provincial Officer" means any person designated in writing by the Minister as a Provincial Officer pursuant to section 5 of the OWRA.

(c) "Ministry" means Ontario Ministry of the Environment, Conservation and Parks.

(d) "District Office" means the Sault Ste. Marie District Office.

(e) "Permit" means this Permit to Take Water No. 3410-BV7S4M including its Schedules, if any, issued in accordance with Section 34.1 of the OWRA.

(f) "Permit Holder" means The Corporation of the Town of Blind River.

(g) "OWRA " means the *Ontario Water Resources Act,* R.S.O. 1990, c. O. 40, as amended.

You are hereby notified that this Permit is issued subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. Compliance with Permit

1.1 Except where modified by this Permit, the water taking shall be in accordance with the application for this Permit To Take Water, dated July 17, 2020 and signed by Kathryn Scott, and all Schedules included in this Permit.

1.2 The Permit Holder shall ensure that any person authorized by the Permit Holder to take water under this Permit is provided with a copy of this Permit and shall take all reasonable measures to ensure that any such person complies with the conditions of this Permit.

1.3 Any person authorized by the Permit Holder to take water under this Permit shall comply with the conditions of this Permit.

1.4 This Permit is not transferable to another person.

1.5 This Permit provides the Permit Holder with permission to take water in accordance with the conditions of this Permit, up to the date of the expiry of this Permit. This Permit does not constitute a legal right, vested or otherwise, to a water allocation, and the issuance of this Permit does not guarantee that, upon its expiry, it will be renewed.

1.6 The Permit Holder shall keep this Permit available at all times at or near the site of the taking, and shall produce this Permit immediately for inspection by a Provincial Officer upon his or her request.

1.7 The Permit Holder shall report any changes of address to the Director within thirty days of any such change. The Permit Holder shall report any change of ownership of the property for which this Permit is issued within thirty days of any such change. A change in ownership in the property shall cause this Permit to be cancelled.

2. General Conditions and Interpretation

2.1 Inspections

The Permit Holder must forthwith, upon presentation of credentials, permit a Provincial Officer to carry out any and all inspections authorized by the OWRA, the *Environmental Protection Act*, R.S.O. 1990, the *Pesticides Act*, R.S.O. 1990, or the *Safe Drinking Water Act,* S. O. 2002.

2.2 Other Approvals

The issuance of, and compliance with this Permit, does not:

(a) relieve the Permit Holder or any other person from any obligation to comply with any other applicable legal requirements, including the provisions of the *Ontario Water Resources Act*, and the *Environmental Protection Act*, and any regulations made thereunder; or

(b) limit in any way any authority of the Ministry, a Director, or a Provincial Officer, including the authority to require certain steps be taken or to require the Permit Holder to furnish any further information related to this Permit.

2.3 Information

The receipt of any information by the Ministry, the failure of the Ministry to take any action or require any person to take any action in relation to the information, or the failure of a Provincial Officer to prosecute any person in relation to the information, shall not be construed as:

(a) an approval, waiver or justification by the Ministry of any act or omission of any person that contravenes this Permit or other legal requirement; or

(b) acceptance by the Ministry of the information's completeness or accuracy.

2.4 Rights of Action

The issuance of, and compliance with this Permit shall not be construed as precluding or limiting any legal claims or rights of action that any person, including the Crown in right of Ontario or any agency thereof, has or may have against the Permit Holder, its officers, employees, agents, and contractors.

2.5 Severability

The requirements of this Permit are severable. If any requirements of this Permit, or the application of any requirements of this Permit to any circumstance, is held invalid or unenforceable, the application of such requirements to other circumstances and the remainder of this Permit shall not be affected thereby.

2.6 Conflicts

Where there is a conflict between a provision of any submitted document referred to in this Permit, including its Schedules, and the conditions of this Permit, the conditions in this Permit shall take precedence.

3. Water Takings Authorized by This Permit

3.1 Expiry

This Permit expires on **November 16, 2030**. No water shall be taken under authority of this Permit after the expiry date.

3.2 Amounts of Taking Permitted

The Permit Holder shall only take water from the source, during the periods and at the rates and amounts of taking specified in Table A. Water takings are authorized only for the purposes specified in Table A.

Table A

	Source Name / Description:	Source: Type:	Taking Specific Purpose:	Taking Major Category:	Max. Taken per Minute (litres):	Max. Num. of Hrs Taken per Day:	Max. Taken per Day (litres):	Max. Num. of Days Taken per Year:	Zone/ Easting/ Northing:
1	Well #5	Well Drilled	Municipal	Water Supply	1,023	24	1,473,000	365	17 349618 5116890
2	Well #6	Well Drilled	Municipal	Water Supply	455	24	855,000	365	17 349645 5116929
3	Well #7	Well Drilled	Municipal	Water Supply	1,023	24	1,473,000	365	17 349699 5116953
4	Well #8	Well Drilled	Municipal	Water Supply	1,137	24	1,637,000	365	17 349813 5117123
5	Well #9	Well Drilled	Municipal	Water Supply	380	24	547,200	365	17 349607 5116867
						Total Taking:	5,785,200		

4. Monitoring

4.1 The Permit Holder shall, on each day water is taken under the authorization of this Permit, record the date, the volume of water taken on that date and the rate at which it was taken. The daily volume of water taken shall be measured by a flow meter or calculated in accordance with the method described in the application for this Permit or as otherwise accepted by the Director. A separate record shall be maintained for each source. The Permit Holder shall keep all records required by this condition current and available at or near the site of the taking and shall produce the records immediately for inspection by a Provincial Officer upon his or her request. The Permit Holder, unless otherwise required by the Director, shall submit, on or before March 31st in every year, the daily water taking data collected and recorded for the previous year to the

ministry's Water Taking Reporting System.

5. Impacts of the Water Taking

5.1 Notification

The Permit Holder shall immediately notify the local District Office of any complaint arising from the taking of water authorized under this Permit and shall report any action which has been taken or is proposed with regard to such complaint. The Permit Holder shall immediately notify the local District Office if the taking of water is observed to have any significant impact on the surrounding waters. After hours, calls shall be directed to the Ministry's Spills Action Centre at 1-800-268-6060.

5.2 For Groundwater Takings

If the taking of water is observed to cause any negative impact to other water supplies obtained from any adequate sources that were in use prior to initial issuance of a Permit for this water taking, the Permit Holder shall take such action necessary to make available to those affected, a supply of water equivalent in quantity and quality to their normal takings, or shall compensate such persons for their reasonable costs of so doing, or shall reduce the rate and amount of taking to prevent or alleviate the observed negative impact. Pending permanent restoration of the affected supplies, the Permit Holder shall provide, to those affected, temporary water supplies adequate to meet their normal requirements, or shall compensate such persons for their reasonable costs of doing so.

If permanent interference is caused by the water taking, the Permit Holder shall restore the water supplies of those permanently affected.

6. Director May Amend Permit

The Director may amend this Permit by letter requiring the Permit Holder to suspend or reduce the taking to an amount or threshold specified by the Director in the letter. The suspension or reduction in taking shall be effective immediately and may be revoked at any time upon notification by the Director. This condition does not affect your right to appeal the suspension or reduction in taking to the Environmental Review Tribunal under the *Ontario Water Resources Act* , Section 100 (4).

The reasons for the imposition of these terms and conditions are as follows:

1. Condition 1 is included to ensure that the conditions in this Permit are complied with and can be enforced.

2. Condition 2 is included to clarify the legal interpretation of aspects of this Permit.

3. Conditions 3 through 6 are included to protect the quality of the natural environment so as to safeguard the ecosystem and human health and foster efficient use and conservation of waters. These conditions allow for the beneficial use of waters while ensuring the fair sharing, conservation and sustainable use of the waters of Ontario. The conditions also specify the water takings that are authorized by this Permit and the scope of this Permit.

In accordance with Section 100 of the Ontario Water Resources Act, R.S.O. 1990, you may by written Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 101 of the Ontario Water Resources Act, R.S.O. 1990, as amended, provides that the Notice requiring the hearing shall state:

1. The portions of the Permit or each term or condition in the Permit in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

In addition to these legal requirements, the Notice should also include:

a. The name of the appellant;
b. The address of the appellant;
c. The Permit to Take Water number;
d. The date of the Permit to Take Water;
e. The name of the Director;
f. The municipality within which the works are located;

This notice must be served upon:

The Secretary
Environmental Review Tribunal
655 Bay Street, 15th Floor
Toronto ON
M5G 1E5
Fax: (416) 326-5370
Email: ERTTribunalsecretary@ontario.ca

AND

The Director, Section 34.1,
Ministry of the Environment, Conservation and Parks
Floor 1, 135 St Clair Ave W
Toronto, ON
M4V 1P5

Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal:

by Telephone at	by Fax at	by e-mail at
(416) 212-6349	(416) 326-5370	www.ert.gov.on.ca
Toll Free 1(866) 448-2248	Toll Free 1(844) 213-3474	

This Permit cancels and replaces Permit Number 2728-B43LJ6, issued on 2018/09/07.

Dated at Toronto this 16th day of November, 2020.

Gregory Meek
Director, Section 34.1
Ontario Water Resources Act , R.S.O. 1990

Schedule A

This Schedule “A” forms part of Permit To Take Water 3410-BV7S4M, dated November 16, 2020.

Ontario

DRINKING WATER WORKS PERMIT

Permit Number: 205-201
Issue Number: 3

Pursuant to the *Safe Drinking Water Act*, 2002, S.O. 2002, c. 32, and the regulations made thereunder and subject to the limitations thereof, this drinking water works permit is issued under Part V of the *Safe Drinking Water Act*, 2002, S.O. 2002, c. 32 to:

The Corporation of the Town of Blind River

11 Hudson Street
P.O. Box 640
Blind River, ON
P0R 1B0

For the following municipal residential drinking water system:

Blind River Drinking Water System

This drinking water works permit includes the following:

Schedule	Description
Schedule A	Drinking Water System Description
Schedule B	General
Schedule C	All documents issued as Schedule C to this drinking water works permit which authorize alterations to the drinking water system
Schedule D	Process Flow Diagrams

DATED at TORONTO this 20th day of June, 2016

Signature

Aziz Ahmed, P.Eng.
Director
Part V, *Safe Drinking Water Act*, 2002

Schedule A: Drinking Water System Description

System Owner	**The Corporation of the Town of Blind River**
Permit Number	**205-201**
Drinking Water System Name	**Blind River Drinking Water System**
Schedule A Issue Date	**June 20, 2016**

1.0 System Description

1.1 The following is a summary description of the works comprising the above drinking water system:

Overview

The **Blind River Drinking Water System** consists of [5] groundwater wells and pump houses, [1] drinking water treatment plant, [2] storage reservoirs (clearwells), [1] elevated storage tanks and approximately 350 meters of trunk watermains and 35 kilometers of distribution watermains.

Groundwater Wells

Well No. 5

Description	Gravel packed well
Location	Located along the east shoreline of Blind River within the built-up section of the Town
UTM Coordinates	NAD27: Zone 17: Easting 349755: Northing 5116840
Dimensions	650 mm x 300 mm, depth 17.6 m
Equipment	Equipped with one (1) submersible pump capable of pumping a minimum of 6.3 L/s and a maximum of 13.24 L/s, discharging into a 400 mm common discharge header.
Notes	GUDI Well

Well No. 6

Description	Gravel packed well
Location	Located along the east shoreline of Blind River within the built-up section of the Town
UTM Coordinates	NAD27: Zone 17: Easting 349640: Northing 5116740
Dimensions	450 mm x 250 mm, depth 20.1 m
Equipment	Equipped with one (1) submersible pump capable of pumping a minimum of 6.3 L/s and a maximum of 13.24 L/s, discharging into a 400 mm common discharge header.
Notes	GUDI Well

Well No. 7

Description	Gravel packed well
Location	Located along the east shoreline of Blind River within the built-up section of the Town
UTM Coordinates	NAD27: Zone 17: Easting 349700: Northing 5116760
Dimensions	600 mm x 300 mm, depth approximately 20 m
Equipment	Equipped with one (1) submersible pump capable of pumping a minimum of 6.3 L/s and a maximum of 13.24 L/s, discharging into a 400 mm common discharge header.
Notes	GUDI Well

Well No. 8

Description	Naturally developed well
Location	Located along the east shoreline of Blind River within the built-up section of the Town
UTM Coordinates	NAD27: Zone 17: Easting 349875: Northing 5116980
Dimensions	200 mm diameter, casing to a depth of 21 m
Equipment	Equipped with one (1) submersible pump capable of pumping a minimum of 6.3 L/s and a maximum of 13.24 L/s, discharging into a 400 mm common discharge header.
Notes	GUDI Well

Well No. 9

Description	Drilled well
Location	Located along the east shoreline of Blind River within the built-up section of the Town near Riverside Drive
UTM Coordinates	NAD83: Zone: 17 Easting: 349607 Northing: 5116867
Dimensions	150 mm diameter, depth 15.24 m
Equipment	Equipped with one (1) submersible pump capable of pumping at 6.3 L/s discharging into a 100 mm pipe to the control building.
Notes	GUDI Well

Blind River Treatment Plant

Blind River Water Treatment Plant

Name	Blind River Water Treatment Plant
Street Address	47 Murray Street
UTM Coordinates	NAD 83: Zone 17: Easting 349593: Northing 5116383
System Type	Chemically assisted filtration and disinfection
Notes	Encloses treatment process units, water storage, pumping facilities, chemical feed and storage facilities, residue management system, loading and unloading facilities, electrical and SCADA control, mechanical equipment, a standby generator set, a laboratory and operations and visitor center. Three parallel treatment process trains, each rated at one third of the design maximum day flow of 6,000 m^3/day comprised of one in-line rapid mixer, three identical flocculation tanks, three dual media filters, three GAC contactors, de-sludging dual-media filtration and backwash facilities

Coagulation

In-Line Rapid Mixer

Description	One (1) in-line mechanical rapid mixer.
Dimensions	300 mm by 600 mm long
Notes	on the raw water header immediately after the coagulant injection location

Flocculation

Flocculation Tank

Description	Three (3) flocculation trains, operating in parallel, each train with two (2) flocculation cells in series.
Equipment	Each cell consisting of one (1) 17.36 m^3 concrete tank with one (1) variable speed drive mixer.
Notes	

Filtration

Dual Media Filters

Description	Gravity Flow Multi-Media Filter Beds
Equipment	Three (3) gravity flow multi-media filter beds with two layers, operating in parallel, each rated at one third of the design maximum day flow or 2000 m^3/day with a filtration rate of approximately 7 m/hr and a hydraulic capacity of 12 m/hr with automatic backwash by air scouring and equipped with filter-to-waste ripening cycle. Multi-media filter beds with a surface area of each filter unit of approximately 12.25 m^2 consisting of top 450 mm layer of anthracite and lower 500 mm layer of Filox-R media.
Notes	One (1) backwash blower capable of delivering approximately 530 SCFM.

GAC Contactors

Description	Three (3) granular activated carbon contactors operating in parallel.
Dimensions	Each contactor unit with a surface area of approximately 12.25 m^2 x 1.67 m depth
Capacity	Rated at (one third of the design maximum day flow) 2,000 m^3/day equipped with an automatic backwash with filtered water.
Equipment	Two (2) vertical turbine pumps (one duty one standby), each rated at 68 L/s pumping from the filtered water well.
Notes	

Instrumentation and Control

Continuous Monitoring/Control Equipment

Description	SCADA System
Equipment	One (1) flow meter on the raw water header, high lift pump discharge header, each dual-media filtered water discharge header, each GAC contactor discharge header, GAC transfer pump discharge header and backwash water pump discharge header.
	One (1) continuous free chlorine residual analyzer with an alarm and recorder on the high lift pump discharge header.
	One (1) continuous free chlorine residual analyzer with an alarm and recorder at the outlet of the water treatment plant after secondary chlorination.
	Ultra-sonic level transmitters on the flocculated water conduit, the dual-media filters, the dual-media filtered water wells, the GAC contactors, the clearwell cells and the residue holding tank.
	One (1) continuous turbidity meter with an alarm and recorder on the raw water header, each dual-media filter discharge pipe and the water treatment plant common discharge pipe.
	One (1) continuous fluoride residual analyzer with an alarm and recorder at the discharge from the water treatment plant.
Notes	

Backwash System

Description	Backwash system for backwashing the dual-media filters and GAC contactors
Equipment	Three (3) vertical turbine pumps (two duty one standby) each rated at 68 L/s at 13 m TDH.
	13.5 kW motor pumping from the filtered water well.
Notes	

Waste Residual Management

Residue Management System

Description	Temporary holding of process wastewater, directed to municipal WWTP
Equipment	One (1) residue holding tank approximately 4.6 m wide x 15.05 m long x 4.0 m SWD.
	Two (2) dry well end suction type pumps (one duty one standby), each rated at 6 L/s at 6.5 m TDH, pumping from the residue holding tank directly into the existing sanitary sewer over a 24 hour period at a uniform rate.
Notes	

High Lift Works

High Lift Pumps

Description	Four (4) vertical turbine pumps (three duty, one standby)
Capacity	Each rated at 34 L/s at 35 m TDH capable of operating simultaneously.
Notes	

On-Site Storage

Dual-Media Filtered Water Well (non-chlorinated)

Description	One (1) two-celled well
Dimensions	Each cell is 6.0 m wide x 8.0 m long x 5.5 m SWD or 127 m^3 (total 254 m^3).
Notes	

Clearwell Cells (chlorine contact)

Description	Two (2) four-compartment clearwell cells
Dimensions	Each with a useable volume of 243.7 m^2 x 5.5 m SWD or 1340.4 m^3 (total 2680.7 m^3).
Notes	

Pump Wells (chlorine contact)

Description	Two (2) high lift suction well.
Dimensions	Each with a useable volume of 4.5 m wide x 6.0 m long x 5.5 m SWD or 148.5 m^3 (total 297 m^3).
Notes	

Emergency Power

Standby Power

Description	
Equipment	One (1) 300 kW prime power standby power diesel generator, water-cooled, sized to accommodate the design maximum day flow located in a separate room of the Water Treatment Plant.
	One (1) 195 kW prime power standby power diesel generator, water-cooled, sized to operate all four existing well pumps and the control facilities in order to ensure continuous raw water supply to the Water Treatment Plant located in a separate room of the Control Building.
	UPS for the water treatment plant SCADA control system.
Notes	

Chemical Addition

Hydrofluosilicic Acid

Description	Fluoridation system
Feed Point	injecting into the high lift discharge header with a carrier water supply.
Equipment	One (1) 1,136 L hydrofluosilicic acid storage tank.
	Two (2) stepper motor driven positive-displacement diaphragm metering pumps, paced to finished water flow,
Notes	

Coagulant (PACL)

Description	Coagulant and coagulant aid system
Equipment	Two (2) 2000 L PACl (coagulant) storage tanks and two (2) 200 L polymer (coagulant aid) supply drums.
	Two (2) positive displacement diaphragm metering pumps for coagulant (one duty, one standby) and one (1) polymer metering pump for coagulant aid, paced to raw water flow, injecting into the raw water header upstream of the inline rapid mixer.
Notes	Notes: Coagulant may change as a result of jar-testing and new product trials to optimize process.

Sodium Hypochlorite

Description	Primary disinfection, pre and post chlorination as well as filter backwash
Equipment	Primary Disinfection - Two (2) common 4,000 L sodium hypochlorite storage tanks Two (2) stepper motor driven positive-displacement diaphragm metering pumps (one duty, one standby), paced to filtered water flow, injecting into the chlorine contact chamber with a carrier water supply, prior to discharge to the pumpwell.
	Post Chlorination - Two (2) stepper motor driven positive-displacement diaphragm metering pumps (one duty, one standby), paced to finished water flow, injecting into the high lift discharge header with a carrier water supply
	Pre-chlorination (provisional) - Two (2) common 4,000 L sodium hypochlorite storage tanks One (1) stepper motor driven positive-displacement diaphragm metering pump, paced to raw water flow, injecting into the raw water header with a carrier water supply, prior to the rapid mix chamber.
	Dual-media filter Backwash NaOCl (provisional) - Two (2) common 4,000 L sodium hypochlorite storage tanks. One (1) stepper motor driven positive-displacement diaphragm metering pump, paced to backwash water flow, injecting into the dual-media filter backwash header with a carrier water supply.
Notes	

Potassium Hydroxide

Description	pH adjustment system
Feed Point	filter effluent header prior to the GAC contactors.
Equipment	One (1) 1,000 L potassium hydroxide storage tank.
	Two (2) stepper motor driven positive-displacement diaphragm metering pumps, paced to filtered water flow,.
Notes	

Elevated Storage Tank

Name	The Town of Blind River Elevated Tank
Street Address	53 Queen Ave., Blind River,
UTM Coordinates	NAD83, Zone 17N, 5116530N, 349820E
System Type	Stand pipe, storage & system pressure
Notes	

Watermains

1.2 Watermains within the distribution system comprise:

1.2.1 Watermains that have been set out in each document or file identified in column 1 of Table 1.

Table 1: Watermains

Column 1 Document or File Name	Column 2 Date
Town of Blind River – Water Distribution System	May 30, 2016

1.2.2 Watermains that have been added, modified, replaced or extended further to the provisions of Schedule C of this drinking water works permit on or after the date identified in column 2 of Table 1 for each document or file identified in column 1.

1.2.3 Watermains that have been added, modified, replaced or extended further to an authorization by the Director on or after the date identified in column 2 of Table 1 for each document or file identified in column 1.

Schedule B: General

System Owner	**The Corporation of the Town of Blind River**
Permit Number	**205-201**
Drinking Water System Name	**Blind River Drinking Water System**
Schedule B Issue Date	**June 20, 2016**

1.0 Applicability

1.1 In addition to any other requirements, the drinking water system identified above shall be altered and operated in accordance with the conditions of this drinking water works permit and the licence.

1.2 The definitions and conditions of the licence shall also apply to this drinking water works permit.

2.0 Alterations to the Drinking Water System

2.1 Any document issued by the Director as a Schedule C to this drinking water works permit shall provide authority to alter the drinking water system in accordance, where applicable, with the conditions of this drinking water works permit and the licence.

2.2 All Schedule C documents issued by the Director for the drinking water system shall form part of this drinking water works permit.

2.3 All parts of the drinking water system in contact with drinking water which are:

2.3.1 Added, modified, replaced, extended; or

2.3.2 Taken out of service for inspection, repair or other activities that may lead to contamination,

shall be disinfected before being put into service in accordance with a procedure approved by the Director or in accordance with the applicable provisions of the following documents:

a) The ministry's Watermain Disinfection Procedure, effective December 20, 2016;
b) AWWA C652 – Standard for Disinfection of Water-Storage Facilities;
c) AWWA C653 – Standard for Disinfection of Water Treatment Plants; and
d) AWWA C654 – Standard for Disinfection of Wells.

2.4 The owner shall notify the Director within thirty (30) days of the placing into service or the completion of any addition, modification, replacement or extension of the drinking water system which had been authorized through:

2.4.1 Schedule B to this drinking water works permit which would require an alteration of the description of a drinking water system component described in Schedule A of this drinking water works permit;

2.4.2 Any Schedule C to this drinking water works permit respecting works other than watermains; or

2.4.3 Any approval issued prior to the issue date of the first drinking water works permit respecting works other than watermains which were not in service at the time of the issuance of the first drinking water works permit.

2.5 For greater certainty, the notification requirements set out in condition 2.4 do not apply to any addition, modification, replacement or extension in respect of the drinking water system which:

2.5.1 Is exempt from subsection 31(1) of the SDWA by subsection 9.(2) of O. Reg. 170/03;

2.5.2 Constitutes maintenance or repair of the drinking water system; or

2.5.3 Is a watermain authorized by condition 3.1 of Schedule B of this drinking water works permit.

2.6 The owner shall notify the legal owner of any part of the drinking water system that is prescribed as a municipal drinking water system by section 2 of O. Reg. 172/03 of the requirements of the licence and this drinking water works permit as applicable to the prescribed system.

2.7 For greater certainty, any alteration to the drinking water system made in accordance with this drinking water works permit may only be carried out after other legal obligations have been complied with including those arising from the *Environmental Assessment Act*, *Niagara Escarpment Planning and Development Act*, *Oak Ridges Moraine Conservation Act, 2001* and *Greenbelt Act, 2005*.

3.0 Watermain Additions, Modifications, Replacements and Extensions

3.1 The drinking water system may be altered by adding, modifying, replacing or extending a watermain within the distribution system subject to the following conditions:

3.1.1 The design of the watermain addition, modification, replacement or extension:

a) Has been prepared by a Professional Engineer;

b) Has been designed only to transmit water and has not been designed to treat water;

c) Satisfies the design criteria set out in the Ministry of the Environment and Climate Change publication “Watermain Design Criteria for Future Alterations Authorized under a Drinking Water Works Permit – June 2012”, as amended from time to time; and

d) Is consistent with or otherwise addresses the design objectives contained within the Ministry of the Environment and Climate Change publication “Design Guidelines for Drinking Water Systems, 2008”, as amended from time to time.

3.1.2 The maximum demand for water exerted by consumers who are serviced by the addition, modification, replacement or extension of the watermain will not result in an exceedance of the rated capacity of a treatment subsystem or the maximum flow rate for a treatment subsystem component as specified in the licence, or the creation of adverse conditions within the drinking water system.

3.1.3 The watermain addition, modification, replacement or extension will not adversely affect the distribution system's ability to maintain a minimum pressure of 140 kPa at ground level at all points in the distribution system under maximum day demand plus fire flow conditions.

3.1.4 Secondary disinfection will be provided to water within the added, modified, replaced or extended watermain to meet the requirements of O. Reg. 170/03.

3.1.5 The watermain addition, modification, replacement or extension is wholly located within the municipal boundary over which the owner has jurisdiction.

3.1.6 The owner of the drinking water system consents in writing to the watermain addition, modification, replacement or extension.

3.1.7 A Professional Engineer has verified in writing that the watermain addition, modification, replacement or extension meets the requirements of condition 3.1.1.

3.1.8 The owner of the drinking water system has verified in writing that the watermain addition, modification, replacement or extension meets the requirements of conditions 3.1.2 to 3.1.6.

3.2 The authorization for the addition, modification, replacement or extension of a watermain provided for in condition 3.1 does not include the addition, modification, replacement or extension of a watermain that:

3.2.1 Passes under or through a body of surface water, unless trenchless construction methods are used;

3.2.2 Has a nominal diameter greater than 750 mm;

3.2.3 Results in the fragmentation of the drinking water system; or

3.2.4 Connects to another drinking water system, unless:

a) Prior to construction, the owner of the drinking water system seeking the connection obtains written consent from the owner or owner's delegate of the drinking water system being connected to; and

b) The owner of the drinking water system seeking the connection retains a copy of the written consent from the owner or owner's delegate of the drinking water system being connected to as part of the record that is recorded and retained under condition 3.3.

3.3 The verifications required in conditions 3.1.7 and 3.1.8 shall be:

3.3.1 Recorded on "Form 1 – Record of Watermains Authorized as a Future Alteration", as published by the Ministry of the Environment and Climate Change, prior to the watermain addition, modification, replacement or extension being placed into service; and

3.3.2 Retained for a period of ten (10) years by the owner.

3.4 For greater certainty, the verification requirements set out in condition 3.3 do not apply to any addition, modification, replacement or extension in respect of the drinking water system which:

3.4.1 Is exempt from subsection 31(1) of the SDWA by subsection 9.(2) of O. Reg. 170/03; or

3.4.2 Constitutes maintenance or repair of the drinking water system.

3.5 The document or file referenced in Column 1 of Table 1 of Schedule A of this drinking water works permit that sets out watermains shall be retained by the owner and shall be updated to include watermain additions, modifications, replacements and extensions within 12 months of the addition, modification, replacement or extension.

3.6 The updates required by condition 3.5 shall include watermain location relative to named streets or easements and watermain diameter.

4.0 Minor Modifications to the Drinking Water System

4.1 The drinking water system may be altered by adding, modifying or replacing the following components in the drinking water system:

4.1.1 Raw water pumps and treatment process pumps in the treatment system;

4.1.2 Coagulant feed systems in the treatment system, including the location and number of dosing points;

4.1.3 Valves;

4.1.4 Instrumentation and controls, including SCADA systems, and software associated with these devices;

4.1.5 Filter media, backwashing equipment and under-drains in the treatment system; or,

4.1.6 Spill containment works.

4.2 The drinking water system may be altered by adding, modifying, replacing or removing the following components in the drinking water system:

4.2.1 Treated water pumps and associated equipment;

4.2.2 Re-circulation devices within distribution system storage facilities;

4.2.3 In-line mixing equipment;

4.2.4 Chemical metering pumps and chemical handling pumps;

4.2.5 Chemical storage tanks (excluding fuel storage tanks) and associated equipment; or,

4.2.6 Measuring and monitoring devices that are not required by regulation, by a condition in the Drinking Water Works Permit, or by a condition otherwise imposed by the Ministry of the Environment and Climate Change.

4.3 The drinking water system may be altered by replacing the following:

4.3.1 Raw water piping, treatment process piping or treated water piping within the treatment subsystem;

4.3.2 Fuel storage tanks and spill containment works, and associated equipment; or

4.3.3 Coagulants and pH adjustment chemicals, where the replacement chemicals perform the same function;

a) Prior to making any alteration to the drinking water system under condition 4.3.3, the owner shall undertake a review of the impacts that the alteration might have on corrosion control or other treatment processes; and

b) The owner shall notify the Director in writing within thirty (30) days of any alteration made under condition 4.3.3 and shall provide the Director with a copy of the review.

4.4 Any alteration of the drinking water system made under conditions 4.1, 4.2 or 4.3 shall not result in:

4.4.1 An exceedance of a treatment subsystem rated capacity or a treatment subsystem component maximum flow rate as specified in the licence;

4.4.2 The bypassing of any unit process within a treatment subsystem;

4.4.3 A deterioration in the quality of drinking water provided to consumers;

4.4.4 A reduction in the reliability or redundancy of any component of the drinking water system;

4.4.5 A negative impact on the ability to undertake compliance and other monitoring necessary for the operation of the drinking water system; or

4.4.6 An adverse effect on the environment.

4.5 The owner shall verify in writing that any addition, modification, replacement or removal of drinking water system components in accordance with conditions 4.1, 4.2 or 4.3 has met the requirements of the conditions listed in condition 4.4.

4.6 The verifications and documentation required in condition 4.5 shall be:

4.6.1 Recorded on "Form 2 – Record of Minor Modifications or Replacements to the Drinking Water System", as published by the Ministry of the Environment and Climate Change, prior to the modified or replaced components being placed into service; and

4.6.2 Retained for a period of ten (10) years by the owner.

4.7 For greater certainty, the verification requirements set out in conditions 4.5 and 4.6 do not apply to any addition, modification, replacement or removal in respect of the drinking water system which:

4.7.1 Is exempt from subsection 31(1) of the SDWA by subsection 9.(2) of O. Reg. 170/03; or

4.7.2 Constitutes maintenance or repair of the drinking water system.

4.8 The owner shall update any drawings maintained for the drinking water system to reflect the modification or replacement of the works, where applicable.

5.0 Equipment with Emissions to the Air

5.1 The drinking water system may be altered by adding, modifying or replacing any of the following drinking water system components that may discharge or alter the rate or manner of a discharge of a compound of concern to the atmosphere:

5.1.1 Any equipment, apparatus, mechanism or thing that is used for the transfer of outdoor air into a building or structure that is not a cooling tower;

5.1.2 Any equipment, apparatus, mechanism or thing that is used for the transfer of indoor air out of a space used for the production, processing, repair, maintenance or storage of goods or materials, including chemical storage;

5.1.3 Laboratory fume hoods used for drinking water testing, quality control and quality assurance purposes;

5.1.4 Low temperature handling of compounds with a vapor pressure of less than 1 kilopascal;

5.1.5 Maintenance welding stations;

5.1.6 Minor painting operations used for maintenance purposes;

5.1.7 Parts washers for maintenance shops;

5.1.8 Emergency chlorine and ammonia gas scrubbers and absorbers;

5.1.9 Venting for activated carbon units for drinking water taste and odour control;

5.1.10 Venting for a stripping unit for methane removal from a groundwater supply;

5.1.11 Venting for an ozone treatment unit;

5.1.12 Natural gas or propane fired boilers, water heaters, space heaters and make-up air units with a total facility-wide heat input rating of less than 20 million kilojoules per hour, and with an individual fuel energy input of less than or equal to 10.5 gigajoules per hour; or

5.1.13 Emergency generators that fire No. 2 fuel oil (diesel fuel) with a sulphur content of 0.5 per cent or less measured by weight, natural gas, propane, gasoline or biofuel, and that are used for emergency duty only with periodic testing.

5.2 The owner shall not add, modify or replace a drinking water system component set out in condition 5.1 for an activity that is not directly related to the treatment and/or distribution of drinking water.

5.3 The emergency generators identified in condition 5.1.13 shall not be used for non-emergency purposes including the generation of electricity for sale or for peak shaving purposes.

5.4 The owner shall prepare an emission summary table for nitrogen oxide emissions only, for each addition, modification or replacement of emergency generators identified in condition 5.1.13.

Performance Limits

5.5 The owner shall ensure that a drinking water system component identified in conditions 5.1.1 to 5.1.13 is operated at all times to comply with the following limits:

5.5.1 For equipment other than emergency generators, the maximum concentration of any compound of concern at a point of impingement shall not exceed the corresponding point of impingement limit;

5.5.2 For emergency generators, the maximum concentration of nitrogen oxides at sensitive populations shall not exceed the applicable point of impingement limit, and at non-sensitive populations shall not exceed the Ministry of the Environment and Climate Change half-hourly screening level of 1880 ug/m^3 as amended; and

5.5.3 The noise emissions comply at all times with the limits set out in publication NPC-300, as applicable.

5.6 The owner shall verify in writing that any addition, modification or replacement of works in accordance with condition 5.1 has met the requirements of the conditions listed in condition 5.5.

5.7 The owner shall document how compliance with the performance limits outlined in condition 5.5.3 is being achieved, through noise abatement equipment and/or operational procedures.

5.8 The verifications and documentation required in conditions 5.6 and 5.7 shall be:

5.8.1 Recorded on “Form 3 – Record of Addition, Modification or Replacement of Equipment Discharging a Contaminant of Concern to the Atmosphere”, as published by the Ministry of the Environment and Climate Change, prior to the additional, modified or replacement equipment being placed into service; and

5.8.2 Retained for a period of ten (10) years by the owner.

5.9 For greater certainty, the verification and documentation requirements set out in conditions 5.6 and 5.8 do not apply to any addition, modification or replacement in respect of the drinking water system which:

5.9.1 Is exempt from subsection 31(1) of the SDWA by subsection 9.(2) of O. Reg. 170/03; or

5.9.2 Constitutes maintenance or repair of the drinking water system.

5.10 The owner shall update any drawings maintained for the works to reflect the addition, modification or replacement of the works, where applicable.

6.0 Previously Approved Works

6.1 The owner may add, modify, replace or extend, and operate part of a municipal drinking water system if:

6.1.1 An approval was issued after January 1, 2004 under section 36 of the SDWA in respect of the addition, modification, replacement or extension and operation of that part of the municipal drinking water system;

6.1.2 The approval expired by virtue of subsection 36(4) of the SDWA; and

6.1.3 The addition, modification, replacement or extension commenced within five years of the date that activity was approved by the expired approval.

7.0 System-Specific Conditions

7.1 Not Applicable

8.0 Source Protection

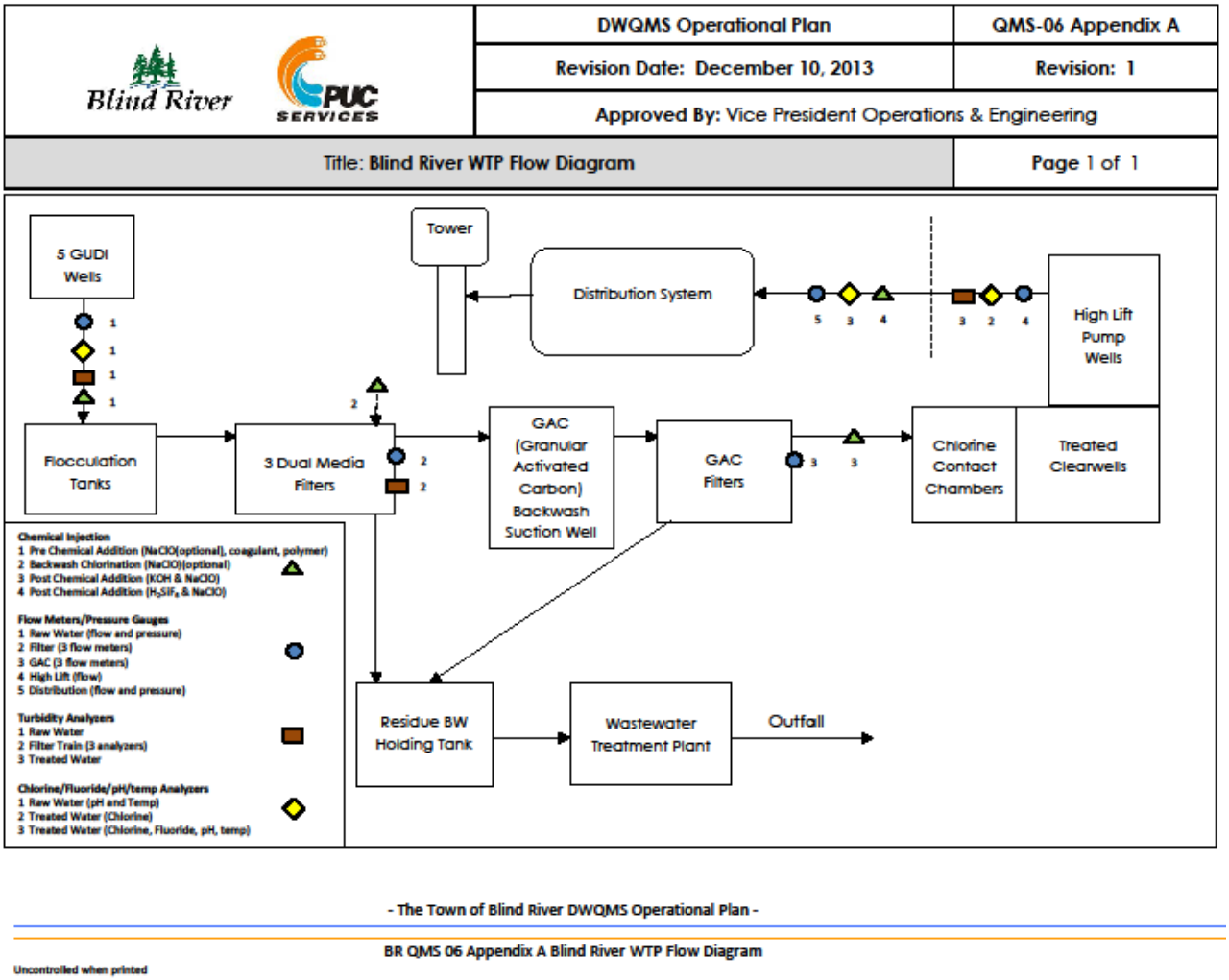
8.1 Not Applicable

Schedule D: Process Flow Diagrams

System Owner	**The Corporation of the Town of Blind River**
Permit Number	**205-201**
Drinking Water System Name	**Blind River Drinking Water System**
Schedule D Issue Date	**June 20, 2016**

1.0 Process Flow Diagrams

Blind River Water Treatment Plant



[Source: Blind River Drinking Water System DWQMS Operation Plan Number 205-401, April 10, 2012]

F

Appendix F: Detailed Evaluation Matrix

Project Title: **Blind River Intake Location Comparison**

Client: Blind River

Project No.: T001592B

Task: Detailed Evaluation of Intake Location Alternatives

Prepared By: K.Farrow **Date:**

Reviewed by: T. Rapley **Revision Date:**

Revision No. : 1 **Revision Date:**

Category	Weight	Criteria	Option 3A			Option 3B			Option 3C			Option 3D		
			Rationale	Score 1 to 5	Weighted Score	Rationale	Score 1 to 5	Weighted Score	Rationale	Score 1 to 5	Weighted Score	Rationale	Score 1 to 5	Weighted Score
Water Quality	20	**Raw Water Quality -** Concentration of water quality parameters and chemicals of concern in the sediments for each potential intake location.	Sampling for selected raw water quality parameters such as temperature, turbidity, pH, chloride, dissolved organic carbon, total dissolved solids, and radionuclides will yeild more informative results. Water sampling under different weather conditions is recommended to confirm water quality variability/consistency. Sediment samples may be required to provide an indication of sediment characteristics within the area. This option has the highest potential to recieve infiltration from the neighbouring recreational marina, and the outfall from the river and WWTP situated to the west. Most recent recorded sampling results from this area show no water quality concerns. This Bay area of Lake Huron is physically well protected. The selected location of the LLPS will have little to no impact on the raw water quality.	3.7	4.9	Sampling for selected raw water quality parameters such as temperature, turbidity, pH, chloride, dissolved organic carbon, total dissolved solids, and radionuclides will yeild more informative results. Water sampling under different weather conditions is recommended to confirm water quality variability/consistency. Sediment samples may be required to provide an indication of sediment characteristics within the area. This area is well protected from current fluctuations and directly inline with any surrounding discharge outfalls. The selected location of the LLPS will have little to no impact on the raw water quality.	4.5	6.0	Sampling for selected raw water quality parameters such as temperature, turbidity, pH, chloride, dissolved organic carbon, total dissolved solids, and radionuclides will yeild more informative results. Water sampling under different weather conditions is recommended to confirm water quality variability/consistency. Sediment samples may be required to provides an indication of sediment characteristics within the area. This area is the deepest which is more likely to provide a higher quality and stable resource of raw water. The selected location of the LLPS will have little to no impact on the raw water quality.	4.8	6.4	Sampling for selected raw water quality parameters such as temperature, turbidity, pH, chloride, dissolved organic carbon, total dissolved solids, and radionuclides will yeild more informative results. Water sampling under different weather conditions is recommended to confirm water quality variability/consistency. Sediment samples may be required to provides an indication of sediment characteristics within the area. This option has the lowest potential to recieve infiltration from neighbouring sources of pollution (marina, wwtp). This area is also the most shallow of options and as such will probably be more susceptible to current changes and seasonal turnover. The selected location of the LLPS will have little to no impact on the raw water quality.	3.8	5.1
		Risk to Contaminants - Potential vulnerability/risk of new intake to contaminants based on intake depth, distance from shore, proximity to potential sources of contaminants such as creek discharges, storm outfalls, drainage ditches, etc.)	The assessed vulnerability factor for the intake area will be determined in qualitative studies performed prior to design and construction. In this area the lake bed is 2.7-3.0 meters deep, the second deepest being reviewed in this evaluation, but still relatively shallow. Shallow water intakes are historically affected by weather changes that can stir up suspended solids and increase the raw water turbidity. Deeper water generally provides more protection from water quality impacts from weather and water current fluctuations. This option has the highest potential to recieve infiltration from the neighbouring Wastewater outfall & the recreational Marina. This area also has the highest potential to be influenced by the Creek and River seasonal runoff which could introduce high levels of turbidity into the new intake depending on the wind and current direction. Most recent recorded sampling results from this area show no water quality contamination of concern. The selected location of the LLPS will have little to no impact on the risk to contaminants.	3.5	4.7	The assessed vulnerability factor for the intake area will be determined in qualitative studies performed prior to design and construction. In this area the lake bed is 2.4-3.0 meters deep. Deeper water generally provides more protection from water quality impacts from weather and current fluctuations. This area is relatively shallow but protected from current fluctuation by the surrounding peninsulas to the east and west of the site. It is also not directly impacted by recreation, tributary influent or industrial outfalls. The selected location of the LLPS will have little to no impact on the risk to contaminants.	4.5	6.0	The assessed vulnerability factor for the intake area will be determined in qualitative studies performed prior to design and construction. In this area the lake bed is 3.7-4.3 meters deep, the deepest being reviewed in this evaluation. Deeper water generally provides more protection from water quality impacts from weather and current fluctuations. The selected location of the LLPS will have little to no impact on the risk to contaminants.	4.5	6.0	The assessed vulnerability factor for the intake area will be determined in qualitative studies performed prior to design and construction. In this area the lake bed is 2.1- 2.4m meters deep, the most shallow of the options. Deeper water generally provides more protection from water quality impacts from weather and current fluctuations. This area is relatively shallow but situated the farthest from potential impacts from recreation, tributary influent or industrial outfalls. There is added protection from the surrounding peninsulas. The selected location of the LLPS will have little to no impact on the risk to contaminants	4.5	6.0
		Capacity Requirements - Ability to meet flow and system pressure demands	A lake-based source has the potenial to continuously provide a large volume of water. The new intake pipe will be designed to meet/exceed flow capacities, pressure demands and provide for future growth and expansion needs. Approximate depth for this intake structure is 2.7-3m. When designing the intake, the length to which it extends from the shoreline could result in an improvement in the vulnerability factor for the overall intake area. Zebra mussel control and frazil ice risks shoud be assessed and mitigated in the overall system design.	4.3	5.7	A lake-based source has the potenial to continuously provide a large volume of water. The new intake pipe will be designed to meet/exceed flow capacities, pressure demands and provide for future growth and expansion needs. Approximate depth for this intake structure is 2.4-3m. This is the second shallowest option but has added protection from Caribou Point and Henriette Peninsula. When designing the intake, the length to which it extends from the shoreline could result in an improvement in the vulnerability factor for the overall intake area. Zebra mussel control and frazil ice risks shoud be assessed and mitigated in the overall system design.	4.1	5.5	A lake-based source has the potenial to continuously provide a large volume of water. The new intake pipe will be designed to meet/exceed flow capacities, pressure demands and provide for future growth and expansion needs. Approximate depth for this intake structure is 3.7-4.3m which is the deepest option. Deeper waters provide more resilience and protection to the source intake. When designing the intake, the length to which it extends from the shoreline could result in an improvement in the vulnerability factor for the overall intake area. Zebra mussel control and frazil ice risks shoud be assessed and mitigated in the overall system design.	4.9	6.5	A lake-based source has the potenial to continuously provide a large volume of water. The new intake pipe will be designed to meet/exceed flow capacities, pressure demands and provide for future growth and expansion needs. Approximate depth for this intake structure is 2.1-2.4m and is the most shallow option. When designing the intake, the length to which it extends from the shoreline could result in an improvement in the vulnerability factor for the overall intake area. Zebra mussel control and frazil ice risks shoud be assessed and mitigated in the overall system design.	3.7	4.9
Maximum Sub-total Score – Water Quality		**20**			**15.3**			**17.5**			**18.9**			**16.0**
Natural Environment	15	**Natural Heritage Features –** Potential impacts to existing natural environment, including terrestrial and aquatic habitats, wildlife and wildlife habitats, sensitive features, areas of natural and scientific interest, etc.	Inland installation of intake pipe will traverse some vegetation communities, which support terrestrial and wildlife habitats, including Blanding's Turtle ,an endangered species that prefers dark, shallow water habitats. Removal of trees which are suitable habitat for species of special concern in the area; including the Peregrine Falcon and the Ferruginous Hawk, may be required to accommodate open cut trenching for the offshore pipe section. These species require open habitats for foraging, with typical nesting on trees and platforms near water. Potential impacts can be mitigated by minimizing tree removal, avoiding construction in their habitat or through application of timing windows for tree clearing activities and breeding, if needed. In-water works will fall within waterfowl concentration areas and in the vicinity of Lake Sturgeon (species of special concern) spawning locations. Construction should not be scheduled to coincide with spawning season when Lake Sturgeon migrate to shallow waters. The Northern Brook Lamprey (endangered species) prefers fast flowing rivers and not lakes so it may be more likely they live in the river that feeds into the lake. Possibility exists of nest on the shore where construction will occur and eggs may be present depending on the time of year. Open-cut marine trench in the lake bottom will be dredged along the entire pipe alignment from the shoreline out to the offshore intake structure position that will impact aquatic habitats and species. Available mitigation measures include implementation of timing windows, setbacks and erosion/sediment control measures. Further studies will need to be completed to confirm potential spawning habitats and specific mitigation measures. Further consultation with MECP will be required to ensure compliance with Endangered Species Act. Effort will be made to situate staging and laydown areas away from the beach and forest/swamp edges to minimize impacts to habitats. This area is closest to human activity which may limit the likelihood of wildlife populations.	4.5	4.5	Inland installation of intake pipe 3B will traverse vegetation communities, which support terrestrial and wildlife habitats, including Blanding's Turtle ,an endangered species that prefers dark, shallow water habitats. Removal of trees which are suitable habitat for species of special concern in the area; including the Peregrine Falcon and the Ferruginous Hawk, may be required to accommodate open cut trenching for the offshore pipe section. These species require open habitats for foraging, with typical nesting on trees and platforms near water. Potential impacts can be mitigated by minimizing tree removal, avoiding construction in their habitat or through application of timing windows for tree clearing activities and breeding, if needed. In-water works will fall within waterfowl concentration areas and in the vicinity of Lake Sturgeon (species of special concern) spawning locations. Construction should not be scheduled to coincide with spawning season when Lake Sturgeon migrate to shallow waters. The Northern Brook Lamprey (endangered species) prefers fast flowing rivers and not lakes so it may be more likely they live in the river that feeds into the lake. Possibility exists of nest on the shore where construction will occur and eggs may be present depending on the time of year. Open-cut marine trench in the lake bottom will be dredged along the entire pipe alignment from the shoreline out to the offshore intake structure position that will impact aquatic habitats and species. Available mitigation measures include implementation of timing windows, setbacks and erosion/sediment control measures. Further studies will need to be completed to confirm potential spawning habitats and specific mitigation measures. Further consultation with MECP will be required to ensure compliance with Endangered Species Act. Effort will be made to situate staging and laydown areas away from the beach and forest/swamp edges to minimize impacts to habitats. This area has less human impact as it is slightly more remote than 3a, increasing the likelihood of wildlife populations.	4.0	4.0	Inland installation of intake pipe 3C will traverse significant vegetation communities, which support terrestrial and wildlife habitats, including Blanding's Turtle ,an endangered species that prefers dark, shallow water habitats. Removal of trees which are suitable habitat for species of special concern in the area; including the Peregrine Falcon and the Ferruginous Hawk, may be required to accommodate open cut trenching for the offshore pipe section. These species require open habitats for foraging, with typical nesting on trees and platforms near water. Potential impacts can be mitigated by minimizing tree removal, avoiding construction in their habitat or through application of timing windows for tree clearing activities and breeding, if needed. In-water works will fall within waterfowl concentration areas and in the vicinity of Lake Sturgeon (species of special concern) spawning locations. Construction should not be scheduled to coincide with spawning season when Lake Sturgeon migrate to shallow waters. The Northern Brook Lamprey (endangered species) prefers fast flowing rivers and not lakes so it may be more likely they live in the river that feeds into the lake. Possibility exists of nest on the shore where construction will occur and eggs may be present depending on the time of year. Open-cut marine trench in the lake bottom will be dredged along the entire pipe alignment from the shoreline out to the offshore intake structure position that will impact aquatic habitats and species. Available mitigation measures include implementation of timing windows, setbacks and erosion/sediment control measures. Further studies will need to be completed to confirm potential spawning habitats and specific mitigation measures. Further consultation with MECP will be required to ensure compliance with Endangered Species Act. Effort will be made to situate staging and laydown areas away from the beach and forest/swamp edges to minimize impacts to habitats. This area is remote and will require a significantly high amount of tree removal and wildlife habitat disposition.	3.0	3.0	Inland installation of intake pipe 3D will traverse vegetation communities, which support terrestrial and wildlife habitats, including Blanding's Turtle ,an endangered species that prefers dark, shallow water habitats. Removal of trees which are suitable habitat forSpecies of special concern in the area; including the Peregrine Falcon and the Ferruginous Hawk, may be required to accommodate open cut trenching for the offshore pipe section. These species require open habitats for foraging, with typical nesting on trees and platforms near water. Potential impacts can be mitigated by minimizing tree removal, avoiding construction in their habitat or through application of timing windows for tree clearing activities and breeding, if needed. In-water works will fall within waterfowl concentration areas and in the vicinity of Lake Sturgeon (species of special concern) spawning locations. Construction should not be scheduled to coincide with spawning season when Lake Sturgeon migrate to shallow waters. The Northern Brook Lamprey (endangered species) prefers fast flowing rivers and not lakes so it may be more likely they live in the river that feeds into the lake. Possibility exists of nest on the shore where construction will occur and eggs may be present depending on the time of year. Open-cut marine trench in the lake bottom will be dredged along the entire pipe alignment from the shoreline out to the offshore intake structure position that will impact aquatic habitats and species. Available mitigation measures include implementation of timing windows, setbacks and erosion/sediment control measures. Further studies will need to be completed to confirm potential spawning habitats and specific mitigation measures. Further consultation with MECP will be required to ensure compliance with Endangered Species Act. Effort will be made to situate staging and laydown areas away from the beach and forest/swamp edges to minimize impacts to habitats. This area is the most remote from human activity but will require slightly less tree removal than option 3C.	3.5	3.5
		Climate Change – Potential impact on climatic conditions during construction and project vulnerability to changing climatic conditions.	Intake structure for 3A will require the incorporation of special design considerations to accomodate the shallow depth of this location, in order to provide a security buffer to the intake should water levels in Lake Huron start to decrease from extreme droughts or shift in water levels (although not historically experienced). Frazil ice and Zebra mussel mitigation systems will be required to ensure the pipe does not accumulate a build up of either. Intake pipeline and marine construction will include a top layer of scour protection (concrete ballast) to ensure pipeline protection from potential extreme climatic conditions, such as strong wave actions and storms. Excavated rock material from lake bottom is expected to be used to backfill the remainder of the trench and return lake bottom to its original contours, which will eliminate/reduce the need to transport and dispose excavated material offsite. Pipe 3A will be the shortest from the WTP and subsequently the least invasive or waste producing during construction.	4.5	4.5	Intake structure for 3B will require the incorporation of special design considerations to accomodate the shallow depth of this location, in order to provide a security buffer to the intake should water levels in Lake Huron start to decrease from extreme droughts or shift in water levels (although not historically experienced). Frazil ice and Zebra mussel mitigation systems will be required to ensure the pipe does not accumulate a build up of either. Intake pipeline and marine construction will include a top layer of scour protection (concrete ballast) to ensure pipeline protection from potential extreme climatic conditions, such as strong wave actions and storms. Excavated rock material from lake bottom is expected to be used to backfill the remainder of the trench and return lake bottom to its original contours, which will eliminate/reduce the need to transport and dispose excavated material offsite. Pipe 3B will be the second shortest from the WTP and subsequently less invasive and waste producing than options C & D.	4.0	4.0	Intake structure for 3C is proposed to be the deepest but will still sit 1-2 m above the lakebed floor (3.7-4.3m) and might require the incorporation of special design considerations to accomodate the depth of this location, in order to provide a security buffer to the intake should water levels in Lake Huron start to decrease from extreme droughts or shift in water levels (although not historically experienced). Frazil ice and Zebra mussel mitigation systems will be required to ensure the pipe does not accumulate a build up of either. Intake pipeline and marine construction will include a top layer of scour protection (concrete ballast) to ensure pipeline protection from potential extreme climatic conditions, such as strong wave actions and storms. Excavated rock material from lake bottom is expected to be used to backfill the remainder of the trench and return lake bottom to its original contours, which will eliminate/reduce the need to transport and dispose excavated material offsite. Pipe 3C and 3D will be the furthest distance from the WTP and subsequently the most invasive and waste producing during construction.	3.5	3.5	Intake structure for 3D will require the incorporation of special design considerations to accomodate the shallow depth of this location, in order to provide a security buffer to the intake should water levels in Lake Huron start to decrease from extreme droughts or shift in water levels (although not historically experienced). Frazil ice and Zebra mussel mitigation systems will be required to ensure the pipe does not accumulate a build up of either. Intake pipeline and marine construction will include a top layer of scour protection (concrete ballast) to ensure pipeline protection from potential extreme climatic conditions, such as strong wave actions and storms. Excavated rock material from lake bottom is expected to be used to backfill the remainder of the trench and return lake bottom to its original contours, which will eliminate/reduce the need to transport and dispose excavated material offsite. Pipe 3C and 3D will be the furthest distance from the WTP and subsequently the most invasive and waste producing during construction.	3.7	3.7
		Source Water Protection – Potential impact on source water protection areas and compliance with source water protection policies.	Source water protection vulnerabilities would normally need to be assessed to reflect new intake location. Blind River, Algoma District are not listed in O.Reg. 284/07 of the Clean Water Act, (2006) as Source Protection Areas/Regions. The Town of Blind River will be voluntarily undertaking a vulnerability and threats assessment and IPZ delineation study for the selected new intake location.	4.5	4.5	Source water protection vulnerabilities would normally need to be assessed to reflect new intake location. Blind River, Algoma District are not listed in O.Reg. 284/07 of the Clean Water Act, (2006) as Source Protection Areas/Regions. The Town of Blind River will be voluntarily undertaking a vulnerability and threats assessment and IPZ delineation study for the selected new intake location.	4.5	4.5	Source water protection vulnerabilities would normally need to be assessed to reflect new intake location. Blind River, Algoma District are not listed in O.Reg. 284/07 of the Clean Water Act, (2006) as Source Protection Areas/Regions. The Town of Blind River will be voluntarily undertaking a vulnerability and threats assessment and IPZ delineation study for the selected new intake location.	4.5	4.5	Source water protection vulnerabilities would normally need to be assessed to reflect new intake location. Blind River, Algoma District are not listed in O.Reg. 284/07 of the Clean Water Act, (2006) as Source Protection Areas/Regions. The Town of Blind River will be voluntarily undertaking a vulnerability and threats assessment and IPZ delineation study for the selected new intake location.	4.5	4.5
Maximum Sub-total Score – Natural Environment		**15**			**13.5**			**12.5**			**11.0**			**11.7**

Project Title: **Blind River Intake Location Comparison**

Client: Blind River

Project No.: T001592B

Task: Detailed Evaluation of Intake Location Alternatives

Prepared By: K.Farrow **Date:**

Reviewed by: T. Rapley **Revision Date:**

Revision No. : 1 **Revision Date:**

Category	Weight	Criteria	Option 3A			Option 3B			Option 3C			Option 3D		
			Rationale	Score 1 to 5	Weighted Score	Rationale	Score 1 to 5	Weighted Score	Rationale	Score 1 to 5	Weighted Score	Rationale	Score 1 to 5	Weighted Score
Socio-Cultural	15	**Public Health and Safety –** Potential risk to public and operations staff health and safety related to water quality, and construction and operation of new intake pipeline and structure.	Water quality of the area surrounding intake structure for 3A will require further assessment to ensure it aligns with the ODWQ standards. This area of North Lake Huron is characteristically pristine, with very little impact from emerging concerns or industrial activity. Onshore and offshore construction will adhere to standard safety operating procedures to ensure a high level of safety while working on,near, above and below the water and ground works.	5.0	5.0	Water quality of the area surrounding intake structure for 3B will require further assessment to ensure it aligns with the ODWQ standards. This area of North Lake Huron is characteristically pristine, with very little impact from emerging concerns or industrial activity. Onshore and offshore construction will adhere to standard safety operating procedures to ensure a high level of safety while working on,near, above and below the water and ground works.	5.0	5.0	Water quality of the area surrounding intake structure for 3C will require further assessment to ensure it aligns with the ODWQ standards. This area of North Lake Huron is characteristically pristine, with very little impact from emerging concerns or industrial activity. Onshore and offshore construction will adhere to standard safety operating procedures to ensure a high level of safety while working on,near, above and below the water and ground works.	5.0	5.0	Water quality of the area surrounding intake structure for 3D will require further assessment to ensure it aligns with the ODWQ standards. This area of North Lake Huron is characteristically pristine, with very little impact from emerging concerns or industrial activity. Onshore and offshore construction will adhere to standard safety operating procedures to ensure a high level of safety while working on,near, above and below the water and ground works.	5.0	5.0
		Long-term Impacts – Potential long-term impact on adjacent residents and local users from siting of new infrastructure.	No long-term impacts on adjacent residents or local users are anticipated.	5.0	5.0	A section of the onshore intake pipeline may cross the roadway that leads to the neighbouring private property, which could result in a minor long-term nuisance for the adjacent property owner. Placement will be reviewed during design and effort made to avoid this predicament.	4.0	4.0	Minor aesthetic long-term impacts are possible with the construction through the forested region. Every effort will be made to minimize impact.	4.5	4.5	Minor aesthetic long-term impacts are possible with the construction through the forested region. Every effort will be made to minimize impact.	4.5	4.5
		Short-term Impacts – Potential short-term disruption to local residents, businesses, commercial and recreational activities due to construction (i.e., noise, dust, vibration, visual, access, parking, road and beach areas closures)	Construction of an in-water intake pipe could impact boat traffic and potential navigation ways, and may impede or limit recreational activities on the adjacent private beaches during the in-water construction period. In-water works shall comply with the Canadian Navigable Waters Act and ensure no interference with navigation. Moderate construction disruptions to local residents in the immediate surrounding area such as noise, dust and vibration resulting from bedrock drilling and blasting will be experienced during the construction period. The inground portion of the pipe construction will be aligned with road ways and existing mains, causing a small level of discomfort to local residents during construction with lane closures, detours and water connections. There maybe some beach closures or shoreline activity limitations associated with this option.	3.5	3.5	Construction of an in-water intake pipe could impact boat traffic and potential navigation ways, and may impede or limit recreational activities on the adjacent private beaches during the in-water construction period. In-water works shall comply with the Canadian Navigable Waters Act and ensure no interference with navigation. Moderate construction disruptions to local residents in the immediate surrounding area such as noise, dust and vibration resulting from bedrock drilling and blasting will be experienced during the construction period. The inground portion of the pipe construction will be aligned with road ways and existing mains, causing a small level of discomfort to local residents during construction with lane closures, detours and water connections. There maybe some shoreline activity limitations, for one private property, associated with this option.	4.0	4.0	Construction of an in-water intake pipe could impact boat traffic and potential navigation ways, and may impede or limit activities during the in-water construction period. In-water works shall comply with the Canadian Navigable Waters Act and ensure no interference with navigation. Moderate construction disruptions to local residents in the immediate surrounding area such as noise, dust and vibration resulting from drilling, blasting, directional boring, digging and tree removal will be experienced during theconstruction period. The inground portion of the pipe construction will be aligned with road ways and existing mains, causing a small level of discomfort to local residents during construction with lane closures, detours and water connections. There maybe some shoreline activity limitations associated with this option but the area is more remote and not used for recreational or industrial purposes at this time. Due to the extended length of this pipe the construction period is expected to be longer.	4.0	4.0	Construction of an in-water intake pipe could impact boat traffic and potential navigation ways, and may impede or limit recreational activities during the in-water construction period. In-water works shall comply with the Canadian Navigable Waters Act and ensure no interference with navigation. Moderate construction disruptions to local residents in the immediate surrounding area such as noise, dust and vibration resulting from drilling and blasting, directional boring and tree removal will be experienced during the construction period. A good portion of the inground pipe construction will be aligned with road ways and existing mains, causing a small level of discomfort to local residents during construction with lane closures, detours and water connections. There maybe some shoreline activity limitations associated with this option but the area is more remote and not used for recreational or industrial purposes at this time. This pipe is the longest option and thus will require a more extensive contruction period	4.0	4.0
Maximum Sub-total Score – Socio-Cultural		**15**			**13.5**			**13.0**			**13.5**			**13.5**
Technical and Operational	30	**Ease of Implementation –** Potential levels of complexity during construction,conflicts with existing infrastruture,ability to facilitate construction with uninteruppted supply and reasonable timeframe.	The implementation and construction of the new intake option 3A will be phased to provide an uninterrupted supply of safe drinking water to the Town with minimal inconvenience. The new infrastructure will be aligned with the existing pipes, appurtenances and well systems and the required connections will be strategically planned with Operations to provide the best manageble and seamless change over while enabling continual supply and a reasonable timeframe. Construction of the new Intake structure, LLPS and inland watermains will be completed and tested before connecting to the existing grid. To provide a risk buffer during the transition, the existing tower can be used to satisfy water storage and system pressure demands. This option may infringe on local business traffic, marine traffic and public shoreline recreation.	4.0	4.8	The implementation and construction of the new intake option 3B is will be phased to provide an uninterrupted supply of safe drinking water to the Town. The new infrastructure will be aligned with the existing pipes, appurtenances and well systems and the required connections will be strategically planned with Operations to provide the best manageble and seamless change over while enabling continual supply and a reasonable timeframe. Construction of the new Intake structure, LLPS and new inland watermains will be completed and tested before connecting to the existing grid. The existing tower can be used to facilitate water storage and pressure, providing a risk buffer during the transition. This option may infringe on local business traffic, marine traffic and private shoreline recreation.	4.5	5.4	The implementation and construction of the new intake option 3C is will be phased to provide an uninterrupted supply of safe drinking water to the Town. The new infrastructure will be aligned with the existing pipes, appurtenances and well systems and the required connections will be strategically planned with Operations to provide the best manageble and seamless change over while enabling continual supply and a reasonable timeframe. Construction of the new Intake, structure, LLPS and new inland watermains will be completed and tested before connecting to the existing grid. The existing tower can be used to facilitate water storage and pressure, providing a risk buffer during the transition. This option may infringe on local business traffic and marine traffic.	4.0	4.8	The implementation and construction of the new intake option 3D is will be phased to provide an uninterrupted supply of safe drinking water to the Town. The new infrastructure will be aligned with the existing pipes, appurtenances and well systems and the required connections will be strategically planned with Operations to provide the best manageble and seamless change over while enabling continual supply and a reasonable timeframe. Construction of the new Intake structure, LLPS and new inland watermains will be completed and tested before connecting to the existing grid. The existing tower can be used to facilitate water storage and pressure, providing a risk buffer during the transition. This option may infringe on local business traffic, marine traffic and private shoreline recreation.	4.0	4.8
		Operational Complexity – Relative added complexity to existing operational practices resulting from construction and operation of new infrastructure.	Expected water quality at new intake location for 3A is expected to add very little complexity to the existing treatment process and operational practices. New intake pipeline and structure will reduce operational requirements associated with the existing direlect wells, reducing maintenance and risk associated with the current supply. All infrastructure will be constructed with access to facilitate any activities required for maintenance or emergency events. Some additional operations will be required to maintain the new LLPS, screens, pumps and motors. Additional hydrants, valves and meters maybe required on the new length of inground pipe main. The addition of invasive mussel control and frazil ice mitigation processes are fairly simple to run and maintain operationally, if required. Close proximity to the existing water works may add convenience to this option.	5.0	6.0	Expected water quality at new intake location for 3B is expected to add very little complexity to the existing treatment process and operational practices. New intake pipeline and structure will reduce operational requirements associated with the existing direlect wells, reducing maintenance and risk associated with the current supply. All infrastructure will be constructed with access to facilitate any activities required for maintenance or emergency events. Some additional operations will be required to maintain the new LLPS, screens, pumps and motors. Additional hydrants, valves and meters maybe required on the new length of inground pipe main. The addition of invasive mussel control and frazil ice mitigation processes are fairly simple to run and maintain operationally, if required. Fairly close proximity to the existing water works may add convenience to this option.	4.5	5.4	Expected water quality at new intake location for 3C is expected to add very little complexity to the existing treatment process and operational practices. New intake pipeline and structure will reduce operational requirements associated with the existing direlect wells, reducing maintenance and risk associated with the current supply. All infrastructure will be constructed with access to facilitate any activities required for maintenance or emergency events. Some additional operations will be required to maintain the new LLPS, screens, pumps and motors. Additional hydrants, valves and meters maybe required on the new length of inground pipe main. The addition of invasive mussel control and frazil ice mitigation processes are fairly simple to run and maintain operationally, if required. Proximity to the existing waterworks facility may create an inconvenience factor to consider with this option.	4.0	4.8	Expected water quality at new intake location for 3D is expected to add very little complexity to the existing treatment process and operational practices. The new intake pipeline and structure will reduce operational requirements associated with the existing direlect wells, reducing maintenance and risk associated with the current supply. All infrastructure will be constructed with access to facilitate any activities required for maintenance or emergency events. Some additional operations will be required to maintain the new LLPS, screens, pumps and motors. Additional hydrants, valves and meters maybe required on the new length of inground pipe main. The addition of invasive mussel control and frazil ice mitigation processes are fairly simple to run and maintain operationally, if required. Proximity to the existing waterworks facility may create an inconvenience factor to consider with this option.	4.0	4.8
		Construction Duration - Duration of project construction and potential for staging and phased construction.	Marine construction will be completed within the specified in-water construction timeframe. In-land construction activities, such as trenching, boring, pipe fusion, hydrostatic testing, etc., will be planned to ensure the complete pipeline is fully tested and ready for installation within specified timeframe. Construction of the LLPS and connection of new intake pipe will be staged to minimize interruptions to operations and maximize protection of the existing wells. Refurbishment of the existing tower and connection to the Lake-based system could facilitate a combined source water in the interim, to ensure supply during construction and limit impacts during change over. This option has the potential to require the shortest construction timeline, based on pipe length which is dependent on the location choice of the LLPS	5.0	6.0	Marine construction will be completed within the specified in-water construction timeframe. In-land construction activities, such as trenching, boring, pipe fusion, hydrostatic testing, etc., will be planned to ensure the complete pipeline is fully tested and ready for installation within specified timeframe. Construction of the LLPS and connection of new intake pipe will be staged to minimize interruptions to operations and maximize protection of the existing wells. Refurbishment of the existing tower and connection to the Lake-based system could facilitate a combined source water in the interim, to ensure supply during construction and limit impacts during change over. This option has the potential to require a reletively shorter construction time line than options 3C and D.	4.5	5.4	Marine construction will be completed within the specified in-water construction timeframe. In-land construction activities, such as trenching, boring, pipe fusion, hydrostatic testing, etc., will be planned to ensure the complete pipeline is fully tested and ready for installation within specified timeframe. Construction of the LLPS and connection of new intake pipe will be staged to minimize interruptions to operations and maximize protection of the existing wells. Refurbishment of the existing tower and connection to the Lake-based system could facilitate a combined source water in the interim, to ensure supply during construction and limit impacts during change over. This option wil require more pipelength to be installed increasing the construction timeline.	4.0	4.8	Marine construction will be completed within the specified in-water construction timeframe. In-land construction activities, such as trenching, boring, pipe fusion, hydrostatic testing, etc., will be planned to ensure the complete pipeline is fully tested and ready for installation within specified timeframe. Construction of the LLPS and connection of new intake pipe will be staged to minimize interruptions to operations and maximize protection of the existing wells. Refurbishment of the existing tower and connection to the Lake-based system could facilitate a combined source water in the interim, to ensure supply during construction and limit impacts during change over. This option wil require more pipelength to be installed increasing the construction timeline.	4.0	4.8
		Regulatory Approvals – Number and complexity of permits/approvals needed for project construction.	Approvals may include: Blind River is not currently under a Conservation Authority so usual applications may not apply including: Application for Development, Interference with Wetlands and Alterations to Shorelines and Watercourse, Update to Source Water Protection Program Ministry of the Environment, Conservation and Parks (MECP) - Amendments to DWWP, MDWL, PTTW, and Source Water Protection Program, Species at Risk, Potential for temporary PTTW if construction dewatering >400,000 L/day, Completion of Information Gathering Form (IGF) Ministry of Natural Resources (MNR) - Work Permit subject to construction timeframe limitations for in-water works and potentially Species at Risk (SARs) permit (subject to IGF) DFO – The Fisheries Act -Permit to Take Fish by Means other than Fishing (dependant on construction technique and blasting requirements) Transport Canada - Approval under Navigable Water Act Building Permit Indigenous Groups - Letter of Approval	4.0	4.8	Approvals may include: Blind River is not currently under a Conservation Authority so usual applications may not apply including: Application for Development, Interference with Wetlands and Alterations to Shorelines and Watercourse, Update to Source Water Protection Program Ministry of the Environment, Conservation and Parks (MECP) - Amendments to DWWP, MDWL, PTTW, and Source Water Protection Program, Species at Risk, Potential for temporary PTTW if construction dewatering >400,000 L/day, Completion of Information Gathering Form (IGF) Ministry of Natural Resources (MNR) - Work Permit subject to construction timeframe limitations for in-water works and potentially Species at Risk (SARs) permit (subject to IGF) DFO – The Fisheries Act -Permit to Take Fish by Means other than Fishing (dependant on construction technique and blasting requirements) Transport Canada - Approval under Navigable Water Act Building Permit Indigenous Groups - Letter of Approval	4.0	4.8	Approvals may include: Blind River is not currently under a Conservation Authority so usual applications may not apply including: Application for Development, Interference with Wetlands and Alterations to Shorelines and Watercourse, Update to Source Water Protection Program Ministry of the Environment, Conservation and Parks (MECP) - Amendments to DWWP, MDWL, PTTW, and Source Water Protection Program, Species at Risk, Potential for temporary PTTW if construction dewatering >400,000 L/day, Completion of Information Gathering Form (IGF) Ministry of Natural Resources (MNR) - Work Permit subject to construction timeframe limitations for in-water works and potentially Species at Risk (SARs) permit (subject to IGF) DFO – The Fisheries Act -Permit to Take Fish by Means other than Fishing (dependant on construction technique and blasting requirements) Transport Canada - Approval under Navigable Water Act Building Permit Indigenous Groups - Letter of Approval	4.0	4.8
		Property Acquisition – Need for land acquisition and availability of property, including temporary and permanent easements.	It has been assumed that LLP1 & LLP3 options (A1 & A3) will be constructed on property that is owned by the Town. Option A2 is assumed to require land acqusition.	4.5	5.4	It has been assumed that LLP1 option (B1) will be constructed on property that is owned by the Town. Option B2 (LLP2B) is assumed to require land acquisition. This option may also require an easement or right of way agreement across the laneway if it is on private property.	3.5	4.2	It has been assumed that LLP1 option (C1) will be constructed on property owned by the Town. Option D2 (LLP2C) has been assumed to require land acqusition.	3.5	4.2	It has been assumed that LLP1 option (D1) will be constructed on property owned by the Town. Option D2 (LLP2D) has been assumed to require land acquisition.	4.0	4.8
Maximum Sub-total Score – Technical & Operational		**30**			**27.0**			**25.2**			**23.4**			**24.0**
Economic	20	**Construction Cost –** Relative scale of construction costs at various locations. Ability to meet the budget constraints and objectives.	Lowest estimated cost when using the A2 configuration. A2 will require increased permits and shorleine construction considerations and A3 option will require a much longer pipemain to be constructed.	4.5	6.0	B1 configuration will be only slightly higher than A1. B2 option will require increased permits and shoreline construction considerations.	4.0	5.3	Option C1 will induce extra costs associated with a longer pipe construction. C2 will cost slightly more than C1 for permitting and approvals. This option has the potential to cost the most based on pipe length and site preparation.	3.0	4.0	Option D1 will induce extra costs accosiated with a longer pipe construction. D2 will cost slightly more than C1 for permitting and approvals. This option has the potential to cost the second most.	3.5	4.7
		Operational Cost – Long term projection of increased savings or expenditures during operation	All options to construct a lakebased intake and LLPs are aimed at reducing long term expenditures. The LLPS location options have relatively equal impact on longterm costs. The pipe length and number of appurtenances will increase the requirement for regular and reactive maintenance.	4.5	6.0	All options to construct a lakebased intake and LLPs are aimed at reducing long term expenditures. The LLPS location options have relatively equal impact on longterm costs. The pipe length and number of appurtenances will increase the requirement for regular and reactive maintenance.	4.3	5.7	All options to construct a lakebased intake and LLPs are aimed at reducing long term expenditures. The LLPS location options have relatively equal impact on longterm costs. The pipe length and number of appurtenances will increase the requirement for regular and reactive maintenance.	3.7	4.9	All options to construct a lakebased intake and LLPs are aimed at reducing long term expenditures. The LLPS location options have relatively equal impact on longterm costs. The pipe length and number of appurtenances will increase the requirement for regular and reactive maintenance.	4.0	5.3
		Future Cost – Economic benefit/detriment to future installations (elevated booster tanks, booster stations, etc.)	All options to construct a lakebased intake and LLPs are aimed at providing considerations for future infrastructure installations and are reletively equal in comparison.	5.0	6.7	All options to construct a lakebased intake and LLPs are aimed at providing considerations for future infrastructure installations and are reletively equal in comparison.	5.0	6.7	All options to construct a lakebased intake and LLPs are aimed at providing considerations for future infrastructure installations and are reletively equal in comparison.	5.0	6.7	All options to construct a lakebased intake and LLPs are aimed at providing considerations for future infrastructure installations and are reletively equal in comparison.	5.0	6.7
Maximum Sub-total Score – Economic		**20**			**18.7**			**17.7**			**15.6**			**16.7**
Total Overall Maximum Weighted Score		**100**			**88.0**			**85.9**			**82.4**			**81.9**

Project Title: **Blind River Intake Location Comparison**
Client: Blind River
Project No.: T001592B
Task: Detailed Evaluation of Low Lift Pumping Station Location Alternatives
Prepared By: K.Farrow **Date:**
Reviewed by: T. Rapley **Revision Date:**
Revision No. : 1 **Revision Date:**

Category	Weight	Criteria	Option A1 (LLP1)			Option A2 (LLP2A)			Option A3 (LLP3)			Option B1 (LLP1)			Option B2 (LLP2B)			Option C1 (LLP1)			Option C2 (LLP2C)			Option D1 (LLP1)			Option D2 (LLP2D)		
			Rationale	Score 1 to 5	Weighted Score	Rationale	Score 1 to 5	Weighted Score	Rationale	Score 1 to 5	Weighted Score	Rationale	Score 1 to 5	Weighted Score	Rationale	Score 1 to 5	Weighted Score	Rationale	Score 1 to 5	Weighted Score	Rationale	Score 1 to 5	Weighted Score	Rationale	Score 1 to 5	Weighted Score	Rationale	Score 1 to 5	Weighted Score
Water Quality	20	**Raw Water Quality** - Concentration of water quality parameters and chemicals of concern in the sediments for each potential intake location	The location of the LLPS will have little to no impact on the raw water quality	5.0	6.7	The location of the LLPS will have little to no impact on the raw water quality	5.0	6.7	The location of the LLPS will have little to no impact on the raw water quality.	5.0	6.7	The location of the LLPS will have little to no impact on the raw water quality.	5.0	6.7	The location of the LLPS will have little to no impact on the raw water quality.	5.0	6.7	The location of the LLPS will have little to no impact on the raw water quality.	5.0	6.7	The location of the LLPS will have little to no impact on the raw water quality.	5.0	6.7	The location of the LLPS will have little to no impact on the raw water quality.	5.0	6.7	The location of the LLPS will have little to no impact on the raw water quality.	5.0	6.7
		Risk to Contaminants - Potential vulnerability/risk of new intake to contaminants based on intake depth, distance from shore, proximity to potential sources of contaminants such as creek discharges, storm outfalls, drainage ditches, etc.)	The location of the LLPS will have little to no impact on the risk to contaminants.	5.0	6.7	The location of the LLPS will have little to no impact on the risk to contaminants.	5.0	6.7	The location of the LLPS will have little to no impact on the risk to contaminants.	5.0	6.7	The location of the LLPS will have little to no impact on the risk to contaminants.	5.0	6.7	The location of the LLPS will have little to no impact on the risk to contaminants.	5.0	6.7	The location of the LLPS will have little to no impact on the risk to contaminants.	5.0	6.7	The location of the LLPS will have little to no impact on the risk to contaminants.	5.0	6.7	The location of the LLPS will have little to no impact on the risk to contaminants.	5.0	6.7	The location of the LLPS will have little to no impact on the risk to contaminants.	5.0	6.7
		Capacity Requirements - Ability to meet flow and system pressure demands	All Options will be designed to have the ability to meet flow and system pressure requirements	5.0	6.7	All Options will be designed to have the ability to meet flow and system pressure requirements	5.0	6.7	All Options will be designed to have the ability to meet flow and system pressure requirements	5.0	6.7	All Options will be designed to have the ability to meet flow and system pressure requirements	5.0	6.7	All Options will be designed to have the ability to meet flow and system pressure requirements	5.0	6.7	All Options will be designed to have the ability to meet flow and system pressure requirements	5.0	6.7	All Options will be designed to have the ability to meet flow and system pressure requirements	5.0	6.7	All Options will be designed to have the ability to meet flow and system pressure requirements	5.0	6.7	All Options will be designed to have the ability to meet flow and system pressure requirements	5.0	6.7
Maximum Sub-total Score – Water Quality		**20**			**20.0**			**20.0**			**20.0**			**20.0**			**20.0**			**20.0**			**20.0**			**20.0**			**20.0**
Natural Environment	15	**Natural Heritage Features –** Potential impacts to existing natural environment, including terrestrial and aquatic habitats, wildlife and wildlife habitats, sensitive features, areas of natural and scientific interest, etc.	All options have the potential to traverse vegetative communities and natural habitats. LLP1 options will be the least impactful to the shoreline and near shore forested areas.	5.0	5.0	Slightly higher impact than option A1 due to increased shorline construction associated with the LLP2A Placement	4.7	4.7	Similar impact to LLP1 as placement is on the WWTP property.	5.0	5.0	All options have the potential to traverse vegetative communities and natural habitats. LLP1 options will be the least impactful to the shoreline and near shore forested areas.	5.0	5.0	Slightly higher impact than B1 due to increased shorline construction.	4.5	4.5	All options have the potential to traverse vegetative communities and natural habitats. LLP1 options will be the least impactful to the shoreline and near shore forested areas. Longer pipe lengths, thru the forested peninsula increases impact.	4.4	4.4	All options have the potential to traverse vegetative communities. Impact associated with longer pipe construction and traverse through the forested peninsula. Impact at this location similar to D2	4.0	4.0	Impact associated with longer pipe construction and traverse through the forested and beach areas. LLP1 options will be the least impactful to the shoreline and near shore forested areas. Longer pipe lengths, thru the forested peninsula increases impact.	4.5	4.5	All options have the potential to traverse vegetative communities. Impact associated with longer pipe construction and traverse through the forested peninsula. Impact at this location is similar to C2	4.0	4.0
		Climate Change – Potential impact on climatic conditions during construction and project vulnerability to changing climatic conditions.	LLP1 is located on the existing WTP property, lessening its overall impact for access and site preparation. Operational and maintenance travel time would be the least with this option.	4.8	4.8	LLP2A is located near the shoreline to the southwest of the Blind River WTP. Operational and maintenance travel time would be slighly longer compared to LLP1 and LLP3 with this option. Minor distal and shoreline impacts	4.2	4.2	LLP3 is located on the existing WWTP property, lessening its overall impact for access and site preparation. Operational and maintenance travel time would be the least with this option.	4.8	4.8	LLP1 is located on the existing WTP property. Operational and maintenance travel time would be the least with this option. Construction of the inland/inwater portion of this pipe will be comparible to intake option A.	4.7	4.7	LLP2B is located near the shoreline to the southeast of the existing WTP. Operational and maintenance travel time would be the least with this option. Construction of the inland/inwater portion of this pipe will be comparible to intake option A.	4.0	4.0	LLP1 is located on the existing WTP property. Operational and maintenance travel time would be the least with this option. Construction of the inland/inwater portion of this pipe will be more extensive than intake options A or B and will require some tree removal.	3.8	3.8	LLP2C is located near the shoreline on the end of Caribou Point (southeast of the existing WTP). Operational and maintenance travel time would be 3 to 4 times that of all other options. Construction of this LLPS and the inland/inwater portion of this pipe will be more extensive than intake options A or B and will require some tree removal. Slightly less impactful than intake option A or B and will require some tree removal.	3.2	3.2	LLP1 is located on the existing WTP property. Operational and maintenance travel time would be 3 to 4 times that of all other options. Construction of this LLPS and the inland/inwater portion of this pipe will be more extensive than intake options A or B and will require some tree removal. Slightly less impactful than intake option A or B and will require some tree removal. Slightly less impactful than intake option D.	4.0	4.0	Option D2, LLP2D is located near the shoreline, northeast of Caribou Point (southeast of the existing WTP). Operational and maintenance travel time would be 3 to 4 times that of all other options. Construction of this LLPS and the inland/inwater portion of this pipe will be more extensive than intake options A or B and will require some tree removal. Slightly less impactful than intake option D.	3.5	3.5
		Source Water Protection – Potential impact on source water protection areas and compliance with source water protection policies.	Blind River is not currently part of a Conservation Authority. Source water protection vulnerabilities would need to be assessed to reflect new intake location.	5.0	5.0	Blind River is not currently part of a Conservation Authority. Source water protection vulnerabilities would need to be assessed to reflect new intake location.	5.0	5.0	Blind River is not currently part of a Conservation Authority. Source water protection vulnerabilities would need to be assessed to reflect new intake location.	5.0	5.0	Blind River is not currently part of a Conservation Authority. Source water protection vulnerabilities would need to be assessed to reflect new intake location.	5.0	5.0	Blind River is not currently part of a Conservation Authority. Source water protection vulnerabilities would need to be assessed to reflect new intake location.	5.0	5.0	Blind River is not currently part of a Conservation Authority. Source water protection vulnerabilities would need to be assessed to reflect new intake location.	5.0	5.0	Blind River is not currently part of a Conservation Authority. Source water protection vulnerabilities would need to be assessed to reflect new intake location.	5.0	5.0	Blind River is not currently part of a Conservation Authority. Source water protection vulnerabilities would need to be assessed to reflect new intake location.	5.0	5.0	Blind River is not currently part of a Conservation Authority. Source water protection vulnerabilities would need to be assessed to reflect new intake location.	5.0	5.0
Maximum Sub-total Score – Natural Environment		**15**			**14.8**			**13.9**			**14.8**			**14.7**			**13.5**			**13.2**			**12.2**			**13.5**			**12.5**
Socio-Cultural	15	**Public Health and Safety –** Potential risk to public and operations staff health and safety related to water quality, and construction and operation of new intake pipeline and structure.	Onshore and offshore construction will adhere to standard safety operating procedures to ensure a high level of safety while working on, above and below the water.	5.0	5.0	Onshore and offshore construction will adhere to standard safety operating procedures to ensure a high level of safety while working on, above and below the water.	5.0	5.0	Onshore and offshore construction will adhere to standard safety operating procedures to ensure a high level of safety while working on, above and below the water.	5.0	5.0	Onshore and offshore construction will adhere to standard safety operating procedures to ensure a high level of safety while working on, above and below the water.	5.0	5.0	Onshore and offshore construction will adhere to standard safety operating procedures to ensure a high level of safety while working on, above and below the water.	5.0	5.0	Onshore and offshore construction will adhere to standard safety operating procedures to ensure a high level of safety while working on, above and below the water.	5.0	5.0	Onshore and offshore construction will adhere to standard safety operating procedures to ensure a high level of safety while working on, above and below the water.	5.0	5.0	Onshore and offshore construction will adhere to standard safety operating procedures to ensure a high level of safety while working on, above and below the water.	5.0	5.0
		Long-term Impacts – Potential long-term impact on adjacent residents and local users from siting of new infrastructure.	No long-term impacts on adjacent residents or local users are anticipated.	5.0	5.0	No long-term impacts on adjacent residents or local users are anticipated.	5.0	5.0	No long-term impacts on adjacent residents or local users are anticipated.	5.0	5.0	A section of the onshore intake pipeline will encroach into the neighbouring private property, which will result in a long-term nuisance for the adjacent property owner.	4.5	4.5	A section of the onshore intake pipeline will encroach into the neighbouring private property, which will result in a long-term nuisance for the adjacent property owner.	4.5	4.5	No long term nuisance is expected with this option	5.0	5.0	No long term nuisance is expected with this option	5.0	5.0	No long term nuisance is expected with this option	5.0	5.0	No long term nuisance is expected with this option	5.0	5.0
		Short-term Impacts – Potential short-term disruption to local residents, businesses, commercial and recreational activities due to construction (i.e., noise, dust, vibration, visual access, parking, road and beach areas closures)	Construction of LLP2A will induce moderate construction disruptions to local residents in the immediate surrounding area such as noise, dust and vibration. Less impactful option as the LLP1 construction can be confined to the WTP property.	4.0	4.0	Construction of LLP2A will induce moderate construction disruptions to local residents in the immediate surrounding area such as noise, dust and vibration. Less impactful option as the LLP1 construction can be confined to the WTP property.	3.5	3.5	Construction of LLP3 will induce moderate construction disruptions to local residents in the immediate surrounding area such as noise, dust and vibration. Less impactful option as the LLP1 construction can be confined to the WTP property. Fewer residents nearby in comparison to LLP1.	4.5	4.5	Construction of LLP1 will induce moderate construction disruptions to local residents in the immediate surrounding area such as noise, dust and vibration. Short term impacts to shoreline activity and local resident road access may be observed	4.5	4.5	Construction of LLP2B will induce moderate construction disruptions to local residents in the immediate surrounding area such as noise, dust and vibration. Less impactful option as the LLP1 construction can be confined to the WTP property.	4.0	4.0	Construction of LLP1 will induce moderate construction disruptions to local residents in the immediate surrounding area such as noise, dust and vibration. Short term impacts to shoreline activity and may be observed.	4.5	4.5	Construction of LLP2C will induce moderate construction disruptions to local residents in the immediate surrounding area such as noise, dust and vibration. Less impactful option as the LLP1 construction can be confined to the WTP property.	4.0	4.0	Construction of LLP1 will induce moderate construction disruptions to local residents in the immediate surrounding area such as noise, dust and vibration. Short term impacts to shoreline activity may be observed.	4.5	4.5	Construction of LLP2D will induce moderate construction disruptions to local residents in the immediate surrounding area such as noise, dust and vibration. Short term impacts to shoreline activity may be observed.	4.0	4.0
Maximum Sub-total Score – Socio-Cultural		**15**			**14.0**			**13.5**			**14.5**			**14.0**			**13.5**			**14.5**			**14.0**			**14.5**			**14.0**
Technical and Operational	30	**Ease of Implementation –** Potential levels of complexity during construction,conflicts with existing infrastructure,ability to facilitate construction with uninterrupted supply and reasonable timeframe.	Higher complexity during construction of LLP1 due to co-location with existing WTP - Potential for conflicts with existing operations and existing infrastructure.	3.0	3.6	Higher complexity during construction of LLP2A due to required electrical and process water connections.	4.0	4.8	Lowest complexity. Site is already serviced with water and electricity due to co-location with WWTP. Unlikely to interfere with WWTP operations due to functional separation from the rest of the property.	4.5	5.4	Higher complexity during construction of LLP1 due to co-location with existing WTP - Potential for conflicts with existing operations and existing infrastructure. Site is already serviced with water and electricity.	3.0	3.6	Higher complexity during construction of LLP2B due to required electrical and process water connections.	4.0	4.8	Higher complexity during construction of LLP1 due to co-location with existing WTP - Potential for conflicts with existing operations and existing infrastructure. Site is already serviced with water and electricity.	3.0	3.6	Higher complexity during construction of LLP2C due to required electrical and process water connections. Relatively difficult to access site.	3.5	4.2	Higher complexity during construction of LLP1 due to co-location with existing WTP - Potential for conflicts with existing operations and existing infrastructure. Site is already serviced with water and electricity.	3.0	3.6	Higher complexity during construction of LLP2D due to required electrical and process water connections. Relatively difficult to access site.	3.5	4.2
		Operational Complexity – Relative added complexity to existing operational practices resulting from construction and operation of new infrastructure.	Some additional operations will be required to maintain the new LLPS, screens, pumps and motors. The addition of invasive mussel control and fraz0 ice mitigation processes are fairly simple to run and maintain operationally, if required. Close proximity to the existing water works may add convenience to this option.	4.5	5.4	Some additional operations will be required to maintain the new LLPS, screens, pumps and motors. The addition of invasive mussel control and fraz0 ice mitigation processes are fairly simple to run and maintain operationally, if required. Relatively close proximity to the existing water works may add convenience to this option.	4.2	5.0	Some additional operations will be required to maintain the new LLPS, screens, pumps and motors. The addition of invasive mussel control and fraz0 ice mitigation processes are fairly simple to run and maintain operationally, if required. Close proximity to the existing wastewater works may add convenience to this option.	4.5	5.4	Some additional operations will be required to maintain the new LLPS, screens, pumps and motors. The addition of invasive mussel control and fraz0 ice mitigation processes are fairly simple to run and maintain operationally, if required. Close proximity to the existing water works may add convenience to this option.	4.5	5.4	Some additional operations will be required to maintain the new LLPS, screens, pumps and motors. The addition of invasive mussel control and fraz0 ice mitigation processes are fairly simple to run and maintain operationally, if required. Close proximity to the existing water works may add convenience to this option.	4.2	5.0	Some additional operations will be required to maintain the new LLPS, screens, pumps and motors. The addition of invasive mussel control and fraz0 ice mitigation processes are fairly simple to run and maintain operationally, if required. Close proximity to the existing water works may add convenience to this option.	4.5	5.4	Some additional operations will be required to maintain the new LLPS, screens, pumps and motors. The addition of invasive mussel control and fraz0 ice mitigation processes are fairly simple to run and maintain operationally, if required. The distance to the existing water works may add inconvenience to this option.	4.0	4.8	This location choice for the new LLPS may impact the expected construction duration with increased measures required to make electrical and process water connections. Procurement and permitting will aslo likely extend the time commitment	4.5	5.4	Some additional operations will be required to maintain the new LLPS, screens, pumps and motors. The addition of invasive mussel control and fraz0 ice mitigation processes are fairly simple to run and maintain operationally, if required. Close proximity to the existing water works may add convenience to this option.	4.0	4.8
		Construction Duration - Duration of project construction and potential for staging and phased construction.	This location choice for the new LLPS should not significantly impact the expected construction duration compared with remote options	4.5	5.4	This location choice for the new LLPS may impact the expected construction duration with increased measures required to make electrical and process water connections. Procurement and permitting will aslo likely extend the time commitment	4.0	4.8	This location choice for the new LLPS should not significantly impact the expected construction duration compared with remote options	4.5	5.4	This location choice for the new LLPS should not significantly impact the expected construction duration compared with remote options	4.5	5.4	This location choice for the new LLPS may impact the expected construction duration with increased measures required to make electrical and process water connections. Procurement and permitting will aslo likely extend the time commitment	4.0	4.8	This location choice for the new LLPS should not significantly impact the expected construction duration compared with remote options	4.5	5.4	This location choice for the new LLPS may impact the expected construction duration with increased measures required to make electrical and process water connections. Procurement and permitting will aslo likely extend the time commitment	4.0	4.8	This location choice for the new LLPS should not significantly impact the expected construction duration compared with remote options	4.5	5.4	This location choice for the new LLPS may impact the expected construction duration with increased measures required to make electrical and process water connections. Procurement and permitting will aslo likely extend the time commitment	4.0	4.8
		Regulatory Approvals – Number and complexity of permits/approvals needed for project construction.	Building Permit, MECP-MDWL, PTTW & DWWP, Archaeological Impacts, inground Utilities location, Trench Permit and other	4.0	4.8	Building Permit, MECP-MDWL, PTTW & DWWP, Archaeological Impacts, inground Utilities location, Trench Permit and other. Shoreline building may require more extensive approvals.	3.5	4.2	Building Permit, MECP-MDWL, PTTW & DWWP, Archaeological Impacts, inground Utilities location, Trench Permit and other	4.0	4.8	Building Permit, MECP-MDWL, PTTW & DWWP, Archaeological Impacts, inground Utilities location, Trench Permit and other	4.0	4.8	Building Permit, MECP-MDWL, PTTW & DWWP, Archaeological Impacts, inground Utilities location, Trench Permit; SAR. Inwater works will require MTO and DFO approvals. Shoreline building may require more extensive approvals.	3.5	4.2	Building Permit, MECP-MDWL, PTTW & DWWP, Archaeological Impacts, inground Utilities location, Trench Permit and other	4.0	4.8	Building Permit, MECP-MDWL, PTTW & DWWP, Archaeological Impacts, inground Utilities location, Trench Permit and other. Shoreline building may require more extensive approvals.	3.5	4.2	Building Permit, MECP-MDWL, PTTW & DWWP, Archaeological Impacts, inground Utilities location, Trench Permit and other	4.0	4.8	Building Permit, MECP-MDWL, PTTW & DWWP, Archaeological Impacts, inground Utilities location, Trench Permit and other. Shoreline building may require more extensive approvals.	3.5	4.2
		Property Acquisition – Need for land acquisition and availability of property, including temporary and permanent easements.	It has been assumed that this property is owned by the Town	5.0	6.0	Acquisition of the propery may be required	4.5	5.4	It has been assumed that this property is owned by the Town	5.0	6.0	It has been assumed that this property is owned by the Town	5.0	6.0	Acquisition of the property and an easment to the laneway will be required	4.0	4.8	It has been assumed that this property is owned by the Town	5.0	6.0	Acquisition of the property may be required	4.5	5.4	It has been assumed that this property is owned by the Town	5.0	6.0	Acquisition of the property may be required	3.0	3.6
Maximum Sub-total Score – Technical & Operational		**30**			**25.2**			**24.2**			**27.0**			**25.2**			**23.6**			**25.2**			**23.4**			**25.2**			**21.6**
Economic	20	**Construction Cost –** Relative scale of construction costs at various locations. Ability to meet the budget constraints and objectives.	All LLP1 Location options, at the WTP site are assessed as equivilent. The 20m low lift shaft cost may be much more than expected if the ground material is bedrock and blasting is required.	4.0	5.3	Shoreline LLPS will require a longer run of electrical conduit and process water line as an additional cost to the on site options plus purchase of land costs	4.2	5.6	Least costly, as the land is assmed to be owned by the town and deep bore tunneling is probably not required. Connections can be made to the existing WWTP	4.5	6.0	All LLP1 Location options, at the WTP site are assessed as equivilent. The 20m low lift shaft cost may be much more than expected if the ground material is bedrock and blasting is required.	4.0	5.3	Shoreline LLPS will require a longer run of electrical conduit and process water line as an additional cost to the on site options plus purchase of land costs	4.0	5.3	All LLP1 Location options, at the WTP site are assessed as equivilent. The 20m low lift shaft cost may be much more than expected if the ground material is bedrock and blasting is required, plus longer pipe.	3.8	5.1	Shoreline LLPS will require a longer run of electrical conduit and process water line as an additional cost to the on site options. plus purchase of land costs	3.9	5.2	All LLP1 Location options, at the WTP site are assessed as equivilent. The 20m low lift shaft cost may be much more than expected if the ground material is bedrock and blasting is required plus longer pipe	3.8	5.1	Shoreline LLPS will require a longer run of electrical conduit and process water line as an additional cost to the on site options. plus purchase of land costs	4.0	5.3
		Operational Cost – Long term projection of increased savings or expenditures during operation	Proximal to WTP = less travel time, ease for deliveries and maintenance. Possible new chemical system, pumps and screens to maintain	4.5	6.0	Close to WTP = less travel time, ease for deliveries and maintenance. Possible new chemical system, pumps and screens to maintain	4.2	5.6	Proximal to WTP = less travel time, ease for deliveries and maintenance. Possible new chemical system, pumps and screens to maintain	4.4	5.9	Proximal to WTP = less travel time, ease for deliveries and maintenance. Possible new chemical system, pumps and screens to maintain	4.5	6.0	Close to WTP = less travel time, ease for deliveries and maintenance. Possible new chemical system, pumps and screens to maintain	4.2	5.6	Proximal to WTP = less travel time, ease for deliveries and maintenance. Possible new chemical system, pumps and screens to maintain	4.8	6.4	Distant to WTP = more travel time for deliveries and maintenance. Possible new chemical system, pumps and screens to maintain	4.0	5.3	Proximal to WTP = less travel time, ease for deliveries and maintenance. Possible new chemical system, pumps and screens to maintain	4.8	6.4	Distant to WTP = more travel time for deliveries and maintenance. Possible new chemical system, pumps and screens to maintain	4.0	5.3
		Future Cost – Economic benefit/detriment to future installations (elevated booster tanks, booster stations, etc.)	Not as much room on site for expansion of the WTP & LLPS. Not expected to impact future installations of infrastructure	5.0	6.7	Not expected to impact future installations of infrastructure	5.0	6.7	Not as much room on site for expansion of the WTP & LLPS. Not expected to impact future installations of infrastructure	5.0	6.7	Not as much room on site for expansion of the WTP & LLPS. Not expected to impact future installations of infrastructure	5.0	6.7	Not expected to impact future installations of infrastructure	5.0	6.7	Not expected to impact future installations of infrastructure	5.0	6.7	Not as much room on site for expansion of the WTP & LLPS. Not expected to impact future installations of infrastructure	5.0	6.7	Not as much room on site for expansion of the WTP & LLPS. Not expected to impact future installations of infrastructure	5.0	6.7	Not as much room on site for expansion of the WTP & LLPS. Not expected to impact future installations of infrastructure	5.0	6.7
Maximum Sub-total Score – Economic		**20**			**18.0**			**17.9**			**18.5**			**18.0**			**17.6**			**18.1**			**17.2**			**18.1**			**17.3**
Total Overall Maximum Weighted Score		**100**			**92.0**			**89.5**			**94.8**			**91.9**			**88.2**			**91.0**			**86.8**			**91.3**			**85.4**

Project Title: Blind River Intake Location Comparison

Client: Blind River

Project No.: T001592B

Task: Detailed Evaluation of Intake & LLPS Location Alternatives

Prepared By: K.Farrow

Reviewed by: T. Rapley

Revision No. : 1

Date:

Revision Date:

Revision Date:

Category	Weight	Criteria	Option A1 (LLP1)			Option A2 (LLP2A)			Option A3 (LLP3)			Option B1 (LLP1)			Option B2 (LLP2B)			Option C1 (LLP1)			Option C2 (LLP2C)			Option D1 (LLP1)			Option D2 (LLP2D)		
			Rationale	Score 1 to 5	Weighted Score	Rationale	Score 1 to 5	Weighted Score	Rationale	Score 1 to 5	Weighted Score	Rationale	Score 1 to 5	Weighted Score	Rationale	Score 1 to 5	Weighted Score	Rationale	Score 1 to 5	Weighted Score	Rationale	Score 1 to 5	Weighted Score	Rationale	Score 1 to 5	Weighted Score	Rationale	Score 1 to 5	Weighted Score
Water Quality	20	**Raw Water Quality -** Concentration of water quality parameters and chemicals of concern in the sediments for each potential intake location.	This intake option has the highest potential to receive infiltration from the neighbouring recreational marina, and the outfall from the river and WWTP situated to the west. Most recent recorded sampling results from this area show no water quality concerns. This Bay area of Lake Huron is physically well protected. The location of the LLPS will have little to no impact on the raw water quality.	4.35	5.8	This intake option has the highest potential to receive infiltration from the neighbouring recreational marina, and the outfall from the river and WWTP situated to the west. Most recent recorded sampling results from this area show no water quality concerns. This Bay area of Lake Huron is physically well protected. The location of the LLPS will have little to no impact on the raw water quality.	4.35	5.8	This intake option has the highest potential to receive infiltration from the neighbouring recreational marina, and the outfall from the river and WWTP situated to the west. Recent recorded sampling results from this area show no water quality concerns. This Bay area of Lake Huron is physically well protected. The location of the LLPS will have little to no impact on the raw water quality.	4.35	5.8	This area is well protected from current fluctuations and directly inline with any surrounding discharge outfalls. The location of the LLPS will have little to no impact on the raw water quality.	4.75	6.3	This area is well protected from current fluctuations and directly inline with any surrounding discharge outfalls. The location of the LLPS will have little to no impact on the raw water quality.	4.75	6.3	This area is the deepest which is more likely to provide a higher quality and stable resource of raw water. The location of the LLPS will have little to no impact on the raw water quality.	4.9	6.5	This area is the deepest which is more likely to provide a higher quality and stable resource of raw water. The location of the LLPS will have little to no impact on the raw water quality.	4.9	6.5	This option has the lowest potential to receive infiltration from neighbouring sources of pollution (e.g., marina, WWTP). This area is also the most shallow of options and as such will probably be more susceptible to current changes and seasonal turnover. The location of the LLPS will have little to no impact on the raw water quality.	4.4	5.9	This option has the lowest potential to receive infiltration from neighbouring sources of pollution (e.g., marina, WWTP). This area is also the most shallow of options and as such will probably be more susceptible to current changes and seasonal turnover. The location of the LLPS will have little to no impact on the raw water quality.	4.4	5.9
		Risk to Contaminants - Potential vulnerability/risk of new intake to contaminants based on intake depth, distance from shore, proximity to potential sources of contaminants such as creek discharges, storm outfalls, drainage ditches, etc.)	In this area the lake bed is 2.7-3.0 meters deep, the second deepest being reviewed in this evaluation, but still relatively shallow. This option has the highest potential to recieve infiltration and have elevated levels of turbidity. Most recent recorded sampling results from this area show no water quality contamination of concern. The location of the LLPS will have little to no impact on the risk to contaminants	4.25	5.7	In this area the lake bed is 2.7-3.0 meters deep, the second deepest being reviewed in this evaluation, but still relatively shallow. This option has the highest potential to recieve infiltration and have elevated levels of turbidity. Most recent recorded sampling results from this area show no water quality contamination of concern. The location of the LLPS will have little to no impact on the risk to contaminants	4.25	5.7	In this area the lake bed is 2.7-3.0 meters deep, the second deepest being reviewed in this evaluation, but still relatively shallow. This option has the highest potential to recieve infiltration and elevated levels of turbidity. Most recent recorded sampling results from this area show no water quality contamination of concern. The location of the LLPS will have little to no impact on therisk to contaminants	4.25	5.7	In this area the lake bed is 2.4-3.0 meters deep. This area is relatively shallow but protected from current fluctuation by the surrounding peninsulas to the east and west of the site. It is also not directly impacted by recreation, tributary influent or industrial outfalls. The location of the LLPS will have little to no impact on therisk to contaminants	4.75	6.3	In this area the lake bed is 2.4-3.0 meters deep. This area is relatively shallow but protected from current fluctuation by the surrounding peninsulas to the east and west of the site. It is also not directly impacted by recreation, tributary influent or industrial outfalls. The location of the LLPS will have little to no impact on therisk to contaminants	4.75	6.3	In this area the lake bed is 3.7-4.3 meters deep, the deepest being reviewed in this evaluation. The location of the LLPS will have little to no impact on the risk to contaminants	4.75	6.3	In this area the lake bed is 3.7-4.3 meters deep, the deepest being reviewed in this evaluation. The location of the LLPS will have little to no impact on the risk to contaminants	4.75	6.3	In this area the lake bed is 2.1- 2.4m meters deep, the most shallow of the options. This area is relatively shallow but situated the farthest from potential impacts from recreation, tributary influent or industrial outfalls. There is added protection from the surrounding peninsulas. The location of the LLPS will have little to no impact on therisk to contaminants	4.75	6.3	In this area the lake bed is 2.1- 2.4m meters deep, the most shallow of the options. This area is relatively shallow but situated the farthest from potential impacts from recreation, tributary influent or industrial outfalls. There is added protection from the surrounding peninsulas. The location of the LLPS will have little to no impact on therisk to contaminants	4.75	6.3
		Capacity Requirements - Ability to meet flow and system pressure demands	Approximate average depth for this intake structure is 2.7-3 meters. All LLPS options will be designed to have the ability to meet flow and system pressure requirements	4.65	6.2	Approximate depth for this intake structure is 2.7-3 meters. All LLPS options will be designed to have the ability to meet flow and system pressure requirements	4.65	6.2	Approximate depth for this intake structure is 2.7-3 meters. All LLPS options will be designed to have the ability to meet flow and system pressure requirements	4.65	6.2	Approximate depth for this intake structure is 2.4-3 meters. This is the second shallowest option. All LLPS options will be designed to have the ability to meet flow and system pressure requirements	4.55	6.1	Approximate depth for this intake structure is 2.4-3 meters. This is the second shallowest option. All LLPS options will be designed to have the ability to meet flow and system pressure requirements	4.55	6.1	Approximate depth for this intake structure is 3.7-4.3 meters. This is the deepest option. All LLPS options will be designed to have the ability to meet flow and system pressure requirements	4.95	6.6	Approximate depth for this intake structure is 3.7-4.3 meters. This is the deepest option. All LLPS options will be designed to have the ability to meet flow and system pressure requirements	4.95	6.6	Approximate depth for this intake structure is 2.1-2.4 meters. This is the most shallow option. All LLPS options will be designed to have the ability to meet flow and system pressure requirements	4.35	5.8	Approximate depth for this intake structure is 2.1-2.4 meters. This is the most shallow option. All LLPS options will be designed to have the ability to meet flow and system pressure requirements	4.35	5.8
Maximum Sub-total Score – Water Quality		**20**			**17.7**			**17.7**			**17.7**			**18.7**			**18.7**			**19.5**			**19.5**			**18.0**			**18.0**
Natural Environment	15	**Natural Heritage Features –** Potential impacts to existing natural environment, including terrestrial and aquatic habitats, wildlife and wildlife habitats, sensitive features, areas of natural and scientific interest, etc.	All options have the potential to traverse vegetative communities and natural habitats. LLP1 options will be the least impactful to the shoreline and near shore forested areas.	4.75	4.8	Slightly higher impact than option A1 due to increased shorline construction associated with the LLP2A Placement	4.6	4.6	Similar impact to LLP1 as placement is on the WWTP property.	4.75	4.8	All options have the potential to traverse vegetative communities and natural habitats. LLP1 options will be the least impactful to the shoreline and near shore forested areas. Additional impact associated with pipe length and shoreline construction	4.5	4.5	Slightly higher impact than B1 due to increased shoreline construction.	4.25	4.3	All options have the potential to traverse vegetative communities and natural habitats. LLP1 options will be the least impactful to the shoreline and near shore forested areas. Longer pipe lengths, thru the forested peninsula increases impact.	3.7	3.7	All options have the potential to traverse vegetative communities. Impact associated with longer pipe construction and traverse through the forested and beach areas. LLP1 options will be the least impactful to the shoreline and near shore forested areas. Longer pipe lengths, thru the forested peninsula increases impact.	3.5	3.5	Impact associated with longer pipe construction and traverse through the forested and beach areas. LLP1 options will be the least impactful to the shoreline and near shore forested areas. Longer pipe lengths, thru the forested peninsula increases impact.	4	4.0	All options have the potential to traverse vegetative communities Impact associated with longer pipe construction and traverse through the forested peninsula. Impact at this location is similar to C2	3.75	3.8
		Climate Change – Potential impact on climatic conditions during construction and project vulnerability to changing climate conditions.	Least impactful option as the LLP1 is closest to the existing WTP (on the same property) and the inland portion of intake pipe will be the shortest of the assessed options. Operational and maintenance travel time would be the least with this option.	4.65	4.7	Second least impactful option as the LLP2A is just down the road from the same property) and the inland portion of intake pipe will be the shortest of the assessed options and follow the same path as option A1.	4.35	4.4	LLP3A is situated on the WWTP property and the inland portion of intake pipe will be almost double the requirement for options A1 & 2.	4.65	4.7	LLP1 is located on the existing WTP property. Operational and maintenance travel time would be the least with this option. Construction of the inland/inwater portion of this pipe will be comparible to A1 and 2 options.	4.35	4.4	LLP2B is located near the shoreline and to the South East of the existing WTP . Operational and maintenance travel time would be slighty more than LLPT . Construction of the inland/inwater portion of this pipe will be comparible to A1 and 2 options.	4	4.0	Option C1 - LLP1 is located on the existing WTP property. Operational and maintenance travel time would be the least with this option. Construction of the inland/inwater portion of this pipe for option C1&2 will be more extensive than options A or B and will require some tree removal.	3.65	3.7	LLP2C is located near the shoreline on the end of Caribou Point and to the South East of the existing WTP . Operational and maintenance travel time would be 3 to 4 times that of all other options. Construction of this station and the inland/inwater portion of this pipe for option C2 will be more extensive than options A or B and will require some tree removal.	3.35	3.4	Option D1 - LLP1 is located on the existing WTP property. Operational and maintenance travel time would be the least with this option. Construction of the inland/inwater portion of this pipe for option D1 & 2 will be more extensive than options A or B and will require some tree removal.	3.85	3.9	LLP2D is located near the shoreline North East of Caribou Point and to the South East of the existing WTP . Operational and maintenance travel time would be 3 to 4 times that of all other options. Construction of this station and the inland/inwater portion of this pipe for option D2 will be more extensive than options A or B and will require some tree removal.	3.6	3.6
		Source Water Protection – Potential impact on source water protection areas and compliance with source water protection policies.	Source water protection vulnerabilities would normally need to be assessed to reflect new intake location. Blind River, Algoma District are not listed in O.Reg. 284/07 of the Clean Water Act, (2006) as Source Protection Areas/Regions. The Town of Blind River will be voluntarily undertaking a vulnerability and threats assessment and IPZ delineation study for the selected new intake location.	4.75	4.8	Source water protection vulnerabilities would normally need to be assessed to reflect new intake location. Blind River, Algoma District are not listed in O.Reg. 284/07 of the Clean Water Act, (2006) as Source Protection Areas/Regions. The Town of Blind River will be voluntarily undertaking a vulnerability and threats assessment and IPZ delineation study for the selected new intake location.	4.75	4.8	Source water protection vulnerabilities would normally need to be assessed to reflect new intake location. Blind River, Algoma District are not listed in O.Reg. 284/07 of the Clean Water Act, (2006) as Source Protection Areas/Regions. The Town of Blind River will be voluntarily undertaking a vulnerability and threats assessment and IPZ delineation study for the selected new intake location.	4.75	4.8	Source water protection vulnerabilities would normally need to be assessed to reflect new intake location. Blind River, Algoma District are not listed in O.Reg. 284/07 of the Clean Water Act, (2006) as Source Protection Areas/Regions. The Town of Blind River will be voluntarily undertaking a vulnerability and threats assessment and IPZ delineation study for the selected new intake location.	4.75	4.8	Source water protection vulnerabilities would normally need to be assessed to reflect new intake location. Blind River, Algoma District are not listed in O.Reg. 284/07 of the Clean Water Act, (2006) as Source Protection Areas/Regions. The Town of Blind River will be voluntarily undertaking a vulnerability and threats assessment and IPZ delineation study for the selected new intake location.	4.75	4.8	Source water protection vulnerabilities would normally need to be assessed to reflect new intake location. Blind River, Algoma District are not listed in O.Reg. 284/07 of the Clean Water Act, (2006) as Source Protection Areas/Regions. The Town of Blind River will be voluntarily undertaking a vulnerability and threats assessment and IPZ delineation study for the selected new intake location.	4.75	4.8	Source water protection vulnerabilities would normally need to be assessed to reflect new intake location. Blind River, Algoma District are not listed in O.Reg. 284/07 of the Clean Water Act, (2006) as Source Protection Areas/Regions. The Town of Blind River will be voluntarily undertaking a vulnerability and threats assessment and IPZ delineation study for the selected new intake location.	4.75	4.8	Source water protection vulnerabilities would normally need to be assessed to reflect new intake location. Blind River, Algoma District are not listed in O.Reg. 284/07 of the Clean Water Act, (2006) as Source Protection Areas/Regions. The Town of Blind River will be voluntarily undertaking a vulnerability and threats assessment and IPZ delineation study for the selected new intake location.	4.75	4.8	Source water protection vulnerabilities would normally need to be assessed to reflect new intake location. Blind River, Algoma District are not listed in O.Reg. 284/07 of the Clean Water Act, (2006) as Source Protection Areas/Regions. The Town of Blind River will be voluntarily undertaking a vulnerability and threats assessment and IPZ delineation study for the selected new intake location.	4.75	4.8
Maximum Sub-total Score – Natural Environment		**15**			**14.2**			**13.7**			**14.2**			**13.6**			**13.0**			**12.1**			**11.6**			**12.6**			**12.1**
Socio-Cultural	15	**Public Health and Safety –** Potential risk to public and operations staff health and safety related to water quality, and construction and operation of new intake pipeline and structure.	Water quality of the area surrounding intake structure will require further assessment to ensure it aligns with the ODWQ standards. This area of North Lake Huron is characteristically pristine, with very little impact from emerging concerns or industrial activity. Onshore and offshore construction will adhere to standard safety operating procedures to ensure a high level of safety while working on,near, above and below the water and ground works.	5	5.0	Water quality of the area surrounding intake structure will require further assessment to ensure it aligns with the ODWQ standards. This area of North Lake Huron is characteristically pristine, with very little impact from emerging concerns or industrial activity. Onshore and offshore construction will adhere to standard safety operating procedures to ensure a high level of safety while working on,near, above and below the water and ground works.	5	5.0	Water quality of the area surrounding intake structure will require further assessment to ensure it aligns with the ODWQ standards. This area of North Lake Huron is characteristically pristine, with very little impact from emerging concerns or industrial activity. Onshore and offshore construction will adhere to standard safety operating procedures to ensure a high level of safety while working on,near, above and below the water and ground works.	5	5.0	Water quality of the area surrounding intake structure will require further assessment to ensure it aligns with the ODWQ standards. This area of North Lake Huron is characteristically pristine, with very little impact from emerging concerns or industrial activity. Onshore and offshore construction will adhere to standard safety operating procedures to ensure a high level of safety while working on,near, above and below the water and ground works.	5	5.0	Water quality of the area surrounding intake structure will require further assessment to ensure it aligns with the ODWQ standards. This area of North Lake Huron is characteristically pristine, with very little impact from emerging concerns or industrial activity. Onshore and offshore construction will adhere to standard safety operating procedures to ensure a high level of safety while working on,near, above and below the water and ground works.	5	5.0	Water quality of the area surrounding intake structure will require further assessment to ensure it aligns with the ODWQ standards. This area of North Lake Huron is characteristically pristine, with very little impact from emerging concerns or industrial activity. Onshore and offshore construction will adhere to standard safety operating procedures to ensure a high level of safety while working on,near, above and below the water and ground works.	5	5.0	Water quality of the area surrounding intake structure will require further assessment to ensure it aligns with the ODWQ standards. This area of North Lake Huron is characteristically pristine, with very little impact from emerging concerns or industrial activity. Onshore and offshore construction will adhere to standard safety operating procedures to ensure a high level of safety while working on,near, above and below the water and ground works.	5	5.0	Water quality of the area surrounding intake structure will require further assessment to ensure it aligns with the ODWQ standards. This area of North Lake Huron is characteristically pristine, with very little impact from emerging concerns or industrial activity. Onshore and offshore construction will adhere to standard safety operating procedures to ensure a high level of safety while working on,near, above and below the water and ground works.	5	5.0	Water quality of the area surrounding intake structure will require further assessment to ensure it aligns with the ODWQ standards. This area of North Lake Huron is characteristically pristine, with very little impact from emerging concerns or industrial activity. Onshore and offshore construction will adhere to standard safety operating procedures to ensure a high level of safety while working on,near, above and below the water and ground works.	5	5.0
		Long-term Impacts – Potential long-term impact on adjacent residents and local users from siting of new infrastructure.	No long-term impacts on adjacent residents or local users are anticipated.	5	5.0	No long-term impacts on adjacent residents or local users are anticipated.	5	5.0	No long-term impacts on adjacent residents or local users are anticipated.	5	5.0	A section of the onshore intake pipeline will encroach into the neighbouring private property, which will result in a long-term nuisance for the adjacent property owner.	4.25	4.3	A section of the onshore intake pipeline will encroach into the neighbouring private property, which will result in a long-term nuisance for the adjacent property owner.	4.25	4.3	A section of the onshore intake pipeline will encroach into the neighbouring private property, which will result in a long-term nuisance for the adjacent property owner.	4.75	4.8	A section of the onshore intake pipeline will encroach into the neighbouring private property, which will result in a long-term nuisance for the adjacent property owner.	4.75	4.8	A section of the onshore intake pipeline will encroach into the neighbouring private property, which will result in a long-term nuisance for the adjacent property owner.	4.75	4.8	A section of the onshore intake pipeline will encroach into the neighbouring private property, which will result in a long-term nuisance for the adjacent property owner.	4.75	4.8
		Short-term Impacts – Potential short-term disruption to local residents, businesses, commercial and recreational activities due to construction (i.e., noise, dust, vibration, visual, access, parking, road and beach areas closures)	Construction of LLP1 will induce moderate construction disruptions to local residents in the immediate surrounding area such as noise, dust and vibration. Less impactful option as the LLP1 construction can be confined to the WTP property.	3.75	3.8	Construction of LLP2A will induce moderate construction disruptions to local residents in the immediate surrounding area such as noise, dust and vibration. Short term impacts to shoreline activity and access will be considered	3.5	3.5	Construction of LLP3 will induce moderate construction disruptions to local residents in the immediate surrounding area such as noise, dust and vibration. Less impactful option as the LLP3 construction can be confined to the WTP property. Fewer residents nearby in comparison to LLP1.	4	4.0	Construction of LLP1 will induce moderate construction disruptions to local residents in the immediate surrounding area such as noise, dust and vibration. Less impactful option as the LLP1 construction can be confined to the WTP property.	4.25	4.3	Construction of LLP2B will induce moderate construction disruptions to local residents in the immediate surrounding area such as noise, dust and vibration. Short term impacts to shoreline activity and local resident road access may be observed	4	4.0	Construction of LLP1 will induce moderate construction disruptions to local residents in the immediate surrounding area such as noise, dust and vibration. Less impactful option as the LLP1 construction can be confined to the WTP property.	4.25	4.3	Construction of LL2PC will induce moderate construction disruptions to local residents in the immediate surrounding area such as noise, dust and vibration. Short term impacts to shoreline activity may be observed.	4	4.0	Construction of LLP1 will induce moderate construction disruptions to local residents in the immediate surrounding area such as noise, dust and vibration. Less impactful option as the LLP1 construction can be confined to the WTP property.	4.25	4.3	Construction of LLP2D will induce moderate construction disruptions to local residents in the immediate surrounding area such as noise, dust and vibration. Short term impacts to shoreline activity may be observed.	4	4.0
Maximum Sub-total Score – Socio-Cultural		**15**			**13.8**			**13.5**			**14.0**			**13.5**			**13.3**			**14.0**			**13.8**			**14.0**			**13.8**
Technical and Operational	30	**Ease of Implementation –** Potential levels of complexity during construction,conflicts with existing infrastructure,ability to facilitate construction with uninterrupted supply and reasonable timeframe.	The implementation and construction of the new intake option 3A will be phased to provide an uninterrupted supply of safe drinking water to the Town with minimal inconvenience. This option may infringe on local business traffic, marine traffic and public shoreline recreation. Higher complexity during construction of LLP1 due to co-location with existing WTP - Potential for conflicts with existing operations and existing infrastructure.	3.5	4.2	The implementation and construction of the new intake option 3A will be phased to provide an uninterrupted supply of safe drinking water to the Town with minimal inconvenience. This option may infringe on local business traffic, marine traffic and public shoreline recreation. Higher complexity during construction of LLP2A due to required electrical and process water connections.	4	4.8	The implementation and construction of the new intake option 3A will be phased to provide an uninterrupted supply of safe drinking water to the Town with minimal inconvenience. This option may infringe on local business traffic, marine traffic and public shoreline recreation. Higher complexity during construction of LLP3 due to co-location with existing WTP - Potential for conflicts with existing operations and existing infrastructure. Site is already serviced with water and electricity due to co-location with WWTP. Unlikely to interfere with WWTP operations due to functional separation from the rest of the property.	4.25	5.1	The implementation and construction of the new intake option 3A will be phased to provide an uninterrupted supply of safe drinking water to the Town with minimal inconvenience. This option may infringe on local business traffic, marine traffic and public shoreline recreation. Higher complexity during construction of LLP1 due to co-location with existing WTP - Potential for conflicts with existing operations and existing infrastructure. Site is already serviced with water and electricity.	3.75	4.5	The implementation and construction of the new intake option 3A will be phased to provide an uninterrupted supply of safe drinking water to the Town with minimal inconvenience. This option may infringe on local business traffic, marine traffic and public shoreline recreation. Higher complexity during construction of LLP2B due to required electrical and process water connections.	4.25	5.1	The implementation and construction of the new intake option 3A will be phased to provide an uninterrupted supply of safe drinking water to the Town with minimal inconvenience. This option may infringe on local business traffic, marine traffic and public shoreline recreation. Higher complexity during construction of LLP1 due to co-location with existing WTP - Potential for conflicts with existing operations and existing infrastructure. Site is already serviced with water and electricity.	3.5	4.2	The implementation and construction of the new intake option 3A will be phased to provide an uninterrupted supply of safe drinking water to the Town with minimal inconvenience. This option may infringe on local business traffic, marine traffic and public shoreline recreation. Higher complexity during construction of LLP1C due to required electrical and process water connections. Relatively difficult to access site.	3.75	4.5	The implementation and construction of the new intake option 3A will be phased to provide an uninterrupted supply of safe drinking water to the Town with minimal inconvenience. This option may infringe on local business traffic, marine traffic and public shoreline recreation. Higher complexity during construction of LLP1 due to co-location with existing WTP - Potential for conflicts with existing operations and existing infrastructure. Site is already serviced with water and electricity.	3.5	4.2	The implementation and construction of the new intake option 3A will be phased to provide an uninterrupted supply of safe drinking water to the Town with minimal inconvenience. This option may infringe on local business traffic, marine traffic and public shoreline recreation. Higher complexity during construction of LLP1 due to co-location with existing WTP - Potential for conflicts with existing operations and existing infrastructure. Site is already serviced with water and electricity due to co-location with WWTP. Unlikely to interfere with WWTP operations due to functional separation from the rest of the property.	3.75	4.5
		Operational Complexity – Relative added complexity to existing operational practices resulting from construction and operation of new infrastructure.	Some additional operations will be required to maintain the new LLPS, screens, pumps and motors. The addition of invasive mussel control and frazil ice mitigation processes are fairly simple to run and maintain operationally, if required. Close proximity to the existing water works may add convenience to this option.	4.75	5.7	Some additional operations will be required to maintain the new LLPS, screens, pumps and motors. The addition of invasive mussel control and frazil ice mitigation processes are fairly simple to run and maintain operationally, if required. Reletively close proximity to the existing water works may add convenience to this option.	4.6	5.5	Some additional operations will be required to maintain the new LLPS, screens, pumps and motors. The addition of invasive mussel control and frazil ice mitigation processes are fairly simple to run and maintain operationally, if required. Close proximity to the existing Wastewater works may add convenience to this option.	4.75	5.7	Some additional operations will be required to maintain the new LLPS, screens, pumps and motors. The addition of invasive mussel control and frazil ice mitigation processes are fairly simple to run and maintain operationally, if required. Close proximity to the existing water works may add convenience to this option.	4.5	5.4	Some additional operations will be required to maintain the new LLPS, screens, pumps and motors. The addition of invasive mussel control and frazil ice mitigation processes are fairly simple to run and maintain operationally, if required. Relatively proximity to the existing water works may add convenience to this option.	4.35	5.2	Some additional operations will be required to maintain the new LLPS, screens, pumps and motors. The addition of invasive mussel control and frazil ice mitigation processes are fairly simple to run and maintain operationally, if required. Close proximity to the existing water works may add convenience to this option.	4.25	5.1	Some additional operations will be required to maintain the new LLPS, screens, pumps and motors. The addition of invasive mussel control and frazil ice mitigation processes are fairly simple to run and maintain operationally, if required. The distance to the existing water works may add inconvenience to this option.	4	4.8	Some additional operations will be required to maintain the new LLPS, screens, pumps and motors. The addition of invasive mussel control and frazil ice mitigation processes are fairly simple to run and maintain operationally, if required. Close proximity to the existing water works may add convenience to this option.	4.25	5.1	Some additional operations will be required to maintain the new LLPS, screens, pumps and motors. The addition of invasive mussel control and frazil ice mitigation processes are fairly simple to run and maintain operationally, if required. The distance to the existing water works may add inconvenience to this option.	4	4.8
		Construction Duration - Duration of project construction and potential for staging and phased construction.	The location choice for the new LLPS should not significantly impact the expected construction duration within intake location options.	4.75	5.7	The location choice for the new LLPS should not significantly impact the expected construction duration within intake location options.	4.5	5.4	The location choice for the new LLPS should not significantly impact the expected construction duration within intake location options.	4.75	5.7	The location choice for the new LLPS should not significantly impact the expected construction duration within intake location options.	4.5	5.4	The location choice for the new LLPS should not significantly impact the expected construction duration within intake location options.	4.25	5.1	The location choice for the new LLPS should not significantly impact the expected construction duration within intake location options.	4.25	5.1	The location choice for the new LLPS should not significantly impact the expected construction duration within intake location options.	4	4.8	The location choice for the new LLPS should not significantly impact the expected construction duration within intake location options.	4.25	5.1	The location choice for the new LLPS should not significantly impact the expected construction duration within intake location options.	4	4.8
		Regulatory Approvals – Number and complexity of permits/approvals needed for project construction	Building Permit, MECP-MDWL, PTTW & DWWP, Archaeological Impacts, inground Utilities location, Trench Permit and other	4	4.8	Building Permit, MECP-MDWL, PTTW & DWWP, Archaeological Impacts, inground Utilities location, Trench Permit, SAR	3.75	4.5	Building Permit, MECP-MDWL, PTTW & DWWP, Archaeological Impacts, inground Utilities location, Trench Permit and other	4	4.8	Building Permit, MECP-MDWL, PTTW & DWWP, Archaeological Impacts, inground Utilities location, Trench Permit and other	4	4.8	Building Permit, MECP-MDWL, PTTW & DWWP, Archaeological Impacts, inground Utilities location, Trench Permit , SAR	3.75	4.5	Building Permit, MECP-MDWL, PTTW & DWWP, Archaeological Impacts, inground Utilities location, Trench Permit and other	4	4.8	Building Permit, MECP-MDWL, PTTW & DWWP, Archaeological Impacts, inground Utilities location, Trench Permit, SAR	3.75	4.5	Building Permit, MECP-MDWL, PTTW & DWWP, Archaeological Impacts, inground Utilities location, Trench Permit and other	4	4.8	Building Permit, MECP-MDWL, PTTW & DWWP, Archaeological Impacts, inground Utilities location, Trench Permit , SAR	3.75	4.5
		Property Acquisition – Need for land acquisition and availability of property, including temporary and permanent easements.	It has been assumed that this property is owned by the Town	4.75	5.7	Acquisition of the propery may be required	4.5	5.4	It has been assumed that this property is owned by the Town	4.75	5.7	It has been assumed that this property is owned by the Town	4.25	5.1	Acquisition of the property and an easment to the lareway will be required	3.75	4.5	It has been assumed that this property is owned by the Town	4.25	5.1	Acquisition of the property may be required	4	4.8	It has been assumed that this property is owned by the Town	4.5	5.4	Acquisition of the property may be required	3.5	4.2
Maximum Sub-total Score – Technical & Operational		**30**			**26.1**			**25.6**			**27.0**			**25.2**			**24.4**			**24.3**			**23.4**			**24.6**			**22.8**
Economic	20	**Construction Cost –** Relative scale of construction costs at various locations. Ability to meet the budget constraints and objectives.	$9.8 million	4.1	5.5	$8.8 million	4.6	6.1	$8.1 million	5	6.7	$10.4 million	3.9	5.2	$9.1 million	4.5	6.0	$11.5 million	3.5	4.7	$10.2 million	4	5.3	$11.2 million	3.6	4.8	$9.9 million	4.1	5.5
		Operational Cost – Long term projection of increased savings or expenditures during operation	Proximal to WTP = Less travel time, ease for deliveries and maintenance. Possible new chemical system, pumps and screens to maintain	4.5	6.0	Distance from WTP = More travel time, more difficult for deliveries and maintenance. Possible new chemical system, pumps and screens to maintain	4.35	5.8	Proximal to WWTP = Less travel time, ease for deliveries and maintenance. Possible new chemical system, pumps and screens to maintain	4.45	5.9	Proximal to WWTP = Less travel time, ease for deliveries and maintenance. Possible new chemical system, pumps and screens to maintain	4.4	5.9	Distance from WTP = More travel time, more difficult for deliveries and maintenance. Possible new chemical system, pumps and screens to maintain	4.25	5.7	Proximal to WTP = Less travel time, ease for deliveries and maintenance. Possible new chemical system, pumps and screens to maintain	4.25	5.7	More than 1 km distance to WTP = More travel time, more difficult for deliveries and maintenance. Possible new chemical system, pumps and screens to maintain	3.85	5.1	Proximal to WTP = Less travel time, ease for deliveries and maintenance. Possible new chemical system, pumps and screens to maintain	4.4	5.9	More than 1 km distance to WTP = More travel time, more difficult for deliveries and maintenance. Possible new chemical system, pumps and screens to maintain	4	5.3
		Future Cost – Economic benefit/detriment to future installations (elevated booster tanks, booster stations, etc.)	Not as much room on site for expansion of the WTP & LLPS. Not expected to impact future installations of infrastructure	5	6.7	Not expected to impact future installations of infrastructure	5	6.7	Not expected to impact future installations of infrastructure	5	6.7	Not as much room on site for expansion of the WTP & LLPS. Not expected to impact future installations of infrastructure	5	6.7	Not expected to impact future installations of infrastructure	5	6.7	Not as much room on site for expansion of the WTP & LLPS. Not expected to impact future installations of infrastructure	5	6.7	Not expected to impact future installations of infrastructure	5	6.7	Not as much room on site for expansion of the WTP & LLPS. Not expected to impact future installations of infrastructure	5	6.7	Not expected to impact future installations of infrastructure	5	6.7
Maximum Sub-total Score – Economic		**20**			**18.1**			**18.6**			**19.3**			**17.7**			**18.3**			**17.0**			**17.1**			**17.3**			**17.5**
Total Overall Maximum Weighted Score		**100**			**89.8**			**89.1**			**92.1**			**88.8**			**87.7**			**86.9**			**85.4**			**86.5**			**84.1**

G

Appendix G: Detailed Cost Estimates

CONCEPTUAL DESIGN COST ESTIMATE

PROJECT: Blind River Lake Based Raw Water Intake
PREPARED BY:
REVIEWED BY:
SUBJECT: Summary of Costs for Each Alternative

PROJ. NO.: T001592B
DATE:
DATE:

Alternative	A1	A2	A3	B1	B2	C1	C2	D1	D2	Notes
In-Water Location Option	3A	3A	3A	3B	3B	3C	3C	3D	**3D**	
LLPS Option	LLPS 1	LLPS 2A	LLPS 3	LLPS 1	LLPS 2B	LLPS 1	LLPS 2C	LLPS 1	LLPS 2D	
Appoximate WM Length (m)	300	465	490	610	640	1265	1295	1065	1140	
Depth @ Intake Structure	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	Assumed for preliminary costing
Property Purchase or Easement (Estimated)	$ -	$ 250,000	$ -	$ -	$ 250,000	$ -	$ 250,000	$ -	$ 250,000	Only required for LLPS 2
Division 1 (General Requirements)	$ 500,000	$ 500,000	$ 500,000	$ 500,000	$ 500,000	$ 500,000	$ 500,000	$ 500,000	$ 500,000	Same for each alternative
Division 2 (Site Works)	$ 361,680	$ 386,250	$ 361,680	$ 361,680	$ 386,250	$ 361,680	$ 386,250	$ 361,680	$ 386,250	Higher for alternatives which use LLPS 2. Exludes raw water piping
Division 2 (Raw Water Piping)	$ 2,250,000	$ 697,500	$ 735,000	$ 2,715,000	$ 960,000	$ 3,697,500	$ 1,942,500	$ 3,397,500	$ 1,710,000	Varies for each alternative
Division 2 (In-Water Works)	$ 2,049,000	$ 2,049,000	$ 2,049,000	$ 2,049,000	$ 2,049,000	$ 2,049,000	$ 2,049,000	$ 2,049,000	$ 2,049,000	Same for each alternative. Assumes 500m intake length.
Divisions 3 - 16 (LLPS Works)	$ 2,026,520	$ 2,026,520	$ 2,026,520	$ 2,026,520	$ 2,026,520	$ 2,026,520	$ 2,026,520	$ 2,026,520	$ 2,026,520	Same for each alternative. Excludes the electrical upgrades require to supply power to the LLPS from Division 16.
Division 16 (Power Supply to LLPS)	$ 225,500	$ 555,500	$ 225,500	$ 225,500	$ 555,500	$ 225,500	$ 555,500	$ 225,500	$ 555,500	Additional costs for LLPS 2 due to greenfield site.
Engineering Fees (Design and Construction)	$ 750,000	$ 750,000	$ 750,000	$ 750,000	$ 750,000	$ 750,000	$ 750,000	$ 750,000	$ 750,000	Assumed for preliminary costing
Permitting and Approvals	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	$ 100,000	Assumed for preliminary costing
Background Studies and Investigations	$ 300,000	$ 300,000	$ 300,000	$ 300,000	$ 300,000	$ 300,000	$ 300,000	$ 300,000	$ 300,000	Assumed for preliminary costing
Sub-Total Estimated Cost	**$ 8,562,700**	**$ 7,614,770**	**$ 7,047,700**	**$ 9,027,700**	**$ 7,877,270**	**$ 10,010,200**	**$ 8,859,770**	**$ 9,710,200**	**$ 8,627,270**	
15% Contingency	$ 1,284,000	$ 1,142,000	$ 1,057,000	$ 1,354,000	$ 1,182,000	$ 1,502,000	$ 1,329,000	$ 1,457,000	$ 1,294,000	
Total Estimated Cost with Contingency	**$ 9,846,700**	**$ 8,756,770**	**$ 8,104,700**	**$ 10,381,700**	**$ 9,059,270**	**$ 11,512,200**	**$ 10,188,770**	**$ 11,167,200**	**$ 9,921,270**	

CONCEPTUAL DESIGN COST ESTIMATE

PROJECT: Blind River Lake Based Raw Water Intake **PROJ. NO.:** T001592B
PREPARED BY: **DATE:**
REVIEWED BY: **DATE:**
SUBJECT: Division 1 - Costs

DIV No.	DESCRIPTION OF ITEM	QTY	UNIT	MATERIAL		LABOUR			TOTAL LABOUR & MAT'L ($)	SUB TOTAL COST ($)
				UNIT COST ($)	TOTAL COST ($)	MAT'L (%)	UNIT COST ($)	TOTAL COST ($)		
DIVISION 1. GENERAL REQUIREMENTS										
01000	General Requirements									
01110	Summary of Work									
01120	Coordination and Sequence of Work									
01200	Alternatives									
01310	Project Management and Coordination									
01320	Construction Progress Documentation									
01330	Submittal Procedures									
01351	Health and Safety									
01420	References									
01450	Quality Control									
01510	Temporary Utilities									
01520	Construction Facilities									
01561	Environmental Protection and Controls									
01610	Basic Product Requirements									
01740	Cleaning									
01760	Warranty Work									
01770	Closeout Procedures									
01780	Closeout Submittals									
01810	Testing and Commissioning									
01820	Demonstration and Training									
	TOTAL Division 1 (includes all items above)									**$500,000**

CONCEPTUAL DESIGN COST ESTIMATE

PROJECT: Blind River Lake Based Raw Water Intake
PROJ. NO.: T001592B
PREPARED BY:
DATE:
REVIEWED BY:
DATE:
SUBJECT: Division 2 - Site Works

DIV No.	DESCRIPTION OF ITEM	QTY	UNIT	MATERIAL		LABOUR			TOTAL LABOUR & MAT'L ($)	SUB TOTAL COST ($)
				UNIT COST ($)	TOTAL COST ($)	MAT'L (%)	UNIT COST ($)	TOTAL COST ($)		
DIVISION 2. SITE WORKS (Alternatives A2, B2, C2, D2) *(excluding watermains)*										
02050	Demolition				**$5,000**	incl				**$5,000**
	General removals	1	LS	$5,000	$5,000					
02137	Bracing and Shoring	300	m2	$350	$105,000	incl.				**$105,000**
02200	Site Preparation				**$168,370**	incl				**$168,370**
	Topsoil Stripping and Stockpile (02233)	200	m3	$10	$2,000					
	Granular for access and laydown	100	t	$50	$5,000					
	Construction Fencing	60	m	$40	$2,400					
	Tree Protection Fencing	60	m	$150	$8,970					
	Dewatering	1	LS	$150,000	$150,000					
02231	Clearing and Grubbing	8	ea	$400	**$3,200**	incl				**$3,200**
02311	Site Grading	1	LS		**$2,500**	incl				**$2,500**
02315	Excavation, Trenching, and Backfilling	2,500	m3	$10	$25,000	incl.				**$25,000**
02530	Sewerage				**$5,000**	incl.				**$5,000**
	Sanitary Building Drain (100 mm)	10.0	m	$250	$2,500					
	Storm Building Drain (100 mm)	10.0	m	$250	$2,500					
02581	Duct Banks and Manholes	100	m	$150	**$15,000**	incl.				**$15,000**
02631	Chamber and Manholes				**$9,000**	incl.				**$9,000**
	MH	1	ea	$5,000	$5,000					
	CB	2	ea	$2,000	$4,000					
02701	Aggregates and Granular Materials				**$10,800**	incl.				**$10,800**
	Granular 'A' Below LLPS	120	m3	$30	$3,600					
	Clear Stone Around LLPS	240	m3	$30	$7,200					
02721	Granular Base	120	m2	$11	**$1,320**	incl.				**$1,320**
02723	Granular Subbase	120	m2	$18	**$2,160**	incl.				**$2,160**
02725	Hot Mix Asphalt	100	m2	$54	**$5,400**	incl.				**$5,400**
02525	Concrete Curbs and Paving				**$8,750**	incl.				**$8,750**
	curb	50	m	$100	$5,000					
	sidewalk and concrete pads	50	m2	$75	$3,750					
02821	Chainlink Fence and Gates				**$14,000**	incl.				**$14,000**
	1.8 m high chain link c/w 3 strand barbed wire	150	m	$60	$9,000					
	6.0 m slide gate	1	ea	$5,000	$5,000					
02911	Topsoil and Finish Grading	250	m2	$15	**$3,750**	incl.				**$3,750**
02922	Sodding	250	m2	$8	**$2,000**	incl.				**$2,000**
	TOTAL Division 2 (Site Works) - Alternatives A2, B2, C2, D2									**$386,250**
DIVISION 2. SITE WORKS (Alternatives A1, A3, B1, C1, D1) *(excluding watermains)*										
02050	Demolition				**$2,500**	incl				**$2,500**
	General removals	1	LS	$2,500	$2,500					
02137	Bracing and Shoring	300	m2	$350	$105,000	incl.				**$105,000**
02200	Site Preparation				**$167,370**	incl				**$167,370**
	Topsoil Stripping and Stockpile (02233)	100	m3	$10	$1,000					
	Granular for access and laydown	100	t	$50	$5,000					
	Construction Fencing	60	m	$40	$2,400					
	Tree Protection Fencing	60	m	$150	$8,970					
	Dewatering	1	LS	$150,000	$150,000					
02231	Clearing and Grubbing	8	ea	$400	**$3,200**	incl				**$3,200**
02311	Site Grading	1	LS		**$2,500**	incl				**$2,500**
02315	Excavation, Trenching, and Backfilling	2,500	m3	$10	$25,000	incl.				**$25,000**
02530	Sewerage				**$5,000**	incl.				**$5,000**
	Sanitary Building Drain (100 mm)	10.0	m	$250	$2,500					
	Storm Building Drain (100 mm)	10.0	m	$250	$2,500					
02581	Duct Banks and Manholes	100	m	$150	**$15,000**	incl.				**$15,000**
02631	Chamber and Manholes				**$9,000**	incl.				**$9,000**
	MH	1	ea	$5,000	$5,000					
	CB	2	ea	$2,000	$4,000					
02701	Aggregates and Granular Materials				**$10,800**	incl.				**$10,800**
	Granular 'A' Below LLPS	120	m3	$30	$3,600					
	Clear Stone Around LLPS	240	m3	$30	$7,200					
02721	Granular Base	120	m2	$11	**$1,320**	incl.				**$1,320**
02723	Granular Subbase	120	m2	$18	**$2,160**	incl.				**$2,160**
02725	Hot Mix Asphalt	50	m2	$54	**$2,700**	incl.				**$2,700**
02525	Concrete Curbs and Paving				**$4,380**	incl.				**$4,380**
	curb	25	m	$100	$2,500					
	sidewalk and concrete pads	25	m2	$75	$1,880					
02911	Topsoil and Finish Grading	250	m2	$15	**$3,750**	incl.				**$3,750**
02922	Sodding	250	m2	$8	**$2,000**	incl.				**$2,000**
	TOTAL Division 2 (Site Works) - Alternatives A1, A3, B1, C1, D1									**$361,680**

CONCEPTUAL DESIGN COST ESTIMATE

PROJECT: Blind River Lake Based Raw Water Intake
PROJ. NO.: T001592B
PREPARED BY:
DATE:
REVIEWED BY:
DATE:
SUBJECT: Division 2 - Raw Water Piping

DIV No.	DESCRIPTION OF ITEM	QTY	UNIT	MATERIAL		LABOUR			TOTAL LABOUR & MAT'L ($)	SUB TOTAL COST ($)
				UNIT COST ($)	TOTAL COST ($)	MAT'L (%)	UNIT COST ($)	TOTAL COST ($)		
DIVISION 2. SITEWORKS - Alternative A1										
02511	Watermains									**$2,250,000**
	600 Diamater Watermain Tunneled from Lake or first open trench connection (option LLP1) to WTP Site	300	m	$7,500	$2,250,000	incl.				$2,250,000
DIVISION 2. SITEWORKS - Alternative A2										
02511	Watermains									**$697,500**
	600 Diameter Watermain HDPE Open Cut from WWTP site to WTP Site.	465	m	$1,500	$697,500	incl.				$697,500
DIVISION 2. SITEWORKS - Alternative A3										
02511	Watermains									**$735,000**
	600 Diameter Watermain HDPE Open Cut from Lake Site to WTP Site	490	m	$1,500	$735,000	incl.				$735,000
DIVISION 2. SITEWORKS - Alternative B1										
02511	Watermains									**$2,715,000**
	600 Diamater Watermain Tunneled from Lake or first open trench connection (option LLP1) to WTP Site	300	m	$7,500	$2,250,000	incl.				$2,250,000
	600 Diameter Watermain HDPE Open Cut from Lake Site to first connection meeting the tunneled pipe section from WTP Site	310	m	$1,500	$465,000	incl.				$465,000
DIVISION 2. SITEWORKS - Alternative B2										
02511	Watermains									**$960,000**
	600 Diameter Watermain HDPE Open Cut from Lake Site to WTP Site	640	m	$1,500	$960,000	incl.				$960,000
DIVISION 2. SITEWORKS (WATERMAIN) - Alternative C1										
02511	Watermains									**$3,697,500**
	600 Diamater Watermain Tunneled from Lake or first open trench connection (option LLP1) to WTP Site	300	m	$7,500	$2,250,000	incl.				$2,250,000
	600 Diameter Watermain HDPE Open Cut from Lake site to first connection meeting micro-tunneled pipe section from WTP Site.	965	m	$1,500	$1,447,500	incl.				$1,447,500
DIVISION 2. SITEWORKS (WATERMAIN) - Alternative C2										
02511	Watermains									**$1,942,500**
	600 Diameter Watermain HDPE Open Cut from Lake site to WTP Site	1,295	m	$1,500	$1,942,500	incl.				$1,942,500
DIVISION 2. SITEWORKS (WATERMAIN) - Alternative D1										
02511	Watermains									**$3,397,500**
	600 Diamater Watermain Tunneled from Lake or first open trench connection (option LLP1) to WTP Site	300	m	$7,500	$2,250,000	incl.				$2,250,000
	600 Diameter Watermain HDPE Open Cut from Lake site to WTP Site	765	m	$1,500	$1,147,500	incl.				$1,147,500
DIVISION 2. SITEWORKS (WATERMAIN) - Alternative D2										
02511	Watermains									**$1,710,000**
	600 Diameter Watermain HDPE Open Cut from Lake site to first connection meeting micro-tunneled pipe section from WTP Site.	1,140	m	$1,500	$1,710,000	incl.				$1,710,000

NOTES:

Per metre price for open cut sections includes excavation, materials, backfill, compaction and finishing (asphalt, topsoil, sod etc.). Assumption that raw water main will be buried at nominal dpeth of 1.8-2.0m to top of pipe below finished grade.

Per metre estimate for tunneled sections includes shafts at both ends and all other associated costs with the tunneling. Shaft depth at lake: 6m; Shaft depth at WTP: 20m

CONCEPTUAL DESIGN COST ESTIMATE

PROJECT: Blind River Lake Based Raw Water Intake **PROJ. NO.:** T001592B
PREPARED BY: **DATE:**
REVIEWED BY: **DATE:**
SUBJECT: Division 2 - In-Water Works

DIV No.	DESCRIPTION OF ITEM	QTY	UNIT	MATERIAL		LABOUR			TOTAL LABOUR & MAT'L ($)	SUB TOTAL COST ($)
				UNIT COST ($)	TOTAL COST ($)	MAT'L (%)	UNIT COST ($)	TOTAL COST ($)		
DIVISION 2. IN-WATER WORKS *(Assume 500m of pipe buried at 1.5m invert depth below lake bed elevation)*										
	Mobilization & Demobilization	1	LS	$300,000	$300,000				$0	**$300,000**
	Site Preparation	1	LS	$34,000	$34,000				$0	**$34,000**
	Excavate Trench - Rock	550	m	$1,500	$825,000				$0	**$825,000**
	600mm Dia. HDPE Intake Pipe - Supply & Install	550	m	$500	$275,000				$0	**$275,000**
	Water sampling line	1	LS	$25,000	$25,000				$0	**$25,000**
	Chlorination line	1	LS	$25,000	$25,000				$0	**$25,000**
	Backfill Trench	550	m	$500	$275,000				$0	**$275,000**
	Scour Protection	1	ea	$150,000	$150,000				$0	**$150,000**
	Intake structure - fine screen inlet	1	ea	$50,000	$50,000				$0	**$50,000**
	Cleanup & Restoration	1	ea	$30,000	$30,000				$0	**$30,000**
	Marine & Environmental Protection	1	ea	$60,000	$60,000				$0	**$60,000**
	TOTAL Division 2 (In-Water Works)									**$2,049,000**

CONCEPTUAL DESIGN COST ESTIMATE

PROJECT: Blind River Lake Based Raw Water Intake
PROJ. NO.: T001592B
PREPARED BY:
DATE:
REVIEWED BY:
DATE:
SUBJECT: Division 3 - 16 - Costs

DIV No.	DESCRIPTION OF ITEM	QTY	UNIT	MATERIAL		LABOUR			TOTAL LABOUR & MAT'L ($)	SUB TOTAL COST ($)
				UNIT COST ($)	TOTAL COST ($)	MAT'L (%)	UNIT COST ($)	TOTAL COST ($)		
DIVISION 3. CONCRETE										
03100	Concrete Formwork (included in 03300)									
03200	Concrete Reinforcement (included in 03300)									
03252	Waterstops (included in 03300)									
03300	Cast-in-Place Concrete									
	Footings	60.0	m^3	$1,500.00	$90,000.00	included			$90,000.00	$90,000
	Walls	104	m^3	$1,400.00	$145,600.00	included			$145,600.00	$145,600
	Structural Slabs	40	m^3	$1,500.00	$60,000.00	included			$60,000.00	$60,000
	Beams	10	m^3	$3,000.00	$30,000.00	included			$30,000.00	$30,000
	Housekeeping Pads, Curbs, Thrust Blocks	5	m^3	$1,500.00	$7,500.00	included			$7,500.00	$7,500
	Concrete Topping and Mud Mats	8	m^3	$900.00	$7,200.00	included			$7,200.00	$7,200
03410	Precast Hollowcore Concrete	100	m^2	$250.00	$25,000.00	included			$25,000.00	$25,000
03600	Grout (included in 03300)									
03612	Equipment Anchor Bolt Epoxy Grout (included in 03300)									
	TOTAL Division 3									**$365,300**
DIVISION 5. METALS										
05120	Structural Steel	15000	kg	$10.00	$150,000.00	included			$150,000.00	$150,000
05500	Metal Fabrications	1	LS	$10,000.00	$10,000.00	included			$10,000.00	$10,000
05510	Metal Ladders	2	ea	$5,000.00	$10,000.00	included			$10,000.00	$10,000
05900	Steel Building Systems	1	LS	$10,000.00	$10,000.00	included			$10,000.00	$10,000
	TOTAL Division 5									**$180,000**
DIVISION 6. WOODS AND PLASTICS										
06101	Rough Carpentry	1	LS	$10,000.00	$10,000.00	included			$10,000.00	$10,000
06310	Prefabricated Wood Roof Trusses	100	m2	$185.00	$18,500.00	included			$18,500.00	$18,500
	TOTAL Division 6									**$28,500**
DIVISION 7. THERMAL AND MOISTURE PROTECTION										
07120	Bituminous Dampproofing	260	m^2	$45.00	$11,700.00	included			$11,700.00	$11,700
07212	Board Insulation									
	Below Grade Insulation	110	m^2	$50.00	$5,500.00	included			$5,500.00	$5,500
	Cavity Wall Insulation	100	m^2	$25.00	$2,500.00	included			$2,500.00	$2,500
	Sloped Roof Insulation	100	m^2	$50.00	$5,000.00	included			$5,000.00	$5,000
	Attic Space Insulation	100	m^2	$13.00	$1,300.00	included			$1,300.00	$1,300
07213	Batt and Blanket Insulation	120	m^2	$25.00	$3,000.00	included			$3,000.00	$3,000
07270	Self-Adhered Air Vapour Barrier	200	m^2	$30.00	$6,000.00	included			$6,000.00	$6,000
07311	Asphalt Shingles	150	m^2	$50.00	$7,500.00	included			$7,500.00	$7,500
07464	Rigid Vinyl Siding	100	m^2	$55.00	$5,500.00	included			$5,500.00	$5,500
07522	MBM - Hot Mopped Applied Roofing	120	m^2	$500.00	$60,000.00	included			$60,000.00	$60,000
07620	Sheet Metal Flashing and Trim	60	m	$150.00	$9,000.00	included			$9,000.00	$9,000
07840	Fire Stopping	1	LS	$5,000.00	$5,000.00	included			$5,000.00	$5,000
07900	Joint Sealants	1	LS	$3,500.00	$3,500.00	included			$3,500.00	$3,500
	TOTAL Division 7									**$125,500**
DIVISION 8. DOORS AND WINDOWS										
08110	Steel Doors and Frames									
	Single Mandoor	1	ea	$2,000.00	$2,000.00	included			$2,000.00	$2,000
	Double Mandoor	3	ea	$3,000.00	$9,000.00	included			$9,000.00	$9,000
08310	Access Hatches	3	ea	$5,000.00	$15,000.00	included			$15,000.00	$15,000
08520	Aluminum Windows	14	m^2	$550.00	$7,700.00	included			$7,700.00	$7,700
08610	Skylights (for pump removal)	4	ea	$2,500.00	$10,000.00	included			$10,000.00	$10,000
08710	Door Hardware (included in 08110)									
08810	Insulating Glass Units (included in 08520)									
	TOTAL Division 8									**$43,700**
DIVISION 9. FINISHES										
09900	Painting	1	LS	$2,500.00	$2,500.00	included			$2,500.00	$2,500
	TOTAL Division 9									**$2,500**
DIVISION 10. SPECIALTIES										
10200	Metal Louvres	4	ea	$1,200.00	$4,800.00	included			$4,800.00	$4,800
	TOTAL Division 9									**$4,800**
DIVISION 11. EQUIPMENT										
11010	**Equipment General Requirements**	1	LS		$10,000			Incl.	$10,000	**$10,000**
11090	**Identification of Equipment, Valves and Piping**	1	LS		$5,000			Incl.	$5,000	**$5,000**
11100	**Process Valves**									
	200mm butterfly valve	3	ea	$1,000	$3,000			$0	$3,000	**$3,000**
	200mm Butterfly (motorized)	2	ea	$1,600	$3,200	25%		$800	$4,000	**$4,000**
	400mm Butterfly valve	2	ea	$4,000	$8,000	25%		$2,000	$10,000	**$10,000**
	200mm Check valve	2	ea	$3,000	$6,000	25%		$1,500	$7,500	**$7,500**
	25mm Combination Air Valve	3	ea	$500	$1,500	25%		$375	$1,875	**$1,875**
	small valves	1	LS	$5,000	$5,000	25%		$1,250	$6,250	**$6,250**
11101	**Piping and Fittings**									
	400mm 304L SS	10	m	$1,000	$10,000	50%		$5,000	$15,000	**$15,000**
	200mm	12	m	$800	$9,600	50%		$4,800	$14,400	**$14,400**
	Fittings, Fixtures, couplings	1	LS	$15,000	$15,000	50%		$7,500	$22,500	**$22,500**
	Travelling Screens (1 screen now, 1 for future)	1	LS	$110,000	$110,000	0%		$0	$110,000	**$110,000**
11105	**Piping Support Systems**	1	LS	$15,000	$15,000	0%		$0	$15,000	**$15,000**
11210	**Vertical Turbine Pumps (2 pumps now, 2 for future)**	2	ea	$75,000	$150,000	0%		$0	$150,000	**$150,000**
11280	**Fabricated Sluice Gate**	5	ea	$15,000	$75,000	0%		$0	$75,000	**$75,000**
	Frazil Ice System	1	LS	$15,000	$15,000	0%		$0	$15,000	**$15,000**
	Chlorine Dosing System	1	LS	$15,000	$15,000	0%		$0	$15,000	**$15,000**
	TOTAL Division 11									**$479,525**
DIVISION 13. INSTRUMENTATION, CONTROL and SCADA										
13100	Control and Instrumentation	1	LS	$10,000	$10,000			incl.	$10,000	**$10,000**
13110	SCADA Integration Services	1	LS	$10,000	$10,000			incl.	$10,000	**$10,000**
13560	Instrumentation General Requirements	1	LS	$10,000	$10,000			incl.	$10,000	**$10,000**
13563	**Pressure and Level Instruments**									
	Pressure Gauge	3	ea	$500	$1,500	50%	$250	$750	$2,250	
	Pressure Transmitter	3	ea	$2,000	$6,000	50%	$1,000	$3,000	$9,000	
	Level Transmitter	2	ea	$3,000	$6,000	50%	$1,500	$3,000	$9,000	
	Level Switch/Float.	6	ea	$500	$3,000	50%	$250	$1,500	$4,500	**$24,750**
13565	**Miscellaneous Instrumentation and Accessories**									
	Chlorine Residual Analyzer	1	ea	$6,000	$6,000	50%	$3,000	$3,000	$9,000	
	Temperature and other instruments.	1	ea	$3,000	$3,000	50%	$1,500	$1,500	$4,500	
	Turbidimeter	1	ea	$2,500	$2,500	50%	$1,250	$1,250	$3,750	
	Limit Switches	2	ea	$300	$600	50%	$150	$300	$900	**$18,150**
13566	Magnetic Flow Meters	1	ea	$10,000	$10,000	50%	$5,000	$5,000	$15,000	**$15,000**
13590	Network Cabling and Equipment	1	ls	$50,000	$50,000	50%	$25,000	$25,000	$75,000	**$75,000**
	TOTAL Division 13									**$162,900**
DIVISION 14 LIFTING AND HOISTING EQUIPMENT										
14400	Lifting and Hoisting Equipment	1	ea	$15,000.00	$15,000.00	included			$15,000.00	$15,000
	TOTAL Division 13									**$15,000**

DIV No.	DESCRIPTION OF ITEM	QTY	UNIT	MATERIAL		LABOUR			TOTAL LABOUR & MAT'L ($)	SUB TOTAL COST ($)
				UNIT COST ($)	TOTAL COST ($)	MAT'L (%)	UNIT COST ($)	TOTAL COST ($)		
DIVISION 15. MECHANICAL										
15010	Mechanical General Requirements	1	LS	$10,000	$10,000			incl.	$10,000	**$10,000**
15020	Systems Verification	1	LS	$5,000	$5,000			incl.	$5,000	**$5,000**
15043	Balancing	1	LS	$5,000	$5,000			incl.	$5,000	**$5,000**
15044	Commissioning	1	LS	$5,000	$5,000			incl.	$5,000	**$5,000**
15090	Supports, Anchors and Seals	1	LS	$5,000	$5,000			incl.	$5,000	**$5,000**
15100	Basic Materials and Methods	1	LS	$5,000	$5,000			incl.	$5,000	**$5,000**
15240	Vibration Isolation	1	LS	$2,000	$2,000			incl.	$2,000	**$2,000**
15260	Thermal Insulation for Piping	1	LS	$2,000	$2,000			incl.	$2,000	**$2,000**
15401	Plumbing General	1	LS	$5,000	$5,000			incl.	$5,000	**$5,000**
15411	Plumbing Specialties and Accessories	1	LS	$5,000	$5,000			incl.	$5,000	**$5,000**
15412	Domestic Water Supply Piping	1	LS	$3,000	$3,000			incl.	$3,000	**$3,000**
15413	Drainage, Waste and Vent Piping	1	LS	$3,000	$3,000			incl.	$3,000	**$3,000**
15500	Heating, Ventilation and Air Conditioning	1	LS	$50,000	$50,000			incl.	$50,000	**$50,000**
	TOTAL Division 15									**$105,000**
DIVISION 16. ELECTRICAL (EXCLUDING POWER SUPPLY TO LLPS)										
16010	Electrical General Requirements									
	General Requirements	1	LS	$ 8,000.00	$8,000			Incl.	$8,000	**$8,000**
16015	Electrical Systems Analysis									
	Protection Coordination and Arc Flash Hazard	1	LS	$ 15,000.00	$15,000			Incl.	$15,000	**$15,000**
16020	Sequence of Activities									
	Coordination and Scheduling of Temporary and Permanent Work.	0	LS	$ 2,000.00	$0			Incl.	$0	**$0**
16021	Demolition of Electrical Systems									
	Demolition of Electrical Systems (HLP station)	0	LS	$ 5,000.00	$0			Incl.	$0	**$0**
16051	Installation of Cables in Trenches and Ducts									
	Fabrication of U/G concrete encased ducts, etc.	0	m	$ 500.00	$0			Incl.	$0	
	Direct buried duct	0	m	$ 200.00	$0			Incl.	$0	**$0**
16062	Grounding - Secondary									
	Bare wire, rods, connectors, etc.	1	LS	$ 3,500.00	$3,500			Incl.	$3,500	**$3,500**
16090	Equipment Identification									
	Customer-specific labels and system identification	1	LS	$ 800.00	$800			Incl.	$800	**$800**
16122	Wires and Cables 0-1000V									
	Power feeders	1	LS	$ 35,000.00	$35,000	40%	$14,000	$14,000	$49,000	
	Building wire, control wire, etc.	1	LS	$ 25,000.00	$25,000	40%	$10,000	$10,000	$35,000	**$84,000**
16131	Splitters, Junction, Pull Boxes & Cabinets	0								
	Splitters, Junction, Pull Boxes and Cabinets	1	LS	$ 3,500.00	$3,500			Incl.	$3,500	**$3,500**
16132	Outlet Boxes, Conduit Boxes & Fittings									
	Outlet Boxes, Conduit Boxes and Fittings	1	LS	$ 1,500.00	$1,500			Incl.	$1,500	**$1,500**
16133	Conduits, Conduit Fastenings & Conduit Fittings									
	Conduits, Conduit Fastenings and Conduit Fittings	1	LS	$ 10,000.00	$10,000			Incl.	$10,000	**$10,000**
16141	Wiring Devices									
	Receptacles, switches, etc.	1	LS	$ 1,000.00	$1,000			Incl.	$1,000	**$1,000**
16199	Electrical Inspection & Testing	1	LS	$ 2,500.00	$2,500			Incl.	$2,500	**$2,500**
16222	AC Induction Motors									
	included in driven equipment costs									
16223	Motor Starters up to 600V									
	(1) supply fan	1	EA	$ 1,250.00	$1,250	40%	$500	$500	$1,750	**$1,750**
16224	Variable Frequency Drives up to 600V									
	included in MCC costs									
16225	Motor Control Centre									
	HLP-MCC	1	LS	$ 250,000.00	$250,000	25%	$62,500	$62,500	$312,500	**$312,500**
16271	Dry Type Transformers									
	600-120/208 V, 3 phase, dry type	1	EA	$ 2,700.00	$2,700	40%	$1,080	$1,080	$3,780	**$3,780**
16400	Basic Electrical Equipment and Materials									
	Local control stations	1	EA	$ 750.00	$750	50%	$375	$375	$1,125	
	Unit Heaters	1	EA	$ 2,000.00	$2,000	50%	$1,000	$1,000	$3,000	**$4,125**
16412	Molded Case Circuit Breakers									
	included in panelboards/MCC/SWGR									
16414	Disconnect Switches - Fused & Unfused									
	600V, 60A	1	EA	$ 400.00	$400	40%	$160	$160	$560	
	600V, 100A	1	EA	$ 600.00	$600	40%	$240	$240	$840	**$1,400**
16423	Control Devices									
16441	Panelboards & Breaker Type									
	120/208 V, 60 CCTS	1	EA	$ 9,000.00	$9,000	40%	$3,600	$3,600	$12,600	
	120/208 V, 18 CCTS	0	EA	$ 4,000.00	$0	40%	$0	$0	$0	**$12,600**
16505	Lighting Equipment									
	Indoor LED	24	EA	$ 200.00	$4,800	40%	$1,920	$1,920	$6,720	
	Outdoor LED	6	EA	$ 800.00	$4,800	40%	$1,920	$1,920	$6,720	
	Misc Controls	4	EA	$ 150.00	$600	40%	$240	$240	$840	**$14,280**
16531	Exit Lights									
	Remote NEMA 4X exit signs	4	EA	$ 300.00	$1,200	40%	$480	$480	$1,680	
	NEMA 4X Battery w/sign	4	EA	$ 1,100.00	$4,400	40%	$1,760	$1,760	$6,160	**$7,840**
16536	Emergency Lighting Units									
	Battery Pack	2	EA	$ 800.00	$1,600	40%	$640	$640	$2,240	
	Battery pack w/ dual LED head + EXIT	4	EA	$ 1,600.00	$6,400	40%	$2,560	$2,560	$8,960	
	Remote LED head, NEMA 4X	2	EA	$ 500.00	$1,000	40%	$400	$400	$1,400	**$12,600**
16671	Surge Protection Devices									
	SPD's	1	LS	$ 8,000.00	$8,000			Incl.	$8,000	**$8,000**
16702	Security System									
	security devices (install and wire)	8	EA	$ 400.00	$3,200	60%	$1,920	$1,920	$5,120	**$5,120**
	TOTAL Division 16 (Inside LLPS)									**$513,795**

CONCEPTUAL DESIGN COST ESTIMATE

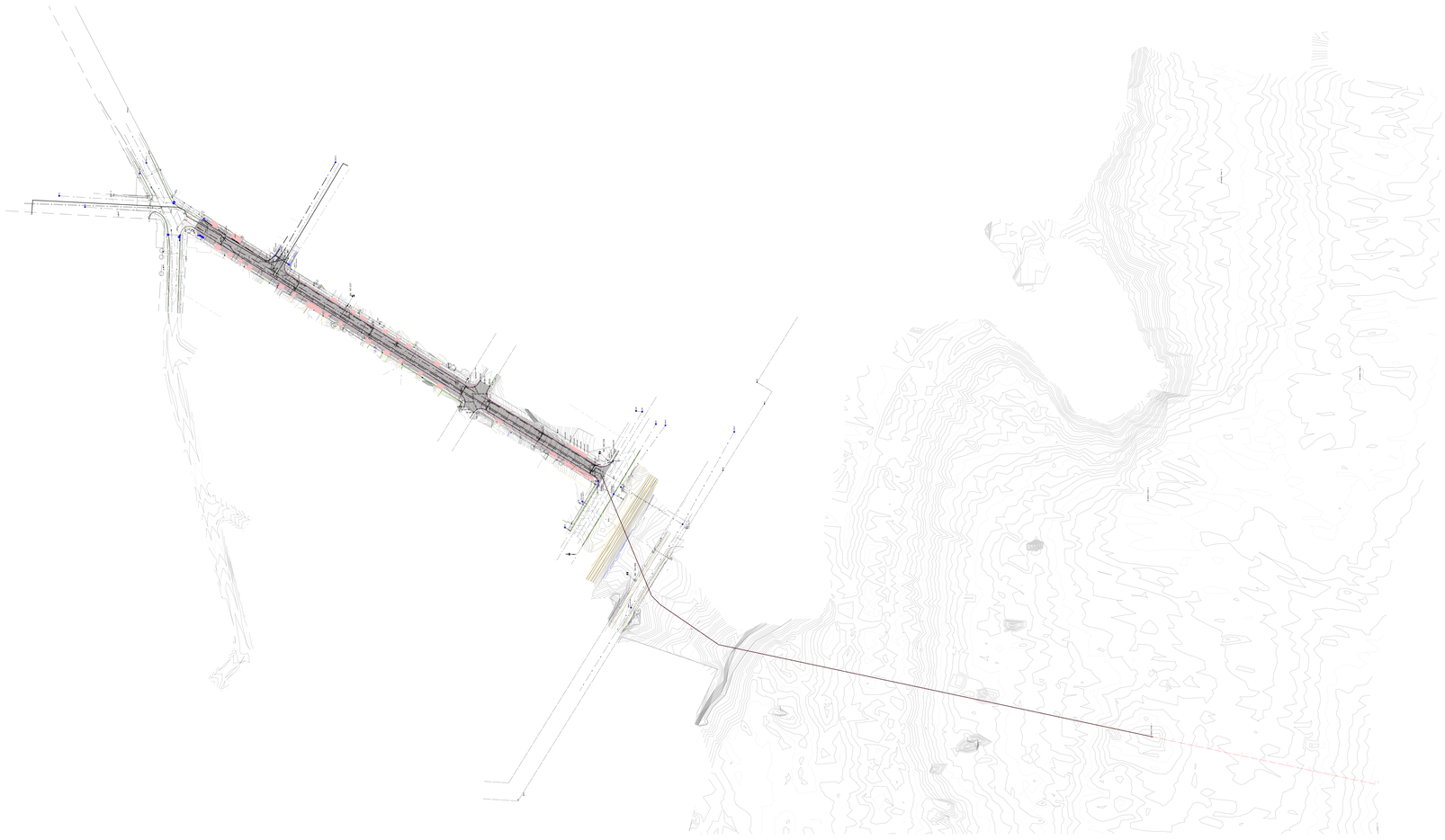
PROJECT: Blind River Lake Based Raw Water Intake
PROJ. NO.: T001592B
PREPARED BY:
DATE:
REVIEWED BY:
DATE:
SUBJECT: Division 16 - Power Supply to LLPS

DIV No.	DESCRIPTION OF ITEM	QTY	UNIT	MATERIAL		LABOUR			TOTAL LABOUR & MAT'L ($)	SUB TOTAL COST ($)
				UNIT COST ($)	TOTAL COST ($)	MAT'L (%)	UNIT COST ($)	TOTAL COST ($)		
DIVISION 16. ELECTRICAL (POWER SUPPLY TO LLPS) - Alternatives A2, B2, C2, D2										
16010	Electrical General Requirements									
	General Requirements	1	LS	$ 5,000.00	$5,000			Incl.	$5,000	**$5,000**
16015	Electrical Systems Analysis									
	Protection Coordination and Arc Flash Hazard	0	LS	$ 15,000.00	$0			Incl.	$0	**$0**
16020	Sequence of Activities									
	Coordination and Scheduling of Temporary and Permanent Work.	0	LS	$ 2,000.00	$0			Incl.	$0	**$0**
16021	Demolition of Electrical Systems									
	Demolition of Electrical Systems (HLP station)	0	LS	$ 5,000.00	$0			Incl.	$0	**$0**
16051	Installation of Cables in Trenches and Ducts									
	Fabrication of U/G concrete encased ducts, etc.	30	m	$ 500.00	$15,000			Incl.	$15,000	
	Direct buried duct	30	m	$ 200.00	$6,000			Incl.	$6,000	**$21,000**
16062	Grounding - Secondary									
	Bare wire, rods, connectors, etc.	1	LS	$ 3,500.00	$3,500			Incl.	$3,500	**$3,500**
	Customer-specific labels and system identification	0	LS	$ 800.00	$0			Incl.	$0	**$0**
16122	Wires and Cables 1000V Plus									
	Power feeders	1	LS	$ 65,000.00	$65,000	40%	$26,000	$26,000	$91,000	**$91,000**
	New Electrical equipment for upgraded supply to station	1	LS	$ 75,000.00	$75,000	40%	$30,000	$30,000	$105,000	**$105,000**
	New electrical service from the street	1	LS	$ 150,000.00	$150,000	40%	$60,000	$60,000	$210,000	**$210,000**
	Standby Power Generator (Outdoor unit with integral diesel storage tank)	1	LS	$ 120,000.00	$120,000				$120,000	**$120,000**
	TOTAL Division 16 (Power Supply to LLPS) - Alternatives A1, A3, B1, C1, D1									**$555,500**

DIVISION 16. ELECTRICAL (POWER SUPPLY TO LLPS) - Alternatives A1, A3, B1, C1, D1										
16010	Electrical General Requirements									
	General Requirements	1	LS	$ 5,000.00	$5,000			Incl.	$5,000	**$5,000**
16015	Electrical Systems Analysis									
	Protection Coordination and Arc Flash Hazard	0	LS	$ 15,000.00	$0			Incl.	$0	**$0**
16020	Sequence of Activities									
	Coordination and Scheduling of Temporary and Permanent Work.	0	LS	$ 2,000.00	$0			Incl.	$0	**$0**
16021	Demolition of Electrical Systems									
	Demolition of Electrical Systems (HLP station)	0	LS	$ 5,000.00	$0			Incl.	$0	**$0**
16051	Installation of Cables in Trenches and Ducts									
	Fabrication of U/G concrete encased ducts, etc.	30	m	$ 500.00	$15,000			Incl.	$15,000	
	Direct buried duct	30	m	$ 200.00	$6,000			Incl.	$6,000	**$21,000**
16062	Grounding - Secondary									
	Bare wire, rods, connectors, etc.	1	LS	$ 3,500.00	$3,500			Incl.	$3,500	**$3,500**
	Customer-specific labels and system identification	0	LS	$ 800.00	$0			Incl.	$0	**$0**
16122	Wires and Cables 1000V Plus									
	Power feeders	1	LS	$ 65,000.00	$65,000	40%	$26,000	$26,000	$91,000	**$91,000**
	New Electrical equipment for upgraded supply to station	1	LS	$ 75,000.00	$75,000	40%	$30,000	$30,000	$105,000	**$105,000**
	TOTAL Division 16 (Power Supply to LLPS) - Alternatives A2, B2, C2, D2									**$225,500**

H

Appendix H: Topographical Study



Appendix I: Geotechnical Investigation

GEOTECHNICAL REPORT

New Water Intake and Huron Street Reconstruction,
Blind River, Ontario

June 2024

TULLOCH Project # 23-0821

June 10, 2024	0	Issued for Use	L. Meneghetti	J. Mercer	G. Liang
February 27, 2024	A	Draft	L. Meneghetti	J. Mercer	G. Liang
Date	**Rev.**	**Status**	**Prepared By**	**Checked By**	**Approved By**
TULLOCH					

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23-0821
June 10, 2024

Town of Blind River
11 Hudson Street
Blind River, Ontario
P0R 1B0

Attention: Kathryn Scott | CAO/Clerk

RE: New Water Intake and Huron Street Reconstruction, Blind River, Ontario

Dear Mrs. Scott,

Please find enclosed our Geotechnical Report for the proposed HDD crossing and reconstruction of approximately 450 linear meters of paved road and municipal services on Huron Avenue, between Causley Street and Woodward Avenue in Blind River, Ontario.

This report outlines the results of the geotechnical investigation and provides geotechnical design recommendations and construction considerations for the HDD crossing and road reconstruction.

We trust the enclosed is adequate for your current needs. If there is anything further that we can assist with, please contact us at your convenience.

Sincerely,

Jackson Mercer, P. Eng.
Geotechnical Engineer

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1. INTRODUCTION AND SCOPE

TULLOCH Engineering Inc. (TULLOCH) was retained by the Town of Blind River (Client) to complete a geotechnical investigation for the proposed HDD crossing utilizing trenchless technology systems for the installation of a 300 mm watermain proposed to be installed below the Huron Central Railway crossing and Causley Street (Highway 17), and the reconstruction of approximately 450 linear meters of paved road and municipal services on Huron Avenue, between Causley Street and Woodward Avenue in Blind River, Ontario.

The purpose of the geotechnical investigation was to evaluate the subsurface conditions within the project site in order to provide recommendations for the trenchless crossing design and the reconstruction of the pavement structure as well as municipal services along Huron Street. A site plan attached in Appendix A outlines the borehole locations completed for the drilling investigation associated with the project.

This report provides the factual geotechnical investigation data and geotechnical design recommendations, which are based on the site investigation data, our understanding of the project scope and engineering experience. Common terminology used in this report can be found in Appendix B and specific terminology is referenced in table notes or in the report body.

2. REGIONAL GEOLOGY AND SITE INFORMATION

Based on review of Bedrock Geology and Northern Ontario Engineering Geology Terrain Study (NOEGTS) (OGS 2005) and Bedrock Geology of Ontario (OGS 2011) mapping as published by the Ontario Geological Survey, the site surficial geology consists of a till material predominantly of sand to silty sand matrix. The bedrock comprised of siltstone, wacke, and argillite, of the McKim Formation belonging to the Elliot Lake Group. The topography of the site is undulating to rolling, with moderate relief and exhibits missed wet and dry drainage conditions.

The project site is located from the shoreline of Lake Huron to the Huron Central Railway and Huron Avenue, between Causley Street and Woodward Avenue in Blind River, Ontario. The roadway proposed for reconstruction consists of a paved two-lane residential road with concrete sidewalks servicing north and south traffic flows. A detailed photo log of the site and investigation is attached in Appendix C.

3. SITE INVESTIGATION AND METHODOLOGY

The field investigation was undertaken from October 30 to November 1, 2023, and consisted of advancing nine (9) geotechnical boreholes referenced as BH-23-01 to BH-23-06, BH-23-09, BH-23-10 and BH-23-12, and three (3) environmental boreholes referenced as BH-23-07, BH-23-08 and BH-23-11. The geotechnical boreholes were advanced to a termination depth between 1.52 m below ground surface (mbgs) to 8.99 mbgs. Shallow auger and spoon refusal were encountered during the advance of BH-23-05 at 0.46 mbgs and BH-23-06 at 2.90 mbgs. The environmental boreholes were advanced to a termination depth of 0.76 mbgs. A supplemental excess soils management investigation was conducted by TULLOCH in accordance with O.Reg. 406/19 concurrently with the geotechnical investigation. Recommendations associated with soil disposal are not included within the scope of this report and are provided in a separate report issued by TULLOCH.

All boreholes were positioned, and field fit to avoid underground utilities present under the direction of a TULLOCH geotechnical representative based on the public and private locate clearances completed prior to the investigation. The following table summarizes the borehole investigation.

Table 3-1: Summary of Borehole Information

Borehole No.	Borehole Type	Easting (m)	Northing (m)	Ground Surface Elevation (m)	Depth of Borehole (mbgs)[1]
BH-23-01	Geotechnical	349 247	5 116 261	178.6	7.12
BH-23-02	Geotechnical	349 299	5 116 307	180.9	5.12
BH-23-03	Geotechnical	349 344	5 116 361	182.7	8.99
BH-23-04	Geotechnical	349 409	5 116 373	182.3	5.90
BH-23-05	Geotechnical	349 454	5 116 455	189.2	0.46
BH-23-06	Geotechnical	349 475	5 116 484	190.3	2.90
BH-23-07	Environmental	349 498	5 116 513	190.4	0.76
BH-23-08	Environmental	349 511	5 116 551	188.5	0.76
BH-23-09	Geotechnical	349 557	5 116 629	185.3	3.05
BH-23-10	Geotechnical	349 578	5 116 660	183.7	1.52
BH-23-11	Environmental	349 592	5 116 674	183.2	0.76
BH-23-12	Geotechnical	349 607	5 116 699	182.9	5.18

Note(s): [1]meters below ground surface.

Boreholes were advanced using a CME 55 truck-mounted drill rig owned and operated by Landcore Drilling in Chelmsford, Ontario. The geotechnical boreholes were advanced using 200 mm OD (outside diameter) continuous flight hollow stem augers and/or using NQ/NWT casing and wash boring. Bedrock cores were retrieved within the NW casing with an NQ2 (76 mm OD) rock core barrel., The environmental boreholes were advanced using continuous flight solid stem augers. The rig was equipped with standard soil sampling equipment including an automatic hammer.

In the overburden, soil samples were obtained using standard split spoon equipment in conjunction with Standard Penetration Tests (SPT) performed in accordance with ASTM D1586. SPT sampling generally occurred at 0.76 m intervals in the upper approximately 1.5 m of the boreholes, and at 1.5 m intervals thereafter and was conducted using an automatic hammer.

The drilling and soil/rock sampling program were directed by a TULLOCH representative, who logged the drilling operations and identified the soil samples and rock cores as they were retrieved. Detailed borehole logs for the proposed site can be found in Appendix D. Detailed bedrock core photos of the retrieved runs are attached in Appendix E.

The recovered soil/rock samples were transported to TULLOCH's CCIL-Certified Laboratory in Sault Ste. Marie for detailed examination and testing. A select number of soil samples were also submitted to Testmark Laboratories in Garson, ON for soil corrosivity analysis. All samples will be stored at the laboratory for three (3) months and then disposed of unless directed otherwise.

4. LABORATORY TESTING PROGRAM

A geotechnical laboratory testing program was performed on representative samples in accordance with ASTM standards. Table 4-1 provides a list of the testing program. Detailed laboratory reports for particle size distribution curves, moisture content, and corrosivity testing can be found in Appendix F.

Table 4-1: Summary of Soil Laboratory Testing Program

Item No.	Test	Number of Tests	ASTM Standard
1	Sieve/Hydrometer Analysis	14	ASTM D422/ D7928
2	Moisture Content	16	ASTM D2216
3	Corrosivity Analysis	2	Various
4	Unconfined Compression Test	4	ASTM D7012

5. SUBSURFACE CONDITIONS

5.1 General

Subsurface conditions encountered within the boreholes during the geotechnical investigation are summarized below. Detailed borehole and associated laboratory testing reports are provided in Appendix D and F, respectively. It should be noted that the soil boundaries indicated on the borehole logs are inferred from non-continuous sampling and observations during drilling. These boundaries are intended to reflect approximate transition zones for the purpose of geotechnical design and should not be interpreted as exact planes of geological change. The soil encountered on the project site consisted of the main deposits outlined below and are described as they were encountered from ground surface.

5.1.1 TOPSOIL

Surficial topsoil was encountered in boreholes BH-23-01 to BH-23-03. The encountered topsoil was found to be approximately 0.2 to 0.4 m thick and was mainly comprised of fine to coarse grained sand with some fine to coarse grained gravel and non-plastic fines, rootlets, and organics. The material was typically dark brown in colour, non-cohesive, and field moisture observations on retrieved split spoon samples indicated the material was moist.

Laboratory testing on a representative sample yielded a moisture content of 17.6%.

Gradation testing was conducted on one (1) of the recovered samples of the topsoil. The laboratory sieve analysis yielded the grain size distributions shown in Table 5-1.

Table 5-1: Grain Size Distribution Summary – Topsoil

Borehole No.	Sample No.	Size Fraction (%)		
		Gravel	Sand	Silt/Clay
BH-23-02	SS01A	7	77	16

5.1.2 COBBLES and BOULDERS

Cobbles and boulders were encountered in BH-23-01 underlying the surficial topsoil. The cobbles and boulders were advanced by utilizing NW/NQ coring techniques from approximately 0.4 to 3.1 mbgs and recorded as Run 1 to Run 3 in the Record of Rockcore No. BH-23-01, found in Appendix D and shown in Appendix E.

5.1.3 (SP) SAND

A sand deposit was encountered below the topsoil layer in BH-23-02. This material was found to be approximately 0.7 m in thickness. The generally the sand deposit was found to be fine to medium grained sand with some fine-grained gravel and some non-plastic fines. The material was brown in colour, non-cohesive, and field moisture observations on retrieved split spoon samples indicated the material was moist. The sand deposit was found to overlie the soil to bedrock contact and exhibited a high SPT 'N' value of 60 blows for 30 cm of sampling advancement indicating a very dense material density and inferred to be caused by interference with the bedrock contact.

5.1.4 ASPHALT

Asphalt from the existing pavement structures was encountered in borehole BH-23-04 to BH-23-12. The encountered asphalt thickness was found between 75 mm to 50 mm across the site, with an average thickness of 53 mm across all boreholes advanced during the investigation. Generally, based on visual observation the pavement condition was generally fair to poor. Alligator, transverse, and longitudinal cracking were observed with patching throughout the project area.

5.1.5 Existing FILL - (SW) SAND to Gravelly SAND

Existing road base/sub-base fills were encountered directly below the topsoil in borehole BH-23-03 and the asphalt in boreholes BH-23-04 to BH-23-12. The walls of each borehole were scratched, and auger cuttings were examined in the field to determine road base and sub-base material thicknesses below the pavement. Distinction between the existing road base and sub-base fills was not possible during the investigation as the fill was found to contain variably mixed sands and gravels and due to the age of the pavement structure, may not exist. The material contained fine to coarse grained sand and gravel and trace to some amounts of non-plastic fines. The material was typically brown to dark brown and black in colour, non-cohesive, and field moisture observations on retrieved split spoon samples indicated the material was moist. Asphalt debris was encountered in samples of the existing fill material obtained from BH-23-03 and BH-23-10.

The SPT 'N' value in this deposit ranged from 2 to 83 blows per 30 cm of sampler advancement in all boreholes, typically the material was observed to be compact to very dense.

Laboratory testing on representative samples yielded moisture contents ranging from 2.6% to 30.1% with an average of 9.9%.

Gradation testing was conducted on nine (9) of the recovered samples of the existing fill. The laboratory sieve analysis yielded the grain size distributions shown in Table 5-2.

Table 5-2: Grain Size Distribution Summary – Existing Fill

Borehole No.	Sample No.	Size Fraction (%)			
		Gravel	Sand	Silt	Clay
BH-23-03	SS03	26	60	14	
BH-23-04	SS01	28	62	10	
BH-23-04	SS02	23	71	6	
BH-23-05	SS01	25	67	8	
BH-23-06	SS01	17	75	8	
BH-23-06	SS02	19	74	7	
BH-23-06	SS05	44	51	5	
BH-23-09	SS02	38	50	12	
BH-23-10	SS01	5	70	22	3

5.1.6 (SM) SILTY SAND

A silty sand deposit was encountered in BH-23-09, BH-23-10, and BH-23-12 below the existing fill. The material was found to range from approximately 1.1 m to 1.6 m thick. The material contained fine to coarse grained sand with trace fine grained gravel. The silty sand was found to be non-plastic, brownish grey to greyish brown in colour with field moisture observations on retrieved split spoon samples indicating the material was moist. The SPT 'N' value in this deposit ranged from 5 to 12 blows per 30 cm of sampler advancement in all boreholes indicating material density of loose to compact. High blow count values of 72 to 121 blows per 30 cm of sampler advancement were encountered in BH-23-09 and are inferred to be caused by interference with cobbles to boulders that resulted in auger and spoon refusal at 2.29 mbgs. BH-23-09 was moved approximately 1.0 m and was continued to 3.05 m.

Laboratory testing on representative samples yielded moisture contents ranging from 7% to 7.5% with an average of 7.3%.

Gradation testing was conducted on two (2) of the recovered samples of the silty sand. The laboratory sieve analysis yielded the grain size distributions shown in Table 5-3.

Table 5-3: Grain Size Distribution Summary – Silty Sand

Borehole No.	Sample No.	Size Fraction (%)			
		Gravel	Sand	Silt	Clay
BH-23-09	SS04	7	61	32	
BH-23-12	SS04	0	65	27	8

5.1.7 (ML) SILT and (SP) SAND

A silt and sand deposit was encountered below the silty sand deposit in BH-23-12. The material was encountered between 2.21 mbgs and 5.18 mbgs. The material contained fine grained sand and trace amounts of clay. The silt & sand was found to be non-plastic, greyish brown in colour with field moisture observations on retrieved split spoon samples indicating the material was moist to wet. The SPT 'N' value in this deposit ranged from 3 to 9 blows per 30 cm of sampler advancement indicating material density of very loose to loose.

Laboratory testing on representative samples yielded moisture contents ranging from 17.8% to 20.1% with an average of 19%.

Gradation testing was conducted on one (1) recovered sample of the silt and sand. The laboratory sieve analysis yielded the grain size distributions shown in Table 5-4.

Table 5-4: Grain Size Distribution Summary – Silt and Sand

Borehole No.	Sample No.	Size Fraction (%)			
		Gravel	Sand	Silt	Clay
BH-23-12	SS04	0	44	54	2

5.1.8 Bedrock

Bedrock was cored in BH-23-01 to BH-23-04 and inferred in BH-23-05 from auger and split spoon sampler refusal at approximately 0.5 m. Based on visual observations of the bedrock coring, the bedrock on the project site generally consisted of greywacke bedrock that was dark grey in colour, fine to medium grained and fresh to faintly weathered.

The RQD values of the retrieved core samples ranged from 0% to 95% indicating a very poor to excellent quality rock with an averaging of 48%. Generally, very poor to poor quality bedrock based on RQD values was recorded in the upper slightly to faintly weathered bedrock which increased to good to excellent quality fresh bedrock with depth.

The core recovery was fair to excellent, with recovery rates ranging from 47% to 100% with an average of 52%. Generally, poorer core recovery was experienced within the upper weathered zone and increased as the bedrock transitioned to slightly weathered to fresh rock.

Solid core recovery ranged from 8% to 92% with an average value of 89% and appears to generally increase with depth. The SCR index was generally influenced by the orientations of the fractures. The values of the Fracture Index range between 0 and 7 fractures per 300 mm of intact core recovered.

Unconfined compression testing was conducted on representative samples of the bedrock encountered throughout BH-23-01 to BH-23-04 and ranged from 45.8 MPa to 135.5 MPa with an average of 75.6 MPa.

5.2 Groundwater Conditions

Groundwater level measurements were taken down open boreholes upon completion of the drilling. Groundwater was not encountered in any of the boreholes advanced during this investigation.

It is noted that the proposed project is close to Lake Huron, for design purposes, the groundwater table can be assumed as the same as the lake level.

The groundwater levels encountered during the investigation may not represent stabilized conditions at the time of measurement, furthermore, it should be noted that groundwater level is subject to seasonal fluctuations with high levels occurring during wet weather conditions in the spring and fall and lower levels during dry weather conditions. As such additional precautions should be taken for groundwater management if necessary.

6. GEOTECHNICAL RECOMMENDATIONS

6.1 General

The following section will discuss trenchless crossing and pavement recommendations and construction considerations for the reconstruction of Huron Avenue. This section will provide our interpretation of the available geotechnical data and geotechnical recommendations and it is intended for the guidance of the design engineer. Where comments are made regarding construction, they are provided only to highlight any aspects that could affect the design of the project. Contractors bidding on or undertaking the construction should make their own interpretation of the provided subsurface information with respect to their planned construction methods, equipment selection, scheduling, and the like.

6.2 Trenchless Crossing

Based on the available information, the following factors should be considered:

- At the time of writing this report, the crossing design was not available to TULLOCH. TULLOCH understands that the proposed trenchless crossing alignment is to cross below the Huron Central Railway owned by Canadian Pacific Railway and Causley Street (Highway 17). From review of the borehole logs it is recommended that the crossing be targeted to go through the greywacke bedrock encountered in BH-23-02 south of Martin Street which will transition from good to excellent quality bedrock and good to fair quality bedrock encountered in BH-23-04 on the east side of Huron Street.

The installation of the trenchless crossing under the Huron Central Railway and Causley Street (Highway 17) must conform to the following standards and guidelines.

- Ontario Provincial Standard Specification (OPSS) 450 Construction Specification for Pipeline and Utility Installation by Horizontal Directional Drilling.
- American Railway Engineering and Maintenance of Way Association (AREMA) Manual for Railway Engineering (2018)
- Transport Canada TC E-10 Standards Respecting to Pipeline Crossing Under Railways
- Transportation Association of Canada (TAC). Guidelines for Underground Utility Installations Crossing Highway Rights-of-Way. March 2013

6.2.1 Installation Depth

It is understood that the proposed crossing pipeline will consist of a twin HDPE pipe watermain with an outside diameter of 12” (300 mm). At this time the proposed bore length is estimated at approximately 70 m.

In accordance with AREMA (2018), under-track bores are to be installed at a minimum depth of 1.68 m below the base of the railway rail and with TAC (2013), the service is to be installed at a minimum depth of 3.0 m under highways unless approved by the road authority. Based on the site geotechnical conditions, TULLOCH recommends installing the utility conduit to be within the good quality bedrock at the site. The target burial depth should be between 4.0 m to 6.0 m depth below the existing ground surface at the crossing location. In accordance with the AREMA guidelines, pipelines under railway tracks are required to be encased in a larger diameter steel casing pipe and extend a minimum distance of 25 m of the railway centerline. The outside

diameter of the casing pipe should be at least 100 mm greater than the carrier pipe. If the casing pipe is installed without protective coating or cathodically protected, the wall thickness of the casing pipe should be increased to the nearest standard size which is a minimum of 1.6 mm greater than the thickness required. The steel casing pipe should also have a specified minimum yield strength of 241 MPa or greater.

For Horizontal Directional Drilling installations, the burial depth will vary adjacent to the entry and receiving pits. At these locations, the cover depth should be at least 3D to maintain the bore stability, where D is the diameter of the conduit. Installing the conduit within the geological settings recommended above (i.e. the good-quality bedrock) will reduce the risk of unacceptable track settlement during the installation.

Section 6.2.4 below summarizes the parameters required to estimate settlement and stresses acting on the conduit.

6.2.2 Installation Method

Three (3) trenchless technologies were considered for the gas pipeline installation given the site geology and replacement pipeline alignment. These include:

- **Jack and Bore**: A horizontal solid auger is used to advance a steel casing from an entry pit to a receiving pit constructed on either side of the crossing. The entry and receiving pits must be excavated to a depth that is below the invert of the conduit since the bore path is straight. A bore machine is erected within the entry pit; this pit must be sized to accommodate the jacking and boring machine, steel casing segments, operators, soil cuttings and shoring system. The auger, which is situated inside the casing is advanced either slightly ahead of or behind the leading edge of the casing depending on the ground conditions. The casing is advanced with the auger using hydraulic jacks. Based on the need for a curved bore path to provide increased pipeline cover at the proposed crossing, this straight path method is considered feasible but likely uneconomical.

- **Horizontal Direction Drilling (HDD)**: HDD involves the boring and enlargement of an uncased borehole, which is kept open using a bentonite-water or bentonite-polymer-water slurry referred to as drill fluid. A relatively small diameter pilot hole is typically bored from an entry pit to a receiving pit along the proposed installation alignment. The drill bit or cutting head at the lead end of the drill string is used to steer the hole along the designed bore path. Accordingly, the bore path can be curved for this type of installation to provide sufficient soil cover between the pipeline and the surface of the proposed crossing

alignment. After executing the pilot hole, the borehole is then enlarged using a reamer until the desired bore diameter is achieved, typically slightly larger than the conduit, and the conduit is pulled through the borehole on the final reaming pass.

- **Micro-tunnelling**: Micro-tunneling involves the use of a Micro-tunnel Boring Machine (MTBM) to advance a small tunnel heading through the ground along the proposed bore path. The MTBM is typically placed in a launch pit and the MTBM and conduit, situated behind the MTBM, are advanced by pipe jacking. The cutting head of the MTBM is often lubricated with a bentonite slurry that is designed based on the sub-surface soil conditions. The MTBM cutter head excavates a tunnel of a slightly larger diameter than the conduit to reduce the friction on the conduit during advancement. Dewatering is necessary during construction to facilitate bore pit operations and prevent workplace flooding. MTBM operations tend to be used for larger-scale operations and often have a higher associated cost. Given the size and length of the bore path planned for this application, it is not considered economical.

Table 6-1 summarizes TULLOCH's assessment of the applicable trenchless technologies for the proposed crossing site. Based on Table 6-1, HDD is the recommended method for the proposed installation due to the small size of the pipe installation, the length of installation required between the sending and receiving pits, no dewatering requirement, the presence of shallow medium to high strength bedrock, lower installation stresses on the conduit from the geological deposits encountered at the project sites, satisfactory settlement control, and relatively low cost. Considering the constructability and economics, HDD is the preferred option when installed by an experienced contractor with adequate experience.

HDD borings are typically done from the ground surface without the use of deep staging excavations, reducing the extent of groundwater control required. HDD also has the ability to control the movement of the reamer to allow for steering of the bore path safely under the Huron Central Railway and Causley Street (Highway 17) crossing. The maximum pressure of the drilling fluid must be controlled to prevent the drilling fluid from migrating into the groundwater system during construction. Preventing and mitigating inadvertent drilling fluid returns should be part of the planning and construction of an HDD installation.

It is the contractor's responsibility for the slurry design and tooling systems for the HDD installation based on the specific site geotechnical conditions as presented in the borehole logs in this report.

The Jack and Bore methodology while feasible, is likely uneconomical and may be more difficult from an installation perspective due to the limited steering ability during advancement. This would require significantly deeper entry and exit pits than other methods and would require larger ground disturbance (e.g. bedrock excavation), resulting in significantly more impact on the roadway. Given the size of the pipe proposed for the trenchless crossing, Jack and Bore technology is likely uneconomical for this application.

It is assumed that more expensive options such as micro-tunnelling are likely not economically feasible in this area. The final choice of equipment and the method of tunnelling should be the Contractor's responsibility.

Successful completion of any trenchless technology or tunnelling project largely depends on an appropriate selection of equipment and methods and the skills and experience of the Contractor. The final selection of the trenchless crossing technique should be made by the Contractor based on their experience and equipment capabilities in addition to their assessment of the subsurface conditions. The soil deposits and groundwater conditions described above may pose several constraints to trenchless installations.

Table 6-1: Trenchless Method Evaluation

Trenchless Technology	Constructability	Cost	Installation Stresses on the Watermain	Ground Surface Settlement Control
Jack and Bore	• Requires deep entry and receiving pits plus shoring. Dewatering may be required to facilitate bore pit operations and prevent workplace flooding, for excavations that exceed the groundwater table. • A Permit to Take Water (PTTW) from the MOE may be required if the dewatering discharge is greater than 50,000 L/day. • Ground settlement may be caused by construction dewatering at the site. • The groundwater table is assumed the same as the adjacent lake level, however, a seasonal higher groundwater table may be encountered during construction. • Not feasible if hard bedrock is present. • Not feasible where curved bore path is needed due to limited steering ability.	• Normally very economical except when executed below the groundwater table. • Increased expense for sending and receiving pits at this site. • Increased expense of equipment for the size of the proposed trenchless installation	• Low to moderate jacking stresses during installation	• Very good settlement control provided the casing is advanced ahead of the auger. • Ground settlement may be caused by dewatering at the site during construction.
HDD	• Entry and receiving pits can be minimized or not required depending on the design and bore path required. • A workspace should be provided at both ends for storage and equipment. • Feasible in medium strength rock • Locally, the rock may be susceptible to raveling for large diameter bores. • No to minimal dewatering is anticipated during construction. • Sufficient installation accuracy over long distances	• Normally very economic	• Typically, lower than Jack and Bore; and much lower in stiff ground.	• Satisfactory settlement control provided the proper design of drill fluid mix and pressure.
Micro-Tunneling	• Requires large entry and exit pits. • Dewatering is required in entry and exit pits. • Micro-tunneling work can be extremely accurate.	• Highest cost option.	• Typically, lower than Jack and Bore; and much lower in stiff ground.	• Satisfactory settlement control can be achieved. • Ground settlement may be caused by dewatering at the entry and exit pits.

6.2.3 Ground Settlement

Invariably there is almost always some ground movement, deformation and settlement associated with tunneling regardless of the method used. It is anticipated that the replacement pipeline invert level will result in an earth cover above the bores of at least 4.0 m to 6.0 m under the Huron Central Railway and Causley Street (Highway 17) crossing. This would correspond to approximately 10 to 15 times the casing diameter of 16" (400 mm), which is considered to be adequate. Assuming a bore size of 16" (400 mm) and a maximum 1% ground loss during tunnelling through the greywacke bedrock, the maximum settlement at ground surface above the center line of the tunnel was estimated to be less than 1 mm at a minimum of 4.0 m relative depth under the Huron Central Railway and Causley Street (Highway 17) crossing, which is negligible. This assumes the bore is conducted exclusively through the medium to high strength greywacke bedrock with reasonably good slurry control and maintenance of appropriate slurry processes and pipe advancement rates.

Once the crossing design has been determined, calculations to determine the allowable ground loss to satisfy the required settlement criteria and Tunnel Induced Surface Settlement should be completed to develop a performance specification for the contractor placing the responsibility to manage the ground loss to the prescribed criteria.

6.2.4 Crossing Design Parameters

Based on the geotechnical investigations at the crossing location, Table 6-2 summarizes the recommended geotechnical parameters for the crossing design within the bedrock at the crossing location. The following summarizes TULLOCH's guidance for the crossing design:

- Based on the borehole data obtained from BH-23-03, the HDD may cross through a very poor to poor quality rock zone between the Huron Central Railway and Causley Street (Highway 17) when advanced with a minimum installation depth of 4.0 m. The contractor should ensure that the equipment performing the work can advance through the bedrock conditions presented in Appendix D and meet the settlement criteria developed for the project.

- The crossing pipeline should be designed for the *in-situ* earth pressures for subsurface conditions encountered at the site plus any additional earth pressure imposed by surface surcharge loads due to train and traffic loading caused by the Huron Central Railway and Causley Street (Highway 17).

- The *in-situ* earth pressures in the rock can be determined using the parameters in Tables 6-4 and 6-5 by the sum of the unit weight of each material times its thickness overlying the conduit centerline. For example, at BH-23-04 and a depth of 4 m, the material zones encountered are a Sand Fill overlying Greywacke bedrock, therefore, the vertical, P_V, and horizontal, P_H, earth pressures on the conduit are:

$$P_V = 0.9\,m \times 20\frac{kN}{m3} + 3.1m \times 25\frac{kN}{m3} = 95.5\,kPa;\;\; P_H = 2 \times P_v = 191\,kPa$$

- The design of the conduit should account for the *in-situ* stress and additional stresses due to installation and surcharge loads at the ground surface during the crossing design life.

- Boussinesq's equation (1985), i.e. for calculating ground stresses due to point load or line load at the surface, can be used to estimate the vertical and horizontal stress acting at the conduit centerline due to train wheel loads.

- The ground settlement caused by train loads can be estimated using elastic solutions and the elastic parameters, referred to as deformation modulus, listed in Tables 6-2 and 6-3.

- Pullback forces on the conduit can be estimated using methods such as PRCI Publication PR-277-144507-Z01 or equivalent using the friction factors listed in Tables 6-2 and 6-3 and assuming a drilling fluid specific gravity of 1.1.

Table 6-2: Overburden (Sand) Properties

Soil Property	Symbol	Unit	Value
Effective Internal Friction Angle	ϕ'	degree	32
Unit Weight	γ	kN/m³	20
Earth Pressure Coefficient at Rest	K_0	Unitless	0.5
Passive Lateral Earth Pressure Coefficient	K_p	Unitless	3.2
Active Lateral Earth Pressure Coefficient	K_a	Unitless	0.3
Vertical Modulus of Subgrade Reaction	K	kN/m³	50,000
Deformation Modulus	E'	MPa	80
Friction Coefficient, for HDD Pullback Forces	μ	Unitless	0.5

Table 6-3: Rock (Greywacke) Mass Properties

Rock Property	Symbol	Unit	Value
Unit Weight of Rock Mass	γ	kN/m^3	25
Earth Pressure Coefficient at Rest	K_0	Unitless	0.44
Intact Rock Strength[1]	σ_{ci}	MPa	75.6
Geological Strength Index	GSI	Unitless	50
Rock Mass Compressive Strength[2]	σ_{cm}	MPa	13.2
Deformation Modulus[3]	E_m	MPa	8700
Poisson's Ratio	v	–	0.2
Friction Angle (Residual)	ϕ'	degree	40

Note(s): [1] The intact rock strength is estimated from the average unconfined compression testing values on retrieved rock cores on site. [2] σcm=(0.0034m_i^0.8) σc [1.029+0.025e^((-0.1m_i))]^GSI (Eberhardt, 2003); [3] Given by Em= √(σc/100)*10^((GSI-10)/40) (Hoek and Brown, 1998).

6.2.5 Construction Considerations

The following considerations should be accounted for during the crossing design:

- Due to the very poor to poor rock quality found in BH-23-03, the conduit should be pulled into place as soon as practical after the initial pilot bore. TULLOCH recommends requiring the contractor to install the conduit during the 1st reaming pass after the initial pilot bore. The initial pilot bore should be as small as practical.
- The contractor should be equipped with appropriate tooling systems that should be selected to handle the possibility of cobbles and boulders as well as advancement through the medium to high strength bedrock encountered throughout the site. The selected contractor should have a contingency plan to handle boulders/cobbles if encountered at the site.
- The amount of surface settlement during construction will depend on the contractor's skill and the care taken to limit ground loss during the conduit installation. As noted above, during the crossing design, the design engineers should determine the allowable ground loss required to satisfy the appropriate settlement criteria and then develop a performance specification for the installation that informs the contractor of these limits and places the responsibility to comply with these limits on the contractor.

6.2.6 Temporary Excavations

As bedrock was encountered within 1.0 m below ground surface in BH-23-02 and BH-23-04, where the presumed sending and receiving pits would be located, the use of temporary excavation and support systems are unlikely. Should open excavations for the entry and receiving pits be adopted, they must be carried out in a manner that complies with the Occupational Health and Safety Act (OHSA), Ontario Regulation 213/91.

6.3 Pavement Design

6.3.1 Existing Pavement Condition

The existing asphalt was found to range between approximately 75 mm to 50 mm thick across BH-23-04 to BH-23-12. The subgrade conditions consisted of an existing gravelly sand to sand fill overlaying native silty sand. During the investigation, granular base and sub-base measurement attempts were made, however, due to the variability of existing fill, the distinguishment between base and sub-base was not possible at the time of investigation and may not exist beneath the asphalt.

Photographs of the asphalt surface of the road were taken during the investigation on October 30 and November 1, 2023, at the borehole locations. Selected representative photos can be found in Appendix C. Visual inspection of the pavement surface noted that it was in fair to poor condition. Most stretches of paved surfaces are visibly distressed, with frequent raveling, longitudinal and transverse cracking noted throughout the site. The depressions and frequent cracking are indications of inadequate or poorly constructed granular base/sub-base not sufficient to support the current traffic loading or future increased traffic volume and may be caused by consolidation or lateral movement of the materials due to traffic loading. No catch basins or manholes were observed along the southern half of Huron Street during the investigation which indicates that there is no existing storm sewer network to provide proper drainage to this portion of the project site. Poor existing fill grading which does not promote natural drainage and the lack of an adequate drainage network could also be leading to increased pavement degradation.

Table 6-4 summarizes the road conditions including asphalt, granular road base and groundwater depth.

Table 6-4: Existing Road Condition Summary Based on Borehole Data

Borehole	Asphalt Thickness (mm)	Existing Road Fill Thickness (mm)	Groundwater Depth (m)[1]
BH-23-01	-	-	N/E[2]
BH-23-02	-	-	N/E[2]
BH-23-03	-	-	N/E[2]
BH-23-04	75	835	N/E[2]
BH-23-05	50	410	N/E[2]
BH-23-06	50	710	N/E[2]
BH-23-07	50	710	N/E[2]
BH-23-08	50	710	N/E[2]
BH-23-09	50	710	N/E[2]
BH-23-10	50	400	N/E[2]
BH-23-11	50	710	N/E[2]
BH-23-12	50	710	N/E[2]

Note(s): [1] Field observation taken upon completion of borehole. Note that the groundwater level from this observation may not represent the stabilized groundwater level [2] N/E = Not Encountered.

6.3.2 Pavement Design

The following section will discuss pavement recommendations for the stretch of roadway. Table 6-2 presented below shows the minimum recommended specifications for a flexible asphaltic concrete pavement structure constructed on the native silty sand. Shallow bedrock was encountered along the southern portion of Huron Street between BH-23-04 and BH-23-05; therefore, recommendations are also provided for pavement structures constructed on exposed competent bedrock. The Client has not provided TULLOCH with the expected daily traffic volume and TULLOCH understands that there is no available traffic data or any published traffic studies for the project site. As such, pavement design has been conducted in accordance with the Routine (Empirical) Method – Experience-Based Standard Section design method as presented in the Pavement Design and Rehabilitation Manual (PDRM) (MTO 2013). The pavement structure design has been conducted to provide a Granular Base Equivalency in accordance with the PDRM and from our previous experience for similar pavement structures in the Blind River, Ontario area.

The reuse of the existing granular fill material has been deemed acceptable based on the gradation results of the existing fill and will be discussed further in Section 6.3.2. Therefore two (2) options have been presented for the Client's consideration. Option 1 is to partially reuse

the existing granular fill as granular sub-base with the Granular Base Equivalency (GBE) factor adjusted accordingly. Alternatively, Option 2 is to reinstate the pavement structure with new imported granular fills.

The recommended pavement options are shown below in Table 6-5.

Table 6-5: Pavement Design Parameters

Pavement Layer	Compaction Requirements	Option 1: Partial Reuse of Existing Fill		Option 2: New Imported Granular Fill	
		Silty Sand (mm)	Competent Bedrock (mm)	Silty Sand (mm)	Competent Bedrock (mm)
Surface Asphalt: HL3 (OPSS.MUNI 1150)	HMA (OPSS.MUNI 310)	40	40	40	40
Binder Asphalt: HL-8 (OPSS.MUNI 1150)	Same as above	50	50	50	50
Base Course: Granular "A" (OPSS 1010)	100% Standard Proctor Maximum Dry Density (ASTM-D698)	150	150	150	150
Sub-base Course: Granular "B" Type I (OPSS 1010)	100% Standard Proctor Maximum Dry Density (ASTM D698)	-	-	300	-
Sub-base Course: Reused Existing Granular Fill[1]	100% Standard Proctor Maximum Dry Density (ASTM D698)	500	-	-	-
Geogrid[2]	-	Yes	-	Yes	-
Non-woven Geotextile[3]	-	Yes	-	Yes	-
Minimum Total Thickness		650 mm	300 mm		

Note(s): [1] It is assumed that the existing sand fill material will be reused as granular subbase. [2] The geogrid should be TBX2500 from Terrafix Geosynthetics Inc. or approved equivalent. [3] Geotextile should be non-woven LP 8 from Layfield or approved equivalent with the grab tensile strength not less than 800 N and AOS (Apparent Opening Size) not larger than 0.3 mm.

Pavement design cases have been based on an estimated design life of 15 years prior to major rehab or reinstatement assuming adequate maintenance is conducted throughout its design life. Higher maintenance costs may be associated with the partial reuse of existing fills given the loose and highly frost susceptible nature of the native subgrade.

6.3.3 Subgrade Preparation

All topsoil, organics, soft soil, asphalt, and construction debris (if any) must be sub-excavated within the proposed subgrade areas below the pavement structure. The site should be graded to the target subgrade profile as per the final pavement profile and the total pavement thickness. Unless the Client elects to proceed with an option that includes the reuse of existing fills, all road base and sub-base material should be comprised of imported and approved engineered fill materials for this site. Given the fine-grained nature of the encountered subgrade, a non-woven geotextile (Layfield LP8 or approved equivalent) should be placed between the native subsoil material and any imported fill material to act as a separation medium and to promote drainage.

The exposed subgrade should be inspected and approved by the geotechnical engineer, or their representative during construction to ensure the encountered subgrade conditions are consistent with the design assumptions used to prepare this report. Proof rolling should be carried out as directed by the geotechnical engineer or their representative to spot and delineate soft areas and may not be required where the subgrade soil is deemed very sensitive. If a soft spot/area is identified, it should be sub-excavated and subsequently replaced with compacted engineered fill such as Granular B or as approved by the geotechnical engineer. If deemed necessary by the engineer, the density of the subgrade should be tested and recorded during backfill inspection. The native fine grained silty sand subgrade may easily become disturbed or degraded when exposed to weather or heavy vibration, as such caution should be taken when compacting the initial lift of fill not to leave the subgrade exposed and should be backfilled immediately upon exposure and inspection.

Should the subgrade soils become disturbed during construction or pockets of unstable or unsuitable areas be encountered, TULLOCH can provide recommendations at the time, which may include but not be limited to the following:

- Compaction of the subgrade soil
- Removal of subgrade material and subsequent replacement with engineered fill
- Stabilization with a non-woven geotextile or geogrid

Post compaction settlement of fine-grained soils can be expected, even when placed to compaction specifications. As such, fill material should be installed as far in advance as possible before finishing the parking lot and roadway for best grade integrity.

Imported granular fill material is to be placed in maximum 200 mm thick lifts compacted to minimum 100% SPMDD within ±2% of optimum moisture content.

Where existing fill is to be re-used it should be recompacted in-situ to 100% of the materials SPMDD and proof-rolled and certified by a geotechnical engineer prior to placement of imported fills.

Quality control will be of utmost importance when selecting the material. The selection of the material should be done as early in the contract as possible to allow sufficient time for gradation and proctor testing on representative samples to ensure it meets project specifications. This material may also be used for general landscaping purposes where compaction is not critical.

The final subgrade crossfall should be at least 2% to drain and be free of depressions. Grading should be completed to promote positive drainage to existing ditches and as required.

6.3.4 Reuse of Existing Granular Fill

Excavated existing granular fills may be re-used assuming sufficient testing and inspection have been conducted to confirm their general conformance with OPSS 1010 standards. While still usable, given the unknown age and construction history of Huron Street, the material may contain greater than 10% fines content causing increased frost susceptibility and decreased strength over time. However, the largely granular fill will likely still be suitable for general re-use on site given the above understanding of risk associated with the re-use of the existing fill and based on inspection and certification by a qualified geotechnical engineer, or their representative.

The native silty sand soils on site may be re-used as general landscaping fills but given high fines contents are frost susceptible and should not be used within the pavement structure reconstruction areas where settlement and/or movement are a concern.

6.3.5 Pavement Materials, Placement and Compaction

The asphalt, base and subbase granular fill should be placed and compacted as per the requirement in this section.

6.3.5.1 Asphalt

The mix design should follow the specifications in OPSS 1150 for HL3. Table 6-6 summarizes the specifications regarding asphalt. The mix designs can use Traffic Category “B” as per the expected traffic volume. The mix design should be submitted and approved by a geotechnical engineer prior to use.

6.3.5.2 *Base and Sub-base Fill*

Table 6-6 below summarizes the specifications regarding base and sub-base fills.

Table 6-6: Requirement for Asphalt, Base and Sub-base Materials

Materials	Notes
Asphalt HMA (OPSS 1150)	- PGAC: Zone 1 52-34 with up to 15% RAP - Performance graded asphalt should conform to OPSS 1101 - Asphalt construction and QA/QC as per OPSS 310 - Mix properties in accordance with AASHTO M323
Base Course: Granular "A" (OPSS 1010)	- 100% Standard Proctor Maximum Dry Density (ASTMD698) at ± 2% of Optimum Moist Content (OMC) - Placement in maximum 200 mm lifts, or as accepted by the engineer in writing
Sub-base Course: Granular "B" Type I, Type II or Approved Fill (OPSS 1010)	- 100% Standard Proctor Maximum Dry Density (ASTMD698) at ± 2% of Optimum Moist Content (OMC) - Placement in maximum 200 mm lifts, or as accepted by the engineer in writing

6.3.5.3 *Inspection and Testing*

During construction, subgrade inspection and in-situ density tests should be conducted, by the field geotechnical engineer, or their representative, to confirm that the conditions exposed are consistent with those encountered in boreholes and to verify the conformance to the design specifications.

6.3.6 *Pavement End Treatment*

Joints between new and existing asphalt should be stepped and constructed according to the requirements of OPSS.PROV 313.07.09 regarding Longitudinal and Transverse joints. The step should be constructed with a width of 300 mm and height equal to half the existing surface course of asphalt, (average step height 25 mm). Tack coating should be applied to any milled surface, including the vertical joint surface.

6.3.7 *Horizontal Transition*

Horizontal transition treatment is required where pavement structure changes occur. The following recommendations should be considered:

- The frost tapers for the transition zone between fine-grained native soil and granular fill should be designed at least 10H:1V to mitigate abrupt differential frost heave.

- Horizontal transition from backfill and native soil should follow OPSD 803.010, OPSD 803.030, and OPSD 803.031.
- To ensure a good tie-in from new to old asphalt, the joints along both longitudinal and transverse direction should be designed as per Section 310.07.11 in OPSS 310.

6.3.8 Pavement Over Underground Utilities

After installation of underground service, the pavement should be constructed as per the recommended pavement structure. Appropriate frost tapers should be implemented in the backfill geometry for the underground service utilities such as culverts as per the OPSD 803 series (e.g., 803.030 and 803.031).

The backfill should be placed in a maximum 200 mm loose lifts and compacted to minimum 95% SPMDD, except the top 1 m of the pavement subgrade which should be compacted to at least 100%.

6.3.9 Pavement Drainage

The surface of the subgrade, subbase and base should be graded with a suitable slope to ensure satisfactory drainage performance.

6.4 Site Utility Servicing – Bedding and Backfilling

Bedding for utilities should be placed as per the pipe design. It is recommended to place a minimum of 150 mm to 200 mm OPSS Granular A below the pipe invert as bedding material. A minimum 300 mm thick cover consisting of Granular A should be placed above and along the sides of the pipe.

In areas where a relatively high groundwater table is encountered during construction, 19 mm clear stone pipe bedding may need to be used as an alternative to Granular A where compaction of the bedding materials may not be possible. A non-woven geotextile such as Layfield LP8 or equivalent should be placed to completely encapsulate the clear stone pipe bedding and act as a filter to prevent fines migration into the bedding material.

Trench backfilling may be completed as per Section 6.7.

If backfilling against slopes, fills should be benched into native slopes per OPSD 208.010.

6.5 Frost Protection

The estimated frost penetration depth at the site is 1.8 m, as such, all servicing shall be situated at least 1.8 m below ground surface to provide adequate soil cover against frost heaving. Alternatively, insulation equivalent to a soil cover can be used to raise the frost line. If shallower embedment is needed, Expanded Polystyrene (EPS) insulation or equivalent can be designed to prevent frost action. A demonstration of a typical methodology can be seen in OPSD 1109.030. Installing insulation does not alter conventional utility line construction practices to an appreciable extent. It should be noted that a wider trench may be required to accommodate frost tapering if backfill soils differ from the surrounding native soils to prevent differential frost heaving and subsequent thaw settlement. A preliminary estimate for cost evaluation can be made assuming that 25 mm of rigid insulation designed for below grade installation is equivalent to approximately 0.3 m soil cover. It should also be noted that as per OPSD 1109.030, the minimum recommended insulation thickness is 50 mm.

If construction is undertaken during the winter months, road subgrade must be protected from freezing.

6.6 Excavation and Groundwater Control

All excavation should be carried out in accordance with Occupational Health and Safety Act (OHSA), Ontario Regulation 213/9, Construction Projects, January 1, 2010, and OPSS 902. Based on the OHSA, the soils are classified as Type 3 soils above the groundwater table and Type 4 soils below the groundwater table. Temporary excavation side slopes in Type 3 soils should remain stable at a slope of 1H:1V. Temporary excavation side slopes in Type 4 soils should remain stable at a slope of 3H:1V. As the native materials are of a glacial origin, there is the possibility of encountering boulders and cobbles during excavation that were not identified in the geotechnical investigation for the proposed road rehabilitation. Therefore, the contractor undertaking the work should supply equipment capable of removing such material. Excavation safety and the stability of temporary construction slopes and lateral support systems are the contractor's responsibility.

Groundwater control may be required during construction to maintain dry excavations. The contractor should direct any surface water and runoff generated from the excavation area. The groundwater level was lower than the expected pavement structure of the boreholes during the investigation. However, seasonal variations in the water table should be expected. Pumping from filtered sumps will likely be sufficient to control groundwater unless deeper excavations are required for such things as servicing where excavation depth extends 0.5 m below the

groundwater table, in which case active de-watering may be required. The temporary groundwater control measures for excavation are the contractor's responsibility.

An application under the Environmental Activity Sector Registry (EASR) of the Ministry of the Environment and Climate Change should be submitted in the event that the dewatering pumping volumes exceed 50,000 L/day.

6.7 Excavated Soil and Trench Backfill

Typical practice in Northern Ontario is to reuse a portion of the in-situ excavated material as fill within utility service trenches, especially where these trenches interrupt travelled sections of a roadway. This is to ensure compatibility with adjacent subgrade soils to minimize differential frost heaving. Maintaining compatibility with adjacent subgrade conditions is crucial to minimize the annual differential frost heaving. This is usually accomplished by backfilling the service trenches with excavated materials. If dissimilar materials are used for trench backfilling, frost tapers should be incorporated in the backfill trench geometry as discussed in Section 6.3.7.

The non-organic material from the service trench excavation may be re-used as backfill above the top of the pipe cover material to the underside of the pavement structure subbase materials. Prior to re-use, all fill materials should be inspected and certified by a qualified geotechnical engineer. All re-used materials must be placed in lifts not exceeding 200 mm and be compacted to 95% of the SPMDD within 2% of the optimum moisture content. Subgrade materials within 1.0m of the road base should be compacted to 100% SPMDD.

TULLOCH cautions that any native material below the groundwater level may not meet the above compaction requirements without reworking (drying) prior to placement. If stockpiling of trench excavated material for re-use is required, it is recommended that it be covered to prevent exposure to rain, and it cannot be allowed to freeze. Furthermore, stockpiles should be kept at a safe distance (distance at least equal to the depth of the excavation) away from open excavations. All unsuitable materials (construction rubble, organics, etc.) from the trench excavation must be disposed of off-site in an environmentally compliant method. Any excavated material contaminated with organics must not be re-used as backfill material. It is recommended that the excavated native soils be inspected and certified by a geotechnical engineer prior to re-use.

6.8 Soil Corrosivity

Testing was completed for soil corrosivity and sulphate concentrations on recovered samples from the borehole investigation. The results of the testing are shown below in Table 6-7. Samples were tested at TESTMARK Laboratories based in Garson, Ontario. The detailed results can be found in Appendix E.

Table 6-7: Soil Corrosivity Results

Borehole No. / Sample No.	Depth (m)	Resistivity (Ω cm)	pH	Redox Potential (mV)	Chloride (µg/g)	Sulfide (µg/g)	Sulphate (µg/g)
BH-23-06 SS04	1.83	21300	6.48	350	4.3	<0.2[1]	11.2
BH-23-12 SS03	1.52	4650	6.26	383	89.8	<0.3[1]	15.7

Note(s): [1]Sulfide testing detection limit.

The results of the chemical testing were assessed in reference to the AWWA C-105 Standard from ANSI/AWWA Corrosivity Rating System. A score greater than 10 indicates the requirement of corrosion protective measures for buried cast iron alloys. The tested samples analyzed for the boreholes referenced in Table 6-4 above scored a ranking of 1, which is below the threshold.

In addition, chloride ions can lead to corrosion of steel. Typically, soils with chloride concentrations greater than 500 µg/g are considered corrosive. As noted in the table, chloride concentrations are less than 500 µg/g in the tested samples. Corrosion protection measures shouldn't be utilized in this area of the site to protect subsurface infrastructure.

The concentration of sulphate indicates the degree of sulphate attack for concrete buried at the site. As shown in the table, the sulphate concentrations are less than 1000 µg/g indicating a low degree of sulphate attack. Type GU Portland Cement should be suitable for use at this site.

7. CLOSURE

This geotechnical report has been prepared by TULLOCH for The Town of Blind River and their authorized agents for the New Water Intake and Huron Street Reconstruction project. Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted practices in the field of geotechnical engineering, for the above-noted location. Classification and identification of soils, and geologic units have been based upon commonly accepted methods employed in professional geotechnical practice. No warranty or other conditions, expressed or implied, should be understood. Please refer to Appendix F, Notice to Reader, which pertains to this report.

We trust that the information in this report will be sufficient for the project. Should further elaboration be required for any portion of this project, we would be pleased to assist.

Laura Meneghetti
Engineering Technologist

Reviewed By:
George Liang, P.Eng.
Senior Geotechnical Engineer/Project Manager

Jackson Mercer, P. Eng
Project Engineer

REFERENCES

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APPENDIX A

SITE LOCATION PLAN

BOREHOLE LOCATION PLAN

0 200
METERS

PROJECT LOCATION

COORDINATES					
NAME	EASTING	NORTHING	NAME	EASTING	NORTHING
BH-23-01	349 247	5 116 261	BH-23-07	349 498	5 116 513
BH-23-02	349 299	5 116 307	BH-23-08	349 511	5 116 551
BH-23-03	349 344	5 116 361	BH-23-09	349 557	5 116 629
BH-23-04	349 409	5 116 373	BH-23-10	349 578	5 116 660
BH-23-05	349 454	5 116 455	BH-23-11	349 592	5 116 674
BH-23-06	349 475	5 116 484	BH-23-12	349 607	5 116 699

NOTES:

1. CO–ORDINATES ARE IN UTM ZONE 17T (NAD83 CSRS).

LEGEND:

BH–23–01 BOREHOLE LOCATION

No.	DATE	BY	ISSUES / REVISIONS
0	2024-01-10	LM	ISSUED FOR USE

TULLOCH

DRAWING: BOREHOLE LOCATION PLAN

PROJECT: **BLIND RIVER WATER INTAKE GEOTECHNICAL INVESTIGATION**

DRAWN BY: L. MENEGHETTI	CHECKED BY: E. GILES	PROJECT No. : 23-0821	
DESIGNED BY: L. MENEGHETTI	APPROVED BY: E. GILES	DRAWING No. 23-0821-001	REVISION No. 0
SCALE: AS NOTED	DATE: 2024-01-10		

P:\2023\230821 Blind River Water Intake\Geotechnical\03 Drawings\03.02 Current\Siteplan\230821_Siteplan.dwg

APPENDIX B

TERMİNOLOGY

ABBREVIATIONS, TERMINOLOGY AND PRINCIPAL SYMBOLS USED IN REPORT AND BOREHOLE LOGS

BOREHOLES AND TEST PIT LOGS

Soils

AS	Auger/Grab Sample	w	Water Content
SS	Split Spoon	wP	Plastic Limit
SH	Shelby Tube	wL	Liquid Limit
PISTON	Thin-walled Piston	VANE	Field Vane
WS	Washed Sample	OR	Organic Content
SC	Soil Core	GR	Gravel
BS	Block Sample	SA	Sand
WH	Weight of Rods & Hammer	SI	Silt
WR	Weight of Rods	CL	Clay

Bedrock

TCR	Total Core Recover	VN	Vein
SCR	Solid Core Recovery	CO	Contact
FI	Fracture Frequency Index	KV	Karstic Void
HQ	Rock Core (63.5 mm dia.)	MB	Mechanical Break
NQ	Rock Core (47.6 mm dia.)	PL	Planar
BQ	Rock Core (36.5 mm dia.)	CU	Curved
JN	Joint	UN	Undulating
FLT	Fault	IR	Irregular
SH	Shear	SM	Smooth
SK	Slickensided	SR	Slightly Rough
BD	Bedding	R	Rough
FO	Foliation	VR	Very rough

IN SITU SOIL TESTING

Standard Penetration Test (SPT) "N" value is the number of blows required to drive a 51 mm OD split barrel sampler into the soil a distance of 300 mm with a 63.5kg weight free falling a distance of 760 mm after an initial penetration of 150 mm has been achieved.

Dynamic Cone Penetration Test (DCPT) is the number of blows required to drive a cone with a 60-degree apex attached to "A" size drill rods continuously into the soil for each 300 mm penetration with a 63.5 kg weight free falling a distance of 760 mm.

Cone Penetration Test (CPT) is an electronic cone point with a 10 cm base area with a 60-degree apex pushed through the soil at a penetration rate of 2cm/s.

Field Vane Test (FVT) consists of a vane blade, a set of rods and torque measuring apparatus used to determine the undrained shear strength of cohesive soils.

SOIL DESCRIPTIONS

The soil descriptions and classifications are based on an expanded Unified Soil Classification System (USCS). The USCS classifies soils on the basis of engineering properties. The system divides soils into three major categories: coarse grained, fine grained and highly organic soils. The soil is then subdivided based on either gradation or plasticity characteristics. The classification excludes particles larger than 75 mm. To aid in quantifying material amounts by weight within the respective grain size fractions, the following terms have been included to expand the USCS:

Soil Classification	
Clay	<0.002 mm
Silt	0.002 to 0.06 mm
Sand	0.075 to 4.75 mm
Gravel	4.751 to 75 mm
Cobbles	75 to 300 mm
Boulders	>300 mm

Terminology	Proportion
“trace”, sand, etc.	1% to 10%
"some"	10% to 20%
Sandy, Gravelly, etc.	20% to 35%
“and” SAND, SILT, (non-cohesive)	>35%
“with” SAND, SILT, (cohesive)	>35%

Notes:

1. Soil properties, such as strength, gradation, plasticity, structure, etc., dictate the soils engineering behaviour over the grain size fractions;
2. With the exception of soil samples tested for grain size distribution or plasticity, all soil sample classifications are based on visual and tactile observations and, therefore, constitute an approximate description.

The following table outlines the qualitative terms used to describe the relative density condition of cohesionless soils related to the SPT “N” value:

Cohesionless Soils

Compactness	SPT “N” Value (blows/30cm)
Very Loose	0 to 4
Loose	5 to 10
Compact	11 to 30
Dense	31 to 50
Very Dense	>50

The following table outlines the qualitative terms used to describe the consistency of cohesive soils related to undrained shear strength and SPT “N” value:

Cohesive Soils

Consistency	Undrained Shear Strength (kPa)	SPT “N” Value (blows/30 cm)
Very Soft	<12.5	< 2
Soft	12.5 to 25	2 to 4
Firm	25 to 50	5 to 8
Stiff	50 to 100	9 to 15
Very Stiff	100 to 200	16 to 30
Hard	> 200	>30

Note: Utilizing the SPT “N” value to correlate the consistency and undrained shear strength of cohesive soils is very approximate and needs to be used with caution.

Particle Sizes

Constituent	Description	Size (mm)	Size (in)
BOULDERS	Not Applicable	>300	>12
COBBLES	Not Applicable	75 to 300	3 to 12
GRAVEL	Coarse Fine	19 to 75 4.75 to 19	0.75 to 3 (4) to 0.75
SAND	Coarse Medium Fine	2.00 to 4.75 0.425 to 2.00 0.075 to 0.425	(10) to (4) (40) to (10) (200) to (40)
SILT/CLAY	Classified by Plasticity	< 0.075	< (200)

Note: Brackets () indicate US Standard Sieve Size Number

ROCK CORING

Rock Quality Designation (RQD) is an indirect measure of the number of fractures within a rock mass, Deere et al. (1967). It is the sum of sound pieces of rock core equal to or greater than 100 mm recovered from the core run, divided by the total length of the core run, expressed as a percentage. If the core section is broken during coring or handling, the pieces are fitted together and, if 100 mm or greater included in the total sum.

Intact Rock Strength

Intact Strength (MPa)	Description
< 1	Extremely low strength
1 to 5	Very low strength
5 to 25	Low strength
25 to 50	Medium strength
50 to 100	High strength
100 to 250	Very high strength
>250	Extremely high strength

Rock Mass Quality

RQD Classification	RQD Value (%)
Very Poor Quality	<25
Poor Quality	25 to 50
Fair Quality	50 to 75
Good Quality	75 to 90
Excellent Quality	90 to 100

Rock Mass Weathering

Term	Description
Unweathered (Fresh)	No visible sign of material weathering and slight discoloration on major discontinuity surfaces.
Slightly Weathered	Discoloration indicates the weathering of rock material and discontinuity of surfaces. All of the rock material may be discoloured by weathering and may be somewhat weaker than its fresh condition.
Moderately Weathered	Less than half the rock material is decomposed and/or disintegrates to soil. Fresh or discoloured rock is present either as a continuous framework of as core stones.
Highly Weathered	More than half the rock material is decomposed and/or disintegrated to soil. Fresh or discoloured rock is present either as a discontinuous framework or as core stones.
Completely Weathered	All rock material is decomposed and/or disintegrated to soil. The original mass structure is largely intact.
Residual Soil	All rock material is converted to soil. The mass structure and material fabric are destroyed. There is a large change in volume, but the soil has not been significantly transported.

Joint and Foliation Spacing

Description	Spacing
Very Wide	Greater than 3 m
Wide	1 m to 3 m
Moderately Close	0.3 m to 1 m
Close	50 mm to 300 mm
Very Close	Less than 50 mm

Bedding Thickness

Description	Spacing
Very thick	Greater than 2 m
Thick	0.6 m to 2 m
Medium	0.2 m to 0.6 m
Thin	60 mm to 0.2 m
Very thin	20 mm to 60 mm
Laminated	6 to 20 mm
Thinly Laminated	Less than 6 mm

SYMBOLS

General

w_N Natural water content within the soil sample
γ Unit weight
γ' Effective unit weight
γ_D Dry unit weight
γ_{SAT} Saturated unit weight
ρ Density
ρ_s Density of solid particles
ρ_w Density of water
ρ_D Dry density
ρ_{SAT} Saturated density
e Void ratio
n Porosity
S Degree of saturation
E_{50} Fifty percent secant modulus

Consistency

w_L Liquid Limit
w_P Plastric Limit
I_P Plasticity Index
w_S Shrinkage Limit
I_L Liquidity Index
I_C Consistency Index
e_{max} Void ratio in loosest state
e_{min} Void ratio in densest state
I_D Density Index (formerly relative density)

Shear Strength

S_u Undrained shear strength parameter (total stress)
c' Effective cohesion intercept
ϕ' Effective friction angle
τ_P Peak shear strength
τ_R Residual shear strength
δ Angle of interface friction
μ Coefficient of friction = tan ϕ'

Consolidation

C_c Compression index (normally consolidated range)
C_r Recompression index (over consolidated range)
m_v Coefficient of volume change
c_v Coefficient of consolidation
T_v Time factor (vertical direction)
U Degree of consolidation
σ'_v Effictive overburden pressure
OCR Overconsolidation ratio

APPENDIX C

SITE PHOTOGRAPH LOG

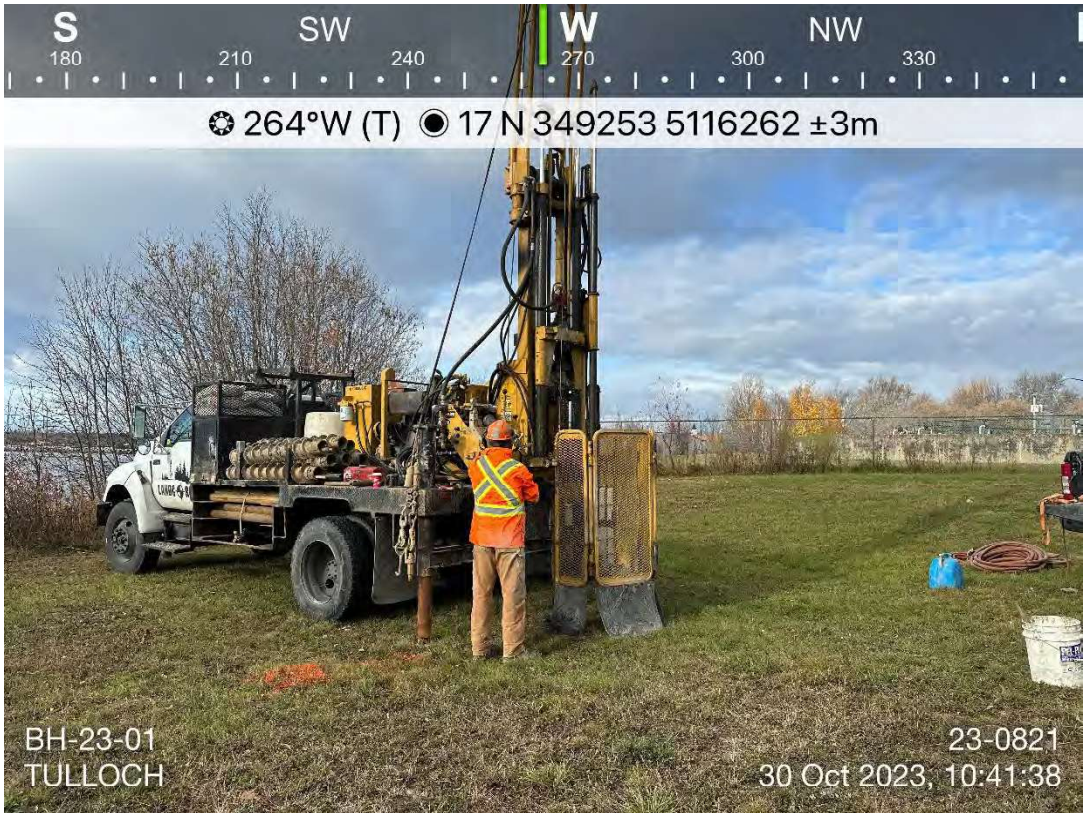

Photo 1: BH-23-01 during advancement. Photo taken facing west.

Photo 2: BH-23-01 following completion of backfill. Photo taken facing southwest.

CLIENT
Town of Blind River

PROJECT
Blind River Water Intake Geotechnical Investigation

CONSULTANT
TULLOCH ENGINEERING

YYYY-MM-DD	2024-01-29
PREPARED	LM
DESIGNED	
REVIEWED	JM
APPROVED	EG

TITLE
BH-23-01 Site Photographs

PROJECT NO.	Phase/Task	Rev.	FIGURE
23-0821			1

0 25 mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

Photo 3: BH-23-02 during advancement. Photo taken facing northwest.

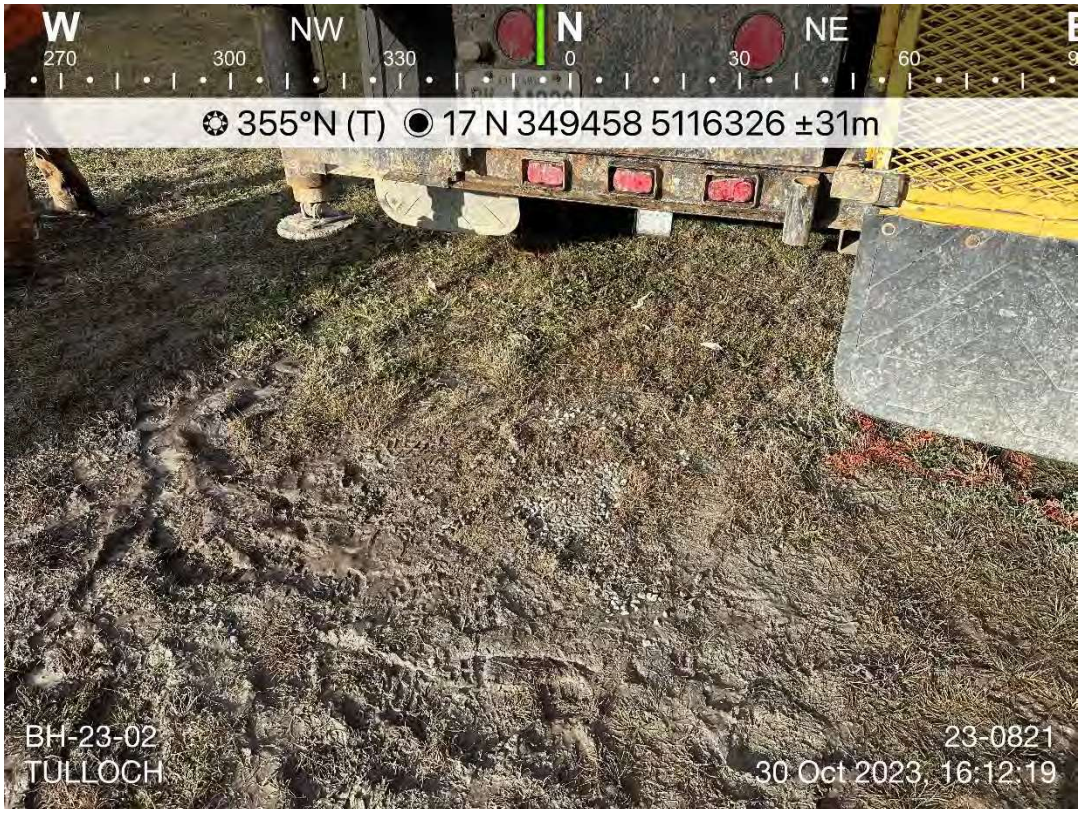

Photo 4: BH-23-02 following completion of backfill. Photo taken facing north.

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YYYY-MM-DD	2024-01-29
PREPARED	LM
DESIGNED	
REVIEWED	JM
APPROVED	EG

TITLE
BH-23-02 Site Photographs

PROJECT NO.	Phase/Task	Rev.	FIGURE
23-0821			2

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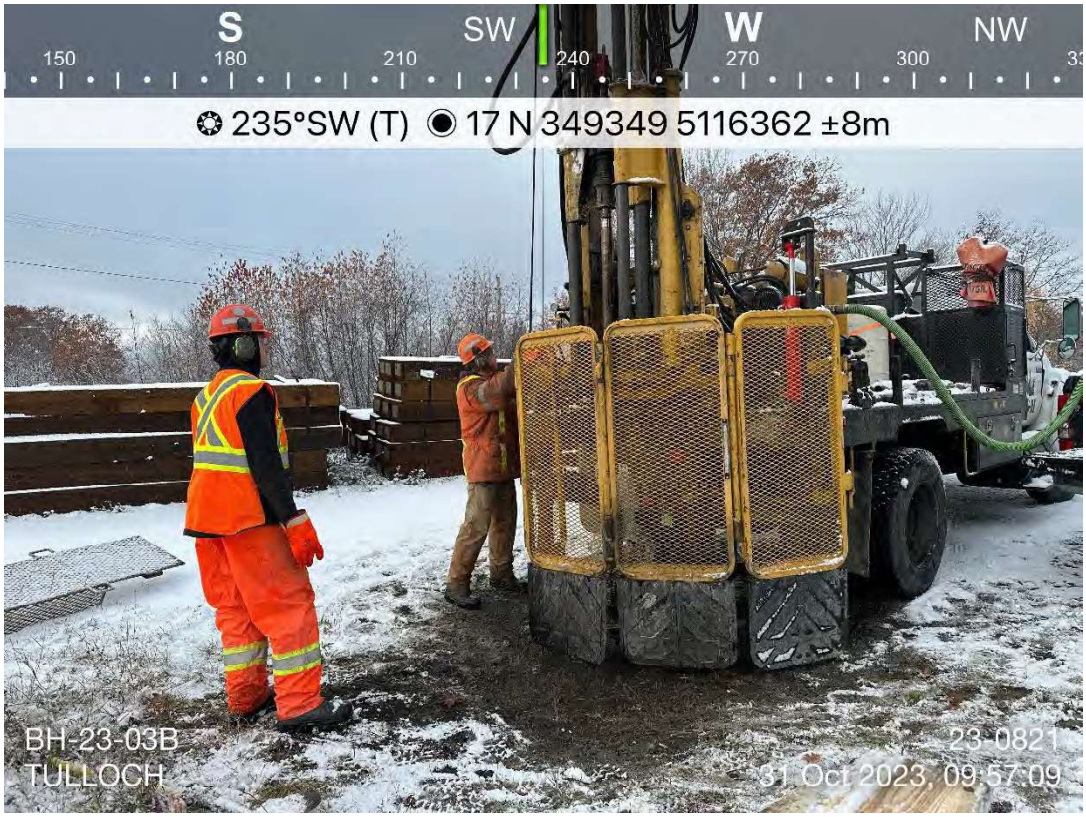

Photo 5: BH-23-03 during advancement. Photo taken facing southwest.

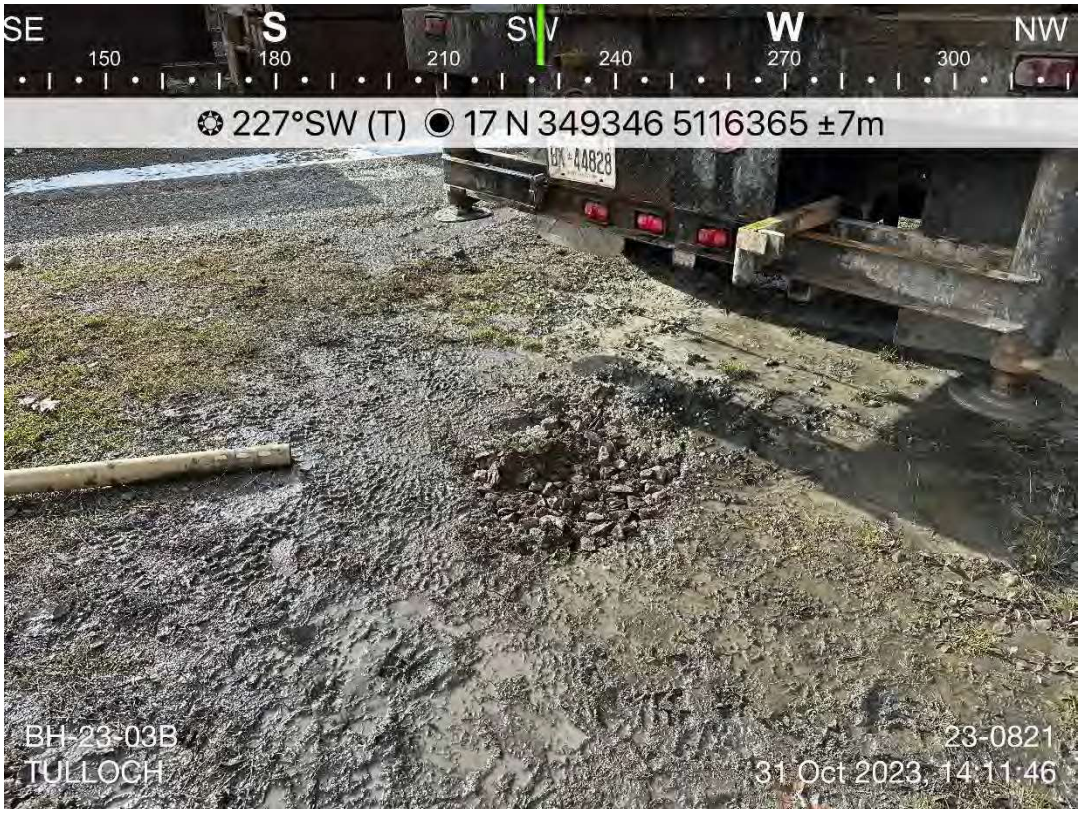

Photo 6: BH-23-03 following completion of backfill. Photo taken facing southwest.

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YYYY-MM-DD	2024-01-29
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TITLE
BH-23-03 Site Photographs

PROJECT NO.	Phase/Task	Rev.	FIGURE
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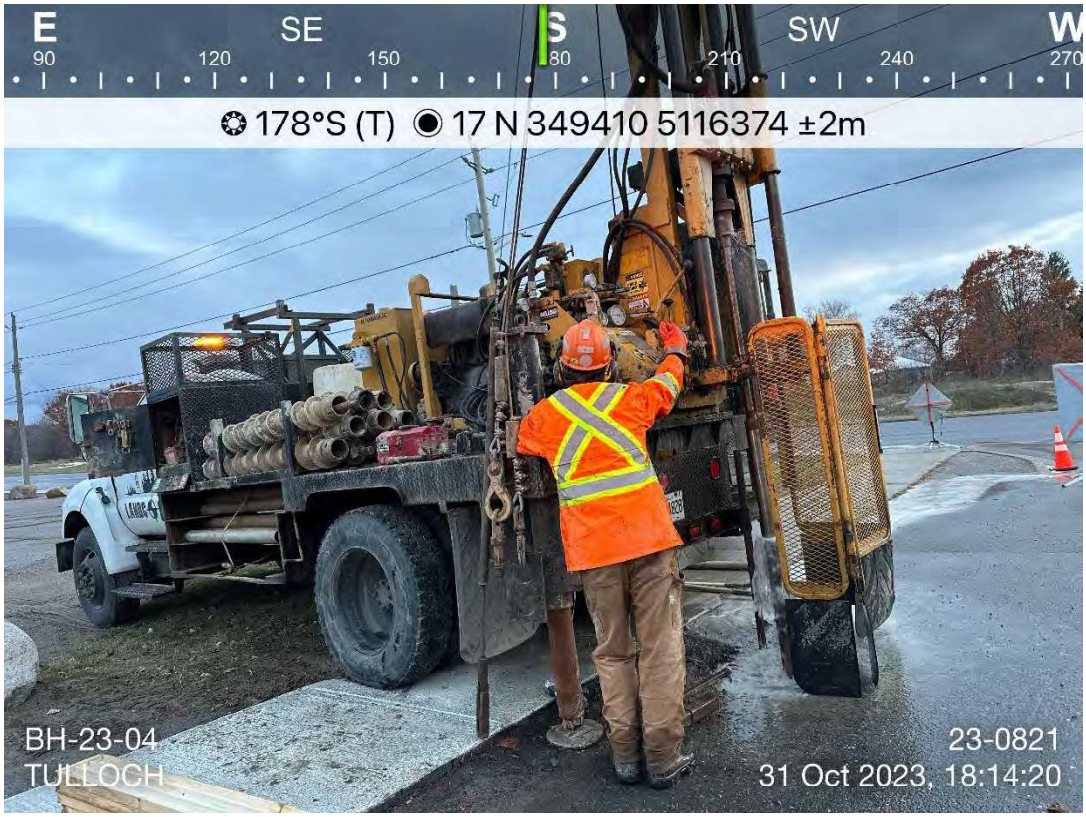

Photo 7: BH-23-04 during advancement. Photo taken facing south.

Photo 8: BH-23-04 following completion of backfill. Photo taken facing north.

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Town of Blind River

PROJECT
Blind River Water Intake Geotechnical Investigation

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TULLOCH ENGINEERING

YYYY-MM-DD	2024-01-29
PREPARED	LM
DESIGNED	
REVIEWED	JM
APPROVED	EG

TITLE
BH-23-04 Site Photographs

PROJECT NO.	Phase/Task	Rev.	FIGURE
23-0821			4

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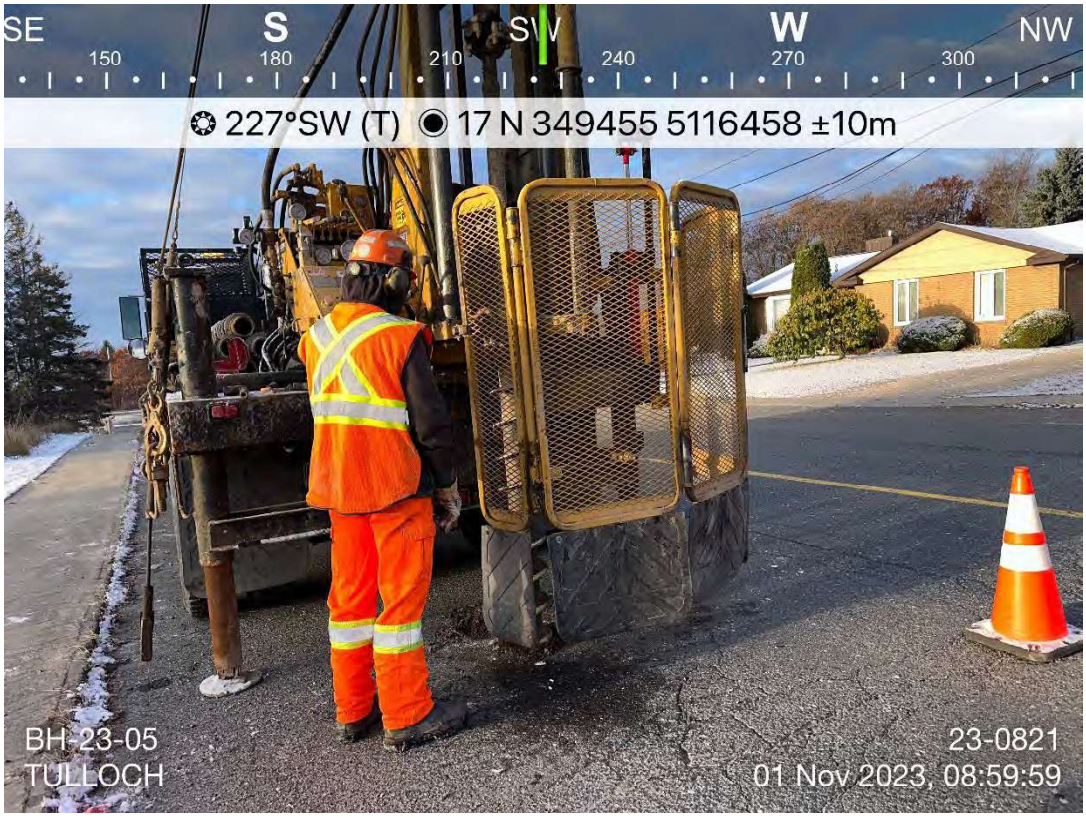

Photo 9: BH-23-05 during advancement. Photo taken facing south.

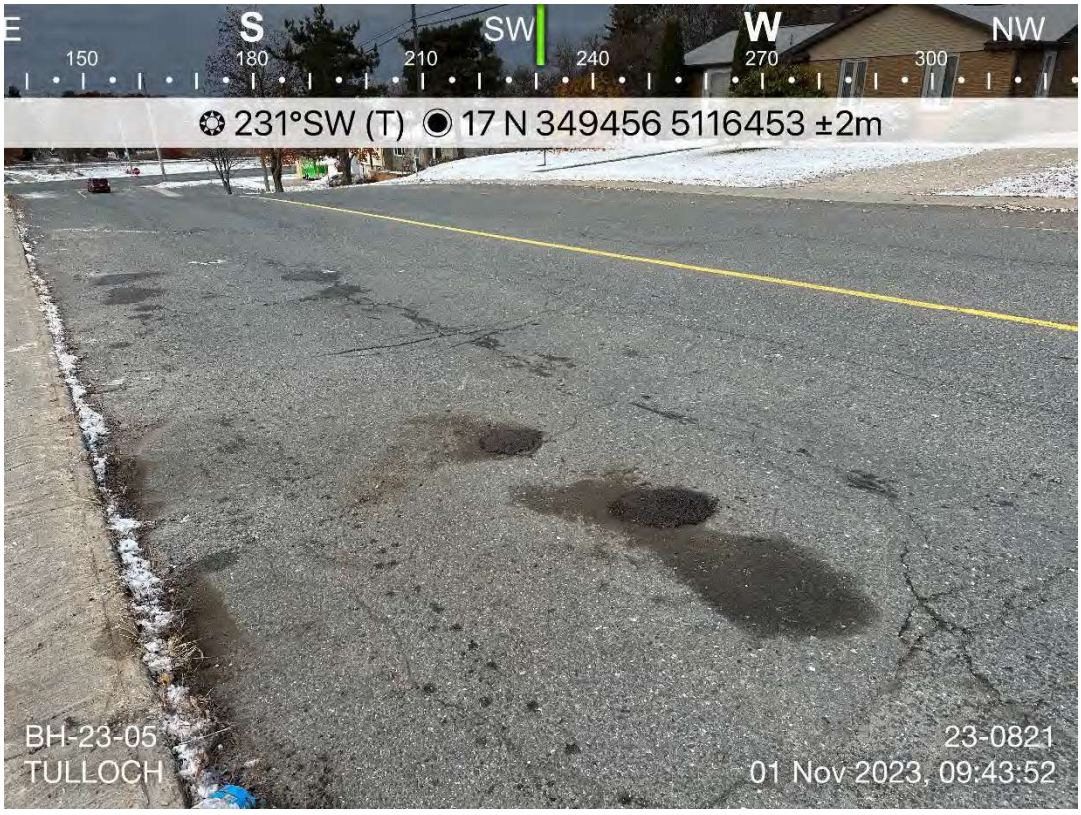

Photo 10: BH-23-05 following completion of backfill. Photo taken facing north.

CLIENT
Town of Blind River

PROJECT
Blind River Water Intake Geotechnical Investigation

CONSULTANT
TULLOCH ENGINEERING

YYYY-MM-DD	2024-01-29
PREPARED	LM
DESIGNED	
REVIEWED	JM
APPROVED	EG

TITLE
BH-23-05 Site Photographs

PROJECT NO.	Phase/Task	Rev.	FIGURE
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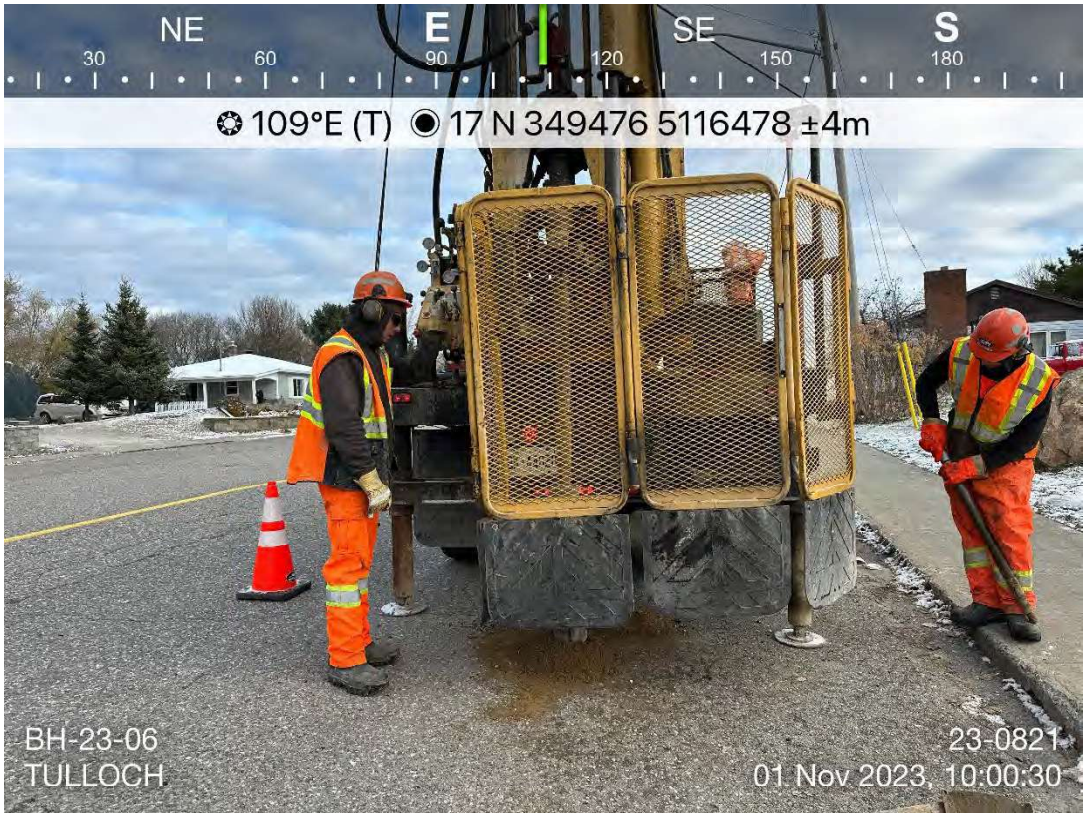


Photo 11: BH-23-06 during advancement. Photo taken facing southeast.

Photo 12: BH-23-06 following completion of backfill. Photo taken facing southwest.

CLIENT
Town of Blind River

PROJECT
Blind River Water Intake Geotechnical Investigation

CONSULTANT
TULLOCH ENGINEERING

YYYY-MM-DD	2024-01-29
PREPARED	LM
DESIGNED	
REVIEWED	JM
APPROVED	EG

TITLE
BH-23-06 Site Photographs

PROJECT NO.	Phase/Task	Rev.	FIGURE
23-0821			6

0 25 mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

Photo 13: BH-23-07 following completion of backfill. Photo taken facing northeast.

CLIENT
Town of Blind River

PROJECT
Blind River Water Intake Geotechnical Investigation

CONSULTANT
TULLOCH ENGINEERING

YYYY-MM-DD	2024-01-29
PREPARED	LM
DESIGNED	
REVIEWED	JM
APPROVED	EG

TITLE
BH-23-07 Site Photographs

PROJECT NO.	Phase/Task	Rev.	FIGURE
23-0821			7

0 25 mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

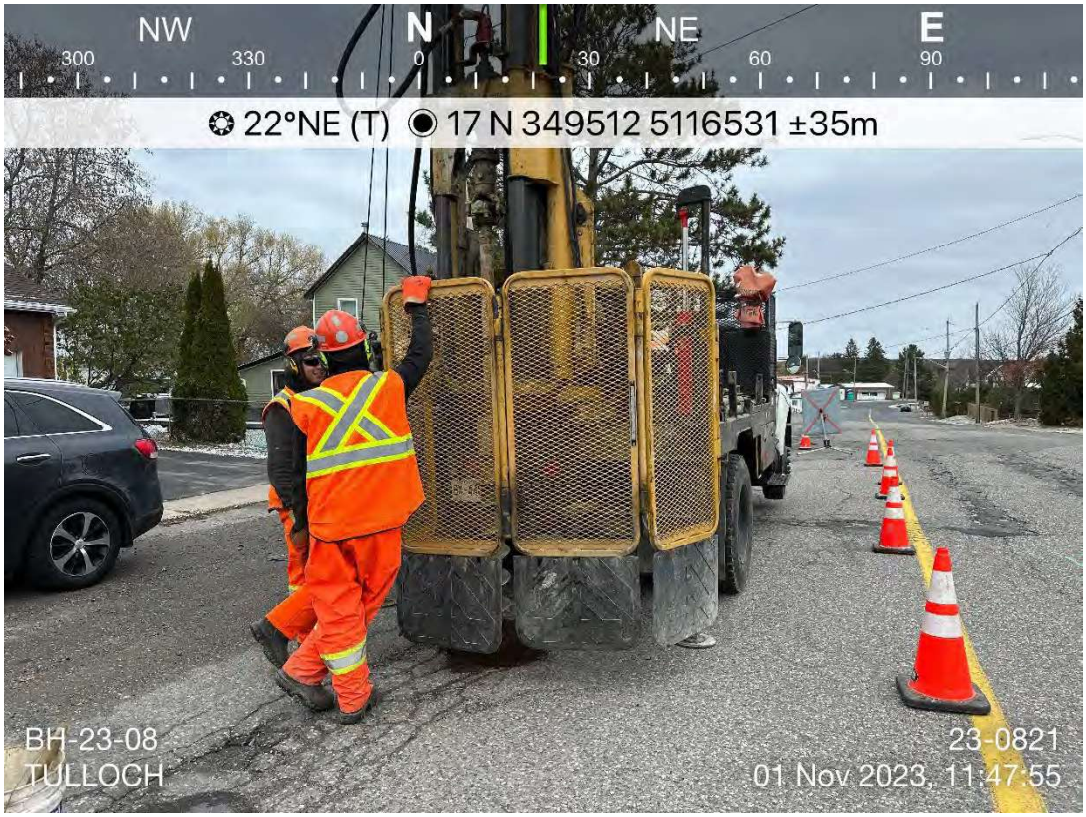


Photo 14: BH-23-08 during advancement. Photo taken facing northeast.

Photo 15: BH-23-08 following completion of backfill. Photo taken facing northeast.

CLIENT
Town of Blind River

PROJECT
Blind River Water Intake Geotechnical Investigation

CONSULTANT
TULLOCH ENGINEERING

YYYY-MM-DD	2024-01-29
PREPARED	LM
DESIGNED	
REVIEWED	JM
APPROVED	EG

TITLE
BH-23-08 Site Photographs

PROJECT NO.	Phase/Task	Rev.	FIGURE
23-0821			8

0 25 mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

Photo 16: BH-23-09 during advancement. Photo taken facing northeast.

Photo 17: BH-23-09 following completion of backfill. Photo taken facing southeast.

CLIENT	Town of Blind River
PROJECT	Blind River Water Intake Geotechnical Investigation
CONSULTANT	TULLOCH ENGINEERING
YYYY-MM-DD	2024-01-29
PREPARED	LM
DESIGNED	
REVIEWED	JM
APPROVED	EG
TITLE	BH-23-09 Site Photographs
PROJECT NO.	23-0821
Phase/Task	
Rev.	
FIGURE	9

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A
25 mm
0

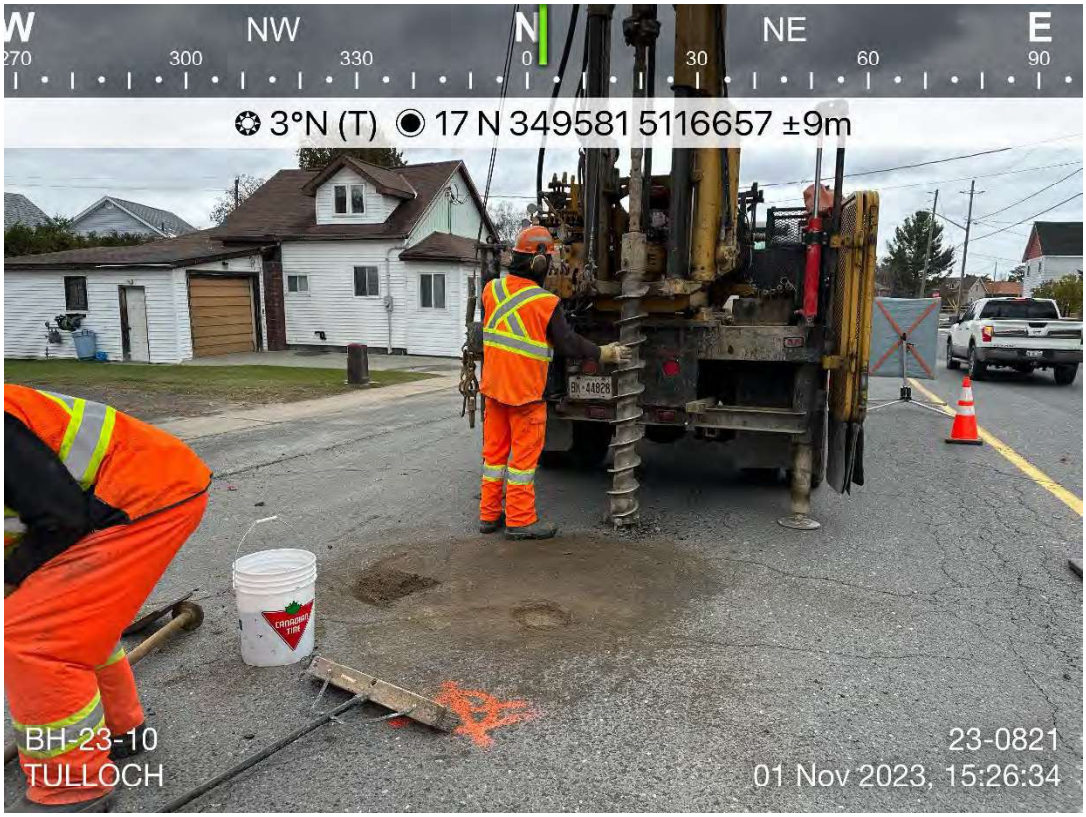


Photo 18: BH-23-10 during advancement. Photo taken facing north.

Photo 19: BH-23-10 following completion of backfill. Photo taken facing northeast.

CLIENT
Town of Blind River

PROJECT
Blind River Water Intake Geotechnical Investigation

CONSULTANT
TULLOCH ENGINEERING

YYYY-MM-DD	2024-01-29
PREPARED	LM
DESIGNED	
REVIEWED	JM
APPROVED	EG

TITLE
BH-23-10 Site Photographs

PROJECT NO.	Phase/Task	Rev.	FIGURE
23-0821			10

0 25 mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

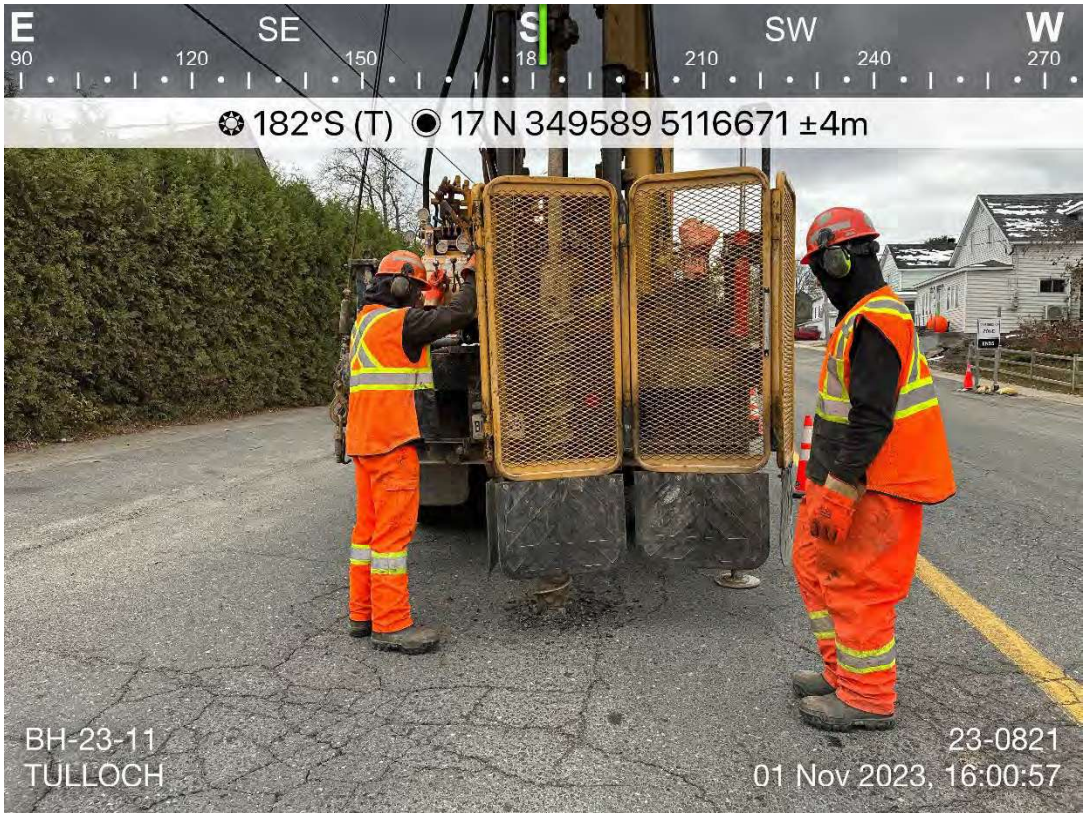


Photo 20: BH-23-11 during advancement. Photo taken facing south.

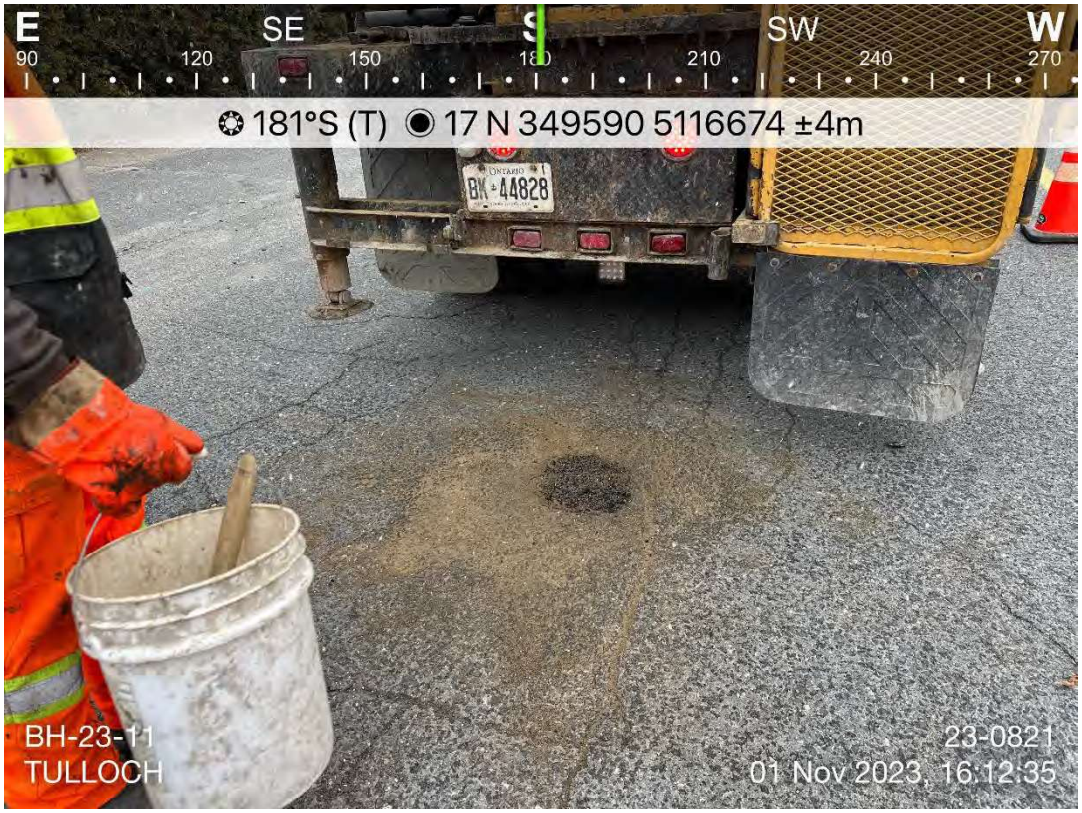


Photo 21: BH-23-11 following completion of backfill. Photo taken facing south.

CLIENT
Town of Blind River

PROJECT
Blind River Water Intake Geotechnical Investigation

CONSULTANT
TULLOCH ENGINEERING

YYYY-MM-DD	2024-01-29
PREPARED	LM
DESIGNED	
REVIEWED	JM
APPROVED	EG

TITLE
BH-23-11 Site Photographs

PROJECT NO.	Phase/Task	Rev.	FIGURE
23-0821			11

0 25 mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

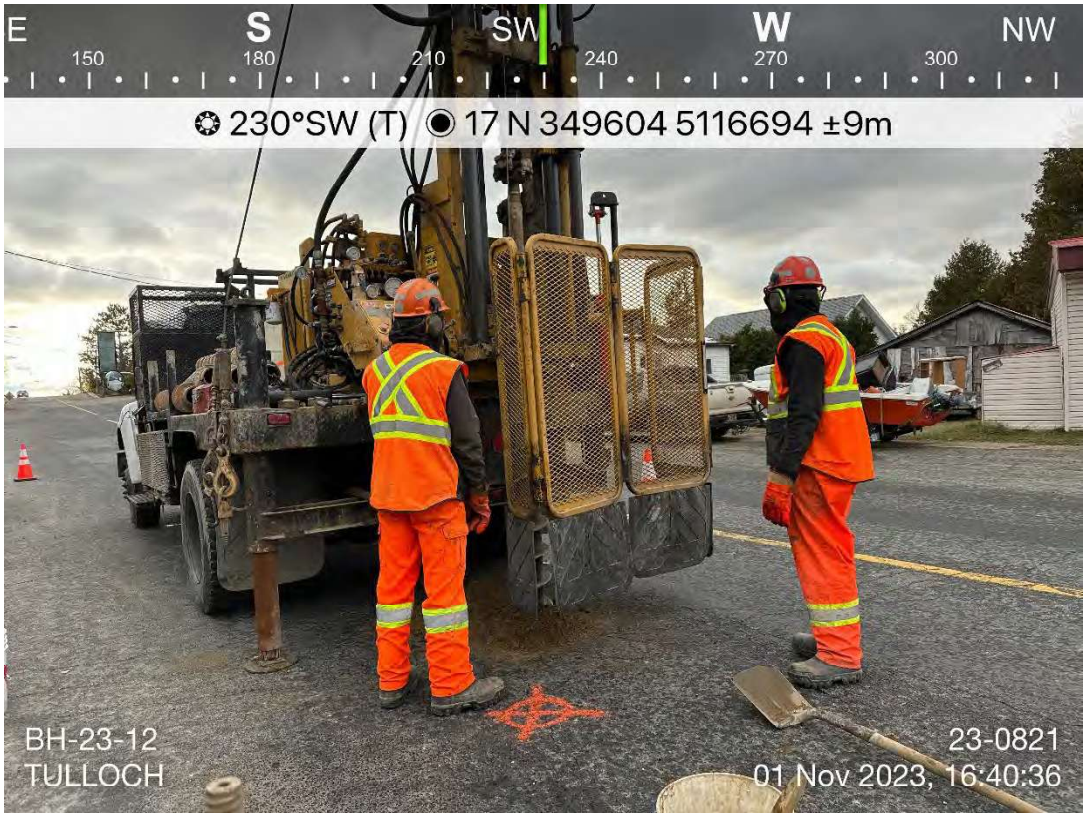


Photo 22: BH-23-12 during advancement. Photo taken facing southwest.

Photo 23: BH-23-12 following completion of backfill. Photo taken facing west.

CLIENT
Town of Blind River

PROJECT
Blind River Water Intake Geotechnical Investigation

CONSULTANT
TULLOCH ENGINEERING

YYYY-MM-DD	2024-01-29
PREPARED	LM
DESIGNED	
REVIEWED	JM
APPROVED	EG

TITLE
BH-23-12 Site Photographs

PROJECT NO.	Phase/Task	Rev.	FIGURE
23-0821			12

0 25 mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI A

APPENDIX D

BOREHOLE LOGS

TULLOCH ENGINEERING

RECORD OF ROCKCORE No BH-23-01

1 OF 1

METRIC

JOB NUMBER 23-0821 LOCATION Blind River, Ontario ORIGINATED BY LM

CLIENT Town of Blind River DATUM 17T BOREHOLE TYPE NW/NQ COMPILED BY LM

DRILLER Landcore Drilling DATE 2023.10.30 NORTHING 5116261 EASTING 349247 CHECKED BY JM

Elev. / Depth	Strat Plot	Description	Depth (m)	Sample No.	Recovery Parameters	RQD % (25 50 75)	Fracture index / ft	Discontinuity Data: Dip Angles W.R.T Core Axis (30 60)	Discontinuity Data: Type and Description (see core log photos)	Compressive Strength (MPa) (50 100 150)	Remarks
178.6											
0.00 178.2		TOPSOIL - with organics and rootlets, fine to coarse grained sand, some fine to coarse grained gravel, non-plastic, dark brown, non-cohesive, moist									
0.43		- Switched from hollow stem augers to NW casing and NQ core barrel at 0.43 mbgs COBBLES and BOULDERS encountered from 0.39 mbgs to 3.05 mbgs	1	RUN 1							
				RUN 2							
			2	RUN 3							
175.5			3								
3.11		GREYWACKE, dark grey, fine to medium grained, fresh to faintly weathered rock, poor rock quality based on RQD		RUN 4	TCR= 61% SCR= 45% RQD= 36%		1				
		- Good rock quality based on RQD below 3.55 mbgs	4	RUN 5	TCR= 98% SCR= 78% RQD= 76%		2 2 1 1				
			5	RUN 6	TCR= 100% SCR= 72% RQD= 52%		2 3 2				
		- Excellent rock quality based on RQD below 6.14 mbgs	6	RUN 7	TCR= 97% SCR= 92% RQD= 95%		1 1			45.8	
171.5			7								
7.12		END OF BOREHOLE Note(s): 1. Groundwater level was unable to be accurately measured following drilling due to injection of water during coring. 2. It should be noted that groundwater may not have stabilized upon completion of the borehole.	8								
			9								

TULLOCH ENGINEERING

Filling		Surface		Type		Aperture	Weathering	
Clean - CL	Clay - Cy	PL	Planar	BD	Bedding	Tight: 0.1 - 0.5mm (T)	FR	Fresh
Iron Stained - Fe	Calcite - Cal	CU	Curved	JN	Joint	Moderately Open:	SW	Slighty
Manganese Stained - Mn	Hematite - Hem	UN	Undulating	FLT	Fault	0.5-2.5mm (MO)	MW	Moderately
Carbonate - C	Pyrite - Py	IR	Irregular	SH	Shear	Open: 2.5-10mm (O)	HW	Highly
Gypsum - G	Serpentine - St			KV	Karstic Void	Very Open: > 10mm (VO)	EW	Extremely
Silty/Clay - SC	Chlorite - Ch							

5. ROCK CORE LOG 230821 ROCK LOGS W ELEVATIONS.GPJ LOG A_RNGN01.GDT 24-2-12

TULLOCH ENGINEERING

RECORD OF BOREHOLE No BH-23-02

1 OF 2

METRIC

JOB NUMBER 23-0821 LOCATION Blind River, Ontario ORIGINATED BY LM

CLIENT Town of Blind River Geodetic DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger COMPILED BY LM

DRILLER Landcore Drilling DATE 2023.10.30 NORTHING 5116307 EASTING 349299 CHECKED BY JM

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	SAMPLES: RECOVERY RATIO (%)	GROUND WATER CONDITIONS	ELEVATION (M)	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ POCKET PEN + FIELD VANE ● QUICK TRIAXIAL × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	REMARKS & GRAIN SIZE DISTRIBUTION (%)
180.90											GR SA SI CL
0.00 180.75	TOPSOIL - with organics and rootlets, some medium grained sand, non-plastic, dark brown, non-cohesive, moist, very dense		SS01A	SS	60	54				○	7 77 (16)
0.15	(SP) SAND, fine to medium grained, some fine grained gravel, some non-plastic fines, brown, non-cohesive, moist, very dense		SS01B	SS	60	54					SS01A: HEX = 60 ppm, IBL = 0 ppm SS01B: HEX = 60 ppm, IBL = 0 ppm
180.09	- Switched from hollow stem augers to NW casing and NQ core barrel at 0.81 mbgs										
0.81	END OF SOIL BOREHOLE LOG; see attached RECORD OF ROCKCORE No. BH-23-02										

200 + : Numbers refer to Field Vane Over Limit

+ 3 , × 3 : Numbers refer to Sensitivity

○ 3% STRAIN AT FAILURE

3. SOIL REPORT+REC. (ELEVATION) 230821 SOIL LOGS W ELEVATIONS.GPJ ONTARIO MTO.GDT 24-2-13

TULLOCH ENGINEERING

RECORD OF ROCKCORE No BH-23-02

2 OF 2

METRIC

JOB NUMBER 23-0821 LOCATION Blind River, Ontario ORIGINATED BY LM

CLIENT Town of Blind River DATUM 17T BOREHOLE TYPE NW/NQ COMPILED BY LM

DRILLER Landcore Drilling DATE 2023.10.30 NORTHING 5116307 EASTING 349299 CHECKED BY JM

Elev. / Depth	Strat Plot	Description	Depth (m)	Sample No.	Recovery Parameters	RQD % (25 50 75)	Fracture index / ft	Discontinuity Data: Dip Angles W.R.T Core Axis (30 60)	Discontinuity Data: Type and Description (see core log photos)	Compressive Strength (MPa) (50 100 150)	Remarks
180.9 / 0.00		Soil Overburden; Please refer to RECORD OF BOREHOLE No. BH-23-02									
180.1 / 0.81		GREYWACKE, dark grey, fine to medium grained, fresh to faintly weathered rock, fair rock quality based on RQD	1	RUN 1	TCR= 91% SCR= 53% RQD= 57%		3				
			2	RUN 2	TCR= 100% SCR= 52% RQD= 59%		1 2 3 2				
		- Good rock quality based on RQD below 3.0 mbgs	3	RUN 3	TCR= 88% SCR= 84% RQD= 84%		2 2 2				
		- Excellent rock quality based on RQD below 4.19 mbgs	4	RUN 4	TCR= 78% SCR= 78% RQD= 94%		1				
175.8 / 5.12		END OF BOREHOLE Note(s): 1. Groundwater level was unable to be accurately measured following drilling due to injection of water during coring. 2. It should be noted that groundwater may not have stabilized upon completion of the borehole.	5	RUN 5	TCR= 100% SCR= 54% RQD= 62%		1 3			73	
			6								
			7								
			8								

TULLOCH ENGINEERING

Filling		Surface		Type		Aperture	Weathering	
Clean - CL	Clay - Cy	PL	Planar	BD	Bedding	Tight: 0.1 - 0.5mm (T)	FR	Fresh
Iron Stained - Fe	Calcite - Cal	CU	Curved	JN	Joint	Moderately Open:	SW	Slighty
Manganese Stained - Mn	Hematite - Hem	UN	Undulating	FLT	Fault	0.5-2.5mm (MO)	MW	Moderately
Carbonate - C	Pyrite - Py	IR	Irregular	SH	Shear	Open: 2.5-10mm (O)	HW	Highly
Gypsum - G	Serpentine - St			KV	Karstic Void	Very Open: > 10mm (VO)	EW	Extremely
Silty/Clay - SC	Chlorite - Ch							

5. ROCK CORE LOG 230821 ROCK LOGS W ELEVATIONS.GPJ LOG A_RNGN01.GDT 24-2-12

TULLOCH ENGINEERING

RECORD OF BOREHOLE No BH-23-03

1 OF 2 **METRIC**

JOB NUMBER 23-0821 LOCATION Blind River, Ontario ORIGINATED BY LM

CLIENT Town of Blind River Geodetic DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger COMPILED BY LM

DRILLER Landcore Drilling DATE 2023.10.31 NORTHING 5116361 EASTING 349344 CHECKED BY JM

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	TYPE	"N" VALUES	RECOVERY RATIO (%)	GROUND WATER CONDITIONS	ELEVATION (M)	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ POCKET PEN + FIELD VANE ● QUICK TRIAXIAL × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
182.70											
0.00 182.55	TOPSOIL - trace organics and rootlets, some fine to coarse grained sand and gravel, non-plastic, dark brown, non-cohesive, moist, compact		SS01A	SS	23	58					SS01A: HEX = 5 ppm, IBL = 3 ppm
0.15	FILL - (SW) Gravelly SAND, fine to coarse grained, trace to some non-plastic fines, dark brown to black, with asphalt debris, non-cohesive, moist to wet, compact to very loose		SS01B	SS	23	58				○	SS01B: HEX = 15 ppm, IBL = 20 ppm
								182			
			SS02	SS	3	8				○	SS02: HEX = 0 ppm, IBL = 0 ppm
								181			
			SS03 AS01	SS AS	5	13				○	SS03: HEX = 0 ppm, IBL = 1 ppm 26 60 (14) AS01: HEX = 15 ppm, IBL = 20 ppm
180.57	- Switched from hollow stem augers to NW casing and NQ core barrel at 2.13 mbgs										
2.13	END OF SOIL BOREHOLE LOG; see attached RECORD OF ROCKCORE No. BH-23-03										

200 + : Numbers refer to Field Vane Over Limit +3, ×3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

3. SOIL REPORT+REC. (ELEVATION) 230821 SOIL LOGS W ELEVATIONS.GPJ ONTARIO MTO.GDT 24-2-13

TULLOCH ENGINEERING

RECORD OF ROCKCORE No BH-23-03

2 OF 2

METRIC

JOB NUMBER 23-0821 LOCATION Blind River, Ontario ORIGINATED BY LM

CLIENT Town of Blind River DATUM 17T BOREHOLE TYPE NW/NQ COMPILED BY LM

DRILLER Landcore Drilling DATE 2023.10.31 NORTHING 5116361 EASTING 349344 CHECKED BY JM

Elev. / Depth	Strat Plot	Description	Depth (m)	Sample No.	Recovery Parameters	RQD % (25 50 75)	Fracture index / ft	Discontinuity Data: Dip Angles W.R.T Core Axis (30 60)	Discontinuity Data: Type and Description (see core log photos)	Compressive Strength (MPa) (50 100 150)	Remarks
182.7											
0.00		Soil Overburden; Please refer to RECORD OF BOREHOLE No. BH-23-03	1								
180.6			2								
2.13		GREYWACKE, dark grey, fine to medium grained, faintly to slightly weathered rock, poor rock quality based on RQD		RUN 1	TCR= 93% SCR= 48% RQD= 15%		2				
							1				
			3	RUN 2	TCR= 92% SCR= 42% RQD= 36%		2				
							4				
			4	RUN 3	TCR= 94% SCR= 29% RQD= 15%		3				
							1				
							2				
			5	RUN 4	TCR= 92% SCR= 40% RQD= 29%		2				
							4				
							5				
			6	RUN 5	TCR= 100% SCR= 33% RQD= 12%		3				
							2				
							1				
		- Good rock quality based on RQD below 7.47 mbgs	7	RUN 6	TCR= 100% SCR= 50% RQD= 42%		2				
										48.3	
			8	RUN 7	TCR= 100% SCR= 72% RQD= 77%		1				
173.7											
8.99		END OF BOREHOLE Note(s): 1. Groundwater level was unable to be accurately measured following drilling due to injection of water during coring. 2. It should be noted that groundwater may not have stabilized upon completion of the borehole.	9								
			10								

TULLOCH ENGINEERING

Filling		Surface		Type		Aperture	Weathering	
Clean - CL	Clay - Cy	PL	Planar	BD	Bedding	Tight: 0.1 - 0.5mm (T)	FR	Fresh
Iron Stained - Fe	Calcite - Cal	CU	Curved	JN	Joint	Moderately Open:	SW	Slighty
Manganese Stained - Mn	Hematite - Hem	UN	Undulating	FLT	Fault	0.5-2.5mm (MO)	MW	Moderately
Carbonate - C	Pyrite - Py	IR	Irregular	SH	Shear	Open: 2.5-10mm (O)	HW	Highly
Gypsum - G	Serpentine - St			KV	Karstic Void	Very Open: > 10mm (VO)	EW	Extremely
Silty/Clay - SC	Chlorite - Ch							

5. ROCK CORE LOG 230821 ROCK LOGS W ELEVATIONS.GPJ LOG A_RNGN01.GDT 24-2-12

TULLOCH ENGINEERING

RECORD OF BOREHOLE No BH-23-04

1 OF 1

METRIC

JOB NUMBER 23-0821 LOCATION Blind River, Ontario ORIGINATED BY LM

CLIENT Town of Blind River DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger COMPILED BY LM

DRILLER Landcore Drilling DATE 2023.10.31 NORTHING 5116373 EASTING 349409 CHECKED BY JM

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	SAMPLES: RECOVERY RATIO (%)	GROUND WATER CONDITIONS	DEPTH (M)	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ POCKET PEN, + FIELD VANE, ● QUICK TRIAXIAL, × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%)	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
182.30									20 40 60 80 100	20 40 60	
0.00 / 182.23	ASPHALT - 75 mm										
0.08	FILL - (SW) Gravelly SAND, fine to coarse grained, trace non-plastic fines, brown, non-cohesive, moist, dense to very dense		SS01 AS01	SS AS	35	25				○	SS01: HEX = 0 ppm, IBL = 4 ppm AS01: HEX = 0 ppm, IBL = 0 ppm 28 62 (10)
181.39	- Switched from hollow stem augers to NW casing and NQ core barrel at 0.91 mbgs		SS02	SS	55	25				○	23 71 (6)
0.91	END OF SOIL BOREHOLE LOG; see attached RECORD OF ROCKCORE No. BH-23-04										SS02: HEX = 0 ppm, IBL = 0 ppm

200 + : Numbers refer to Field Vane Over Limit

+ 3 , × 3 : Numbers refer to Sensitivity

○ 3% STRAIN AT FAILURE

2. SOIL REPORT+REC. (DEPTH) 230821 SOIL LOGS W ELEVATIONS.GPJ ONTARIO MTO.GDT 24-2-13

TULLOCH ENGINEERING

RECORD OF ROCKCORE No BH-23-04

2 OF 2

METRIC

JOB NUMBER 23-0821 LOCATION Blind River, Ontario ORIGINATED BY LM

CLIENT Town of Blind River DATUM 17T BOREHOLE TYPE NW/NQ COMPILED BY LM

DRILLER Landcore Drilling DATE 2023.10.31 NORTHING 5116373 EASTING 349409 CHECKED BY JM

Elev. / Depth	Strat Plot	Description	Depth (m)	Sample No.	Recovery Parameters	RQD % (25 50 75)	Fracture index / ft	Discontinuity Data: Dip Angles W.R.T Core Axis (30 60)	Discontinuity Data: Type and Description (see core log photos)	Compressive Strength (MPa) (50 100 150)	Remarks
182.3 0.00		Soil Overburden; Please refer to RECORD OF BOREHOLE No. BH-23-04									
181.4 0.91		GREYWACKE, dark grey, fine to medium grained, faintly to slightly weathered rock, very poor to poor rock quality based on RQD	1	RUN 1	TCR= 47% SCR= 14% RQD= 0%						
			2	RUN 2	TCR= 72% SCR= 8% RQD= 0%		3 3				
			3	RUN 3	TCR= 88% SCR= 47% RQD= 29%		5 1				
		- Good rock quality based on RQD below 4.07 mbgs	4	RUN 4	TCR= 92% SCR= 58% RQD= 76%		3 1				
			5	RUN 5	TCR= 94% SCR= 53% RQD= 65%		2 1			135.2	
176.4 5.90		END OF BOREHOLE Note(s): 1. Groundwater level was unable to be accurately measured following drilling due to injection of water during coring. 2. It should be noted that groundwater may not have stabilized upon completion of the borehole.	6 7 8								

TULLOCH ENGINEERING

Filling		Surface		Type		Aperture	Weathering	
Clean - CL	Clay - Cy	PL	Planar	BD	Bedding	Tight: 0.1 - 0.5mm (T)	FR	Fresh
Iron Stained - Fe	Calcite - Cal	CU	Curved	JN	Joint	Moderately Open:	SW	Slighty
Manganese Stained - Mn	Hematite - Hem	UN	Undulating	FLT	Fault	0.5-2.5mm (MO)	MW	Moderately
Carbonate - C	Pyrite - Py	IR	Irregular	SH	Shear	Open: 2.5-10mm (O)	HW	Highly
Gypsum - G	Serpentine - St			KV	Karstic Void	Very Open: > 10mm (VO)	EW	Extremely
Silty/Clay - SC	Chlorite - Ch							

5. ROCK CORE LOG 230821 ROCK LOGS W ELEVATIONS.GPJ LOG A_RNGN01.GDT 24-2-12

TULLOCH ENGINEERING

RECORD OF BOREHOLE No BH-23-05

1 OF 1

METRIC

JOB NUMBER 23-0821 LOCATION Blind River, Ontario ORIGINATED BY LM

CLIENT Town of Blind River Geodetic DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger COMPILED BY LM

DRILLER Landcore Drilling DATE 2023.11.01 NORTHING 5116455 EASTING 349454 CHECKED BY JM

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	SAMPLES: RECOVERY RATIO (%)	GROUND WATER CONDITIONS	ELEVATION (M)	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ POCKET PEN, + FIELD VANE, ● QUICK TRIAXIAL, × LAB VANE; 20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
189.20											
189.08 / 0.00	ASPHALT - 50mm										
0.05	FILL - (SW) Gravelly SAND, fine to coarse grained, trace non-plastic fines, brown, non-cohesive, moist, very dense		1 1	SS AS	83	83		189		○	25 67 (8)
188.74 / 0.46	Auger and spoon refusal - END OF BOREHOLE Note(s): - Groundwater was not encountered upon completion of drilling. - It should be noted that groundwater may not have stabilized upon completion of the borehole. - Borehole did not cave in upon removal of augers.										SS01: HEX = 0 ppm, IBL = 4 ppm - Auger and spoon refusal at 0.46 mbgs - Borehole moved 1m southwest

200 + : Numbers refer to Field Vane Over Limit

+ 3 , × 3 : Numbers refer to Sensitivity

○ 3% STRAIN AT FAILURE

3. SOIL REPORT+REC. (ELEVATION) 230821 SOIL LOGS W ELEVATIONS.GPJ ONTARIO MTO.GDT 24-2-13

TULLOCH ENGINEERING

RECORD OF BOREHOLE No BH-23-06

1 OF 1

METRIC

JOB NUMBER 23-0821 LOCATION Blind River, Ontario ORIGINATED BY LM

CLIENT Town of Blind River Geodetic DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger COMPILED BY LM

DRILLER Landcore Drilling DATE 2023.11.01 NORTHING 5116484 EASTING 349475 CHECKED BY JM

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	TYPE	"N" VALUES	RECOVERY RATIO (%)	GROUND WATER CONDITIONS	ELEVATION (M)	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ POCKET PEN, + FIELD VANE, ● QUICK TRIAXIAL, × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
190.30											
190.00 / 0.00	ASPHALT - 50mm										
	FILL - (SW) SAND , fine to coarse grained, some fine grained gravel, trace non-plastic fines, brown, non-cohesive, moist, dense to compact		1 1	SS AS	39	75		190			SS01: HEX = 0 ppm, IBL = 0 ppm 17 75 (8) AS01: HEX = 0 ppm, IBL = 0 ppm SS02: HEX = 5 ppm, IBL = 0 ppm
			2	SS	27	53					19 74 (7)
	- Loose below 1.22 mbgs		3	SS	6	29		189			SS03: Spoon refusal encountered at 1.14 mbgs, augered to 1.22 mbgs SS03: HEX = 5 ppm, IBL = 0 ppm
			4	SS	5	58					SS04: HEX = 0 ppm, IBL = 0 ppm
188.01											
2.29	FILL - (SW/GW) SAND and GRAVEL, fine to coarse grained, trace non-plastic fines, brown, wet, very loose		5	SS	2	13		188			44 51 (5) SS05: HEX = 5 ppm, IBL = 0 ppm
187.40											
2.90	END OF BOREHOLE Note(s): - Borehole terminated when crew could not retrieve the spoon following SS05. Crew required to pull augers to retrieve sample and elected to terminate the borehole due to caving and heaving sands. - Heaving sands encountered between 2.74 and 2.90 mbgs - Borehole cave-in at 2.19 mbgs upon removal of augers. - Groundwater was not encountered upon completion of drilling. - It should be noted that groundwater may not have stabilized upon completion of the borehole.										

200 + : Numbers refer to Field Vane Over Limit +3, ×3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

3. SOIL REPORT+REC. (ELEVATION) 230821 SOIL LOGS W ELEVATIONS.GPJ ONTARIO MTO.GDT 24-2-13

TULLOCH ENGINEERING

RECORD OF BOREHOLE No BH-23-07

1 OF 1

METRIC

JOB NUMBER 23-0821 LOCATION Blind River, Ontario ORIGINATED BY LM

CLIENT Town of Blind River Geodetic DATUM Geodetic BOREHOLE TYPE Solid Stem Auger COMPILED BY LM

DRILLER Landcore Drilling DATE 2023.11.01 NORTHING 5116513 EASTING 349498 CHECKED BY JM

SOIL PROFILE			SAMPLES				GROUND WATER CONDITIONS	ELEVATION (M)	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	RECOVERY RATIO (%)			20 40 60 80 100	w_P w w_L	GR SA SI CL
190.40											
190.00 0.00	ASPHALT - 50mm FILL - (SP) SAND, fine to medium grained, trace fine gravel, brown, non-cohesive, moist		1	AS				190			SS01: HEX = 0 ppm, IBL = 0 ppm
189.64											
0.76	END OF BOREHOLE Note(s): - Groundwater was not encountered upon completion of drilling. - It should be noted that groundwater may not have stabilized upon completion of the borehole. - Borehole did not cave in upon removal of augers.										

SHEAR STRENGTH kPa: ○ POCKET PEN + FIELD VANE ● QUICK TRIAXIAL × LAB VANE

WATER CONTENT (%): 20 40 60

200 + : Numbers refer to Field Vane Over Limit +3, ×3: Numbers refer to Sensitivity ○3% STRAIN AT FAILURE

3. SOIL REPORT+REC. (ELEVATION) 230821 SOIL LOGS W ELEVATIONS.GPJ ONTARIO MTO.GDT 24-2-13

TULLOCH ENGINEERING

RECORD OF BOREHOLE No BH-23-08

1 OF 1

METRIC

JOB NUMBER 23-0821 LOCATION Blind River, Ontario ORIGINATED BY LM

CLIENT Town of Blind River Geodetic DATUM Geodetic BOREHOLE TYPE Solid Stem Auger COMPILED BY LM

DRILLER Landcore Drilling DATE 2023.11.01 NORTHING 5116551 EASTING 349511 CHECKED BY JM

SOIL PROFILE			SAMPLES				GROUND WATER CONDITIONS	ELEVATION (M)	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	RECOVERY RATIO (%)					GR SA SI CL
188.50											
188.00 0.00	ASPHALT - 50mm										
	FILL - (SP) SAND, fine to medium grained, trace fine gravel, dark brown, non-cohesive, moist		1	AS				188			SS01: HEX = 10 ppm, IBL = 0 ppm
187.74											
0.76	END OF BOREHOLE										

Note(s):
- Groundwater was not encountered upon completion of drilling.
- It should be noted that groundwater may not have stabilized upon completion of the borehole.
- Borehole did not cave in upon removal of augers.

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH kPa: ○ POCKET PEN + FIELD VANE ● QUICK TRIAXIAL × LAB VANE; 20 40 60 80 100

PLASTIC LIMIT w_P NATURAL MOISTURE CONTENT w LIQUID LIMIT w_L

WATER CONTENT (%): 20 40 60

200^{+}: Numbers refer to Field Vane Over Limit

$+^{3}, \times^{3}$: Numbers refer to Sensitivity

$\circ^{3\%}$ STRAIN AT FAILURE

3. SOIL REPORT+REC. (ELEVATION) 230821 SOIL LOGS W ELEVATIONS.GPJ ONTARIO MTO.GDT 24-2-13

TULLOCH ENGINEERING

RECORD OF BOREHOLE No BH-23-09

1 OF 1

METRIC

JOB NUMBER 23-0821 LOCATION Blind River, Ontario ORIGINATED BY LM

CLIENT Town of Blind River Geodetic DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger COMPILED BY LM

DRILLER Landcore Drilling DATE 2023.11.01 NORTHING 5116629 EASTING 349557 CHECKED BY JM

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	SAMPLES: RECOVERY RATIO (%)	GROUND WATER CONDITIONS	ELEVATION (M)	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ POCKET PEN + FIELD VANE ● QUICK TRIAXIAL × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
185.30	ASPHALT - 50mm										
185.00 / 0.05	FILL - (SP) Gravelly SAND, fine to medium grained, some non-plastic fines, brown, non-cohesive, moist, dense		1 1	SS AS	39	54		185			SS01: HEX = 15 ppm, IBL = 0 ppm AS01: HEX = 15 ppm, IBL = 0 ppm SS02: HEX = 0 ppm, IBL = 0 ppm
			2	SS	25	29				○	38 50 (12)
183.85								184			
1.45	(SM) SILTY SAND, fine to medium grained, some to trace fine gravel, non-plastic, brownish grey, non-cohesive, moist, very dense		3	SS	72	67					SS03: HEX = 0 ppm, IBL = 0 ppm - Auger and spoon refusal at 2.29 mbgs - Borehole moved 1m northeast
			4	SS	121	79		183		○	7 61 (32) SS04: HEX = 0 ppm, IBL = 0 ppm
182.25											
3.05	END OF BOREHOLE Note(s): - Groundwater was not encountered upon completion of drilling. - It should be noted that groundwater may not have stabilized upon completion of the borehole. - Borehole did not cave in upon removal of augers.										

200 + : Numbers refer to Field Vane Over Limit +3, ×3: Numbers refer to Sensitivity ○ 3% STRAIN AT FAILURE

3. SOIL REPORT+REC. (ELEVATION) 230821 SOIL LOGS W ELEVATIONS.GPJ ONTARIO MTO.GDT 24-2-13

TULLOCH ENGINEERING

RECORD OF BOREHOLE No BH-23-10

1 OF 1

METRIC

JOB NUMBER 23-0821 LOCATION Blind River, Ontario ORIGINATED BY LM

CLIENT Town of Blind River Geodetic DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger COMPILED BY LM

DRILLER Landcore Drilling DATE 2023.11.01 NORTHING 5116660 EASTING 349578 CHECKED BY JM

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	SAMPLES: RECOVERY RATIO (%)	GROUND WATER CONDITIONS	ELEVATION (M)	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ POCKET PEN + FIELD VANE ● QUICK TRIAXIAL × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
183.70											
183.65 0.05	ASPHALT - 50mm FILL - (SP) SAND, fine to medium grained, some to trace fine gravel, greyish brown, with asphalt debris, non-cohesive, moist, very dense		1	SS	22	92					SS01: HEX = 0 ppm, IBL = 0 ppm
183.25 0.45	- Approximately 50 mm of ashaplt pavement encoutnered at approximately 0.40 mbgs.		1	AS						○	5 70 22 3
	(SM) SILTY SAND, fine to medium grained, trace fine gravel, non-plastic, greyish brown, non-cohesive, moist, very dense							183			AS01: HEX = 0 ppm, IBL = 0 ppm
			2	SS	12	79					SS02: HEX = 0 ppm, IBL = 0 ppm
182.18											
1.52	END OF BOREHOLE Note(s): - Groundwater was not encountered upon completion of drilling. - It should be noted that groundwater may not have stabilized upon completion of the borehole. - Borehole did not cave in upon removal of augers.										

200 + : Numbers refer to Field Vane Over Limit +3, ×3: Numbers refer to Sensitivity ○3% STRAIN AT FAILURE

3. SOIL REPORT+REC. (ELEVATION) 230821 SOIL LOGS W ELEVATIONS.GPJ ONTARIO MTO.GDT 24-2-13

TULLOCH ENGINEERING

RECORD OF BOREHOLE No BH-23-11

1 OF 1 **METRIC**

JOB NUMBER 23-0821 LOCATION Blind River, Ontario ORIGINATED BY LM

CLIENT Town of Blind River Geodetic DATUM Geodetic BOREHOLE TYPE Solid Stem Auger COMPILED BY LM

DRILLER Landcore Drilling DATE 2023.11.01 NORTHING 5116674 EASTING 349592 CHECKED BY JM

SOIL PROFILE			SAMPLES				GROUND WATER CONDITIONS	ELEVATION (M)	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES	RECOVERY RATIO (%)			20 40 60 80 100	w_P w w_L	GR SA SI CL
183.20											
183.00 0.00	ASPHALT - 50mm FILL - (SP) SAND, fine grained, trace fine gravel, brown, non-cohesive, moist		1	AS				183			SS01: HEX = 0 ppm, IBL = 0 ppm
182.44											
0.76	END OF BOREHOLE Note(s): - Groundwater was not encountered upon completion of drilling. - It should be noted that groundwater may not have stabilized upon completion of the borehole. - Borehole did not cave in upon removal of augers.										

SHEAR STRENGTH kPa: ○ POCKET PEN + FIELD VANE ● QUICK TRIAXIAL × LAB VANE

WATER CONTENT (%): 20 40 60

200 + : Numbers refer to Field Vane Over Limit

+ 3 , × 3 : Numbers refer to Sensitivity

○ 3% STRAIN AT FAILURE

3. SOIL REPORT+REC. (ELEVATION) 230821 SOIL LOGS W ELEVATIONS.GPJ ONTARIO MTO.GDT 24-2-13

TULLOCH ENGINEERING

RECORD OF BOREHOLE No BH-23-12

1 OF 1 **METRIC**

JOB NUMBER 23-0821 LOCATION Blind River, Ontario ORIGINATED BY LM

CLIENT Town of Blind River Geodetic DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger COMPILED BY LM

DRILLER Landcore Drilling DATE 2023.11.01 NORTHING 5116699 EASTING 349607 CHECKED BY JM

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	TYPE	"N" VALUES	RECOVERY RATIO (%)	GROUND WATER CONDITIONS	ELEVATION (M)	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ POCKET PEN, + FIELD VANE, ● QUICK TRIAXIAL, × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
182.90									20 40 60 80 100	20 40 60	
182.80	ASPHALT - 50mm										
0.10	FILL - (SP) SAND, fine grained, trace coarse gravel, light brown, non-cohesive, moist, compact		1	SS	16	83					SS01: HEX = 0 ppm, IBL = 0 ppm
182.14								182			SS02: HEX = 0 ppm, IBL = 0 ppm
0.76	(SM) SILTY SAND, fine grained, non-plastic, greyish brown, non-cohesive, moist, loose		2	SS	5	63				○	0 65 27 8
			3	SS	8	83		181			SS03: HEX = 0 ppm, IBL = 0 ppm
180.69											
2.21	(ML) SILT and SAND, non-plastic, fine grained sand, trace clay, greyish brown, non-cohesive, moist to wet, loose to very loose		4	SS	9	71				○	SS04: HEX = 0 ppm, IBL = 0 ppm 0 44 54 2
			5	SS	4	71		180			SS05: HEX = 0 ppm, IBL = 0 ppm
								179			
			6	SS	3	58		178		○	SS06: HEX = 0 ppm, IBL = 0 ppm
177.72											
5.18	END OF BOREHOLE Note(s): - Groundwater was not encountered upon completion of drilling. - It should be noted that groundwater may not have stabilized upon completion of the borehole. - Borehole cave-in at 3.81 mbgs upon removal of augers.										

200 + : Numbers refer to Field Vane Over Limit +3, ×3: Numbers refer to Sensitivity ○3% STRAIN AT FAILURE

3. SOIL REPORT+REC. (ELEVATION) 230821 SOIL LOGS W ELEVATIONS.GPJ ONTARIO MTO.GDT 24-2-13

APPENDIX E

ROCK CORE PHOTOGRAPH LOG

Retrieved Rock Core at Borehole Location

BH-23-01

Run 1 to 6

Top of Bedrock Elevation: 178.6 m

CLIENT
Town of Blind River

PROJECT
Blind River Water Intake Geotechnical Investigation

CONSULTANT
TULLOCH ENGINEERING

YYYY-MM-DD	2024-02-13
PREPARED	AU
DESIGN	AU
REVIEW	JM
APPROVED	GL

TITLE
Rock Core Photos – BH-23-01

PROJECT No.	Phase / Task	Rev.	Figure
23-0821	**103**	**0**	**1**

Photos of Bedrock Core – Discontinuity Logging

BH-23-01

Run 1 to 6

1

2

3

4

CLIENT	Town of Blind River
PROJECT	Blind River Water Intake Geotechnical Investigation
CONSULTANT	TULLOCH ENGINEERING
YYYY-MM-DD	2024-02-13
PREPARED	AU
DESIGN	AU
REVIEW	JM
APPROVED	GL
TITLE	Rock Core Photos – BH-23-01

PROJECT No.	Phase / Task	Rev.	Figure
23-0821	103	0	2

Retrieved Rock Core at Borehole Location

BH-23-01

Run 7

Bottom of Core Elevation: 171.5 m

CLIENT
Town of Blind River

PROJECT
Blind River Water Intake Geotechnical Investigation

CONSULTANT
TULLOCH ENGINEERING

YYYY-MM-DD	2024-02-13
PREPARED	AU
DESIGN	AU
REVIEW	JM
APPROVED	GL

TITLE
Rock Core Photos – BH-23-01

PROJECT No.	Phase / Task	Rev.	Figure
23-0821	**103**	**0**	**3**

Photos of Bedrock Core – Discontinuity Logging

BH-23-01

Run 7

1

2

3

CLIENT
Town of Blind River

PROJECT
Blind River Water Intake Geotechnical Investigation

CONSULTANT
TULLOCH ENGINEERING

YYYY-MM-DD	2024-02-13
PREPARED	AU
DESIGN	AU
REVIEW	JM
APPROVED	GL

TITLE
Rock Core Photos – BH-23-01

PROJECT No.	Phase / Task	Rev.	Figure
23-0821	**103**	**0**	**4**

Retrieved Rock Core at Borehole Location

BH-23-02

Run 1 to 3

Top of Bedrock Elevation: 180.90 m

CLIENT	Town of Blind River
CONSULTANT	TULLOCH ENGINEERING
YYYY-MM-DD	2024-02-13
PREPARED	AU
DESIGN	AU
REVIEW	JM
APPROVED	GL
PROJECT	Blind River Water Intake Geotechnical Investigation
TITLE	Rock Core Photos – BH-23-02

PROJECT No.	Phase / Task	Rev.	Figure
23-0821	103	0	5

Photos of Bedrock Core – Discontinuity Logging

BH-23-02

Run 1 to 3

1

2

3

4

CLIENT	Town of Blind River
PROJECT	Blind River Water Intake Geotechnical Investigation
CONSULTANT	TULLOCH ENGINEERING
YYYY-MM-DD	2024-02-13
PREPARED	AU
DESIGN	AU
REVIEW	JM
APPROVED	GL
TITLE	Rock Core Photos – BH-23-02

PROJECT No.	Phase / Task	Rev.	Figure
23-0821	103	0	6

Retrieved Rock Core at Borehole Location

BH-23-02

Run 4 to 5

CLIENT
Town of Blind River

PROJECT
Blind River Water Intake Geotechnical Investigation

CONSULTANT
TULLOCH ENGINEERING

YYYY-MM-DD	2024-02-13
PREPARED	AU
DESIGN	AU
REVIEW	JM
APPROVED	GL

TITLE
Rock Core Photos – BH-23-02

PROJECT No.	Phase / Task	Rev.	Figure
23-0821	**103**	**0**	**7**

Photos of Bedrock Core – Discontinuity Logging

BH-23-02

Run 4 to 5

1

2

3

CLIENT
Town of Blind River

PROJECT
Blind River Water Intake Geotechnical Investigation

CONSULTANT
TULLOCH ENGINEERING

YYYY-MM-DD	2024-02-13
PREPARED	AU
DESIGN	AU
REVIEW	JM
APPROVED	GL

TITLE
Rock Core Photos – BH-23-02

PROJECT No.	Phase / Task	Rev.	Figure
23-0821	**103**	**0**	**8**

Retrieved Rock Core at Borehole Location

BH-23-03

Run 1 to 4

Top of Bedrock Elevation: 182.70 m

CLIENT	Town of Blind River
PROJECT	Blind River Water Intake Geotechnical Investigation
CONSULTANT	TULLOCH ENGINEERING
YYYY-MM-DD	2024-02-13
PREPARED	AU
DESIGN	AU
REVIEW	JM
APPROVED	GL
TITLE	Rock Core Photos – BH-23-03

PROJECT No.	Phase / Task	Rev.	Figure
23-0821	103	0	9

Photos of Bedrock Core – Discontinuity Logging

BH-23-03

Run 1 to 4

1

2

3

4

CLIENT	Town of Blind River
PROJECT	Blind River Water Intake Geotechnical Investigation
CONSULTANT	TULLOCH ENGINEERING
YYYY-MM-DD	2024-02-13
PREPARED	AU
DESIGN	AU
REVIEW	JM
APPROVED	GL
TITLE	Rock Core Photos – BH-23-03

PROJECT No.	Phase / Task	Rev.	Figure
23-0821	103	0	10

Retrieved Rock Core at Borehole Location

BH-23-03

Run 4 to 6

CLIENT
Town of Blind River

PROJECT
Blind River Water Intake Geotechnical Investigation

CONSULTANT
TULLOCH ENGINEERING

YYYY-MM-DD	2024-02-13
PREPARED	AU
DESIGN	AU
REVIEW	JM
APPROVED	GL

TITLE
Rock Core Photos – BH-23-03

PROJECT No.	Phase / Task	Rev.	Figure
23-0821	103	0	11

Photos of Bedrock Core – Discontinuity Logging

BH-23-03

Run 4 to 6

1

2

3

4

CLIENT
Town of Blind River

PROJECT
Blind River Water Intake Geotechnical Investigation

CONSULTANT
TULLOCH ENGINEERING

YYYY-MM-DD	2024-02-13
PREPARED	AU
DESIGN	AU
REVIEW	JM
APPROVED	GL

TITLE
Rock Core Photos – BH-23-03

PROJECT No.	Phase / Task	Rev.	Figure
23-0821	103	0	12

Retrieved Rock Core at Borehole Location

BH-23-03

Run 7

Bottom of Core Elevation: 175.8 m

CLIENT
Town of Blind River

PROJECT
Blind River Water Intake Geotechnical Investigation

CONSULTANT
TULLOCH ENGINEERING

YYYY-MM-DD	2024-02-13
PREPARED	AU
DESIGN	AU
REVIEW	JM
APPROVED	GL

TITLE
Rock Core Photos – BH-23-03

PROJECT No.	Phase / Task	Rev.	Figure
23-0821	103	0	13

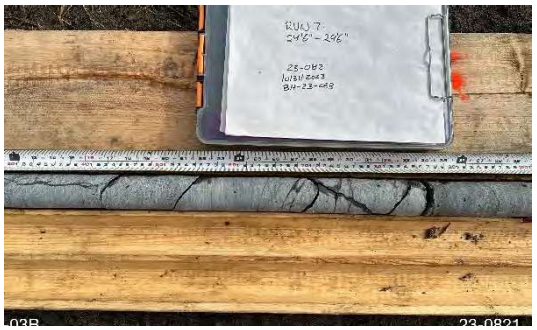
Photos of Bedrock Core – Discontinuity Logging

BH-23-03

Run 7

1

2



3

4

CLIENT	Town of Blind River
PROJECT	Blind River Water Intake Geotechnical Investigation
CONSULTANT	TULLOCH ENGINEERING
YYYY-MM-DD	2024-02-13
PREPARED	AU
DESIGN	AU
REVIEW	JM
APPROVED	GL
TITLE	Rock Core Photos – BH-23-03

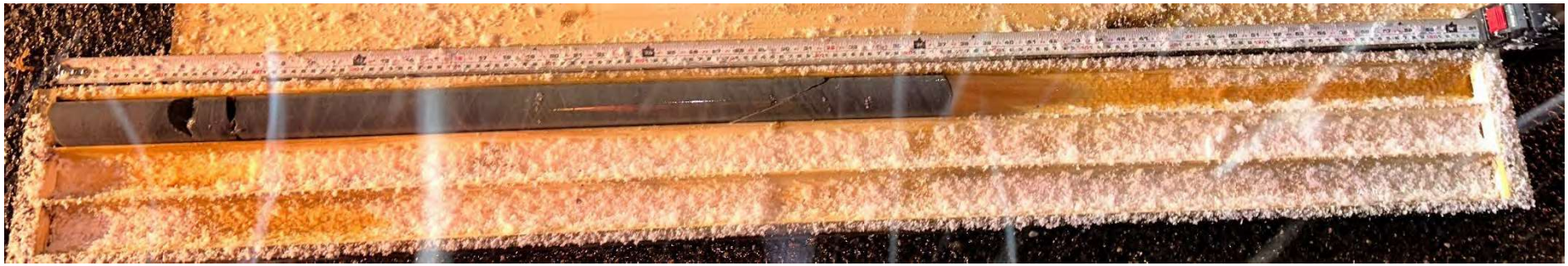
PROJECT No.	Phase / Task	Rev.	Figure
23-0821	103	0	14

Retrieved Rock Core at Borehole Location

BH-23-04

Run 1 to 5

Top of Bedrock Elevation: 182.30 m



Bottom of Core Elevation: 176.4 m

CLIENT	Town of Blind River
PROJECT	Blind River Water Intake Geotechnical Investigation
CONSULTANT	TULLOCH ENGINEERING
YYYY-MM-DD	2024-02-13
PREPARED	AU
DESIGN	AU
REVIEW	JM
APPROVED	GL
TITLE	Rock Core Photos – BH-23-04

PROJECT No.	Phase / Task	Rev.	Figure
23-0821	103	0	15

Photos of Bedrock Core – Discontinuity Logging

BH-23-04

Run 1 to 5

1

2

3

4

5

6

CLIENT
Town of Blind River

PROJECT
Blind River Water Intake Geotechnical Investigation

CONSULTANT
TULLOCH ENGINEERING

YYYY-MM-DD	2024-02-13
PREPARED	AU
DESIGN	AU
REVIEW	JM
APPROVED	GL

TITLE
Rock Core Photos – BH-23-04

PROJECT No.	Phase / Task	Rev.	Figure
23-0821	103	0	16

APPENDIX F

LABORATORY RESULTS

TULLOCH ENGINEERING

CSA A283 Certified Laboratory for Concrete Testing
CCIL Certified Laboratory for Aggregates and Asphalt Testing
CSA/CCIL Certified Technicians

Canadian Council of Independent Laboratories | Conseil canadien des laboratoires indépendants

WATER CONTENT TEST

TEST METHOD: LS 701 / ASTM C 566 / D 2216

CONTRACT NO: 23-0821 DATE SAMPLED: 2023-10-31

PROJECT: Blind River Water Intake SOURCE: Boreholes

DATE TESTED: 2023-11-20 TESTED BY: J.Draper

			Gross (inc. Tare) (g)				
Tare ID	Sample ID	Depth (m)	Wet Weight	Dry Weight	TARE	Mass Lost	Water %
	BH23-02 SS01A	0.0 to 0.2	357.62	335.96	212.55	21.66	17.6%

REMARKS:

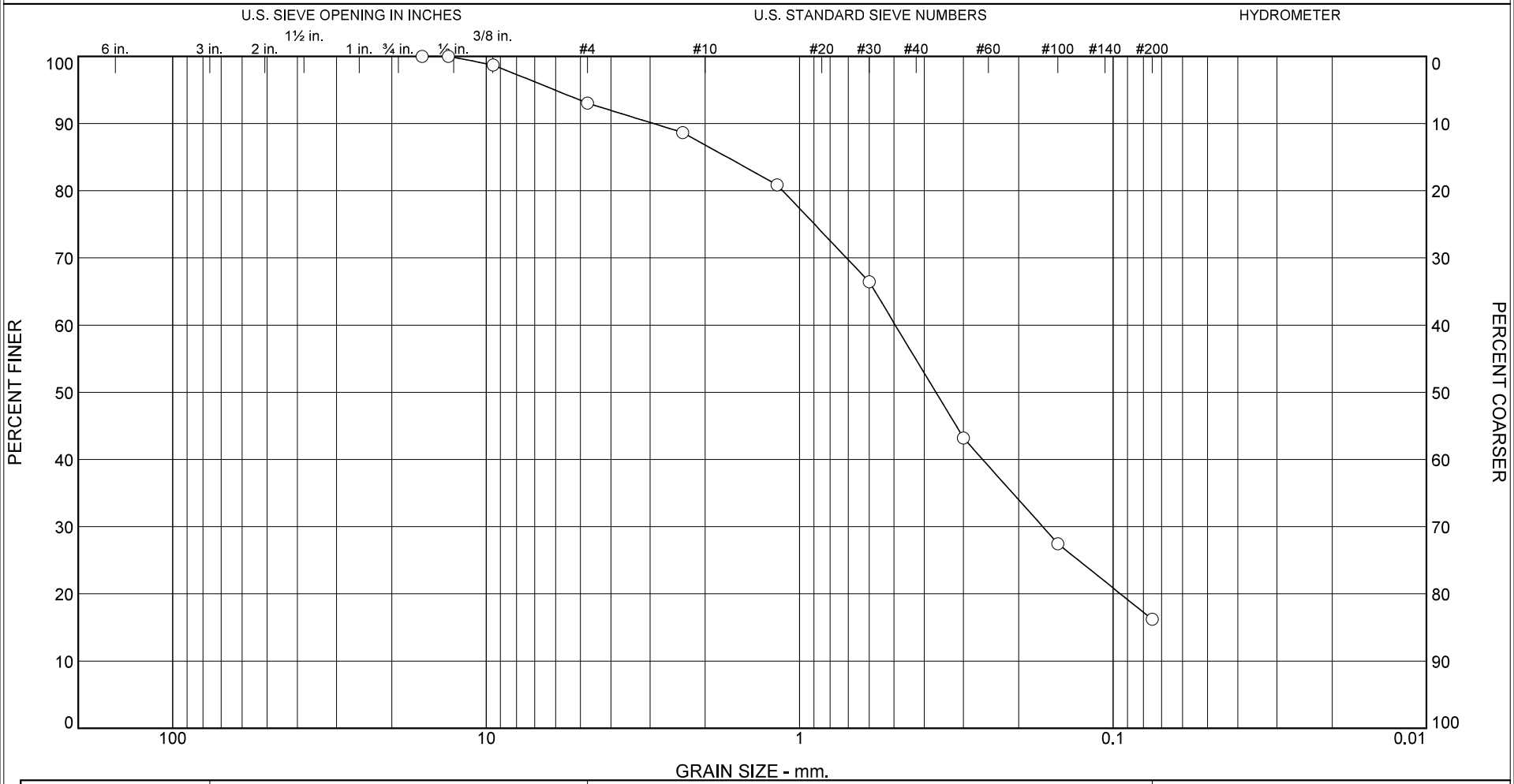
CLIENT: Town of Blind River

COPIES TO:

Tulloch Engineering, Materials Testing Laboratory, 71 Black Road - Unit 3, Sault Ste. Marie, ON. Canada P6B 0A3

Tel: (705) 949-1457 Fax: (705) 945-5092 email: daren.stadnisky@tulloch.ca

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	Silt
0.0	0.0	7.0	6.2	31.9	38.7	16.2

Identification	Date Sampled	Date Received	Date Tested
Source of Sample: BH-23-02 Sample Number: SS1A	Oct 31, 2023		Nov 24, 2023

Client Town of Blind River

Project Blind River Water Intake

Project No. 23-0821 Figure

TULLOCH ENGINEERING
71 Black Road
Unit 8
Sault Ste. Marie, ON
P6B 0A3
T. 705 949.1457
F. 705 949.9606
TF. 866 806.6602
Daren.Stadnisky@TULLOCH.ca

Tested By: S. Campbell **Checked By:** T. Linley

GRAIN SIZE DISTRIBUTION TEST DATA

2023-11-28

Client: Town of Blind River
Project: Blind River Water Intake
Project Number: 23-0821
Location: BH-23-02
Sample Number: SS1A
Date Sampled: Oct 31, 2023 **Date Tested:** Nov 24, 2023
Tested by: S. Campbell **Checked by:** T. Linley

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer	Percent Retained
336.00	212.60	16mm	0.00	0.00	100.0	0.0
		13.2mm	0.00	0.00	100.0	0.0
		9.5mm	1.60	0.00	98.7	1.3
		#4	7.00	0.00	93.0	7.0
		#8	5.40	0.00	88.7	11.3
		#16	9.60	0.00	80.9	19.1
		#30	17.80	0.00	66.5	33.5
		#50	28.70	0.00	43.2	56.8
		#100	19.40	0.00	27.5	72.5
		#200	13.90	0.00	16.2	83.8

Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	7.0	7.0	6.2	31.9	38.7	76.8			16.2

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
			0.0947	0.1677	0.2606	0.3675	0.4951	1.1326	1.7041	2.9262	6.0422

Fineness Modulus
2.02

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WATER CONTENT TEST

TEST METHOD: LS 701 / ASTM C 566 / D 2216

CONTRACT NO: 23-0821 DATE SAMPLED: 2023-10-31

PROJECT: Blind River Water Intake SOURCE: Boreholes

DATE TESTED: 2023-11-20 TESTED BY: J.Draper

			Gross (inc. Tare) (g)				
Tare ID	Sample ID	Depth (m)	Wet Weight	Dry Weight	TARE	Mass Lost	Water %
	BH23-03 SS01A	0.2 to 0.6	689.53	658.03	271.80	31.5	8.2%
	BH23-03 SS02	0.8 to 1.4	101.57	87.06	13.78	14.51	19.8%
	BH23-03 SS03	1.5 to 2.1	398.06	361.89	241.85	36.17	30.1%

REMARKS:

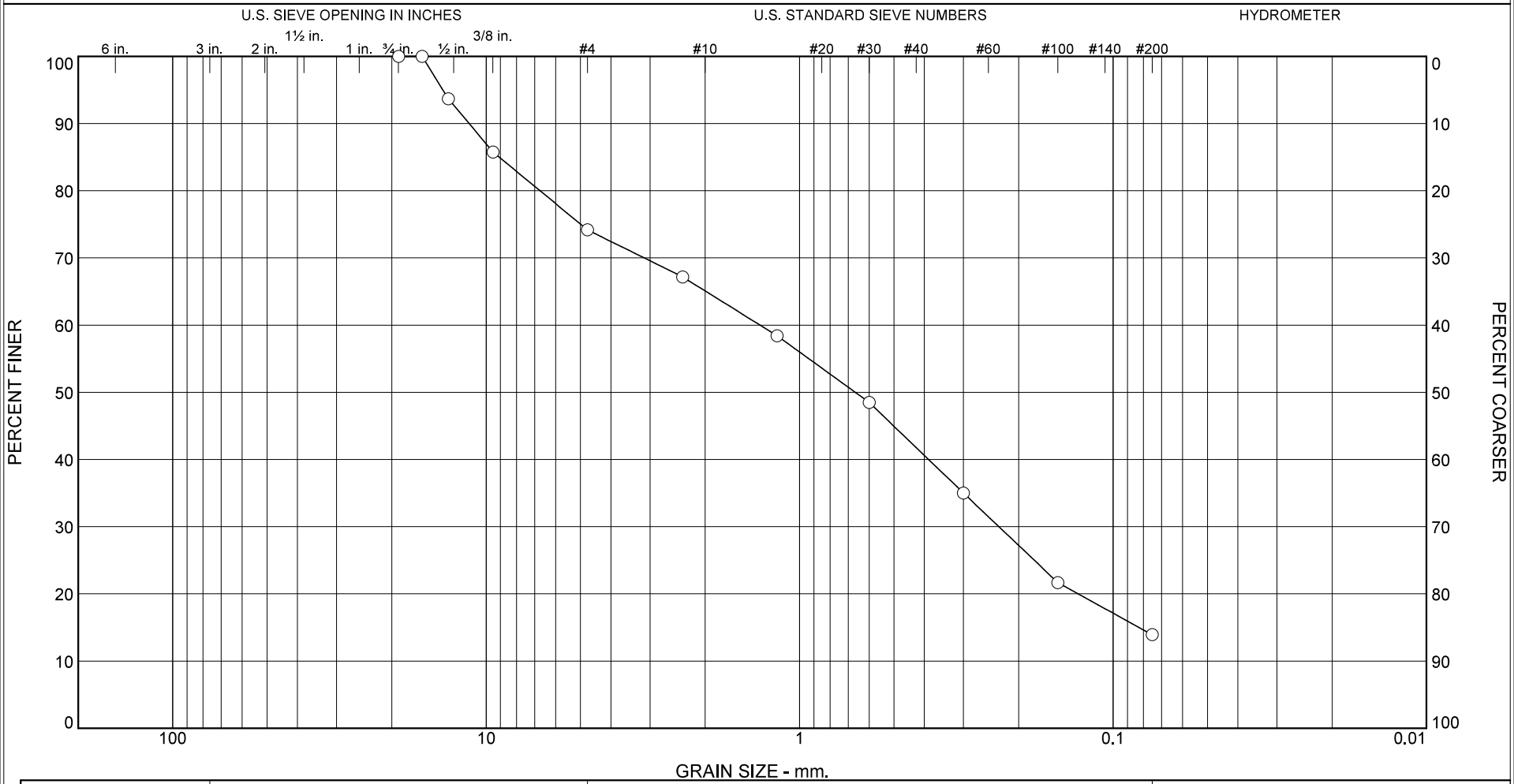
CLIENT: Town of Blind River

COPIES TO:

Tulloch Engineering, Materials Testing Laboratory, 71 Black Road - Unit 3, Sault Ste. Marie, ON. Canada P6B 0A3

Tel: (705) 949-1457 Fax: (705) 945-5092 email: daren.stadnisky@tulloch.ca

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	Silt
0.0	0.0	25.8	9.1	23.3	27.9	13.9

Identification	Date Sampled	Date Received	Date Tested
Source of Sample: BH-23-03 Depth: 1.5m - 2.1m Sample Number: SS03	Oct 31, 2023		Nov 21, 2023

Client Town of Blind River

Project Blind River Water Intake

Project No. 23-0821 Figure

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Tested By: S. Campbell **Checked By:** T. Linley

GRAIN SIZE DISTRIBUTION TEST DATA

2023-11-28

Client: Town of Blind River
Project: Blind River Water Intake
Project Number: 23-0821
Location: BH-23-03
Depth: 1.5m - 2.1m **Sample Number:** SS03
Date Sampled: Oct 31, 2023 **Date Tested:** Nov 21, 2023
Tested by: S. Campbell **Checked by:** T. Linley

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer	Percent Retained
361.90	241.90	19mm	0.00	0.00	100.0	0.0
		16mm	0.00	0.00	100.0	0.0
		13.2mm	7.60	0.00	93.7	6.3
		9.5mm	9.50	0.00	85.8	14.2
		#4	13.90	0.00	74.2	25.8
		#8	8.40	0.00	67.2	32.8
		#16	10.50	0.00	58.4	41.6
		#30	11.90	0.00	48.5	51.5
		#50	16.20	0.00	35.0	65.0
		#100	16.00	0.00	21.7	78.3
		#200	9.30	0.00	13.9	86.1

Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	25.8	25.8	9.1	23.3	27.9	60.3			13.9

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
		0.0826	0.1292	0.2313	0.3878	0.6646	1.3377	6.7343	9.0831	11.3347	13.7456

Fineness Modulus
3.09

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WATER CONTENT TEST

TEST METHOD: LS 701 / ASTM C 566 / D 2216

CONTRACT NO: 23-0821 DATE SAMPLED: 2023-10-31

PROJECT: Blind River Water Intake SOURCE: Boreholes

DATE TESTED: 2023-11-20 TESTED BY: J.Draper

			Gross (inc. Tare) (g)				
Tare ID	Sample ID	Depth (m)	Wet Weight	Dry Weight	TARE	Mass Lost	Water %
	BH23-04-SS01	0.2 to 0.8	658.70	634.46	217.58	24.24	5.8%
	BH23-04-SS02	0.8 to 1.4	510.36	486.26	219.53	24.1	9.0%

REMARKS:

CLIENT: Town of Blind River

COPIES TO:

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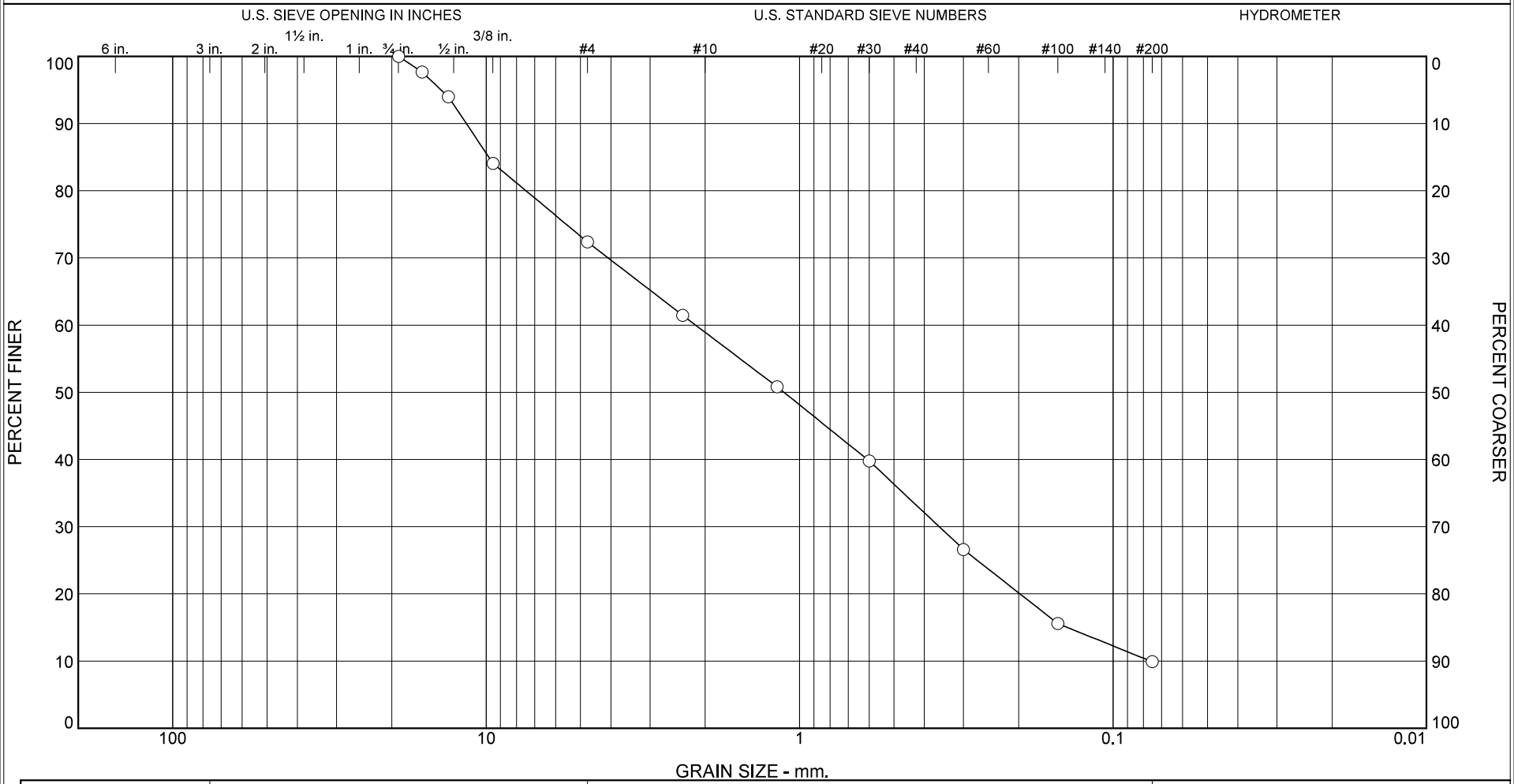
Tel: (705) 949-1457 Fax: (705) 945-5092 email: daren.stadnisky@tulloch.ca

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	Silt
0.0	0.0	27.6	13.5	25.7	23.3	9.9

Identification	Date Sampled	Date Received	Date Tested
Source of Sample: BH-23-04 Depth: 0.2m - 0.8m Sample Number: SS1	Oct 31, 2023		Nov 22, 2023

Client Town of Blind River

Project Blind River Water Intake

Project No. 23-0821 Figure

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Tested By: S. Campbell **Checked By:** T. Linley

GRAIN SIZE DISTRIBUTION TEST DATA

2023-11-28

Client: Town of Blind River
Project: Blind River Water Intake
Project Number: 23-0821
Location: BH-23-04
Depth: 0.2m - 0.8m **Sample Number:** SS1
Date Sampled: Oct 31, 2023 **Date Tested:** Nov 22, 2023
Tested by: S. Campbell **Checked by:** T. Linley

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer	Percent Retained
634.50	217.60	19mm	0.00	0.00	100.0	0.0
		16mm	9.80	0.00	97.6	2.4
		13.2mm	15.30	0.00	94.0	6.0
		9.5mm	41.30	0.00	84.1	15.9
		#4	48.80	0.00	72.4	27.6
		#8	45.50	0.00	61.5	38.5
		#16	44.30	0.00	50.8	49.2
		#30	46.00	0.00	39.8	60.2
		#50	55.00	0.00	26.6	73.4
		#100	46.00	0.00	15.6	84.4
		#200	23.60	0.00	9.9	90.1

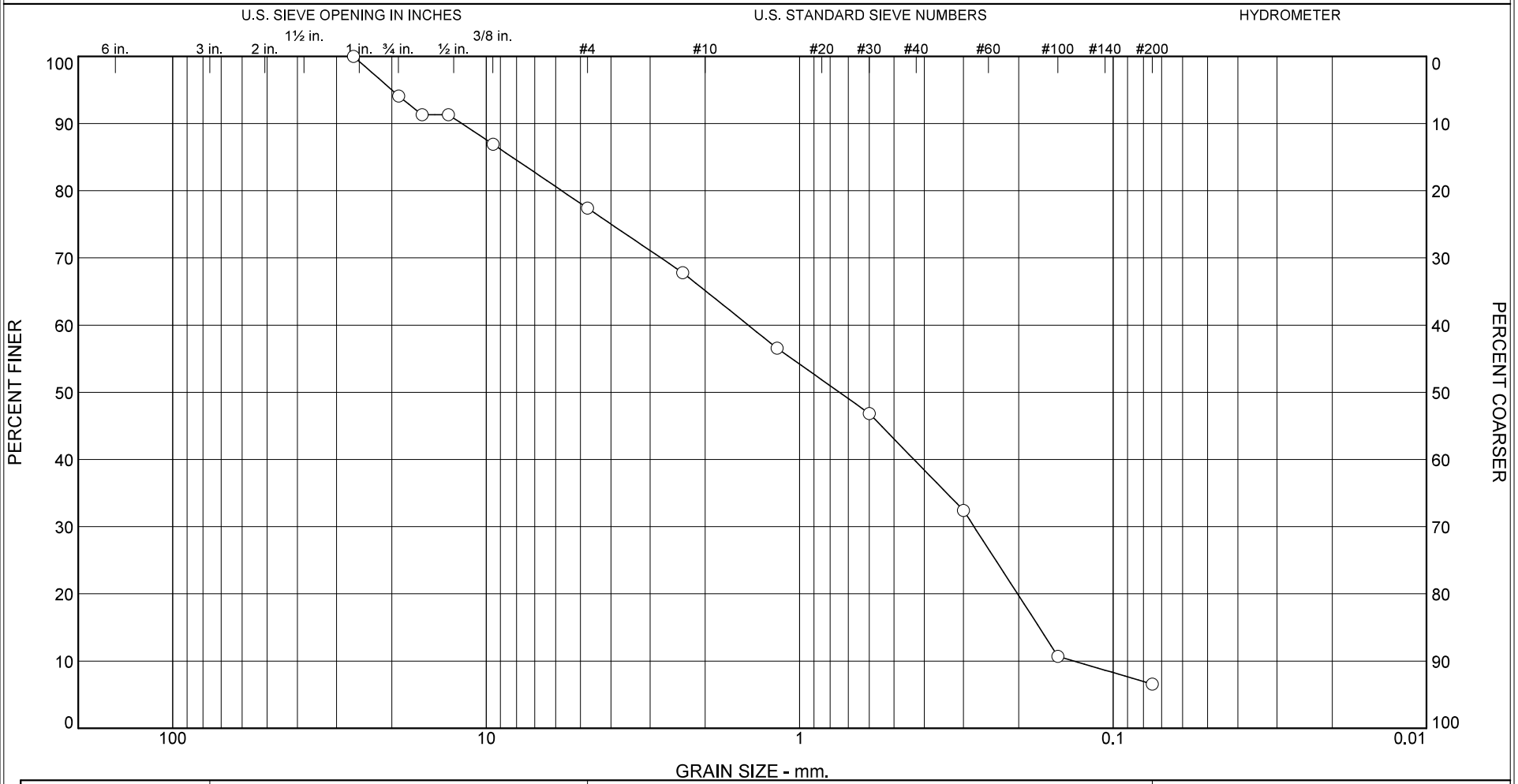
Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	27.6	27.6	13.5	25.7	23.3	62.5			9.9

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
	0.0759	0.1399	0.1982	0.3587	0.6076	1.1216	2.1465	7.4641	9.7970	11.5662	13.9254

Fineness Modulus	C_u	C_c
3.49	28.29	0.79

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	Silt
0.0	5.9	16.7	12.3	25.4	33.1	6.6

Identification	Date Sampled	Date Received	Date Tested
Source of Sample: BH-23-04 Depth: 0.8m - 1.4m Sample Number: SS2	Oct 31, 2023		Nov 23, 2023

Client Town of Blind River

Project Blind River Water Intake

Project No. 23-0821 Figure

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Daren.Stadnisky@TULLOCH.ca

Tested By: S. Campbell **Checked By:** T. Linley

GRAIN SIZE DISTRIBUTION TEST DATA

2023-11-28

Client: Town of Blind River
Project: Blind River Water Intake
Project Number: 23-0821
Location: BH-23-04
Depth: 0.8m - 1.4m **Sample Number:** SS2
Date Sampled: Oct 31, 2023 **Date Tested:** Nov 23, 2023
Tested by: S. Campbell **Checked by:** T. Linley

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer	Percent Retained
486.30	219.50	26.5mm	0.00	0.00	100.0	0.0
		19mm	15.80	0.00	94.1	5.9
		16mm	7.40	0.00	91.3	8.7
		13.2mm	0.00	0.00	91.3	8.7
		9.5mm	11.70	0.00	86.9	13.1
		#4	25.40	0.00	77.4	22.6
		#8	25.60	0.00	67.8	32.2
		#16	30.00	0.00	56.6	43.4
		#30	25.90	0.00	46.9	53.1
		#50	38.50	0.00	32.4	67.6
		#100	57.90	0.00	10.7	89.3
		#200	11.10	0.00	6.6	93.4

Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	5.9	16.7	22.6	12.3	25.4	33.1	70.8			6.6

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
	0.1331	0.1720	0.2018	0.2777	0.4317	0.7472	1.4588	5.7404	8.2612	11.9698	20.0102

Fineness Modulus	C_u	C_c
3.27	10.96	0.40

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WATER CONTENT TEST

TEST METHOD: LS 701 / ASTM C 566 / D 2216

CONTRACT NO: 23-0821 DATE SAMPLED: 2023-11-01

PROJECT: Blind River Water Intake SOURCE: Boreholes

DATE TESTED: 2023-11-20 TESTED BY: J.Draper

			Gross (inc. Tare) (g)				
Tare ID	Sample ID	Depth (m)	Wet Weight	Dry Weight	TARE	Mass Lost	Water %
	BH23-05-SS01	0.2 to 0.5	869.91	820.24	214.53	49.67	8.2%

REMARKS:

CLIENT: Town of Blind River

COPIES TO:

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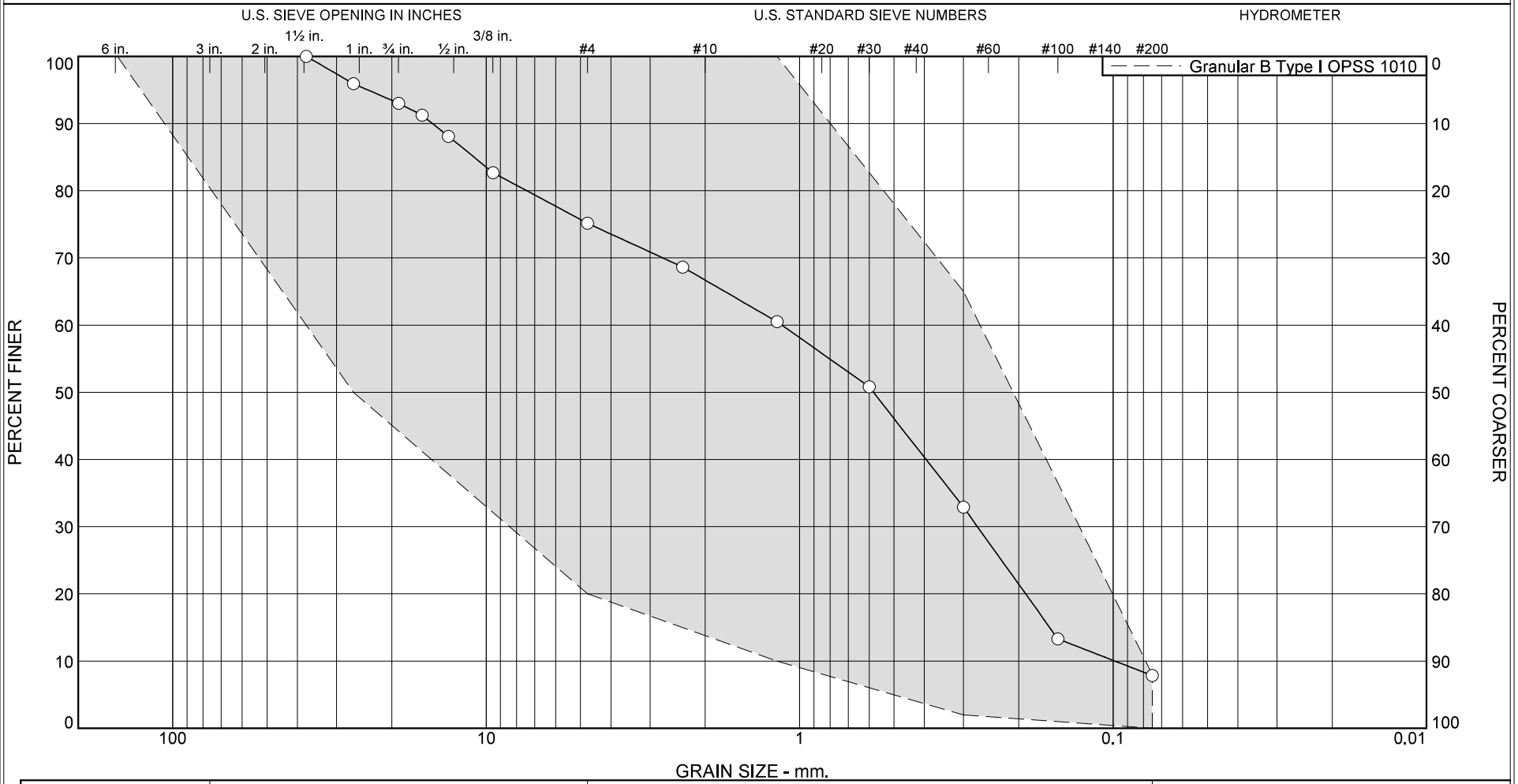
Tel: (705) 949-1457 Fax: (705) 945-5092 email: daren.stadnisky@tulloch.ca

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	Silt
0.0	7.0	17.8	8.5	24.8	34.1	7.8

Identification	Date Sampled	Date Received	Date Tested
Source of Sample: BH-23-05 Depth: 0.2m - 0.5m Sample Number: SS1	Nov 1, 2023		Nov 21, 2023

Client Town of Blind River

Project Blind River Water Intake

Project No. 23-0821 Figure

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Tested By: S. Campbell **Checked By:** T. Linley

GRAIN SIZE DISTRIBUTION TEST DATA

2023-11-28

Client: Town of Blind River
Project: Blind River Water Intake
Project Number: 23-0821
Location: BH-23-05
Depth: 0.2m - 0.5m **Sample Number:** SS1
Date Sampled: Nov 1, 2023 **Date Tested:** Nov 21, 2023
Tested by: S. Campbell **Checked by:** T. Linley
Material specification: Granular B Type I OPSS 1010

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer	Percent Retained	Lower Spec. Limit, %	Upper Spec. Limit, %	Deviation From Spec., %
820.20	214.50	37.5mm	0.00	0.00	100.0	0.0			
		26.5mm	24.70	0.00	95.9	4.1	50.0	100.0	
		19mm	17.70	0.00	93.0	7.0			
		16mm	10.70	0.00	91.2	8.8			
		13.2mm	19.00	0.00	88.1	11.9			
		9.5mm	32.80	0.00	82.7	17.3			
		#4	45.60	0.00	75.2	24.8	20.0	100.0	
		#8	39.50	0.00	68.6	31.4			
		#16	49.30	0.00	60.5	39.5	10.0	100.0	
		#30	58.70	0.00	50.8	49.2			
		#50	108.50	0.00	32.9	67.1	2.0	65.0	
		#100	118.70	0.00	13.3	86.7			
		#200	33.00	0.00	7.8	92.2	0.0	8.0	

Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	7.0	17.8	24.8	8.5	24.8	34.1	67.4			7.8

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
	0.0987	0.1594	0.1902	0.2709	0.3950	0.5817	1.1402	7.4219	10.9369	14.8345	23.8591

Fineness Modulus	C_u	C_c
3.23	11.55	0.65

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WATER CONTENT TEST

TEST METHOD: LS 701 / ASTM C 566 / D 2216

CONTRACT NO: 23-0821 DATE SAMPLED: 2023-11-01

PROJECT: Blind River Water Intake SOURCE: Boreholes

DATE TESTED: 2023-11-20 TESTED BY: J.Draper

			Gross (inc. Tare) (g)				
Tare ID	Sample ID	Depth (m)	Wet Weight	Dry Weight	TARE	Mass Lost	Water %
	BH23-06-SS01	0.2 to 0.8	1350.76	1265.53	204.26	85.23	8.0%
	BH23-06-AS01	0.2 to 0.8	93.89	91.84	13.78	2.05	2.6%
	BH23-06-SS02	0.8 to 1.2	500.91	487.46	171.33	13.45	4.3%
	BH23-06-SS03	1.2 to 1.8	135.62	124.26	15.24	11.36	10.4%
	BH23-06-SS05	2.3 to 2.9	413.49	390.51	169.39	22.98	10.4%

REMARKS:

CLIENT: Town of Blind River

COPIES TO:

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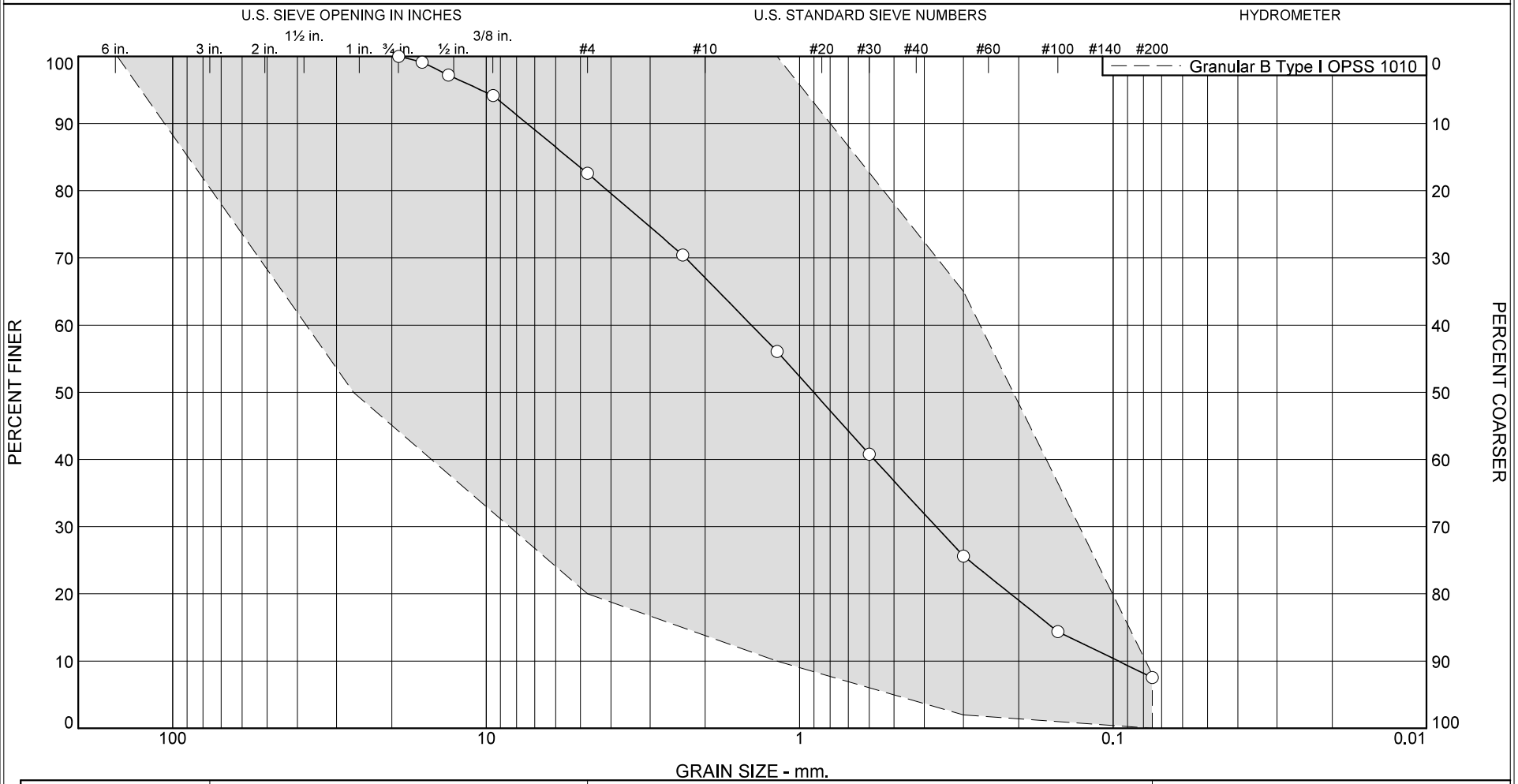
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	Silt
0.0	0.0	17.4	15.6	33.8	25.6	7.6

Identification	Date Sampled	Date Received	Date Tested
Source of Sample: BH-23-06 Depth: 0.2m - 0.8m Sample Number: SS1	Nov 1, 2023		Nov 23, 2023

Client Town of Blind River

Project Blind River Water Intake

Project No. 23-0821 Figure

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Tested By: S. Campbell **Checked By:** T. Linley

GRAIN SIZE DISTRIBUTION TEST DATA

2023-11-28

Client: Town of Blind River
Project: Blind River Water Intake
Project Number: 23-0821
Location: BH-23-06
Depth: 0.2m - 0.8m **Sample Number:** SS1
Date Sampled: Nov 1, 2023 **Date Tested:** Nov 23, 2023
Tested by: S. Campbell **Checked by:** T. Linley
Material specification: Granular B Type I OPSS 1010

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer	Percent Retained	Lower Spec. Limit, %	Upper Spec. Limit, %	Deviation From Spec., %
1265.50	204.30	19mm	0.00	0.00	100.0	0.0			
		16mm	9.30	0.00	99.1	0.9			
		13.2mm	20.30	0.00	97.2	2.8			
		9.5mm	32.40	0.00	94.2	5.8			
		#4	122.80	0.00	82.6	17.4	20.0	100.0	
		#8	128.90	0.00	70.4	29.6			
		#16	152.30	0.00	56.1	43.9	10.0	100.0	
		#30	162.40	0.00	40.8	59.2			
		#50	161.00	0.00	25.6	74.4	2.0	65.0	
		#100	119.30	0.00	14.4	85.6			
		#200	72.30	0.00	7.6	92.4	0.0	8.0	

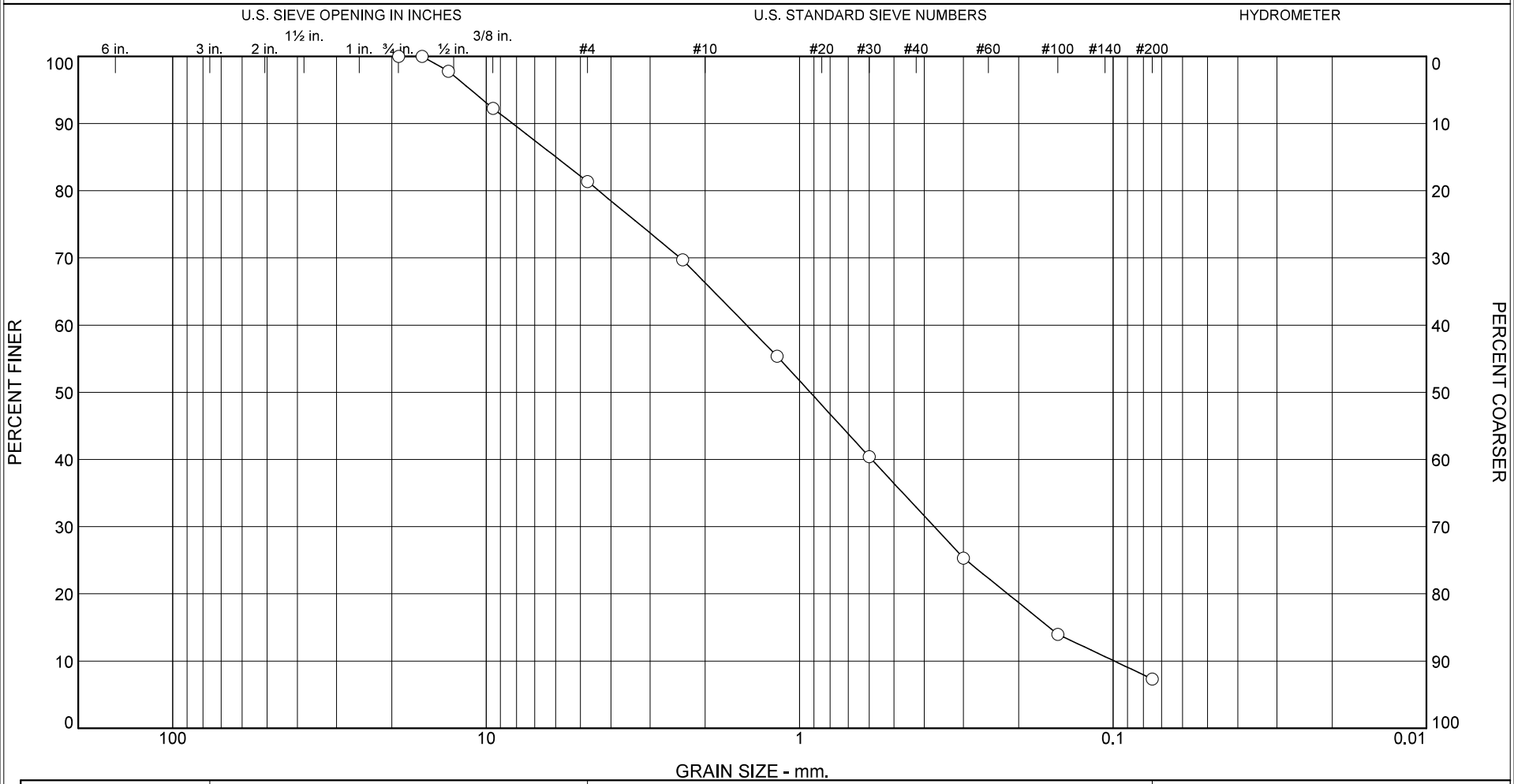
Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	17.4	17.4	15.6	33.8	25.6	75.0			7.6

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
	0.0962	0.1559	0.2122	0.3666	0.5789	0.9017	1.4254	4.0928	5.4891	7.4057	10.4025

Fineness Modulus	C_u	C_c
3.16	14.82	0.98

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	Silt
0.0	0.0	18.6	15.1	33.4	25.6	7.3

Identification	Date Sampled	Date Received	Date Tested
Source of Sample: BH-23-06 Depth: 0.8m - 1.2m Sample Number: SS2	Nov 1, 2023		Nov 24, 2023

Client Town of Blind River

Project Blind River Water Intake

Project No. 23-0821 Figure

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Tested By: S. Campbell **Checked By:** T. Linley

GRAIN SIZE DISTRIBUTION TEST DATA

2023-11-28

Client: Town of Blind River
Project: Blind River Water Intake
Project Number: 23-0821
Location: BH-23-06
Depth: 0.8m - 1.2m **Sample Number:** SS2
Date Sampled: Nov 1, 2023 **Date Tested:** Nov 24, 2023
Tested by: S. Campbell **Checked by:** T. Linley

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer	Percent Retained
487.50	171.30	19mm	0.00	0.00	100.0	0.0
		16mm	0.00	0.00	100.0	0.0
		13.2mm	7.00	0.00	97.8	2.2
		9.5mm	17.50	0.00	92.3	7.7
		#4	34.40	0.00	81.4	18.6
		#8	36.90	0.00	69.7	30.3
		#16	45.30	0.00	55.4	44.6
		#30	47.30	0.00	40.4	59.6
		#50	47.70	0.00	25.3	74.7
		#100	35.90	0.00	14.0	86.0
		#200	21.00	0.00	7.3	92.7

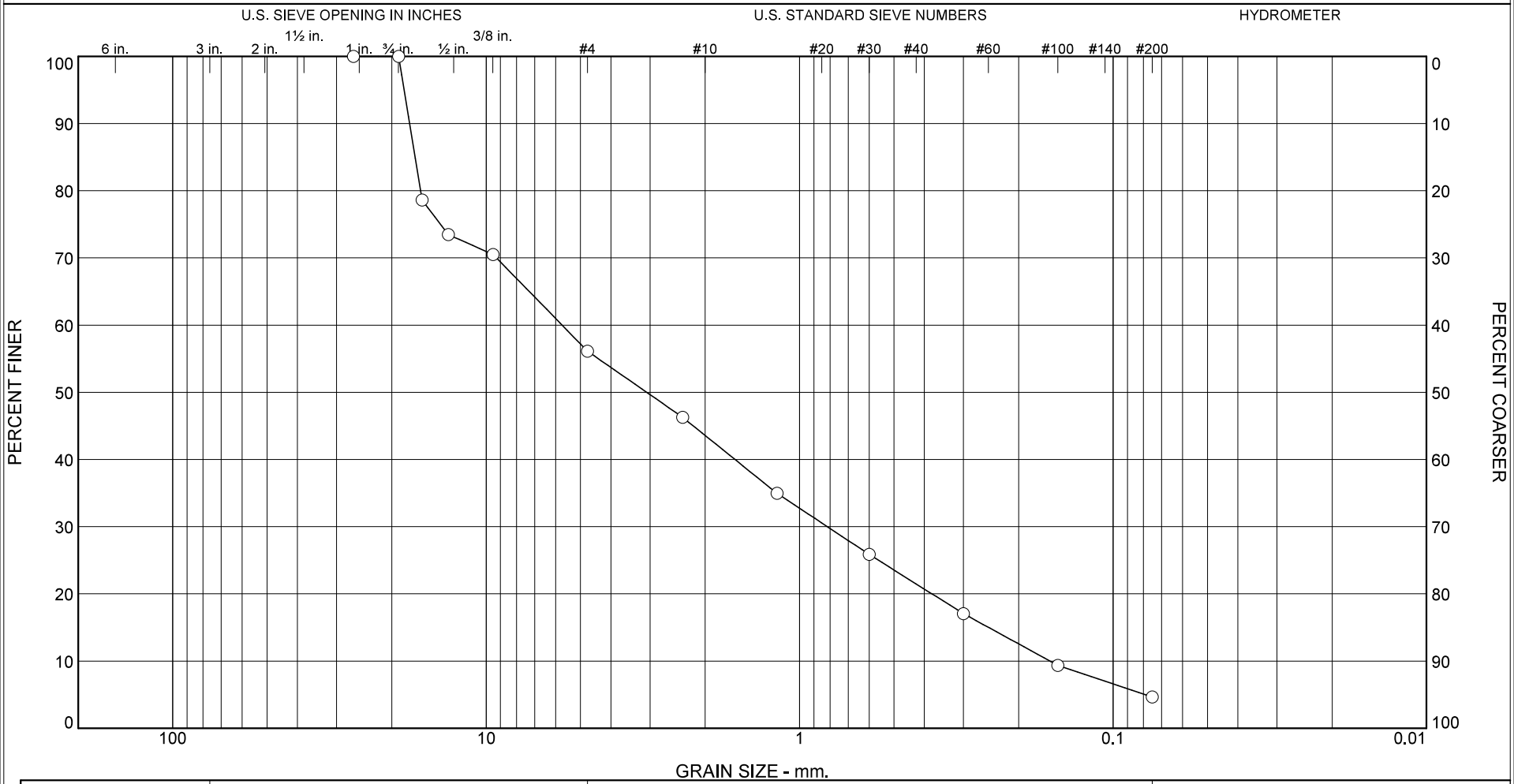
Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	18.6	18.6	15.1	33.4	25.6	74.1			7.3

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
	0.0990	0.1597	0.2166	0.3718	0.5886	0.9254	1.4758	4.3749	5.9850	8.2303	11.1856

Fineness Modulus	C_u	C_c
3.22	14.90	0.95

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	Silt
0.0	0.0	43.9	12.5	22.1	16.8	4.7

Identification	Date Sampled	Date Received	Date Tested
Source of Sample: BH-23-06 Depth: 2.3m - 2.9m Sample Number: SS5	Nov 1, 2023		Nov 23, 2023

Client Town of Blind River

Project Blind River Water Intake

Project No. 23-0821 Figure

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Tested By: S. Campbell **Checked By:** T. Linley

GRAIN SIZE DISTRIBUTION TEST DATA

2023-11-28

Client: Town of Blind River
Project: Blind River Water Intake
Project Number: 23-0821
Location: BH-23-06
Depth: 2.3m - 2.9m **Sample Number:** SS5
Date Sampled: Nov 1, 2023 **Date Tested:** Nov 23, 2023
Tested by: S. Campbell **Checked by:** T. Linley

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer	Percent Retained
390.50	169.40	26.5mm	0.00	0.00	100.0	0.0
		19mm	0.00	0.00	100.0	0.0
		16mm	47.30	0.00	78.6	21.4
		13.2mm	11.40	0.00	73.5	26.5
		9.5mm	6.50	0.00	70.5	29.5
		#4	31.80	0.00	56.1	43.9
		#8	21.80	0.00	46.3	53.7
		#16	25.00	0.00	35.0	65.0
		#30	20.10	0.00	25.9	74.1
		#50	19.50	0.00	17.1	82.9
		#100	17.00	0.00	9.4	90.6
		#200	10.40	0.00	4.7	95.3

Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	43.9	43.9	12.5	22.1	16.8	51.4			4.7

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
0.0789	0.1589	0.2494	0.3782	0.8158	1.6070	3.0752	5.7243	16.1800	16.8431	17.5334	18.2520

Fineness Modulus	C_u	C_c
4.40	36.03	0.73

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WATER CONTENT TEST

TEST METHOD: LS 701 / ASTM C 566 / D 2216

CONTRACT NO: 23-0821 DATE SAMPLED: 2023-11-01

PROJECT: Blind River Water Intake SOURCE: Boreholes

DATE TESTED: 2023-11-20 TESTED BY: J.Draper

			Gross (inc. Tare) (g)				
Tare ID	Sample ID	Depth (m)	Wet Weight	Dry Weight	TARE	Mass Lost	Water %
	BH23-09-SS02	0.8 to 1.4	649.27	630.25	221.93	19.02	4.7%
	BH23-09-SS04	2.3 to 2.9	1595.47	1508.82	349.56	86.65	7.5%

REMARKS:

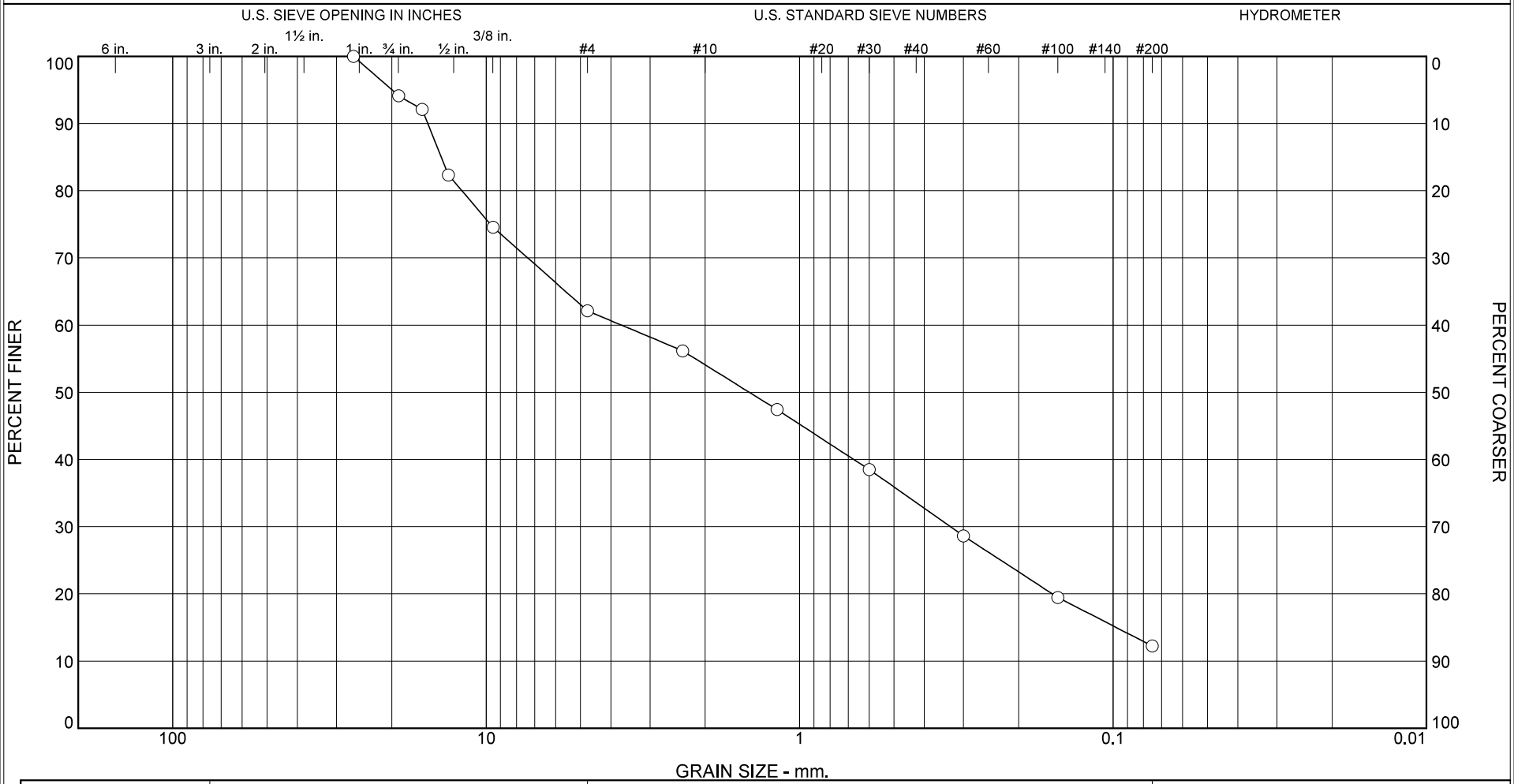
CLIENT: Town of Blind River

COPIES TO:

Tulloch Engineering, Materials Testing Laboratory, 71 Black Road - Unit 3, Sault Ste. Marie, ON. Canada P6B 0A3

Tel: (705) 949-1457 Fax: (705) 945-5092 email: daren.stadnisky@tulloch.ca

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	Silt
0.0	5.8	32.1	8.0	20.5	21.4	12.2

Identification	Date Sampled	Date Received	Date Tested
Source of Sample: BH-23-09 Depth: 0.8m - 1.4m Sample Number: SS2	Nov 1, 2023		Nov 24, 2023

Client Town of Blind River

Project Blind River Water Intake

Project No. 23-0821 Figure

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Tested By: S. Campbell **Checked By:** T. Linley

GRAIN SIZE DISTRIBUTION TEST DATA

2023-11-28

Client: Town of Blind River
Project: Blind River Water Intake
Project Number: 23-0821
Location: BH-23-09
Depth: 0.8m - 1.4m **Sample Number:** SS2
Date Sampled: Nov 1, 2023 **Date Tested:** Nov 24, 2023
Tested by: S. Campbell **Checked by:** T. Linley

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer	Percent Retained
630.30	221.90	26.5mm	0.00	0.00	100.0	0.0
		19mm	24.00	0.00	94.1	5.9
		16mm	8.20	0.00	92.1	7.9
		13.2mm	39.90	0.00	82.3	17.7
		9.5mm	31.80	0.00	74.6	25.4
		#4	50.80	0.00	62.1	37.9
		#8	24.30	0.00	56.2	43.8
		#16	35.70	0.00	47.4	52.6
		#30	36.40	0.00	38.5	61.5
		#50	40.40	0.00	28.6	71.4
		#100	37.40	0.00	19.5	80.5
		#200	29.50	0.00	12.2	87.8

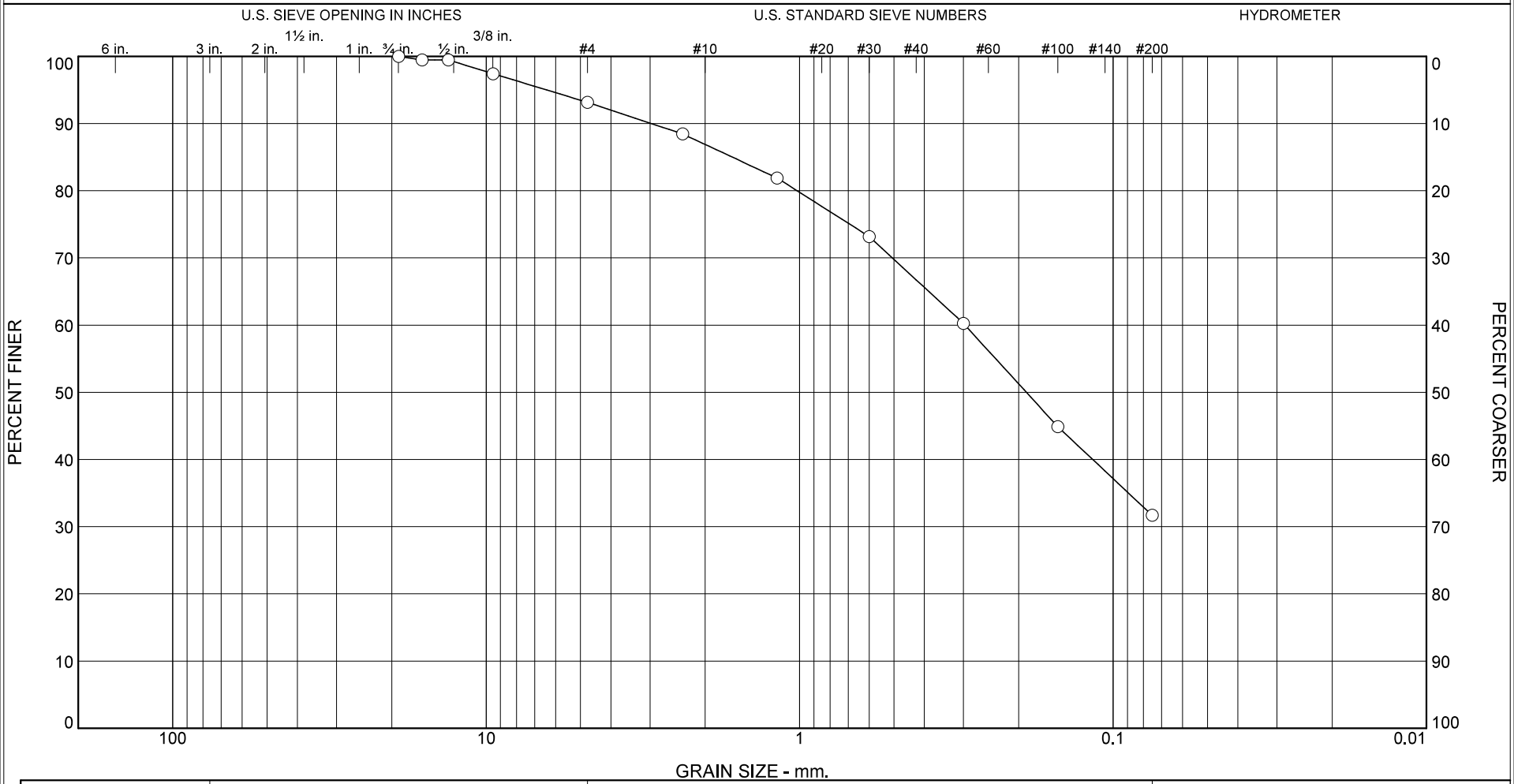
Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	5.8	32.1	37.9	8.0	20.5	21.4	49.9			12.2

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
		0.0977	0.1562	0.3304	0.6715	1.4468	3.7020	11.9547	13.9082	15.3472	19.9667

Fineness Modulus
3.79

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines
	Coarse	Fine	Coarse	Medium	Fine	Silt
0.0	0.0	6.8	6.3	20.2	35.0	31.7

Identification	Date Sampled	Date Received	Date Tested
Source of Sample: BH-23-09 Depth: 2.3m - 2.9m Sample Number: SS4	Nov 1, 2023		Nov 24, 2023

Client Town of Blind River

Project Blind River Water Intake

Project No. 23-0821 Figure

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Tested By: S. Campbell **Checked By:** T. Linley

GRAIN SIZE DISTRIBUTION TEST DATA

2023-11-28

Client: Town of Blind River
Project: Blind River Water Intake
Project Number: 23-0821
Location: BH-23-09
Depth: 2.3m - 2.9m **Sample Number:** SS4
Date Sampled: Nov 1, 2023 **Date Tested:** Nov 24, 2023
Tested by: S. Campbell **Checked by:** T. Linley

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer	Percent Retained
1508.80	349.60	19mm	0.00	0.00	100.0	0.0
		16mm	6.30	0.00	99.5	0.5
		13.2mm	0.00	0.00	99.5	0.5
		9.5mm	23.80	0.00	97.4	2.6
		#4	49.20	0.00	93.2	6.8
		#8	54.70	0.00	88.4	11.6
		#16	75.90	0.00	81.9	18.1
		#30	101.00	0.00	73.2	26.8
		#50	150.00	0.00	60.2	39.8
		#100	178.20	0.00	44.9	55.1
		#200	152.80	0.00	31.7	68.3

Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	6.8	6.8	6.3	20.2	35.0	61.5			31.7

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
					0.1161	0.1891	0.2968	1.0188	1.6396	2.9739	6.4160

Fineness Modulus
1.61

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WATER CONTENT TEST

TEST METHOD: LS 701 / ASTM C 566 / D 2216

CONTRACT NO: 23-0821 DATE SAMPLED: 2023-11-01

PROJECT: Blind River Water Intake SOURCE: Boreholes

DATE TESTED: 2023-11-20 TESTED BY: J.Draper

			Gross (inc. Tare) (g)				
Tare ID	Sample ID	Depth (m)	Wet Weight	Dry Weight	TARE	Mass Lost	Water %
	BH23-10-SS01	0.2 to 0.8	1337.19	1259.02	375.09	78.17	8.8%

REMARKS:

CLIENT: Town of Blind River

COPIES TO:

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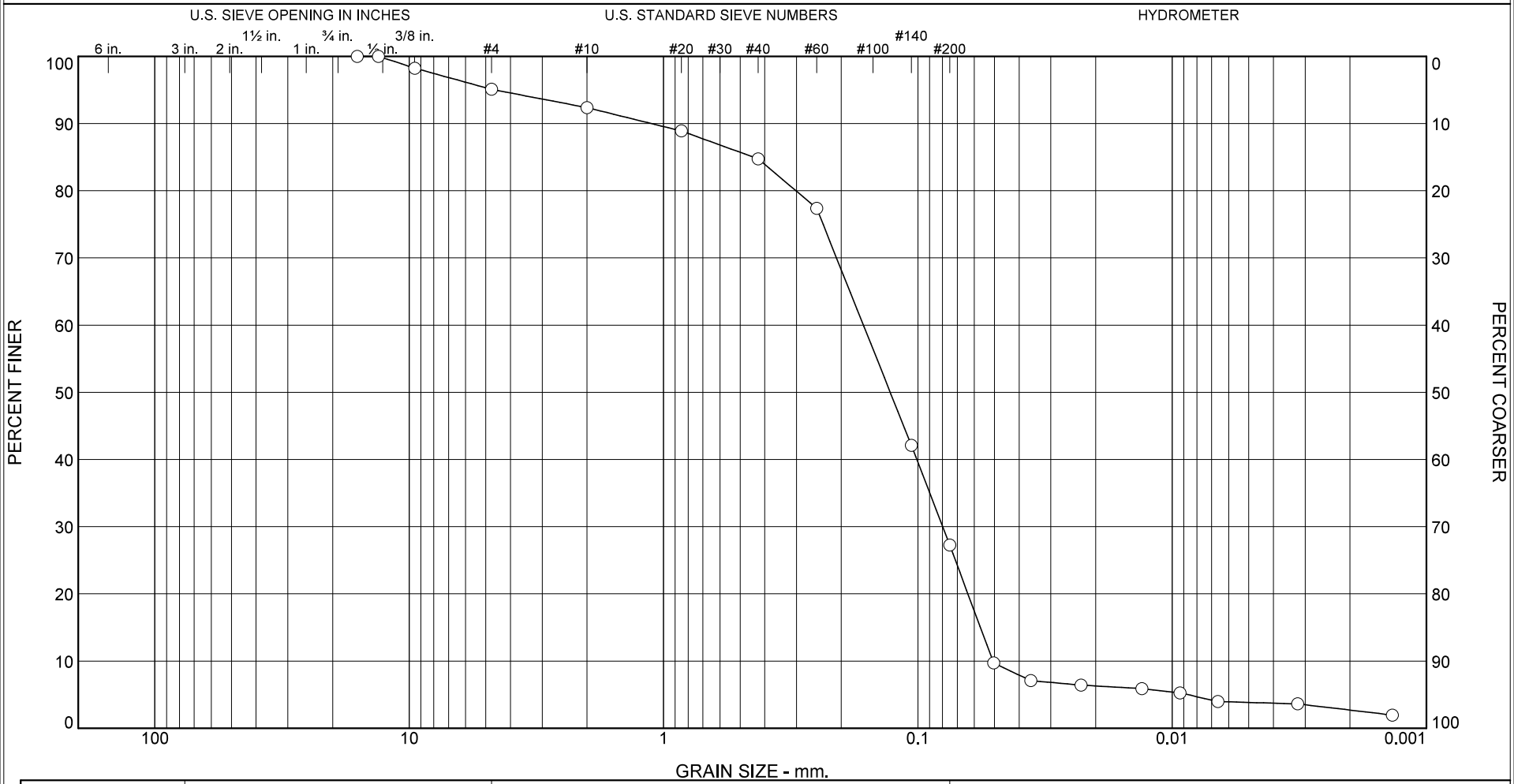
Tel: (705) 949-1457 Fax: (705) 945-5092 email: daren.stadnisky@tulloch.ca

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	4.9	2.7	7.7	57.4	24.6	2.7

Identification	Date Sampled	Date Received	Date Tested
Source of Sample: BH-23-10 Depth: 0.2m - 0.8m Sample Number: SS1	Nov 1, 2023		Nov 28, 2023

Client Town of Blind River

Project Blind River Water Intake

Project No. 23-0821 Figure

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Tested By: T. Linley **Checked By:** D. Stadnisky

GRAIN SIZE DISTRIBUTION TEST DATA

2023-11-29

Client: Town of Blind River
Project: Blind River Water Intake
Project Number: 23-0821
Location: BH-23-10
Depth: 0.2m - 0.8m **Sample Number:** SS1
Date Sampled: Nov 1, 2023 **Date Tested:** Nov 28, 2023
Tested by: T. Linley **Checked by:** D. Stadnisky

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer	Percent Retained
1259.00	375.10	16mm	0.00	0.00	100.0	0.0
		13.2mm	0.00	0.00	100.0	0.0
		9.5mm.	15.70	0.00	98.2	1.8
		#4	27.70	0.00	95.1	4.9
		#10	24.10	0.00	92.4	7.6
69.10	0.00	#20	2.60	0.00	88.9	11.1
		#40	3.10	0.00	84.7	15.3
		#60	5.50	0.00	77.4	22.6
		#140	26.40	0.00	42.1	57.9
		#200	11.10	0.00	27.3	72.7

Hydrometer Test Data

Hydrometer test uses material passing #10
Percent passing #10 based upon complete sample = 92.4
Weight of hydrometer sample =69.1
Automatic temperature correction
Composite correction (fluid density and meniscus height) at 20 deg. C = -4
Meniscus correction only = -1.0
Specific gravity of solids = 2.70
Hydrometer type = 152H
Hydrometer effective depth equation: L = 16.294964 **-** .164 **x Rm**

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer	Percent Retained
1.00	21.8	11.0	7.4	0.0131	10.0	14.7	0.0503	9.7	90.3
2.00	21.8	9.0	5.4	0.0131	8.0	15.0	0.0360	7.1	92.9
5.00	21.8	8.5	4.9	0.0131	7.5	15.1	0.0228	6.4	93.6
15.00	22.2	8.0	4.5	0.0131	7.0	15.1	0.0131	5.9	94.1
30.00	22.3	7.5	4.0	0.0131	6.5	15.2	0.0093	5.3	94.7
60.00	22.4	6.5	3.0	0.0131	5.5	15.4	0.0066	4.0	96.0
250.00	23.3	6.0	2.7	0.0129	5.0	15.5	0.0032	3.6	96.4
1440.00	22.3	5.0	1.5	0.0131	4.0	15.6	0.0014	2.0	98.0

Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	4.9	4.9	2.7	7.7	57.4	67.8	24.6	2.7	27.3

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
0.0087	0.0506	0.0567	0.0636	0.0799	0.1009	0.1284	0.1638	0.3018	0.4436	1.1177	4.6164

Fineness Modulus	C_u	C_c
1.00	3.23	0.77

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WATER CONTENT TEST

TEST METHOD: LS 701 / ASTM C 566 / D 2216

CONTRACT NO: 23-0821 DATE SAMPLED: 2023-11-01

PROJECT: Blind River Water Intake SOURCE: Boreholes

DATE TESTED: 2023-11-20 TESTED BY: J.Draper

			Gross (inc. Tare) (g)				
Tare ID	Sample ID	Depth (m)	Wet Weight	Dry Weight	TARE	Mass Lost	Water %
	BH23-12-SS02	0.8 to 1.4	844.34	804.13	230.85	40.21	7.0%
	BH23-12-SS04	2.3 to 2.9	1138.69	1005.07	255.92	133.62	17.8%
	BH23-12-SS06	4.6 to 5.2	97.48	83.44	13.67	14.04	20.1%

REMARKS:

CLIENT: Town of Blind River

COPIES TO:

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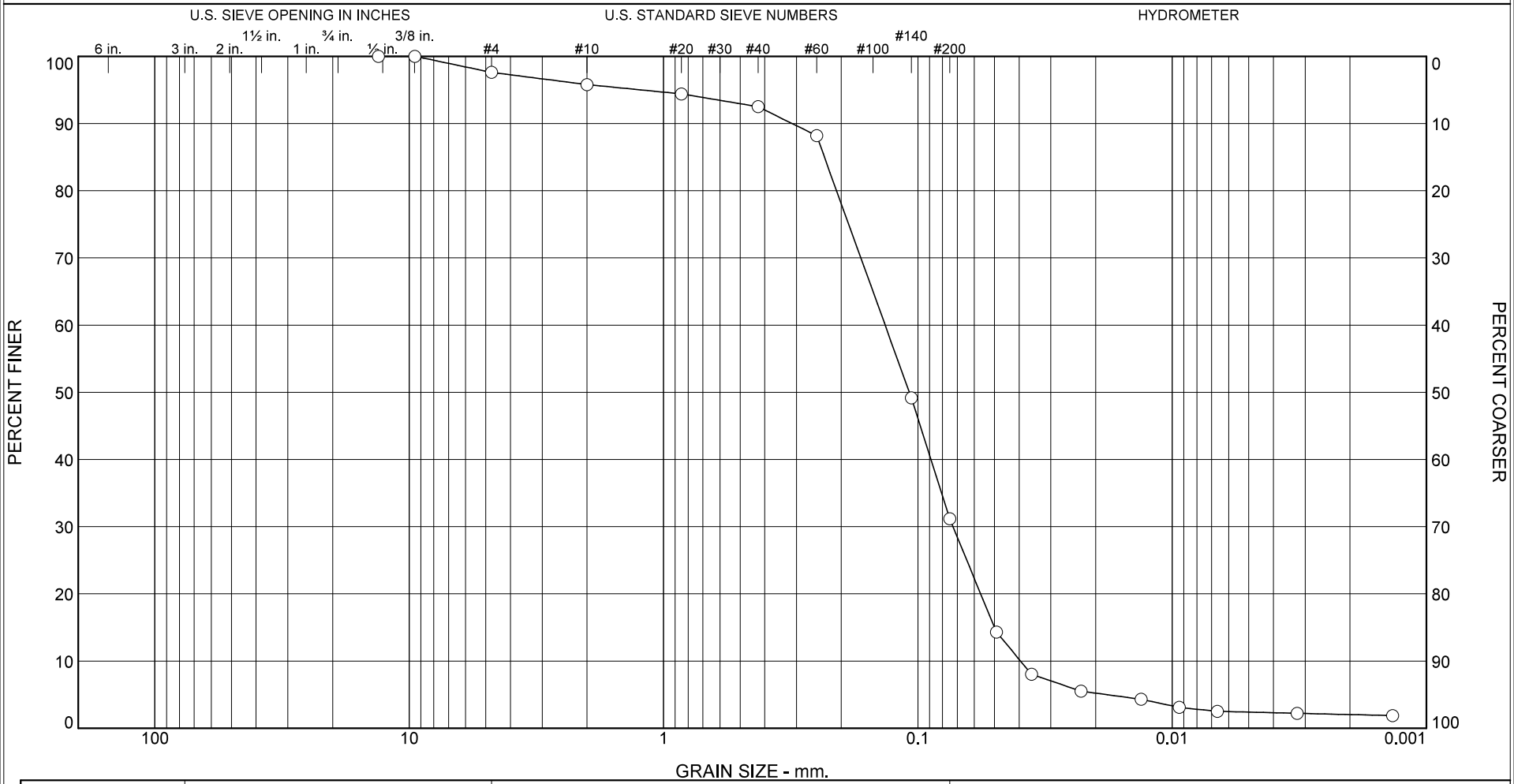
Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	2.4	1.8	3.3	61.3	29.2	2.0

Identification	Date Sampled	Date Received	Date Tested
Source of Sample: BH-23-12 Depth: 0.8m - 1.4m Sample Number: SS2	Nov 1, 2023		Nov 28, 2023

Client Town of Blind River

Project Blind River Water Intake

Project No. 23-0821 Figure

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Tested By: T. Linley **Checked By:** D. Stadnisky

GRAIN SIZE DISTRIBUTION TEST DATA

2023-11-29

Client: Town of Blind River
Project: Blind River Water Intake
Project Number: 23-0821
Location: BH-23-12
Depth: 0.8m - 1.4m **Sample Number:** SS2
Date Sampled: Nov 1, 2023 **Date Tested:** Nov 28, 2023
Tested by: T. Linley **Checked by:** D. Stadnisky

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer	Percent Retained
804.10	230.90	13.2mm	0.00	0.00	100.0	0.0
		9.5mm.	0.00	0.00	100.0	0.0
		#4	13.70	0.00	97.6	2.4
		#10	10.40	0.00	95.8	4.2
75.60	0.00	#20	1.10	0.00	94.4	5.6
		#40	1.50	0.00	92.5	7.5
		#60	3.40	0.00	88.2	11.8
		#140	30.80	0.00	49.2	50.8
		#200	14.20	0.00	31.2	68.8

Hydrometer Test Data

Hydrometer test uses material passing #10
Percent passing #10 based upon complete sample = 95.8
Weight of hydrometer sample =75.6
Automatic temperature correction
Composite correction (fluid density and meniscus height) at 20 deg. C = -4
Meniscus correction only = -1.0
Specific gravity of solids = 2.70
Hydrometer type = 152H
Hydrometer effective depth equation: L = 16.294964 **-** .164 **x Rm**

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer	Percent Retained
1.00	22.0	15.0	11.4	0.0131	14.0	14.0	0.0491	14.3	85.7
2.00	22.0	10.0	6.4	0.0131	9.0	14.8	0.0357	8.0	92.0
5.00	22.0	8.0	4.4	0.0131	7.0	15.1	0.0228	5.5	94.5
15.00	22.1	7.0	3.4	0.0131	6.0	15.3	0.0132	4.3	95.7
30.00	22.3	6.0	2.5	0.0131	5.0	15.5	0.0094	3.1	96.9
60.00	22.4	5.5	2.0	0.0131	4.5	15.6	0.0066	2.5	97.5
250.00	23.4	5.0	1.8	0.0129	4.0	15.6	0.0032	2.2	97.8
1440.00	22.4	5.0	1.5	0.0131	4.0	15.6	0.0014	1.9	98.1

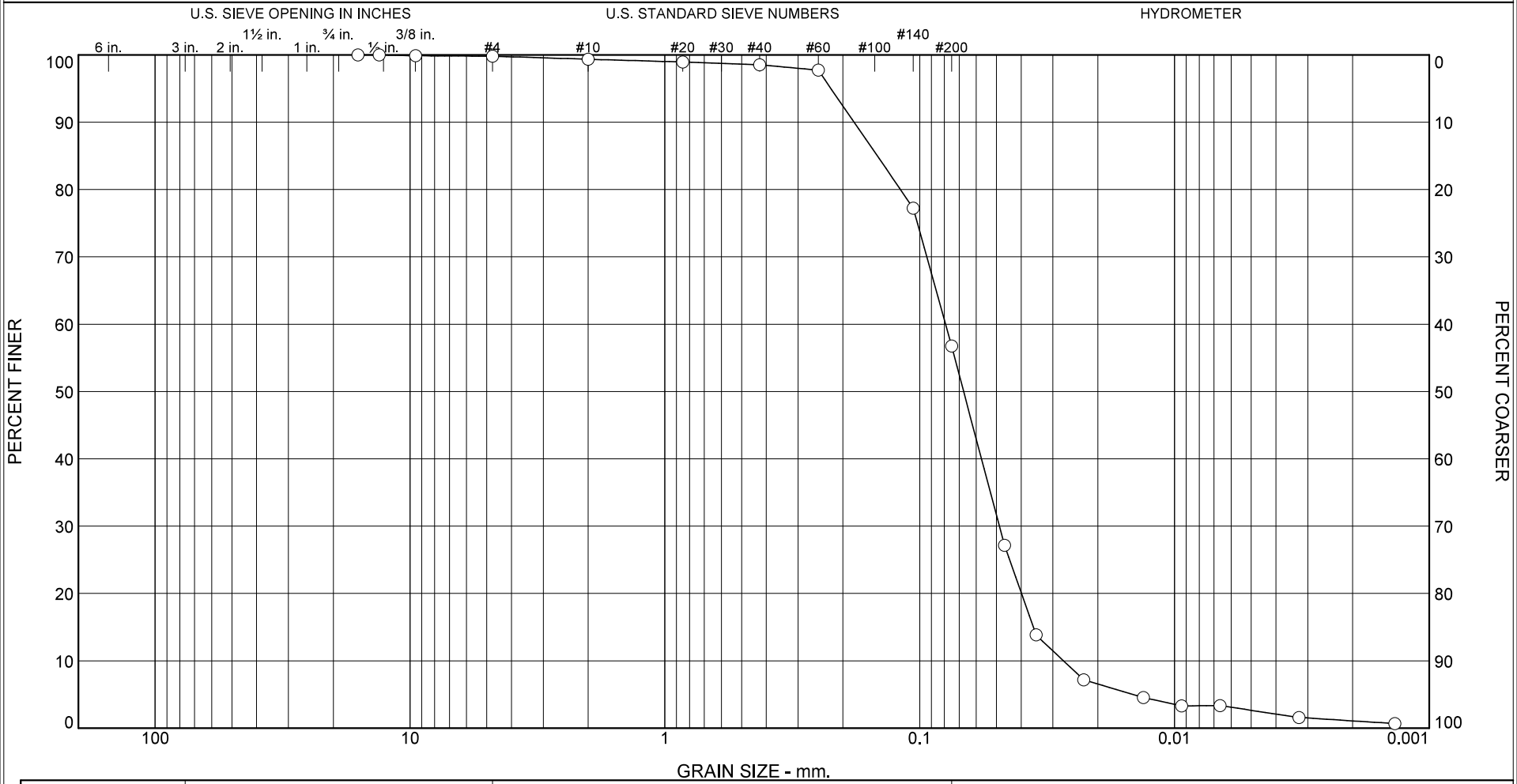
Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	2.4	2.4	1.8	3.3	61.3	66.4	29.2	2.0	31.2

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
0.0181	0.0395	0.0500	0.0566	0.0728	0.0889	0.1080	0.1345	0.2088	0.2331	0.3123	1.2273

Fineness Modulus	C_u	C_c
0.63	3.41	1.00

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.2	0.5	0.8	41.8	55.6	1.1

Identification	Date Sampled	Date Received	Date Tested
Source of Sample: BH-23-12 Depth: 2.3m - 2.9m Sample Number: SS4	Nov 1, 2023		Nov 28, 2023

Client Town of Blind River

Project Blind River Water Intake

Project No. 23-0821 Figure

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Tested By: T. Linley **Checked By:** D. Stadnisky

GRAIN SIZE DISTRIBUTION TEST DATA

2023-11-29

Client: Town of Blind River
Project: Blind River Water Intake
Project Number: 23-0821
Location: BH-23-12
Depth: 2.3m - 2.9m **Sample Number:** SS4
Date Sampled: Nov 1, 2023 **Date Tested:** Nov 28, 2023
Tested by: T. Linley **Checked by:** D. Stadnisky

Sieve Test Data

Dry Sample and Tare (grams)	Tare (grams)	Sieve Opening Size	Weight Retained (grams)	Sieve Weight (grams)	Percent Finer	Percent Retained
1005.10	255.90	16mm	0.00	0.00	100.0	0.0
		13.2mm	0.00	0.00	100.0	0.0
		9.5mm.	1.00	0.00	99.9	0.1
		#4	0.50	0.00	99.8	0.2
		#10	3.40	0.00	99.3	0.7
73.70	0.00	#20	0.30	0.00	98.9	1.1
		#40	0.30	0.00	98.5	1.5
		#60	0.60	0.00	97.7	2.3
		#140	15.20	0.00	77.2	22.8
		#200	15.20	0.00	56.7	43.3

Hydrometer Test Data

Hydrometer test uses material passing #10
Percent passing #10 based upon complete sample = 99.3
Weight of hydrometer sample =73.7
Automatic temperature correction
Composite correction (fluid density and meniscus height) at 20 deg. C = -4
Meniscus correction only = -1.0
Specific gravity of solids = 2.70
Hydrometer type = 152H
Hydrometer effective depth equation: L = 16.294964 **-** .164 **x Rm**

Elapsed Time (min.)	Temp. (deg. C.)	Actual Reading	Corrected Reading	K	Rm	Eff. Depth	Diameter (mm.)	Percent Finer	Percent Retained
1.00	21.9	24.0	20.4	0.0131	23.0	12.5	0.0465	27.2	72.8
2.00	21.9	14.0	10.4	0.0131	13.0	14.2	0.0349	13.8	86.2
5.00	21.9	9.0	5.4	0.0131	8.0	15.0	0.0227	7.2	92.8
15.00	22.0	7.0	3.4	0.0131	6.0	15.3	0.0133	4.5	95.5
30.00	22.3	6.0	2.5	0.0131	5.0	15.5	0.0094	3.3	96.7
60.00	22.4	6.0	2.5	0.0131	5.0	15.5	0.0066	3.3	96.7
250.00	23.1	4.5	1.2	0.0129	3.5	15.7	0.0032	1.6	98.4
1440.00	22.4	4.0	0.5	0.0131	3.0	15.8	0.0014	0.7	99.3

Fractional Components

Cobbles	Gravel			Sand				Fines		
	Coarse	Fine	Total	Coarse	Medium	Fine	Total	Silt	Clay	Total
0.0	0.0	0.2	0.2	0.5	0.8	41.8	43.1	55.6	1.1	56.7

D_5	D_{10}	D_{15}	D_{20}	D_{30}	D_{40}	D_{50}	D_{60}	D_{80}	D_{85}	D_{90}	D_{95}
0.0146	0.0273	0.0358	0.0399	0.0486	0.0572	0.0672	0.0792	0.1190	0.1467	0.1809	0.2230

Fineness Modulus	C_u	C_c
0.20	2.91	1.10

TULLOCH ENGINEERING

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CCIL Certified Laboratory for Aggregates and Asphalt Testing
CSA/CCIL Certified Technicians

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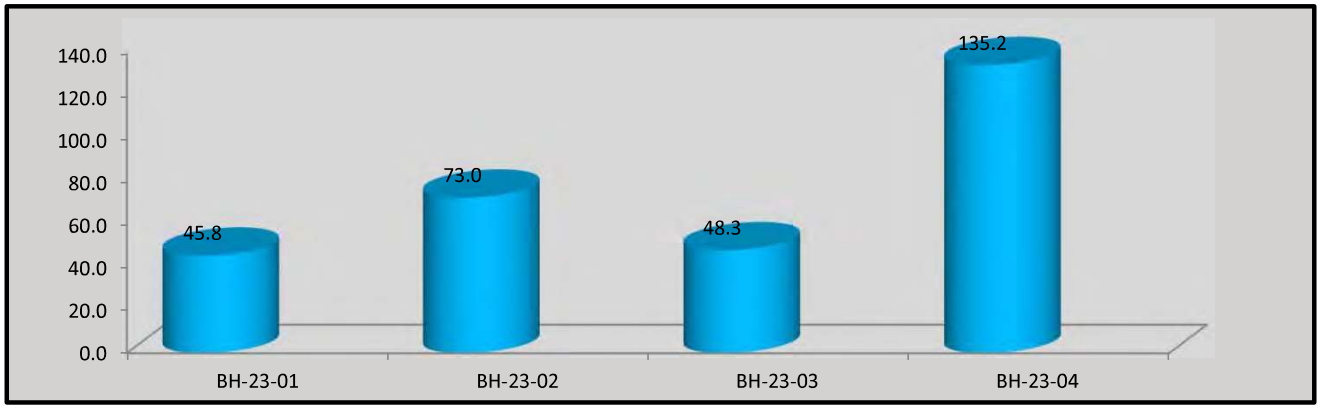
Rock Core Compressive Strength Report

PROJECT: Blind River Water Intake
CONTRACT: 23-0821
DATE SAMPLED: Oct 30-31/23
RUN BY: J.Draper
DATE TESTED: Nov 22/23
SOURCE: Boreholes

Sample Location	Run #	Distance from top of run (cm)	Height (mm)	Diameter (mm)	L/D Ratio	Correction Factor	Peak Load (lbs)	Compressive Stength (Mpa)
BH-23-01	7	40	94.76	47.38	2	1.000	18140	45.8
BH-23-02	5	24	94.66	47.33	2	1.000	28860	73.0
BH-23-03	7	94	94.70	47.35	2	1.000	19110	48.3
BH-23-04	5	53	94.72	47.36	2	1.000	53530	135.2



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Committed to Quality and Service

CERTIFICATE OF ANALYSIS

Client:	Laura Meneghetti	Work Order Number:	520089
Company:	Tulloch Engineering - Sault Ste. Marie	PO #:	
Address:	71 Black Road Unit 8 Sault Ste. Marie, ON, P6B 0A3	Regulation: Project #:	Information not provided 23-0821
Phone/Fax:	(705) 949-1457 / (705) 949-9606	DWS #:	
Email:	Laura.Meneghetti@tulloch.ca	Sampled By:	Laura Meneghetti
Date Order Received:	11/24/2023	Analysis Started:	11/25/2023
Arrival Temperature:	8 C	Analysis Completed:	12/1/2023

WORK ORDER SUMMARY

ANALYSES WERE PERFORMED ON THE FOLLOWING SAMPLES. THE RESULTS RELATE ONLY TO THE ITEMS TESTED.

Sample Description	Lab ID	Matrix	Type	Comments	Date Collected	Time Collected
BH-23-06 SS04	1955638	Soil	None		11/1/2023	
BH-23-12 SS03	1955639	Soil	None		11/1/2023	

METHODS AND INSTRUMENTATION

THE FOLLOWING METHODS WERE USED FOR YOUR SAMPLE(S):

Method	Lab	Description	Reference
Anions Soil (A5)	Garson	Determination of Anions in Soil	Modified from SW846-9056A
Cond Soil (R12)	Garson	Determination of conductivity in soil (1:2)	Modified from EPA SW846-9050A
Moisture (A99)	Garson	Determination of Percent Moisture	In-House
pH Soil (A2.0)	Garson	Determination of soil pH by Ion Selective Electrode	Modified from EPA SW-846 9045D
RedOx - Soil (T06)	Mississauga	Determination of RedOx Potential of Soil	Modified from APHA-2580B
Resistivity Soil (R12)	Garson	Determination of Resistivity in Soil (1:2)	Modified from Carter 18.3
Sulphide/S (R98)	Garson	Determination of Sulphide in Soil	In-House

REPORT COMMENTS

RedOx - Soil (A6): Hold time exceeded for methods BEFORE receipt date/time.

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Tulloch Engineering - Sault Ste. Marie

Work Order Number: 520089

This report has been approved by:

Brad Halvorson, B.Sc.
Laboratory Director

7 Margaret Street, Garson, ON, P3L 1E1
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Work Order Number: 520089

WORK ORDER RESULTS

Sample Description	BH - 23 - 06 SS04		BH - 23 - 12 SS03		
Sample Date	11/1/2023 12:00 AM		11/1/2023 12:00 AM		
Lab ID	1955638		1955639		
Anions (Soil)	Result	MDL	Result	MDL	Units
Bromide	<0.2	0.2	<0.2	0.2	µg/g
Chloride	4.3	0.4	89.8	0.4	µg/g
Fluoride	0.38	0.02	0.09	0.02	µg/g
Nitrate (as N)	0.17	0.06	0.70	0.06	µg/g
Nitrite (as N)	<0.04	0.04	<0.04	0.04	µg/g
Sulphate	11.2	0.4	15.7	0.4	µg/g

Sample Description	BH - 23 - 06 SS04		BH - 23 - 12 SS03		
Sample Date	11/1/2023 12:00 AM		11/1/2023 12:00 AM		
Lab ID	1955638		1955639		
General Chemistry	Result	MDL	Result	MDL	Units
% Moisture	0.3	0.1	13.5	0.1	%
Conductivity	47	1	215	1	µS/cm
pH	6.48	N/A	6.26	N/A	pH
RedOx (vs. S.H.E.)	350 [350]	N/A	383	N/A	mV
Resistivity	21300	N/A	4650	N/A	ohm-cm
Sulphide	<0.2	0.2	<0.3	0.3	µg/g

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Tulloch Engineering - Sault Ste. Marie

Work Order Number: 520089

LEGEND

rmatted as mm/dd/year throughout this report.
ction limit or minimum reporting limit.
ratory replicates are shown in square brackets immediately below the associated sample result for ease of comparison.
sis: Data reported for organic analysis in soils samples are corrected for moisture content.
associated Quality Control data is available on request.
Limit.
l Limit.

QAQCID: This is a unique reference to the quality control data set used to generate the reported value. Contact our lab for this information, as it is traceable through our LIMS.

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Deviations: A noted sample condition deviation may affect the validity of the result. Results apply to the sample(s) as received.
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oluble: The ICPMS Dustfall Insoluble Portion method analyzes only the particulate matter from the Dustfall Sampler which is retained on the analysis filter during the Dustfall method.
risons: Disclaimer: Please note that regulation criteria are provided for comparative purposes, however the onus on ensuring the validity of this comparison rests with the client.

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QUALITY CONTROL DATA

THIS SECTION REPORTS QC RESULTS ASSOCIATED WITH THE TEST BATCH; THESE ARE NOT YOUR SAMPLE RESULTS.
QAQC details include only values where sufficient sample data allowed measurement.

Anions (Soil)

Blank: LRB-6 (Blank) (6)

Parameter	MDL	Units	LCL	Result	UCL	QAQCID
Bromide	0.2	µg/g	0	<0.2	0.6	20231128.A5C
Chloride	0.4	µg/g	0	<0.4	1.2	20231128.A5C
Fluoride	0.02	µg/g	0	<0.02	0.6	20231128.A5C
Nitrate (as N)	0.2	µg/g	0	<0.2	0.6	20231128.A5C
Nitrite (as N)	0.1	µg/g	0	<0.1	0.18	20231128.A5C
Sulphate	0.4	µg/g	0	<0.4	6	20231128.A5C

Positive Control: LFB-5 (0.1/0.02/0.002 mg/g equiv) (5)

Parameter	MDL	Units	LCL	Result	UCL	QAQCID
Bromide	N/A	%	80	115	120	20231128.A5C
Chloride	N/A	%	80	107	120	20231128.A5C
Fluoride	N/A	%	80	111	120	20231128.A5C
Nitrate (as N)	N/A	%	80	111	120	20231128.A5C
Nitrite (as N)	N/A	%	80	118	120	20231128.A5C
Sulphate	N/A	%	80	102	120	20231128.A5C

Positive Control: LFB-7 (0.2/0.1/0.02 mg/g equiv) (7)

Parameter	MDL	Units	LCL	Result	UCL	QAQCID
Bromide	N/A	%	80	91.1	120	20231128.A5C
Chloride	N/A	%	80	102	120	20231128.A5C
Fluoride	N/A	%	80	99.9	120	20231128.A5C
Nitrate (as N)	N/A	%	80	101	120	20231128.A5C
Nitrite (as N)	N/A	%	80	86.6	120	20231128.A5C
Sulphate	N/A	%	80	98.1	120	20231128.A5C

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Sample Replicate: % RPD (8)

Parameter	MDL	Units	LCL	Result	UCL	QAQCID
Fluoride	N/A	%	0	14.3	35	20231128.A5C
Sulphate	N/A	%	0	4.5	35	20231128.A5C

General Chemistry

Calibration Check: Lab Control Sample (2)

Parameter	MDL	Units	LCL	Result	UCL	QAQCID
Conductivity	N/A	%	475	519	525	20231127.TM-G.R12B

Method Blank: Method Blank (1)

Parameter	MDL	Units	LCL	Result	UCL	QAQCID
Conductivity	1	µS/cm	0	<1	5	20231127.TM-G.R12B

Positive Control: LCS (pH 8) (2)

Parameter	MDL	Units	LCL	Result	UCL	QAQCID
pH	N/A	pH	7.8	7.93	8.2	20231127.TM-G.R2B

Positive Control: LFB-7 (7)

Parameter	MDL	Units	LCL	Result	UCL	QAQCID
Sulphide	0.05	µg/g	0.24	0.288	0.36	20231201.R98B

Positive Control: LRB-6 (Blank) (6)

Parameter	MDL	Units	LCL	Result	UCL	QAQCID
Sulphide	0.02	µg/g	0	<0.02	0.06	20231201.R98B

Positive Control: ORP Control 240 (7)

Parameter	MDL	Units	LCL	Result	UCL	QAQCID
RedOx (vs. S.H.E.)	N/A	mV	220	243	260	20231130.TM-M.A6B

Sample Replicate: % RPD (3)

Parameter	MDL	Units	LCL	Result	UCL	QAQCID
pH	N/A	pH	0	0.05	0.3	20231127.TM-G.R2B

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Sample Replicate: % RPD (8)						
Parameter	MDL	Units	LCL	Result	UCL	QAQCID
Conductivity	N/A	%	0	12.3	10	20231127.TM-G.R12B

Sample Replicate: % RPD (9)						
Parameter	MDL	Units	LCL	Result	UCL	QAQCID
RedOx (vs. S.H.E.)	N/A	%	0	0	10	20231130.TM-M.A6B

THIS INDEX SHOWS HOW YOUR SAMPLES ARE ASSOCIATED TO THE CONTROLS INCLUDED IN THE IDENTIFIED BATCHES.

Sample Description				Prep QAQCID
			-	
BH - 23 - 06 SS04			-	
			-	
BH - 23 - 06 SS04		-	-	
BH - 23 - 06 SS04			-	
BH - 23 - 06 SS04				
		-	-	
BH - 23 - 12 SS03			-	
BH - 23 - 12 SS03			-	
			-	
		-	-	
			-	
BH - 23 - 12 SS03	1955639	Sulphide/S (R98)	20231201.R98B	

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APPENDIX G

NOTICE TO READER

NOTICE TO READER

This Report has been prepared by TULLOCH Engineering Inc. ('TULLOCH') for the sole and exclusive use of the Town of Blind River (the 'Client') to support the New Water Intake and Huron Street Reconstruction (the 'Development') in Blind River, Ontario (the 'Site'). The Report shall not be used for any other purpose, or provided to, relied upon or used by any third party without the express written consent of TULLOCH.

A limited number of boreholes were advanced at the Site; and as such, the information collected and presented herein applies to the borehole locations only. The subsurface conditions between boreholes can change and accordingly any use of the data contained in this Report should take into consideration the nature of the materials and potential variation between test pit locations.

This Report contains opinions, conclusions and recommendations made by TULLOCH using professional judgment and reasonable care for the purpose of pavement design for the Development. Use of or reliance on this report by the Client is subject to the following conditions:

a) the report being read in the context of and subject to the terms of the Engineering Services Agreement for the Work, including any methodologies, procedures, techniques, assumptions and other relevant terms or conditions specified or agreed therein;
b) the report being read in its entirety. TULLOCH is not responsible for the use of portions of the report without reference to the entire report;
c) the conditions of the site may change over time or may have already changed due to natural forces or human intervention, and TULLOCH takes no responsibility for the impact that such changes may have on the accuracy or validity of the observations, conclusions and recommendations set out in this report;
d) the classification of soils and rocks in this report is based on commonly accepted methods. However, the classification of geologic materials and the boundaries between subsurface layers involves judgement. Boundaries between different soils layers may also be transitional rather than abrupt. TULLOCH does not warrant or guarantee the exactness of these descriptions and boundaries.
e) the subsurface conditions must be verified by a qualified geotechnical engineer during construction to ensure that the borehole data presented herein is representative of the actual site conditions so that the design recommendations contained herein remain valid; and
f) the report is based on information made available to TULLOCH by the Client or by certain third parties; and unless stated otherwise in the Agreement, TULLOCH has not verified the accuracy, completeness or validity of such information, makes no representation regarding its accuracy and hereby disclaims any liability in connection therewith.

This report has been prepared with the degree of care, skill and diligence normally provided by engineers in the performance of comparable services for projects of similar nature. The scope of this report includes foundation engineering design only and it specifically excludes investigation, detection, prevention and assessment of the presence of subsurface contaminants. No conclusions or inferences should be drawn regarding contamination at the site including but not limited to molds, fungi, spores, bacteria, viruses, soil gases such as Radon, PCBs, petroleum hydrocarbons, inorganic and volatile organic compounds, polycyclic aromatic hydrocarbons and or any by products thereof.

J

Appendix J: Hydrogeological Investigation

Tulloch Engineering Inc.

New Water Intake and Low Lift Pumping Station, Blind River, Ontario

HYDROGEOLOGICAL INVESTIGATION

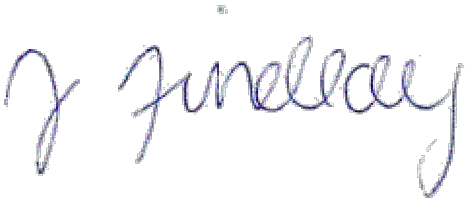
CIMA+ file number: T001592B
23 April 2025

Tulloch Engineering Inc.

New Water Intake and Low Lift Pumping Station, Blind River, Ontario

HYDROGEOLOGICAL INVESTIGATION

Prepared by:



Jenna Findlay, P.Geo.
Senior Hydrogeologist

Verified by:

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Senior Hydrogeologist

600–1400 Blair Towers Place, Ottawa, ON K1J 9B8 CANADA T 613 860-2462 F 613 860-1870

CIMA+ file number: T001592A
23 April 2025

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1. Introduction

CIMA Canada Inc. (CIMA+) was retained by Tulloch Engineering Inc. (Tulloch) on behalf of the Town of Blind River (the 'Town') to complete a Hydrogeological Investigation to support the New Water Intake and Low Lift Pumping Station (LLPS) (the 'Project') associated with the Blind River Water Treatment Plant (WTP) located in Blind River, Ontario, herein referred to as (the 'Project').

1.1 Site Description

The Project Site is approximately 0.55 hectares, located adjacent to the existing Blind River WTP, bounded by Martin Street to the north, Lake Huron to the south and residential housing to the east. The centre of the Project Site is in UTM Zone 17T, with approximate coordinates of Easting 349268 m and Northing 5116291 m.

The Study Area for the hydrogeological investigation has been established herein based on industry standard practices to include the surrounding area within a 500-meter (m) radius of the Site boundaries to support baseline characterization of Site conditions and identification of potential receptors of any expected impacts where applicable.

The Project Site and Study Area are delineated as shown on **Figure 1 (Attachment A)** and described below.

1.2 Objective

The hydrogeological investigation aims to characterize the existing hydrogeological conditions at the Project Site to inform detailed design of the Low Lift Pumping Station (LLPS) for the Project. The purpose of the hydrogeological investigation is to:

- Characterize the subsurface soil and shallow bedrock groundwater conditions at the Site and within the Study Area, consisting of a 500 m radius from the planned excavation area.
- Assess the need for groundwater control and temporary construction dewatering and evaluate permitting requirements - Ministry of the Environment, Conservation and Parks (MECP) Permit to Take Water (PTTW) Application(s) or a water taking registration on the Environmental Activity and Sector Registry (EASR).
- Identify potential receptors, evaluate potential groundwater impacts attributable to construction dewatering, and provide recommended mitigation measures for construction dewatering.

2. Methodology

The following activities were completed as part of the hydrogeological investigation provided herein for the Project:

- Desktop review of public information sources, including but not limited to online water well database maintained by the Ministry of the Environment, Conservation and Parks (MECP), geological mapping prepared by the Ontario Geological Survey (OGS), watershed impact studies, Source Water Protection Atlas, and other publicly available information;
- Coordination with Walker Drilling Ltd. (Walker Drilling) and Tulloch for the installation of a 5-inch (127 mm) open hole test well completed to a depth of approximately 10 m below ground surface (bgs) and sealed into bedrock, and two 2-inch (50.8 mm) monitoring wells, including well development and recovery observations to inform pumping test design;
- Completion of a step-rate pumping test using an electric submersible pump on the newly constructed test well to determine physical hydrogeological properties of the shallow bedrock unit across the test well interval;
- Water level monitoring within the newly constructed test well and observation wells throughout the duration of the pumping test using pressure transducers and data loggers;
- Completion of single well response tests (SWRT) at the newly constructed overburden monitoring well for evaluation of the horizontal hydraulic conductivity of the subsurface material at the Project Site;
- Collection of groundwater samples for comparison to the applicable criteria;
- Completion of a dewatering assessment;
- Development of groundwater mitigation, monitoring, and contingency plan(s), if required; and,
- Recommendations for additional studies and or assessments to support permitting and/or construction activities.

2.1 Borehole Advancement and Monitoring Well Installation

A drilling program was completed at the Project Site between October 22 and 23, 2024 by Walker Drilling under the direction of Tulloch and CIMA+. A total of three (3) boreholes were completed by Tulloch. BH-100 located adjacent to the future building footprint was advanced as a 5-inch (127 mm) borehole into bedrock to a total depth of 10.68 m bgs using PW/PQ drilling equipment. The borehole was sealed into bedrock encountered at a depth of 4.57 m bgs and completed as an open hole test well. BH-101 and BH-102 were advanced as 2-inch (50.8 mm) boreholes using HW/HQ drilling equipment. BH-101 was advanced to bedrock at 11.48 m bgs and installed as a 2-inch PVC monitoring well with a 10-foot (3.05 m) screen extending from 8.43 to 11.48 m bgs. BH-102 was advanced to 7.16 m bgs and installed as a 2-inch PVC monitoring well with a 5-foot (1.52 m) screen extending from 5.03 to 6.55 m bgs. Borehole logs including well installation details are included in **Appendix B**.

2.2 Test Well Development

Under the direction of Tulloch and CIMA+, on November 1, 2024 Walker Drilling completed well development and collection of initial recovery observations at the newly constructed BH-100 test well to determine the appropriate pumping rate for the planned pumping test. The test well was pumped manually with 5/8-inch Waterra tubing for approximately 30 minutes until the well was dry. Recovery was monitored via manual water level measurements using a Solinst® Model 101 electric water level tape for approximately 60 minutes following completion of development.

2.3 Pumping Test

On November 21, 2024, CIMA+ conducted a step-rate pumping test on the test well BH-100. The test was conducted with a stainless-steel Monsoon® submersible pump installed at a depth of 11.21 m below the top of casing. Water level information was collected using Solinst® Levelogger transducers and data loggers, as supplemented by manual water level measurements using a Solinst® Model 101 electric water level tape. A barometric transducer (Solinst® Barologger Model 3001) was utilized to permit water level data correction to changes in barometric pressure.

The test well was pumped at 3.79 L/min (1 USGPM) initially and was increased to 7.57 L/min (2 USGPM) after seven (7) minutes and was maintained for the remainder of the pumping test, which was terminated after 30 minutes when the water level had reached the pump intake. Water level recovery data was recorded until the water level reached approximately 95% of its original elevation, which was achieved after 180 minutes following pump shutoff. Results of the pumping test was analysed using the AQTESOLV Pro software and the Theis (1935) conceptual model and the Cooper-Jacob (1945) approximation.

An additional verification pumping test was performed on monitoring well BH-101 on November 22, 2024 following the methodology described above, yielding comparable results to those observed at BH-100.

2.4 Single Well Response Testing

Single well response testing (SWRT) was completed by CIMA+ personnel at the newly installed overburden monitoring well (BH-102) on November 21, 2024 to determine the horizontal hydraulic conductivity of the overburden material at the Project Site. The in-situ hydraulic testing was completed following standard slug and bail test methodology, involving the rapid raising (slug test) or lowering (bail test) of the hydraulic head using an object of known volume followed by the recording of the recovery response until the water level well has returned to within at least 90% of its original elevation.

Water level information was collected using Solinst® Levelogger transducers and data loggers, as supplemented by manual water level measurements using a Solinst® Model 101 electric water level tape. A barometric transducer (Solinst® Barologger Model 3001) was utilized to permit water level data correction to changes in barometric pressure. Results of the hydraulic testing were analysed using the AQTESOLV Pro software and the Hvorslev (1951) method.

2.5 Groundwater Level Monitoring

CIMA+ personnel conducted groundwater level monitoring at all newly constructed well locations at the Project Site on November 21, 2024. All manual water level measurements collected by CIMA+ personnel were collected using a Solinst® Model 101 electric water level tape relative to the top of casing reference elevation.

2.6 Groundwater Sampling

Groundwater samples were collected from the bedrock test well (BH-100) and overburden monitoring well BH-102 by CIMA+ personnel on November 21, 2024, for analysis of select general chemistry parameters for preliminary assessment of potential dewatering constraints in comparison to the Provincial Water Quality Objectives (PWQO) published by the Ministry of Environment and Energy (MOEE. 1994).

Samples were collected using standard groundwater sampling methodology in conjunction with parameter stabilization. Groundwater samples were collected from BH-100 using a stainless-steel Monsoon® submersible pump powered by a 12V portable battery in combination with standard Waterra® 5/8" x 1/2" LDPE tubing, while the sample collected from BH-102 was obtained the standard Waterra® LDPE tubing and inertial lift foot-valve. Groundwater quality field parameters were measured using a Horiba® U-52 multi-parameter instrument. Groundwater samples were collected once parameter stabilization was achieved.

Groundwater samples were submitted under strict chain-of-custody protocols to AGAT Laboratories Ltd. (AGAT) in Mississauga, Ontario, a Canadian Association for Laboratory Accreditation Inc. (CALA) accredited laboratory.

3. Background

3.1 Land Use and Servicing

The Project Site is located on Martin Street and along on the shores of Lake Huron within the Town of Blind River, south of Highway 17 and east of Blind River as indicated in **Figure 1 (Appendix A)**. Existing land use within the surrounding Study Area is dominated by industrial/commercial properties to the north and west, as well as residential properties to the east.

Based on the information presented in the Town of Blind River Official Plan (2015), the Project Site is located within an area zoned as Open Space. It is noted that the Official Plan designates areas of shoreline along Lake Huron and Blind River as being Environmental Protection (EP) zones; select EP zones fall within 200 m of the Project Site.

Based on available mapping information and a reconnaissance of the Project Site and surrounding area, it's assumed that the residential areas adjoining the Project Site are fully serviced with municipal water supply and sewer services.

3.2 Aerial Photography & Satellite Imagery

Current and historical aerial photographs obtained from the Land Information Ontario (LIO) interactive map tool and Google Earth Pro (accessed January, 2025) were used to conduct a preliminary desktop review of land usage in the immediate vicinity of the Project Site for identification of potential sources of environmental impacts to groundwater.

In addition to the existing WTP adjacent to the Project Site and commercial properties to the north, information gathered from the desktop review identified a property located at 75 Causley Street, at the corner of Huron Avenue and Causley Street/Hwy 17, which appears to have contained a building which was demolished between 2009 and 2019. The nature of the former building is unknown however a series of groundwater monitoring wells appear to have been installed surrounding the property, suggesting potential environmental concern. The property is approximately 150 m northeast of the Project Site.

3.3 Topography

Review of the regional topographic and drainage mapping information presented by the Ministry of Natural Resources and Forestry (MNRF) (accessed January, 2025) indicates that topography across the Project Site slopes gradually to the south towards Lake Huron. Ground surface elevations within the Project Site range from a maximum of approximately 185 metres

(m) above sea level (asl) on the north side of the Site, decreasing to approximately 180 m asl along the shores of Lake Huron to the south. No notable topographic features are indicated on or in proximity to the Project Site based on the available mapping information. The regional topography is shown in **Figure 2 (Appendix A)**.

3.4 Geology

3.4.1 Surficial Geology

Surficial geology mapping presented by the OGS (2010) and reproduced within **Figure 3 (Appendix A)** indicates that the surficial geology over the Project Site is dominated by Pleistocene till, undifferentiated, predominantly sand to silty sand matrix, high content of clasts, often low in matrix carbonate content. Records from the Water Well Information System (WWIS) indicate that overburden material locally is generally described as sand and gravel fill material overlaying silt and clay.

Ontario Soil Surveys Report no. 50, Soils of Blind River – Sault Ste Marie Area includes some mapping of the Study Area. Available soil mapping classifies soil as orthic humo-ferric podzol, described as noncalcareous very stony sand and/or clay lacustrine. The soil type is classified as 'well' drained.

3.4.2 Bedrock Geology

Regional bedrock geology mapping information presented by the OGS (2007) indicates that the bedrock underlying the overburden material within the Project Site has been classified as the McKim Formation in the Elliot Lake Group, characteized as siltstone, wacke and argillite. OGS bedrock geology mapping is reproduced within **Figure 4 (Appendix A)**.

Observations from the November 2024 drilling program completed at the Site indicated that bedrock was encountered at depths ranging from 4.57 to 6.43 m bgs.

3.4.3 Hydrogeology

Based on the available information and watershed mapping, regional groundwater flow within the overburden and bedrock material is inferred to follow regional ground surface topography sloping to the south towards Lake Huron.

A search of the WWIS indicated a total thriteen (13) water well records for locations within a 250 meter (m) radius of the Project Site boundaries, as presented in **Figure 5 (Appendix A)**. Review of the information indicates that all records correspond with monitoring wells and test holes completed in the overburden, to depths up to approximately 4 m bgs. No static water level information or yield assessment was available.

Additional details pertaining to hydrogeological observations and results from the field investigations are included in **Section 4**.

3.5 Surface Water Features and Areas of Natural and Scientific Interest

The Project Site is not located within the jurisdiction of a Conservation Authority, however as noted in **Section 3.1**, the Town of Blind River Official Plan designates areas of shoreline along Lake Huron and Blind River as being Environmental Protection (EP) zones; select EP zones fall within 200 m of the Project Site.

Review of the Ontario Watershed Information Tool (OFAT, accessed March, 2025) presented by the MNR indicates that surficial drainage in the vicinity of the Project Site is predominantly oriented towards the south, following gently sloping topography towards Lake Huron.

3.6 Source Water Protection

Based on the online interactive mapping information included within the Source Protection Information Atlas (MECP, accessed March 2025), no Source Water Protection measures have been developed within proximity to the Project Site.

4. Field Investigation

4.1 Groundwater Level Monitoring

CIMA+ personnel conducted groundwater level monitoring at all newly constructed well locations at the Project Site during the November 21, 2024 hydrogeological investigation event. Water level depths were measured to range from 2.83 m bgs at the open hole bedrock test well (BH-100) to 3.61 m bgs at the shallow overburden monitoring well (BH-102). Calculated water level elevations were determiend to be relatively consistent between monitoring intervals, ranging from 176.75 to 176.97 m asl. Monitoring well construction details and groundwater elevations collected by CIMA+ are included below in **Table A**. Borehole locations are presented on **Figure 6 (Appendix A)**.

Table A: Monitoring Well Information

Monitoring Location	Ground Surface Elevation	Top of Bedrock		Top of Screen		Bottom of Screen		Water Level November 21, 2024	
	m asl	m asl	m bgs	m asl	m bgs	m asl	m bgs	m asl	m bgs
BH-100[1]	179.58	175.01	4.57	175.01[2]	4.57	168.90[3]	10.68	176.75	2.83
BH-101	180.38	173.95	6.43	171.95	8.43	168.90	11.48	176.97	3.41
BH-102	180.38	173.95	6.43	178.86	5.03	173.83	6.55	176.77	3.61

bgs - below ground surface
asl - above sea level
1 - open hole test well
2 - bottom of casing
3 - end of borehole

4.2 Pumping Test

On November 21, 2024 CIMA+ conducted a step-rate pumping test on the open hole bedrock test well BH-100. The test well was pumped at 3.79 L/min (1 USGPM) initially and was increased to 7.57 L/min (2 USGPM) after seven (7) minutes and was maintained for the remainder of the pumping test, which was terminated after 30 minutes when the water level had reached the pump intake. Water level recovery data was recorded until the water level reached approximately 95% of its original elevation, which was achieved after 180 minutes following pump shutoff.

Results of the pumping test were analysed using the AQTESOLV Pro software and the Theis (1935) conceptual model and the Cooper-Jacob (1945) approximation for an unconfined aquifer condition. Results from the pumping test are summarized below in **Table B**. The individual pumping test analyses are included in **Appendix C**.

An additional verification pumping test was performed on monitoring well BH-101 on November 22, 2024, yielding comparable results to those observed at BH-100.

Table B: Pumping Test Results

Monitoring Location	Analysis[1]	Calculated Transmissivity (m^2/s)	Mean Transmissivity (m^2/s)
BH-100	Theis	1.32 E-06	2.67 E-06
	Cooper-Jacob	4.02 E-06	

Notes:

1 Theis (1935) Pumping Test Solution
Cooper-Jacob (1945) Pumping Test Solution

4.3 Single Well Response Testing

Single well response testing (SWRT) was completed by CIMA+ personnel at the newly installed overburden monitoring well (BH-102) on November 21, 2024 to determine the horizontal hydraulic conductivity of the subsurface material at the Project Site. Results of the hydraulic testing were analysed using the AQTESOLV Pro software and the Hvorslev (1951) method. Results of the single well response tests are summarized below in **Table C**. The individual SWRT analyses are included in **Appendix C**.

The hydraulic testing at BH-102 yielded a mean hydraulic conductivity result of 1.54E-05 m/s, which is typical of the inferred sand to silty sand till overburden material in which the monitoring well was screened.

Table C: Single Well Response Test Results

Monitoring Location	Screened Interval (m bgs)	Screened Geological Unit	Test ID	Hydraulic Conductivity (K)[1] (m/s)	Mean Hydraulic Conductivity (K) (m/s)
BH-102	5.03 to 6.55	Till – sand to silty sand	Slug 1	1.82E-05	1.54E-05
			Bail 1	1.35E-05	
			Slug 2	1.52E-05	
			Bail 2	1.48E-05	

Notes:

1 - Hvorslev (1951) aquifer test solution

4.4 Groundwater Sampling

Groundwater samples were collected from the test well (BH-100) and monitoring well BH-102 by CIMA+ personnel on November 21, 2024, for analysis of select general chemistry parameters for preliminary assessment of potential dewatering constraints in comparison to the Provincial Water Quality Objectives (PWQO) published by the Ministry of Environment and Energy (MOEE. 1994). The groundwater quality results are presented in **Table 1 (Appendix D)** in comparison to the applicable criteria. Laboratory Certificates of Analysis are included as **Appendix E**.

Total cobalt and total copper were reported in exceedance of the PWQO for samples collected at both BH-100 and BH-102, while total vanadium, total phosphorous, and chromium VI at BH102, and total silver at BH-100, were also reported in exceedance of the PWQO.

5. Construction Dewatering Assessment

5.1 Excavation Parameters

It is understood that open cut construction methods will be used for excavation of the LLPS. The details of the trench excavation summarized below in **Table D** have been interpreted based on the available information in the 90% Detailed Design plans completed by CIMA+ (November 2024). Based on the available information, the base of the excavation required to support the planned work is assumed to be approximately 7.2 m bgs. To maintain dry working conditions within the excavations it is assumed water levels will have to be lowered to an elevation 1 m below the base of all excavations during the planned work.

Table D: Dewatering Assessment Parameters

Excavation Specifications	Depth m bgs	Elevation m asl
Ground Surface	-	180.56
Groundwater Elevation[1]	1.0	179.56
Bedrock Surface	4.57	175.01
Bottom of excavation - Wet Well[2]	7.17	173.39
Maximum Groundwater Elevation under Dewatering	8.17	172.39
Required Drawdown (m)	7.17	

Notes: 1 Conservative high water level estimate
2 Tulloch (November 2024)

5.2 Groundwater Infiltration

In consideration of groundwater infiltration contributions from the overburden unit, the mean hydraulic conductivity value of 1.54E-05 m/s described in **Section 4.3** above was evaluated as being representive of the inferred sand to silty sand till unit for use in the construction dewatering assessment herein.

With respect to groundwater infiltration contributions from the bedrock unit, hydraulic conductivity was estimated using the mean Transmissivity (T) m^2/s value of 2.67E-06 m^2/s calculated as described in **Section 4.2** based on the analyses of the pumping test conducted at BH-100 in conjunction with an assumed aquifer thickness of 10 m. Hydraulic conductivity is related to Transmissivity as follows:

$$K = T/b$$

Where:

K = Hydraulic conductivity of the geological unit (m/s)

T = Transmissivity (m^2/s)

b = Aquifer Thickness (m), set as 10 m

Based on the above calculation, hydraulic conductivity within the bedrock unit is estimated to be 2.67E-07 m/s. The hydraulic conductivity value is considered to be reflective of a conservative assessment of groundwater infiltration, based on comparison to typical theoretical hydraulic conductivity values for siltstone and field observations during the hydrogeological investigation.

The infiltration rate calculations provided herein are based on the following assumptions:

- The geological material on-Site is isotropic and as a result the hydraulic conductivity of the stratigraphic unit is uniform.

- Vertical flow is negligeable and there is no upward hydraulic pressure or confined/artesian conditions. The bedrock aquifer is inferred to be unconfined based on observations from the field program and aquifer testing.
- The infiltration of groundwater is isolated from other sources including nearby streams or bodies of water.
- No other dewatering or pumping activity in the vicinity of the site will impact groundwater inflow rates during the excavation.

Infiltration rate calculations were performed using the Dupuit (1863) and Forchheimer (1930) method (presented in Powers et. al., 2007) for estimating steady-state groundwater flow to a point source under unconfined aquifer conditions, as described below. The Dupuit-Forchheimer approximation assumes that for the excavation areas, the vertical flow is negligeable, and that the groundwater discharge is proportional to the saturated aquifer thickness, driven by the slope of the water table.

$$Q = \frac{\pi K * (H^2 - h_w^2)}{\ln \frac{R0 + r_w}{r_w}}$$

Where:

Q = Groundwater inflow rate into the excavation (m^3/s)

K = Hydraulic conductivity of the geological unit (m/s)

H = Saturated thickness prior to dewatering (m)

h_w = Saturated thickness after dewatering (m)

R_o = Radius of influence from point source (m)

r_w = Effective radius of point source (m)

The effective radius (r_w) is approximated by the equation below:

$$r_w = \sqrt{\frac{ab}{\pi}}$$

a = Length of the excavation, assumed to be 13.5 m

b = Width of the excavation (m), assumed to be 13 m

The radius of influence (Ro) is approximated by the method described by Sichardt et Kyrieleis (1930):

$$R_o = 3000(H - h_w)\sqrt{K}$$

Calculations and results from the dewatering assessment are included in **Appendix F**. A summary of the estimated infiltration rates is presented in **Table E** along with an applied safety factor of 3 to compensate for potential components of additional inflow not captured within the above equations, including incidental precipitation events.

Table E: Infiltration Rates into Excavation

Dewatering Assessment	Estimated infiltration rate (m^3/day)	
LLPS Excavation	Estimated infiltration rate	42
	Applied Safety Factor (x3)	127

Based on the calculations presented in **Appendix F** and summarized in **Table D** above, the vertical and lateral groundwater inflow from the walls and base of the planned excavation, with dimensions of 13 x 13.5 m and a depth of 7.17 m bgs, located within the Project Site is estimated to be approximately 127 m^3/day (23 USGPM) inclusive of the applied safety factor of 3 to compensate for potential components of additional inflow not captured within the above equations, including incidental precipitation events. The associated predicted radius of influence was estimated to be 54 m in the overburden unit, and 4 m in the bedrock unit.

5.3 Permitting

The construction dewatering assessment presented in **Section 5.2** above anticipates conservative construction dewatering needs of up to 172 m^3/day, dependent on excavation dimensions and location within the Project Site.

Based on the assessment herein, a water taking registration on the Environmental Activity and Sector Registry (EASR) would be required to facilitate Project construction dewatering activities. A Permit to Take Water (PTTW) is not anticipated to be required.

6. Impact Assessment and Proposed Mitigations

6.1 Impact Assessment

An impact assessment was completed to evaluate the potential for adverse impact resulting from the planned Project construction dewatering activities. The Site setting, land use, as well as geological and hydrogeological Site conditions were taken into consideration. The following assessment is provided based on the planned Project activities and their potential impacts:

- The predicted radius of influence associated with planned dewatering activities was estimated to be 54 m in the overburden unit, and 4 m in the bedrock unit as presented in Appendix F.
- Based on available mapping information and a reconnaissance of the Project Site and surrounding area, it's assumed that the residential areas adjoining the Project Site are fully serviced with municipal water supply and sewer services and therefore no impacts to the municipal water supply or other water users are anticipated as a result of the planned Project activities.
- Based on the online interactive mapping information included within the Source Protection Information Atlas (MECP, accessed March 2025), no Source Water Protection measures have been developed within proximity to the Project Site.
- Desktop environmental review of properties within the Study Area identified a series of groundwater monitoring wells located at 75 Causley Street suggesting potential environmental concern at the property. Given the approximately 150 m distance between the property and the Project Site, and the relatively small radius of influence calculated as part of the dewatering assessment (54 m in overburden and 4 m in bedrock), the potential for environmental concern at 75 Causley Street is not anticipated to represent a constraint or impact planned Project construction dewatering activities.
- Potential impacts to the surrounding environment related to water taking and water discharge as a result of the required dewatering activities for the Project will be addressed through the development of a Water Taking and Discharge Plan as required by the EASR registration. It is noted that select total metals and general chemistry parameters (chromium VI, cobalt, copper vanadium, silver, and total phosphorous) were reported in exceedance of the PWQO for groundwater samples collected among newly installed test and monitoring wells and should be considered as part of the anticipated Water Taking and Discharge Plan in the event of anticipated discharge to the environment.
- Geotechnical assessment of potential settlement as a result of dewatering is not anticipated to be required based on the absence of existing structures within the estimated radius of influence.

6.2 Mitigation Measures

6.2.1 Management of Discharge

It is recommended that a Water Taking and Discharge Plan be developed in advance of construction dewatering activities, as required by the EASR registration for construction dewatering, including assessment of dewatering effluent discharge location(s) and treatment requirements in consideration of the identified PWQO exceedances for select total metals and general chemistry parameters including chromium VI, cobalt, copper vanadium, silver, and total phosphorous.

6.2.2 Mitigation Measures

During dewatering discharge, it is recommended that the Contractor develop and implement best management practices to mitigate any potential impacts to the environment. Mitigation measures may include but not be limited to:

- Erosion and Sediment Control (ESC) measures (silt fences etc.);
- Stormwater management (efforts to direct surface water flow away from the excavation etc.);
- Spill containment and response plan; and,
- Proper storage and management of excavated soils for reuse and/or off-Site disposal.

6.2.3 Proposed Monitoring

It is recommended that a monitoring program (quality and quantity) be developed in advance of the construction dewatering activities in consideration of the anticipated EASR registration and associated Water Taking and Discharge Plan. The monitoring program should consider Project specific dewatering practices, the discharge location, and available intact monitoring wells.

7. Limiting Conditions

CIMA+ completed diligent and reasonable research in the conduct of this evaluation, with respect to the recognized laws and standards of practice.

The facts presented in this report are strictly limited to the period of investigation. The conclusions presented in this report are based on the available information and documents, the observations made during the Site visit and the information obtained from communications with various contacts. The interpretation presented in this report is limited to this data.

CIMA+ is not responsible for erroneous conclusions due to voluntary abstention or the non-availability of pertinent information. Any opinion expressed in relation to legal or regulatory conformity is technical and should not be, in any case, considered as legal advice.

CIMA+ has prepared this report for the sole use of the client. Any use of this report by a third party, as any decision based on this report, is the singular responsibility of the third party. CIMA+ will not be held responsible for eventual damages towards a third party resulting from decisions taken, or based, on this report.

8. References

CIMA+ (2024). Blind River Intake and LLPS Drawings Issued for 90% Detailed Design.

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Part II.2 of the Environmental Protection Act (EPA or Act), Ontario Regulation (O. Reg.) 245/11 (Registrations Under II.2 of the Act – General) and O. Reg. 63/16 (Registrations under II.2 of the Act – Water Taking)

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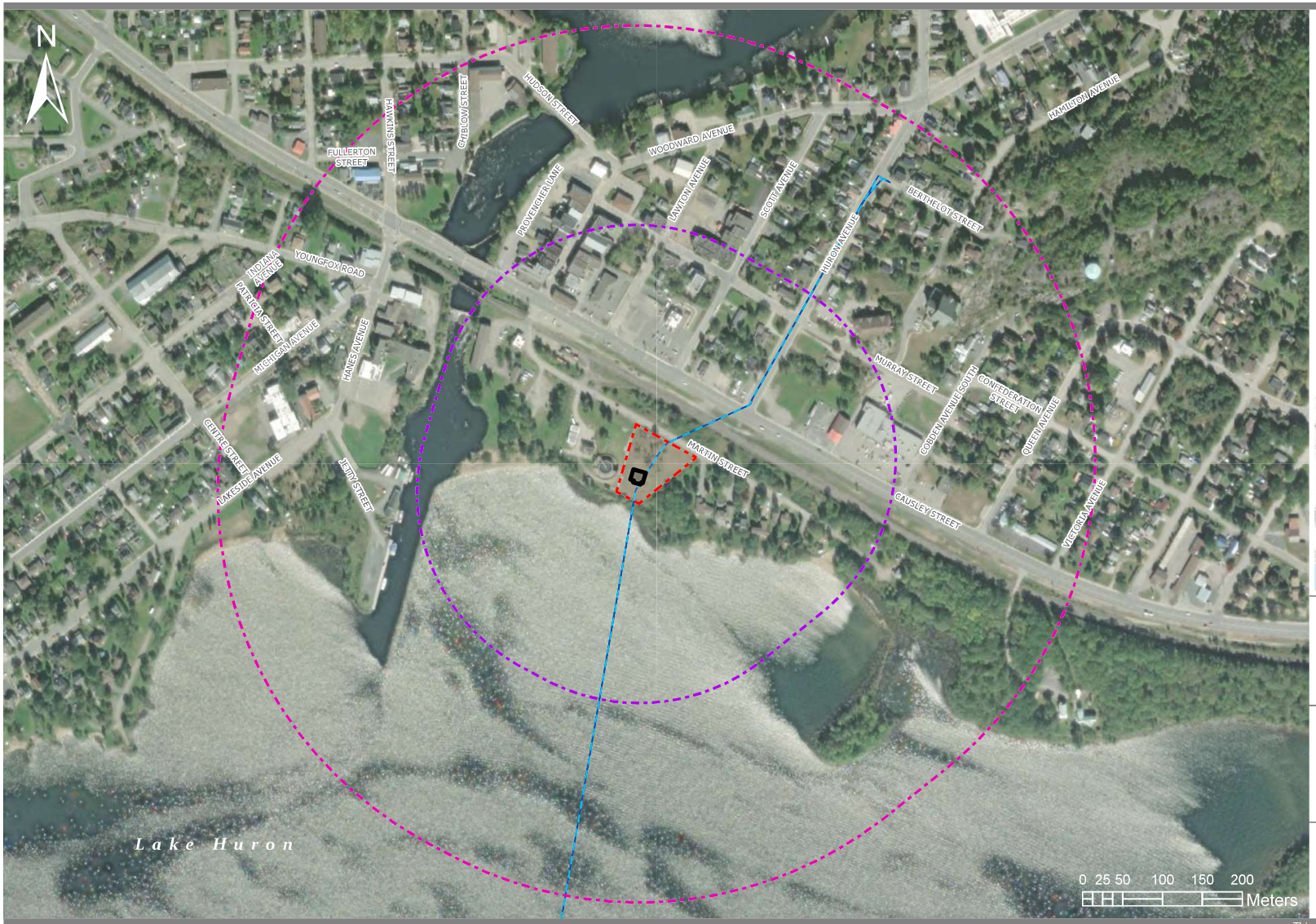
A

Appendix A
Figures



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Sources:
- Road Labels, ORN, 2024
- Topographic Contours, Watercourse, LIO, 2024
- Basemap : Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community, Province of Ontario, Ontario MNR, Esri Canada, Esri, HERE, Garmin, INCREMENT P, USGS, METI/NASA, EPA,

General Notes:
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Figure 1 - Site Location Map

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Hydrogeological Investigation - New Water Intake & Huron Ave. Reconstruction
17 T 4850065 N; 5116292 E, Blind River, Ontario
Tulloch Engineering Inc.

Ref # : T001592B

Survey by : -
Figure by : S. Scott
Concept by : S. Scott
Verified by : M. Klein

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Figure 2 - Topography & Drainage Map

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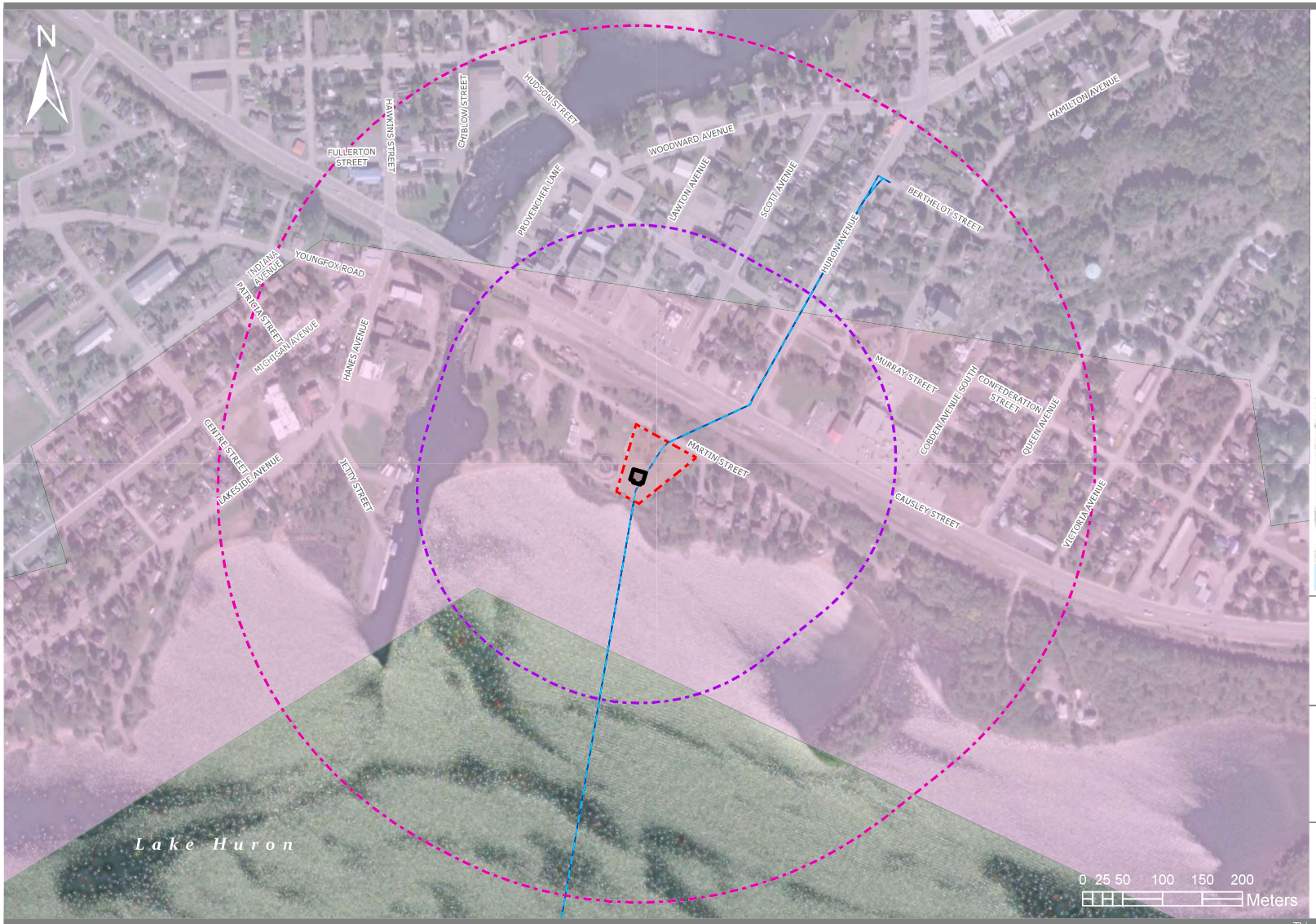
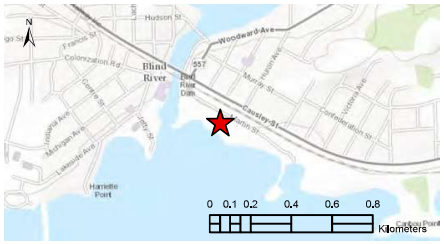


Project Site
Study Area - 250 m
Study Area - 500 m
Proposed Building Footprint
Proposed Water Intake

Quaternary Geology

Bedrock
Till



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Sources:
- Road Labels, ORN, 2024
- Ontario Geological Survey 2000. Quaternary geology of Ontario; Ontario Geological Survey, ERLIS Data Set —EDS014-REV.
- Basemap : Province of Ontario, Ontario MNR, Esri Canada, Esri, HERE, Garmin, INCREMENT P, USGS,

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Figure 3 - Surficial Geology Map

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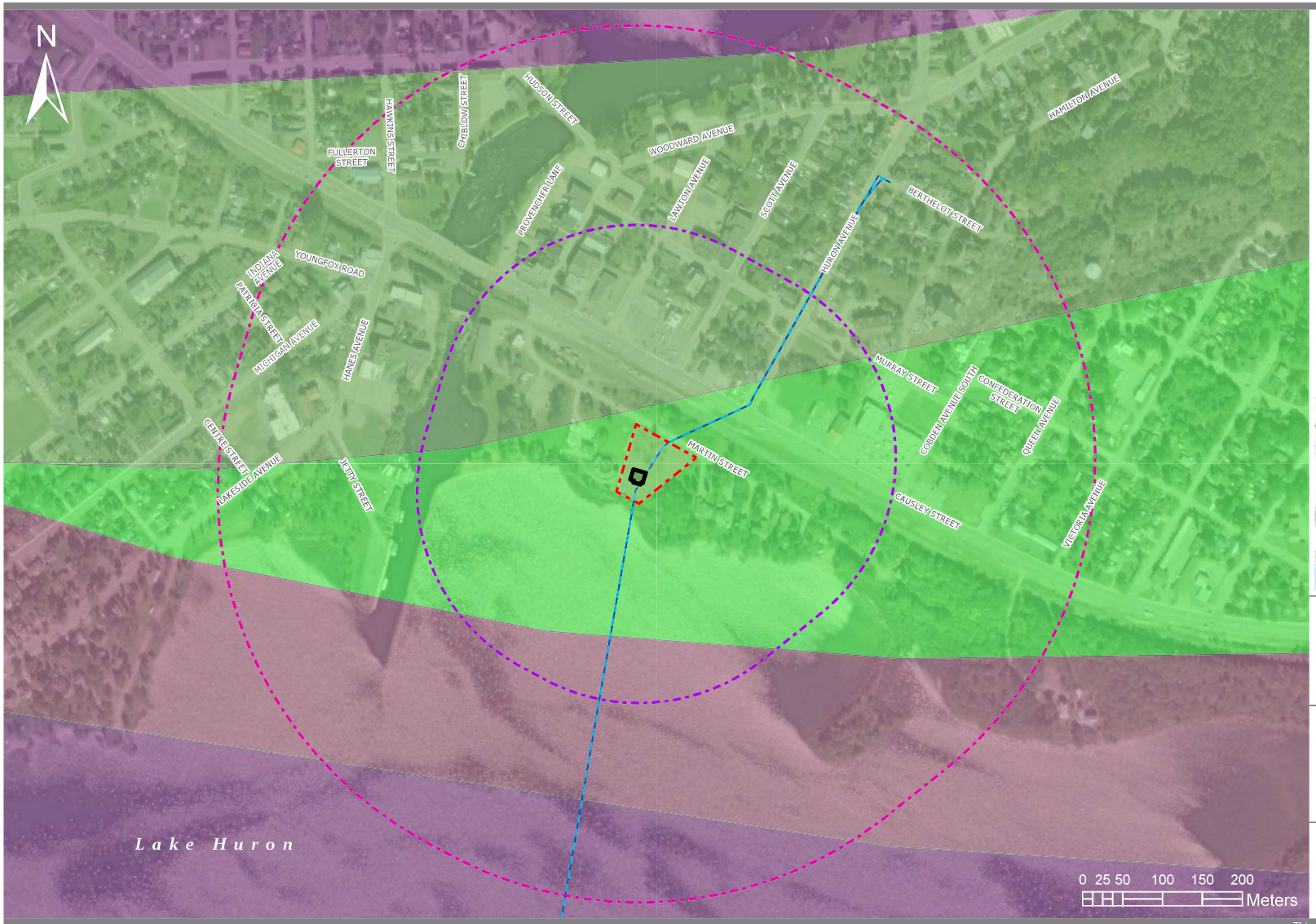


Project Site
Study Area - 250 m
Study Area - 500 m
Proposed Building Footprint
Proposed Water Intake

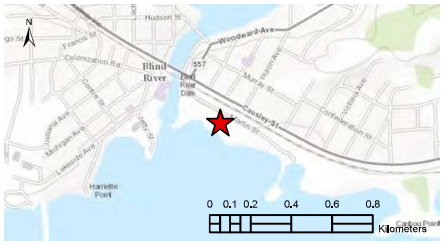
Bedrock Geology

18a,Siltstone, wacke, argillite

19a,Quartz-felspar snadstone, argillite and conglomerate,19a,Quartz-felspar snadstone, argillite and conglomerate

19b,Siltstone, argillite, wacke, minor sandstone

23d,Nipissing mafic sills (2219 Ma): mafic sills, mafic dikes and related granophyre,23d,Nipissing mafic sills (2219 Ma): mafic sills, mafic dikes and related granophyre



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Datum: North American 1983 CSRS
Map Units: Meter
Scale: 1:5,000

Sources:
- Road Labels, ORN, 2024
- Ontario Geological Survey 2011. 1:25,000 scale bedrock geology of Ontario; Ontario Geological Survey, Miscellaneous Release—Data 126 – Rev 1.
- Basemap : Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community, Province

General Notes:
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Figure 4 - Bedrock Geology Map

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Ref # : T001592B

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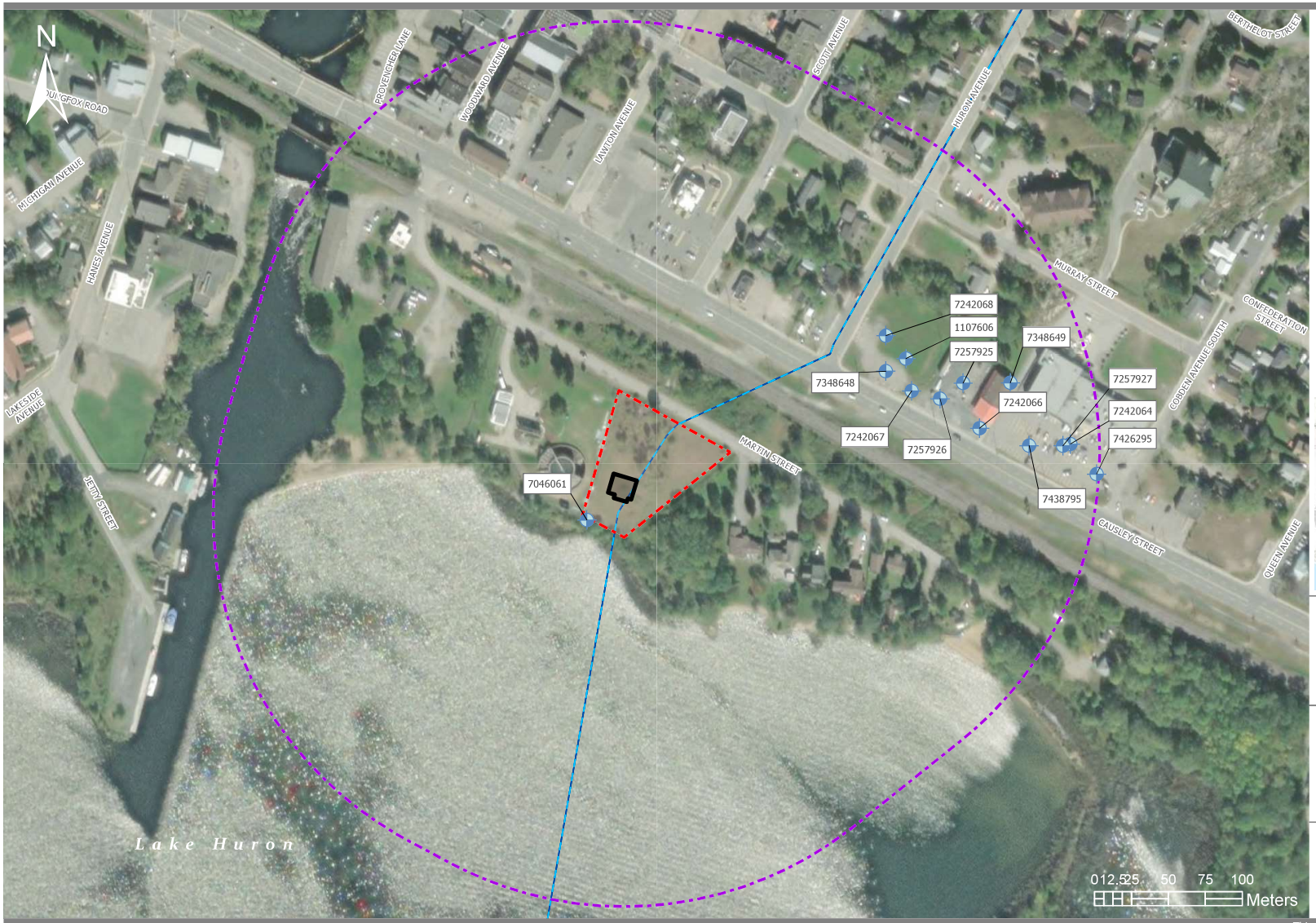

Spatial Reference:
Name: NAD 1983 CSRS MTM 13
GCS: GCS North American 1983 CSRS
Datum: North American 1983 CSRS
Map Units: Meter
Scale: 1:2,700

Sources:
- Road Labels, ORN, 2024
- MECP Well Record Locations, LIO, 2024
- Basemap : Maxar, Microsoft, Province of Ontario, Ontario MNR, Esri Canada, Esri, HERE, Garmin, INCREMENT P, USGS, METI/NASA, NGA, EPA, USDA, AAFC, NRCan

General Notes:
Dimensions on the plan should be read and not measured. Any errors or omissions should be reported to CIMA +. The boundaries, areas, and title deeds must be verified by a surveyor.

Figure 5 - MECP Well Locations

This plan is the intellectual property of "CIMA+"; any total or partial reproduction is subject to the explicit prior agreement of an employee of "CIMA+".

Hydrogeological Investigation - New Water Intake & Huron Ave. Reconstruction
17 T 4850065 N; 5116292 E, Blind River, Ontario
Tulloch Engineering Inc.

Ref # : T001592B

Survey by : -
Figure by : S. Scott
Concept by : S. Scott
Verified by : M. Klein

Revision 00 - - Issued for report - April 23, 2025 10:41:32 AM

Spatial Reference:
Name: NAD 1983 CSRS MTM 13
GCS: GCS North American 1983 CSRS
Datum: North American 1983 CSRS
Map Units: Meter
Scale: 1:750

Sources:
- Road Labels, ORN, 2024
- Basemap : Maxar, Microsoft, Province of Ontario, Ontario MNR, Esri Canada, Esri, HERE, Garmin, INCREMENT P, USGS, METI/NASA, NGA, EPA, USDA, AAFC, NRCan

General Notes:
Dimensions on the plan should be read and not measured. Any errors or omissions should be reported to CIMA +. The boundaries, areas, and title deeds must be verified by a surveyor.

Figure 6 - Monitoring Well Locations

This plan is the intellectual property of "CIMA+"; any total or partial reproduction is subject to the explicit prior agreement of an employee of "CIMA+".

Hydrogeological Investigation - New Water Intake & Huron Ave. Reconstruction
17 T 4850065 N; 5116292 E, Blind River, Ontario
Tulloch Engineering Inc.

Ref # : T001592B

Survey by : -
Figure by : S. Scott
Concept by : S. Scott
Verified by : M. Klein

Revision 00 - - Issued for report - April 23, 2025 10:31:55 AM

B

Appendix B
Borehole Logs

Consultant: CIMA+

Client: **Town of Blind River**

BOREHOLE LOGGING

Borehole N° BH-100

Project name :	**Blind River Intake Location Study**
Applicant :	
Location :	**Blind River, Ontario, Canada**
Drilling contractor :	**Walker Drilling Ltd.**
Type of drill :	**CME**
Borehole diameter :	**PW**
Executed by :	**Tulloch Engineering Inc.**
Compiled by :	**J. Tardioli**
Dip :	
Strike :	
Core diameter :	**PQ**
Verified by :	**M. Klein**

Coordinates (m) 17 ()	X: **349246.0**
	Y: **5116289.0**
	Z: **179.58**
Project No. :	**T001592B**
Localization figure No. :	
Drilling start date :	**2024-10-22**
Total borehole depth :	**10.68 m**

SAMPLE TYPE

SS	Split Spoon
DC	Diamond rock core
MA	Manual sampling
AS	Auger
ST	Shelby tube
TW	Thin wall sampler

TERMINOLOGY

"Traces"	1-10%
"Some"	10-20%
adjective (...y)	20-35%
"and"	35-50%

ROC QUALITY DESIGNATION

% RQD	QUALIFICATIVE
<25	Very poor
25-50	Poor
50-75	Fair
75-90	Good
90-100	Excellent

COMPACTION / INDEX "N"

Very loose	0-4
Loose	4-10
Compact	10-30
Dense	30-50
Very dense	>50

GROUNDWATER

Date: 2024-11-21 Date:

Depth (m): 3.82 Depth (m):

SAMPLE STATE

Remoulded

Intact (thin wall sampler)

Lost

Core (diamond rock core)

SYMBOLS

N: Standard penetration value
R: Refusal (N > 100)
WoH: Weight of Hammer / 61 cm
R.Q.D: Rock quality designation
% R.Q.D = ΣCores > 4 po. (10 cm) / Drilled length

SOIL CLASSIFICATION

Clay	< 0,002 mm
Silt	0,002 to 0,080 mm
Sand	0,080 to 5 mm
Gravel	5 to 80 mm
Cobbles	80 to 300 mm
Boulders	> 300mm

CONSISTENCY / SHEAR STRENGTH (Cu)

Very soft	<12 kPa
Soft	12-25 kPa
Firm	25-50 kPa
Stiff	50-100 kPa
Very stiff	100-200 kPa
Hard	>200 kPa

DEPTH (m)	DEPTH - ft	LEVEL (m)/ DEPTH	DESCRIPTION OF SOILS AND ROCK	SYMBOLS	TYPE NO	SUB - SAMPLE	STATE	RECOVERY %	N, Nc or RQD	BLOWS/15cm	GRAPHIC	WATER LEVEL (m)	WELL INSTALLATION	TESTS
		180.56									▲ : N (standard pen.) △ : Nc (dynamic pen.) ● : Cu (laboratory) ▽ : Cur (laboratory) × : Cu (on-site) + : Cur (on-site) Wp w WL 20 40 60 80			GSA : Grain size analysis S : Sedimentometry Att : Atterberg limits Wn : Water content PAH : PAH analysis C10 : C10-C50 analysis MX : 14 metals analysis UCS : Uniaxial compressive strength To : Brasilian CA : Chemical analysis DUP : Duplicate sample
0	0	179.58	Ground Surface											
		0.00	Till Predominantly sand to silty sand matrix, high content of clasts, often low in matrix carbonate content (Ontario Geological Survey, 2000)											
1	5													
2														
3	10													
4												3.82 11-21-2024		
	15	175.01												
		4.57	Bedrock Siltstone, wacke, argillite from the Huronian Supergroup (2.2 Ga to 2450 Ma); Elliot Lake Group; McKim Formation (Ontario Geological Survey, 2011)											
5														
6	20													
7														
	25													
8														
9	30													
10														
	35	168.90												
		10.68	End of Borehole at 10.68 m.											

Remark(s):

Creation date 2025-04-22

Cima_Log_en_official_CLEAN.sty

Consultant: CIMA+

Client: **Town of Blind River**

BOREHOLE LOGGING

Borehole N° BH-101

Project name :	**Blind River Intake Location Study**
Applicant :	
Location :	**Blind River, Ontario, Canada**
Drilling contractor :	**Walker Drilling Ltd.**
Type of drill :	**CME**
Borehole diameter :	**HW**
Executed by :	**Tulloch Engineering Inc.**
Compiled by :	**J. Tardioli**
Dip :	
Strike :	
Core diameter :	**HQ**
Verified by :	**M. Klein**

Coordinates (m) 17 ()	X: **349282.0**
	Y: **5116294.0**
	Z: **180.38**
Project No. :	**T001592B**
Localization figure No. :	
Drilling start date :	**2024-10-22**
Total borehole depth :	**11.48 m**

SAMPLE TYPE

SS	Split Spoon
DC	Diamond rock core
MA	Manual sampling
AS	Auger
ST	Shelby tube
TW	Thin wall sampler

TERMINOLOGY

"Traces"	1-10%
"Some"	10-20%
adjective (...y)	20-35%
"and"	35-50%

ROC QUALITY DESIGNATION

% RQD	QUALIFICATIVE
<25	Very poor
25-50	Poor
50-75	Fair
75-90	Good
90-100	Excellent

COMPACTION / INDEX "N"

Very loose	0-4
Loose	4-10
Compact	10-30
Dense	30-50
Very dense	>50

GROUNDWATER

Date: 2024-11-21 Date:

Depth (m): 4.27 Depth (m):

SAMPLE STATE

Remoulded

Intact (thin wall sampler)

Lost

Core (diamond rock core)

SYMBOLS

N: Standard penetration value
R: Refusal (N > 100)
WoH: Weight of Hammer / 61 cm
R.Q.D: Rock quality designation
% R.Q.D = ΣCores > 4 po. (10 cm) / Drilled length

SOIL CLASSIFICATION

Clay	< 0,002 mm
Silt	0,002 to 0,080 mm
Sand	0,080 to 5 mm
Gravel	5 to 80 mm
Cobbles	80 to 300 mm
Boulders	> 300mm

CONSISTENCY / SHEAR STRENGTH (Cu)

Very soft	<12 kPa
Soft	12-25 kPa
Firm	25-50 kPa
Stiff	50-100 kPa
Very stiff	100-200 kPa
Hard	>200 kPa

DEPTH (m)	DEPTH - ft	LEVEL (m)/ DEPTH	DESCRIPTION OF SOILS AND ROCK	SYMBOLS	TYPE NO	SUB - SAMPLE	STATE	RECOVERY %	N, Nc or RQD	BLOWS/15cm	GRAPHIC	WATER LEVEL (m)	WELL INSTALLATION
		181.19											
0	0	180.38	Ground Surface										
		0.00	Till Predominantly sand to silty sand matrix, high content of clasts, often low in matrix carbonate content (Ontario Geological Survey, 2000)										
1	5												
2	10												
3	15												
4	20												
5		173.95											
		6.43	Bedrock Siltstone, wacke, argillite from the Huronian Supergroup (2.2 Ga to 2450 Ma); Elliot Lake Group; McKim Formation (Ontario Geological Survey, 2011)										
6													
7	25												
8	30												
9	35												
10													
11		168.90											
		11.48	End of Borehole at 11.48 m.										

GRAPHIC

▲ : N (standard pen.)
△ : Nc (dynamic pen.)
● : Cu (laboratory)
▽ : Cur (laboratory)
× : Cu (on-site)
+ : Cur (on-site)

Wp w WL

20 40 60 80

WATER LEVEL (m): 4.27 11-21-2024

TESTS

GSA : Grain size analysis
S : Sedimentometry
Att : Atterberg limits
Wn : Water content
PAH : PAH analysis
C10 : C10-C50 analysis
MX : 14 metals analysis
UCS : Uniaxial compressive strength
To : Brasilian
CA : Chemical analysis
DUP : Duplicate sample

Remark(s):

Creation date 2025-04-22

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Consultant: CIMA+

Client: **Town of Blind River**

BOREHOLE LOGGING

Borehole N° **BH-102**

Project name :	**Blind River Intake Location Study**
Applicant :	
Location :	**Blind River, Ontario, Canada**
Drilling contractor :	**Walker Drilling Ltd.**
Type of drill :	**Unknown**
Borehole diameter :	**HW**
Executed by :	**Tulloch Engineering Inc.**
Compiled by :	**J. Tardioli**
Dip :	
Strike :	
Core diameter :	**HQ**
Verified by :	**M. Klein**

Coordinates (m) 17 ()
X: **349283.0**
Y: **5116295.0**
Z: **180.38**

Project No. : **T001592B**
Localization figure No. :
Drilling start date : **2024-10-23**
Total borehole depth : **6.55 m**

SAMPLE TYPE

SS	Split Spoon
DC	Diamond rock core
MA	Manual sampling
AS	Auger
ST	Shelby tube
TW	Thin wall sampler

TERMINOLOGY

"Traces"	1-10%
"Some"	10-20%
adjective (...y)	20-35%
"and"	35-50%

ROC QUALITY DESIGNATION

% RQD	QUALIFICATIVE
<25	Very poor
25-50	Poor
50-75	Fair
75-90	Good
90-100	Excellent

COMPACTION / INDEX "N"

Very loose	0-4
Loose	4-10
Compact	10-30
Dense	30-50
Very dense	>50

GROUNDWATER

Date: 2024-11-21 Date:
Depth (m): 4.52 Depth (m):

SAMPLE STATE

Remoulded
Intact (thin wall sampler)
Lost
Core (diamond rock core)

SYMBOLS

N: Standard penetration value
R: Refusal (N > 100)
WoH: Weight of Hammer / 61 cm
R.Q.D: Rock quality designation
% R.Q.D = ΣCores > 4 po. (10 cm) / Drilled length

SOIL CLASSIFICATION

Clay	< 0,002 mm
Silt	0,002 to 0,080 mm
Sand	0,080 to 5 mm
Gravel	5 to 80 mm
Cobbles	80 to 300 mm
Boulders	> 300mm

CONSISTENCY / SHEAR STRENGTH (Cu)

Very soft	<12 kPa
Soft	12-25 kPa
Firm	25-50 kPa
Stiff	50-100 kPa
Very stiff	100-200 kPa
Hard	>200 kPa

DEPTH (m)	DEPTH - ft	LEVEL (m)/ DEPTH	STRATIGRAPHY: DESCRIPTION OF SOILS AND ROCK	SYMBOLS: SYMBOLS	TYPE NO	SUB - SAMPLE	STATE	RECOVERY %	N, Nc or RQD	BLOWS/15cm	GRAPHIC	WATER LEVEL (m)	WELL INSTALLATION	TESTS
		181.29									▲ : N (standard pen.) △ : Nc (dynamic pen.) ● : Cu (laboratory) ▽ : Cur (laboratory) × : Cu (on-site) + : Cur (on-site) W_p w W_l 20 40 60 80			GSA : Grain size analysis S : Sedimentometry Att : Atterberg limits Wn : Water content PAH : PAH analysis C10 : C10-C50 analysis MX : 14 metals analysis UCS : Uniaxial compressive strength To : Brasilian CA : Chemical analysis DUP : Duplicate sample
0	0	180.38	Ground Surface											
		0.00	Till Predominantly sand to silty sand matrix, high content of clasts, often low in matrix carbonate content (Ontario Geological Survey, 2000)											
1	5													
2														
3	10													
4														
	15													
5														
6	20	173.95												
		6.43												
		173.83	Bedrock Siltstone, wacke, argillite from the Huronian Supergroup (2.2 Ga to 2450 Ma); Elliot Lake Group; McKim Formation (Ontario Geological Survey, 2011)											
7		6.55												
	25													

4.52
11-21-2024

Remark(s):

Creation date 2025-04-22

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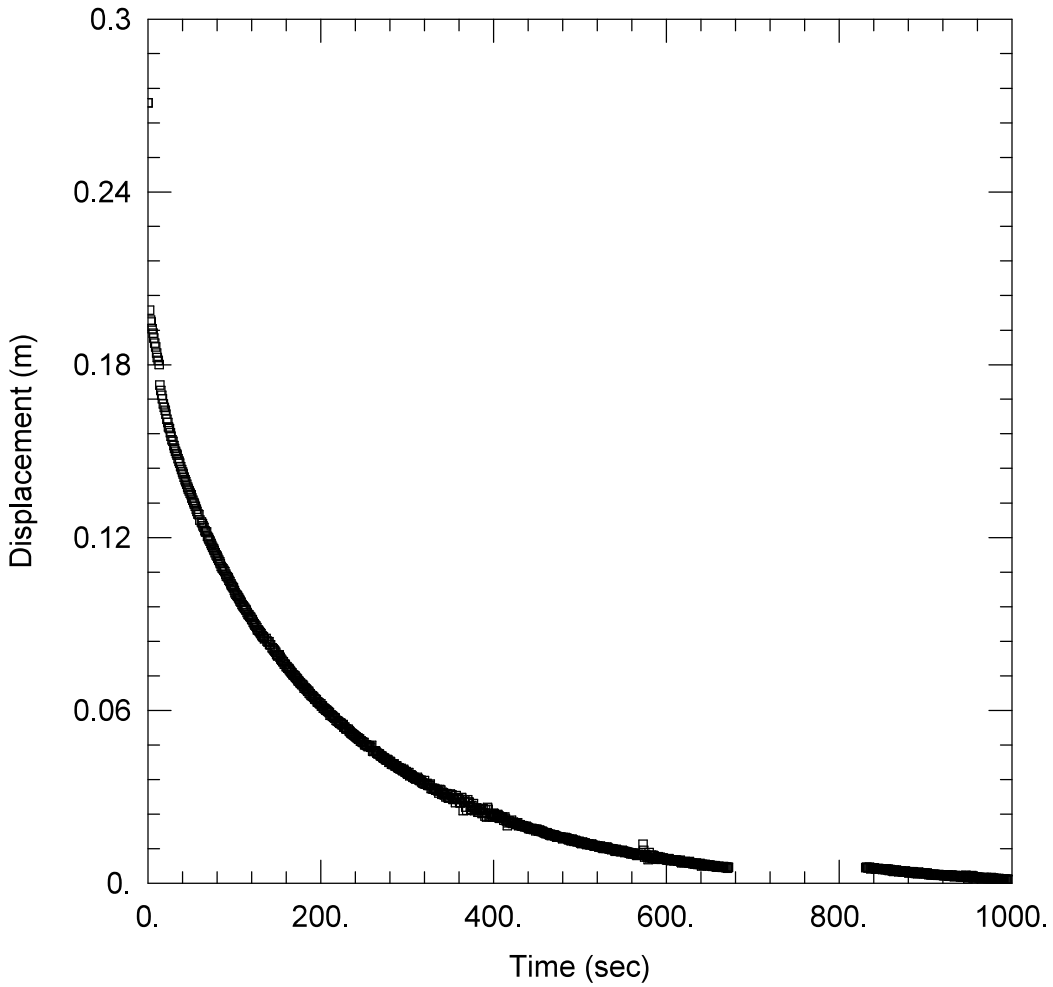
C

Appendix C
Single Well Response Test Analyses



WELL TEST ANALYSIS

Data Set: C:\...\BH-102 Slug 1 Linear vs draw.aqt
Date: 03/31/25 Time: 10:58:25

PROJECT INFORMATION

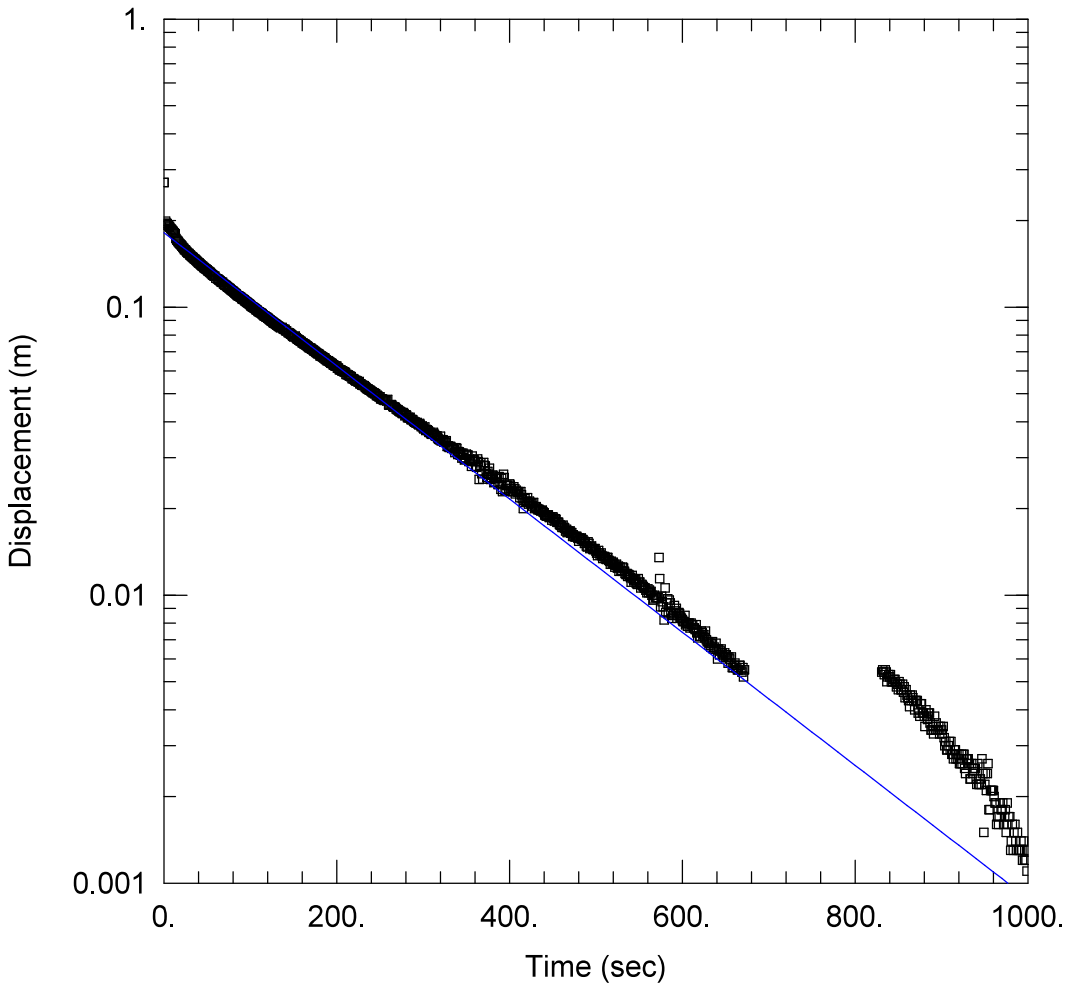
Company: CIMA+
Project: T001592B
Location: Blind River, ON
Test Well: BH-102
Test Date: 2024-11-21

AQUIFER DATA

Saturated Thickness: 3.57 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH-102)

Initial Displacement: 0.271 m
Total Well Penetration Depth: 2.034 m
Casing Radius: 0.0505 m
Static Water Column Height: 3.57 m
Screen Length: 1.524 m
Well Radius: 0.0254 m



WELL TEST ANALYSIS

Data Set: C:\...\BH-102 Slug 1 Hvorslev unconfined.aqt
Date: 03/31/25 Time: 11:00:49

PROJECT INFORMATION

Company: CIMA+
Project: T001592B
Location: Blind River, ON
Test Well: BH-102
Test Date: 2024-11-21

AQUIFER DATA

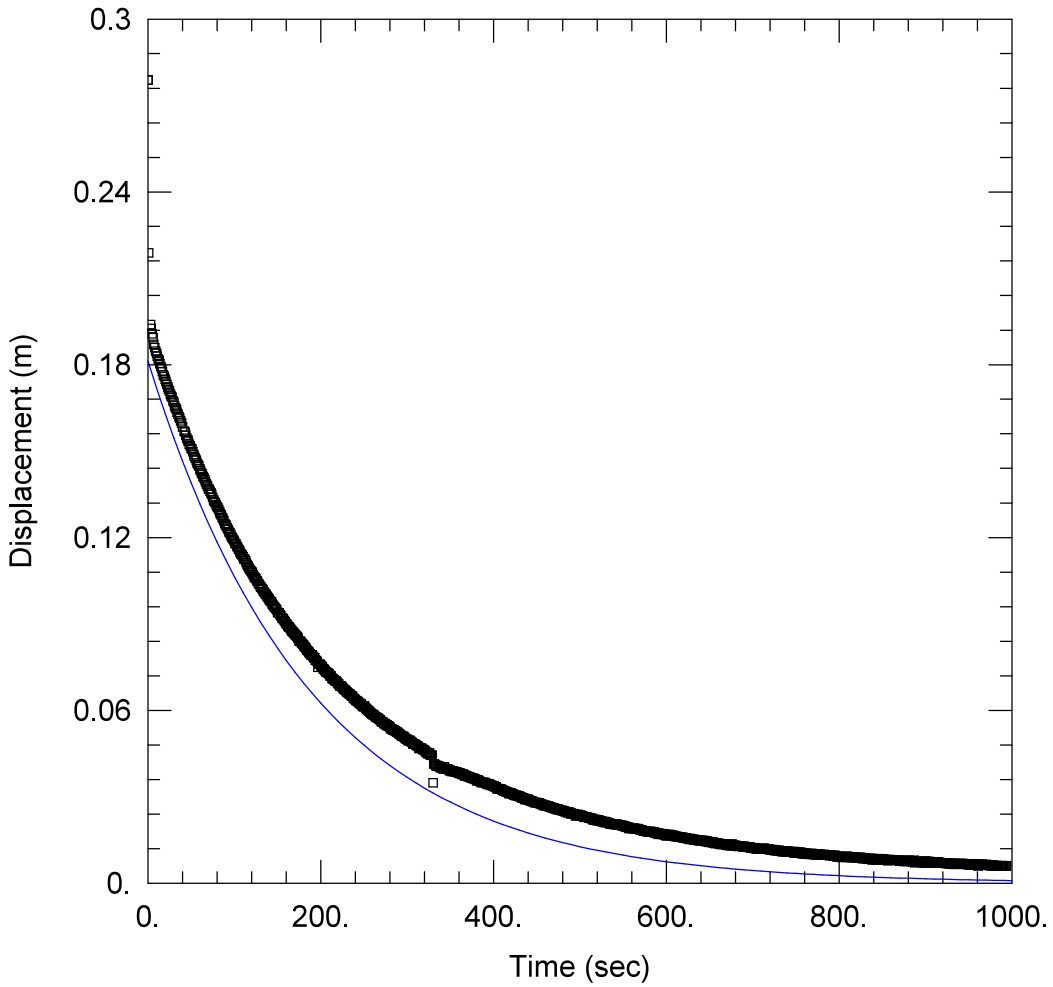
Saturated Thickness: 3.57 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH-102)

Initial Displacement: 0.271 m
Total Well Penetration Depth: 2.034 m
Casing Radius: 0.0505 m
Static Water Column Height: 3.57 m
Screen Length: 1.524 m
Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 1.824E-5 m/sec
y0 = 0.1812 m



WELL TEST ANALYSIS

Data Set: C:\...\BH-102 Bail 1 Linear vs draw.aqt
Date: 03/31/25 Time: 11:03:30

PROJECT INFORMATION

Company: CIMA+
Project: T001592B
Location: Blind River, ON
Test Well: BH-102
Test Date: 2024-11-21

AQUIFER DATA

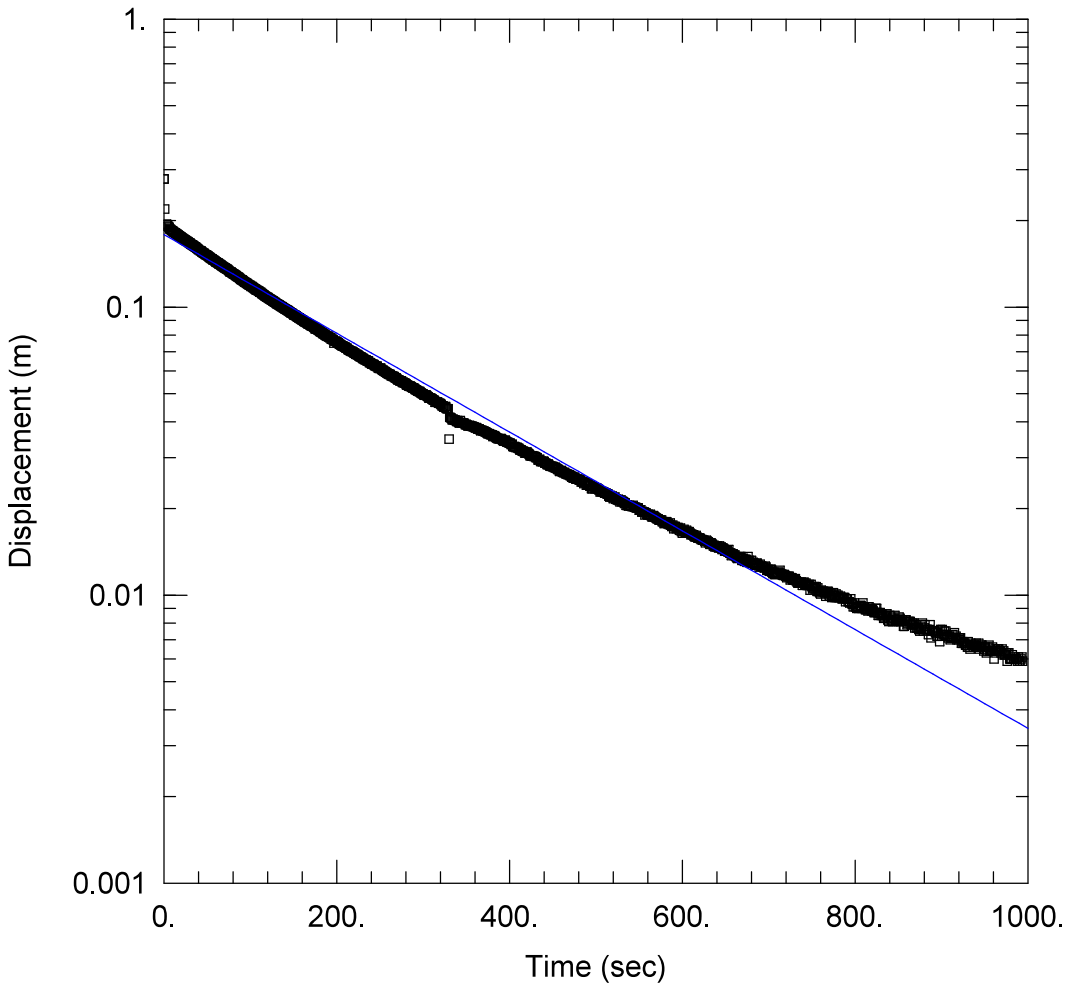
Saturated Thickness: 3.57 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH-102)

Initial Displacement: 0.2788 m
Total Well Penetration Depth: 2.034 m
Casing Radius: 0.0505 m
Static Water Column Height: 3.57 m
Screen Length: 1.524 m
Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 1.824E-5 m/sec
y0 = 0.1812 m



WELL TEST ANALYSIS

Data Set: C:\...\BH-102 Bail 1 Hvorslev unconfined.aqt
Date: 03/31/25 Time: 11:09:09

PROJECT INFORMATION

Company: CIMA+
Project: T001592B
Location: Blind River, ON
Test Well: BH-102
Test Date: 2024-11-21

AQUIFER DATA

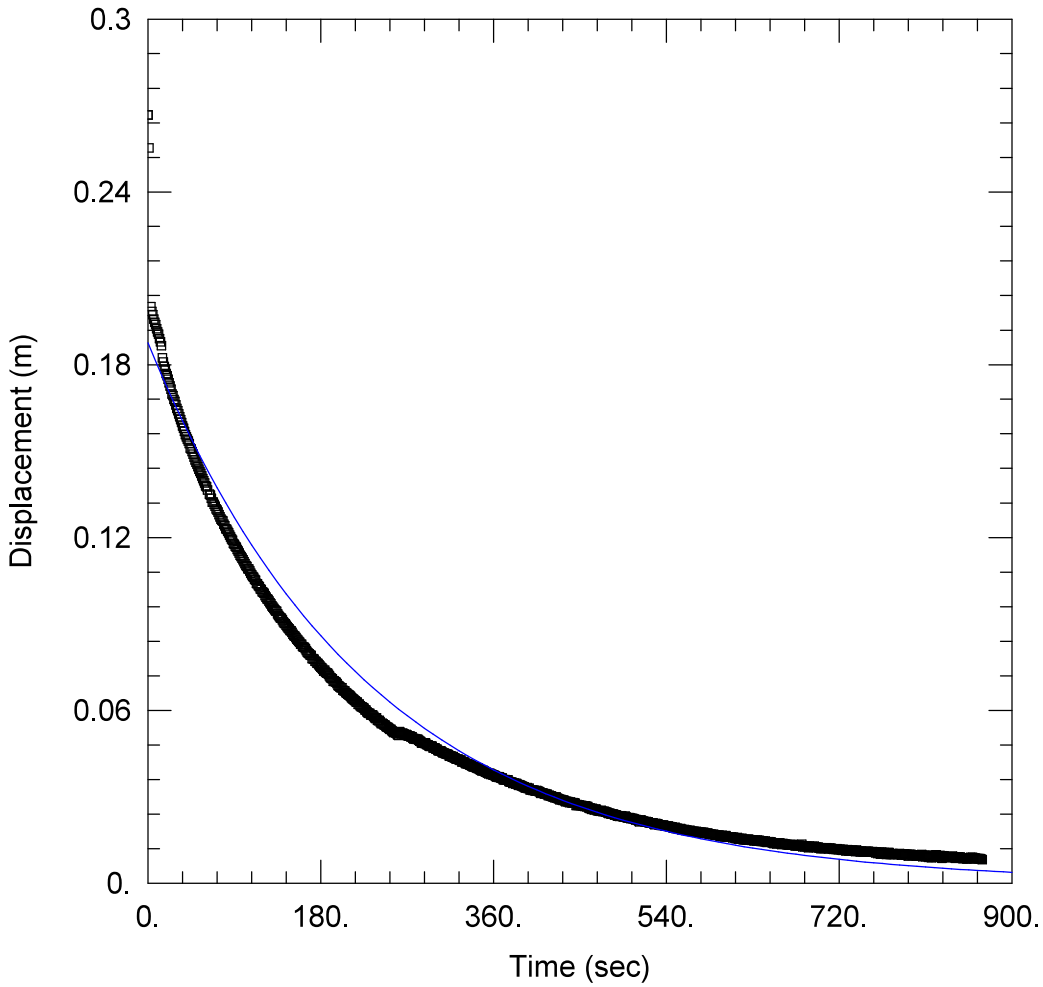
Saturated Thickness: 3.57 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH-102)

Initial Displacement: 0.2788 m
Total Well Penetration Depth: 2.034 m
Casing Radius: 0.0505 m
Static Water Column Height: 3.57 m
Screen Length: 1.524 m
Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 1.353E-5 m/sec
y0 = 0.1786 m



WELL TEST ANALYSIS

Data Set: C:\...\BH-102 Slug 2 Linear vs draw.aqt
Date: 03/31/25 Time: 11:11:53

PROJECT INFORMATION

Company: CIMA+
Project: T001592B
Location: Blind River, ON
Test Well: BH-102
Test Date: 2024-11-21

AQUIFER DATA

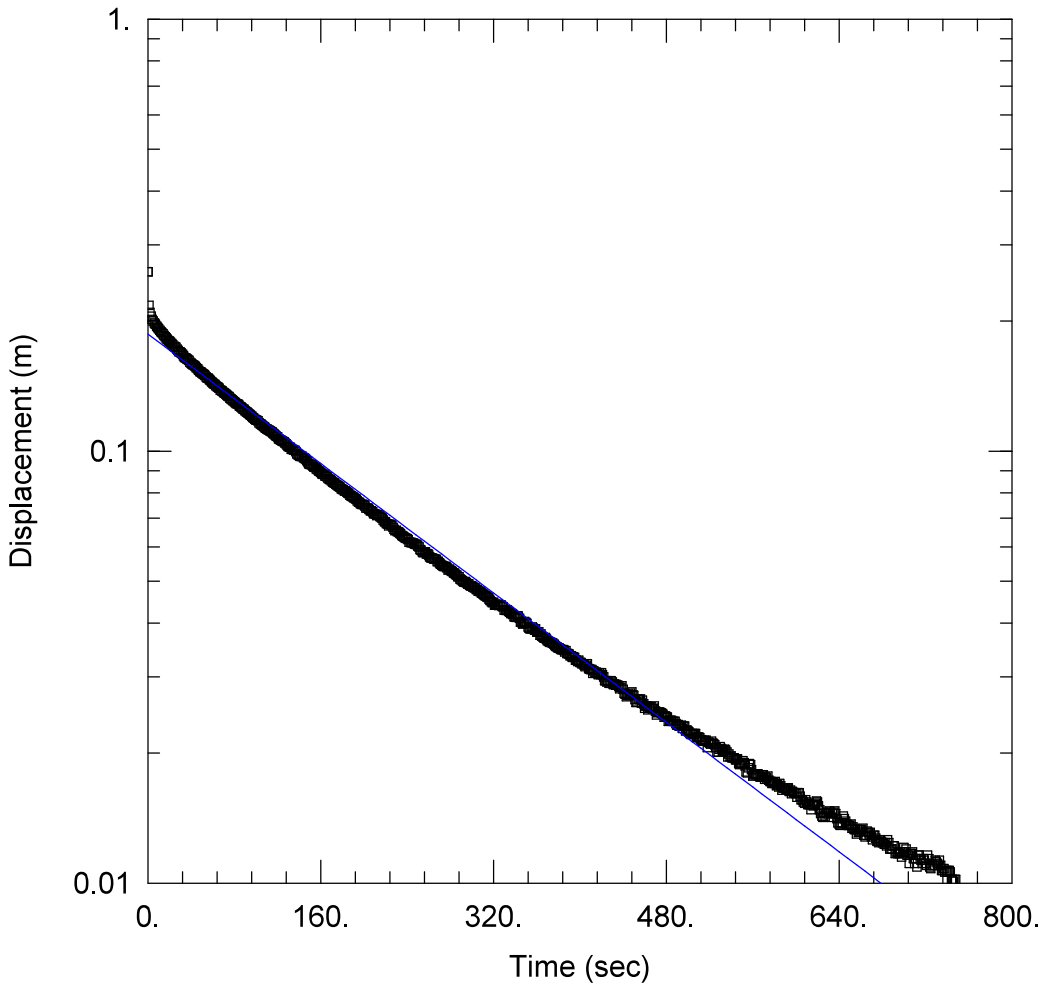
Saturated Thickness: 3.57 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH-102)

Initial Displacement: 0.2667 m
Total Well Penetration Depth: 2.034 m
Casing Radius: 0.0505 m
Static Water Column Height: 3.57 m
Screen Length: 1.524 m
Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 1.487E-5 m/sec
y0 = 0.1876 m



WELL TEST ANALYSIS

Data Set: C:\...\BH-102 Bail 2 Hvorslev unconfined.aqt
Date: 03/31/25 Time: 11:19:58

PROJECT INFORMATION

Company: CIMA+
Project: T001592B
Location: Blind River, ON
Test Well: BH-102
Test Date: 2024-11-21

AQUIFER DATA

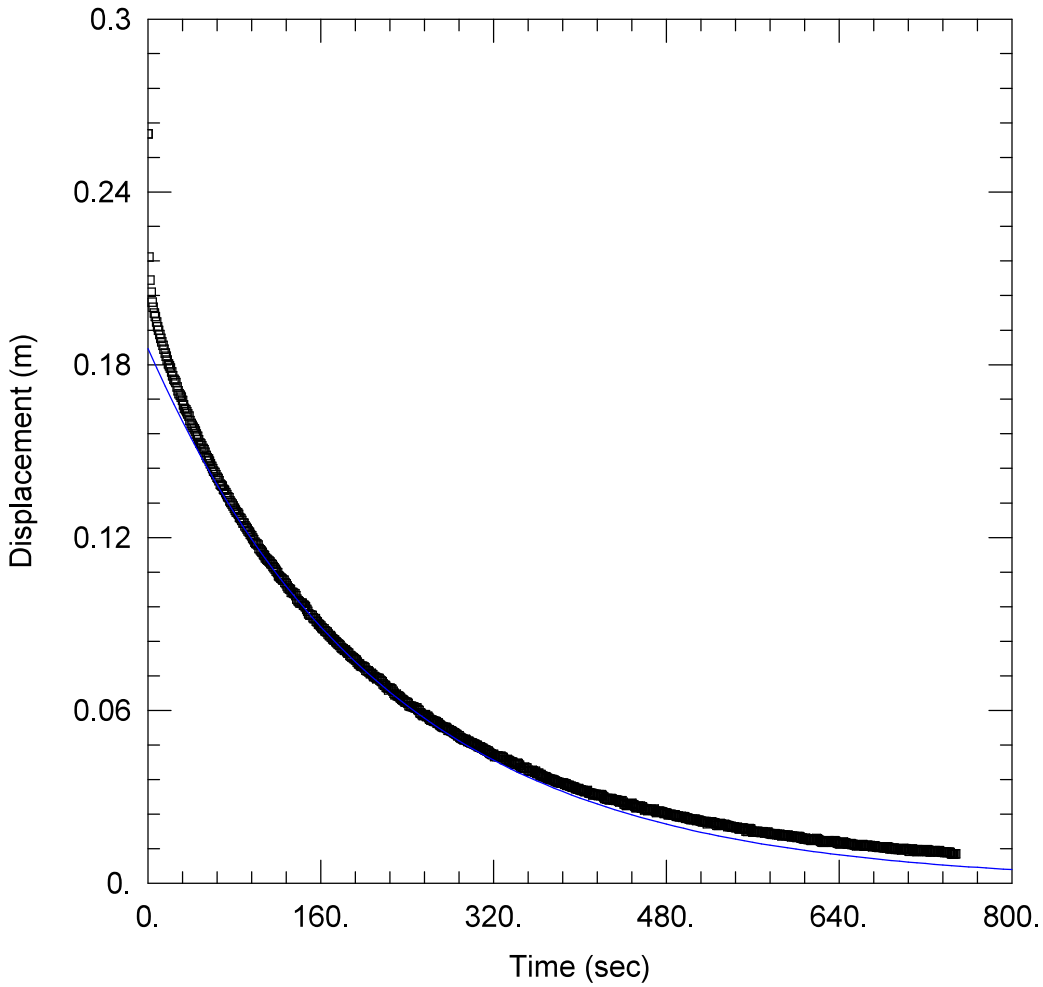
Saturated Thickness: 3.57 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH-102)

Initial Displacement: 0.2602 m
Total Well Penetration Depth: 2.034 m
Casing Radius: 0.0505 m
Static Water Column Height: 3.57 m
Screen Length: 1.524 m
Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 1.477E-5 m/sec
y0 = 0.1866 m



WELL TEST ANALYSIS

Data Set: C:\...\BH-102 Bail 2 Linear vs draw.aqt
Date: 03/31/25 Time: 11:17:12

PROJECT INFORMATION

Company: CIMA+
Project: T001592B
Location: Blind River, ON
Test Well: BH-102
Test Date: 2024-11-21

AQUIFER DATA

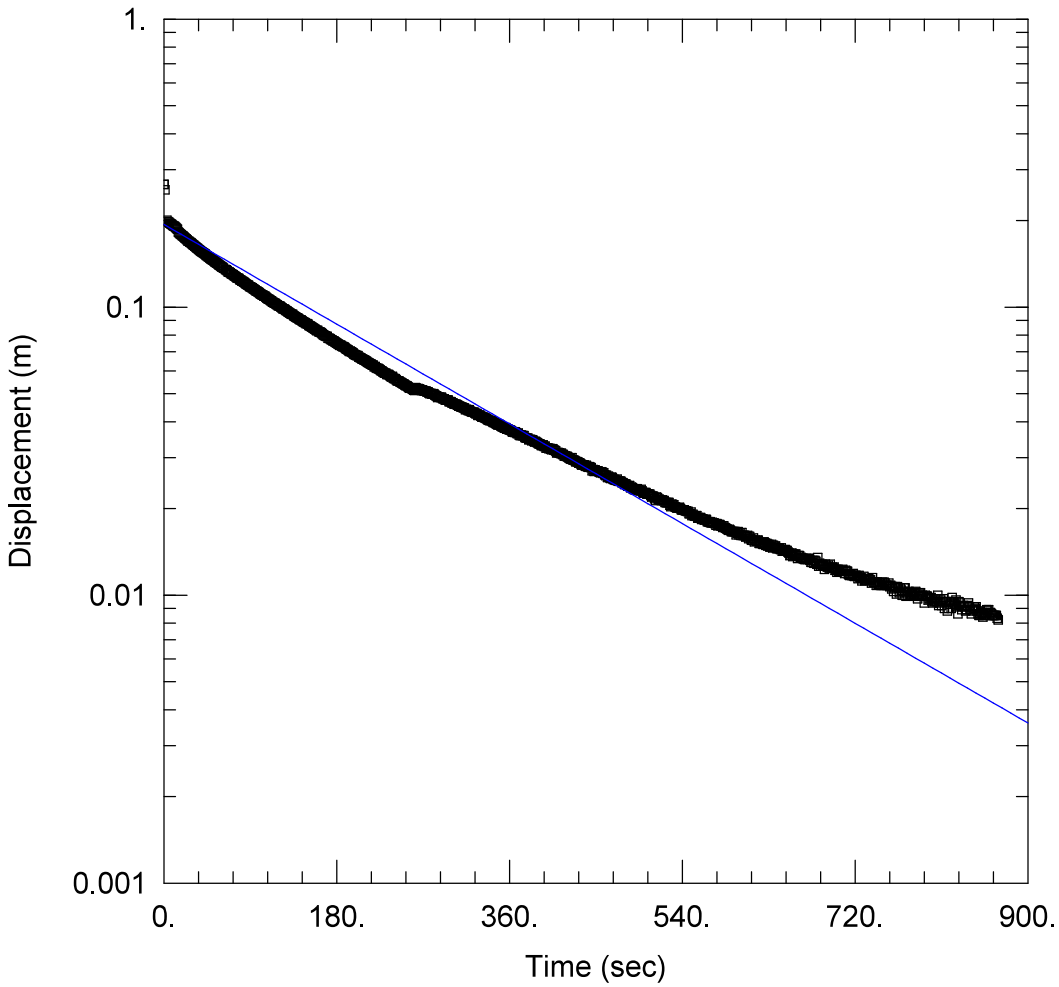
Saturated Thickness: 3.57 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH-102)

Initial Displacement: 0.2602 m
Total Well Penetration Depth: 2.034 m
Casing Radius: 0.0505 m
Static Water Column Height: 3.57 m
Screen Length: 1.524 m
Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 1.574E-5 m/sec
y0 = 0.1856 m



WELL TEST ANALYSIS

Data Set: C:\...\BH-102 Slug 2 Hvorslev unconfined.aqt
Date: 03/31/25 Time: 11:13:43

PROJECT INFORMATION

Company: CIMA+
Project: T001592B
Location: Blind River, ON
Test Well: BH-102
Test Date: 2024-11-21

AQUIFER DATA

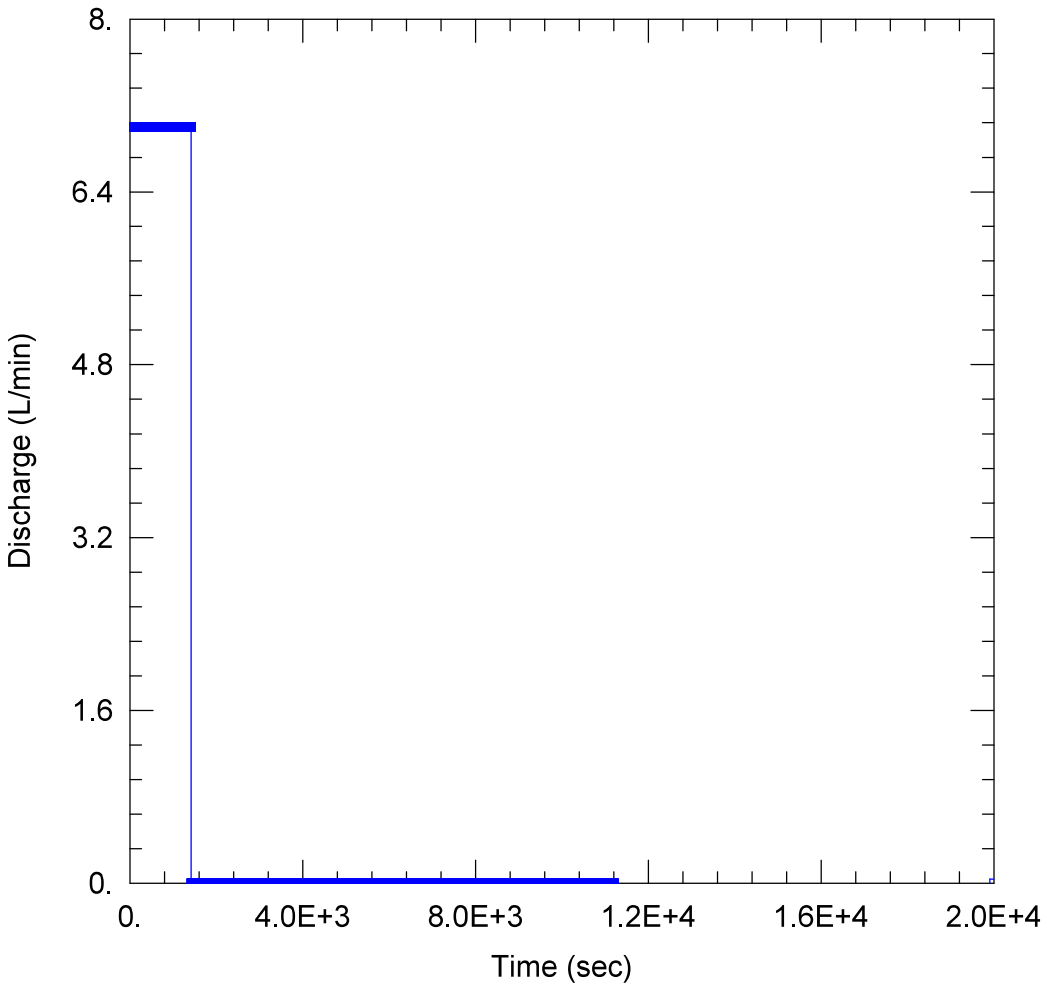
Saturated Thickness: 3.57 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH-102)

Initial Displacement: 0.2667 m
Total Well Penetration Depth: 2.034 m
Casing Radius: 0.0505 m
Static Water Column Height: 3.57 m
Screen Length: 1.524 m
Well Radius: 0.0254 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 1.517E-5 m/sec
y0 = 0.1937 m



WELL TEST ANALYSIS

Data Set: C:\...\BH-100 Pumping Test - Theis Recovery.aqt
Date: 04/02/25 Time: 14:23:13

PROJECT INFORMATION

Company: CIMA+
Project: T00159B
Location: Blind River
Test Well: BH-100
Test Date: 2024-11-21

AQUIFER DATA

Saturated Thickness: 7.99 m Anisotropy Ratio (Kz/Kr): 1.

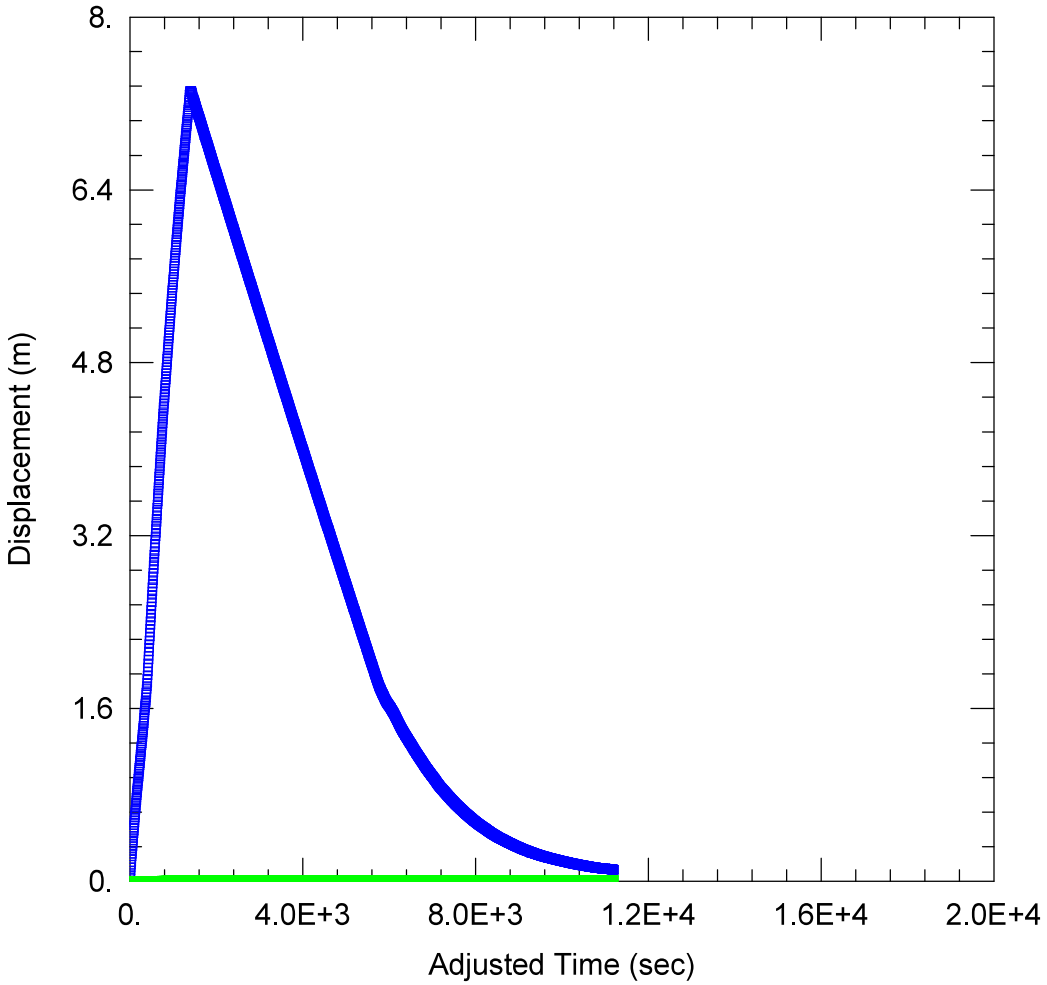
WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
BH-100	349246	5116289

Observation Wells

Well Name	X (m)	Y (m)
BH-100	349246	5116289
BH-101	349282	5116294



WELL TEST ANALYSIS

Data Set: C:\...\BH-100 Pumping Test - Theis Recovery.aqt
Date: 04/02/25 Time: 14:24:29

PROJECT INFORMATION

Company: CIMA+
Project: T00159B
Location: Blind River
Test Well: BH-100
Test Date: 2024-11-21

AQUIFER DATA

Saturated Thickness: 7.99 m Anisotropy Ratio (Kz/Kr): 1.

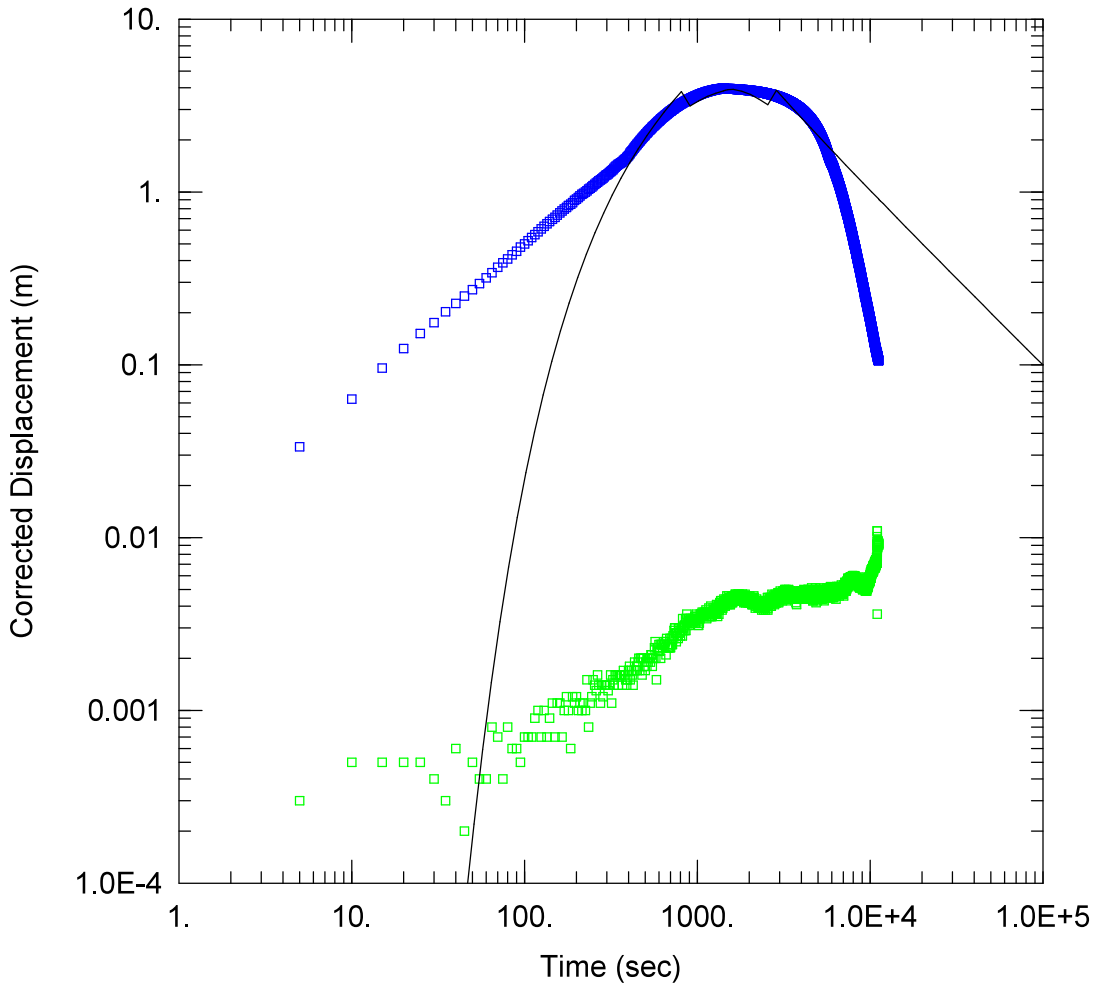
WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
BH-100	349246	5116289

Observation Wells

Well Name	X (m)	Y (m)
BH-100	349246	5116289
BH-101	349282	5116294



WELL TEST ANALYSIS

Data Set: C:\...\BH-100 Pumping Test 2 - with Pumping and Recovery.aqt
Date: 04/15/25 Time: 13:57:12

PROJECT INFORMATION

Company: CIMA+
Project: T00159B
Location: Blind River
Test Well: BH-100
Test Date: 2024-11-21

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
BH-100	349246	5116289

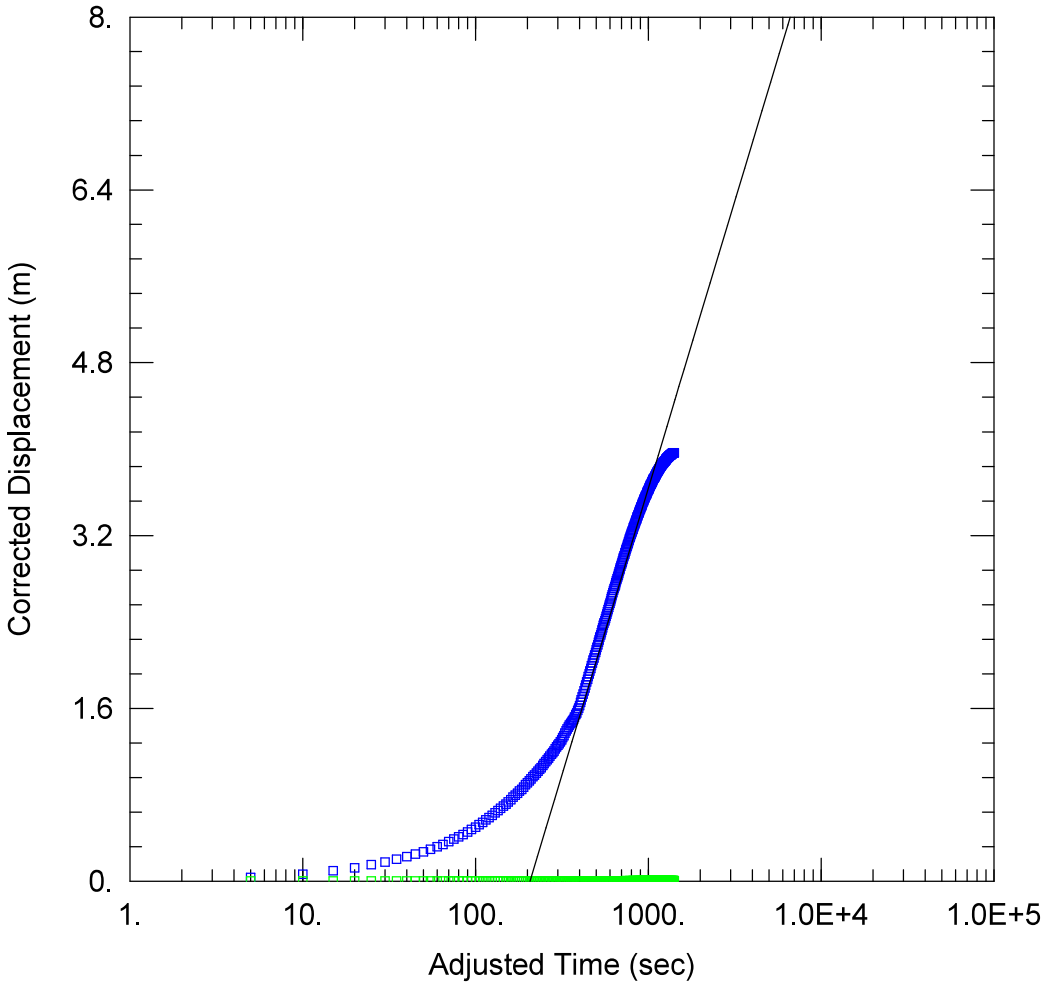
Observation Wells

Well Name	X (m)	Y (m)
BH-100	349246	5116289
BH-101	349282	5116294

SOLUTION

Aquifer Model: Unconfined
Solution Method: Theis

T = 1.322E-6 m^2/sec
S = 0.5468
Kz/Kr = 1583.2
b = 7.99 m



WELL TEST ANALYSIS

Data Set: C:\...\BH-100 Pumping Test 2 - with Pumping and Recovery.aqt
Date: 04/15/25 Time: 13:59:29

PROJECT INFORMATION

Company: CIMA+
Project: T00159B
Location: Blind River
Test Well: BH-100
Test Date: 2024-11-21

AQUIFER DATA

Saturated Thickness: 7.99 m Anisotropy Ratio (Kz/Kr): 1583.2

WELL DATA

Pumping Wells

Well Name	X (m)	Y (m)
BH-100	349246	5116289

Observation Wells

Well Name	X (m)	Y (m)
BH-100	349246	5116289
BH-101	349282	5116294

SOLUTION

Aquifer Model: Unconfined Solution Method: Cooper-Jacob

T = 4.027E-6 m^2/sec S = 0.4633

D

Appendix D
Tables

Appendix D, Table 1 - Soil Quality Analytical Results
T001592B - Hydrogeological Investigation - New Water Intake & Huron Street Reconstruction, Blind River, ON

Parameter	Units	RDL	PWQO and IPWQOs[1]	Sample ID	BH-100	BH-102
				Date	2024-11-21	2024-11-21
Parameters						
Total Antimony	mg/L	0.003	0.02		<0.003	<0.003
Total Arsenic	mg/L	0.003c - 0.006d	0.1		<0.003	0.013
Total Barium	mg/L	0.002c - 0.004d	-		0.016	0.197
Total Beryllium	mg/L	0.001c - 0.002d	0.011[a]		<0.001	<0.002
Total Boron	mg/L	0.01c - 0.02d	0.2[b]		0.052	0.08
Total Cadmium	mg/L	0.0001c - 0.0002d	0.0002		<0.0001	<0.0002
Total Chromium	mg/L	0.003c - 0.006d	-		0.011	0.019
Total Cobalt	mg/L	0.0005c - 0.0010d	0.0009[b]		**0.0051**	**0.04**
Total Copper	mg/L	0.002c - 0.004d	0.005		**0.007**	**0.033**
Total Lead	mg/L	0.0005c - 0.0010d	0.025[b]		<0.0005	0.0085
Total Molybdenum	mg/L	0.002c - 0.004d	0.04[b]		0.017	<0.004
Total Nickel	mg/L	0.003c - 0.006d	0.025		0.016	0.019
Total Selenium	mg/L	0.002c - 0.004d	0.1		<0.002	<0.004
Total Silver	mg/L	0.0001c - 0.0002d	0.0001		**0.0002**	<0.0002
Total Thallium	mg/L	0.0003c - 0.0006d	0.0003[b]		<0.0003	<0.0006
Total Uranium	mg/L	0.0005c - 0.0010d	0.005[b]		<0.0005	0.0014
Total Vanadium	mg/L	0.002c - 0.004d	0.006[b]		<0.002	**0.037**
Total Zinc	mg/L	0.02c - 0.04d	0.03		<0.020	<0.040
Chromium VI	mg/L	0.001	0.001		<0.001	**0.003**
Total Mercury	mg/L	0.0001	0.0002		<0.0001	<0.0001
Chloride	mg/L	0.10c - 0.12d	-		78	160
Total Phosphorus	mg/L	0.02c - 0.06d	0.02[b]		<0.02	**0.61**
Phenols	mg/L	0.001	0.001		0.001	0.001
Cyanide, WAD	mg/L	0.002c - 0.005d	0.005		<0.002	<0.002
Hardness (as CaCO3) (Calculated)	mg/L	0.5	-		33.7	85.7
Total Sodium	mg/L	0.10	-		49.5	78.8
Electrical Conductivity	uS/cm	2	-		388	838
pH	ph Units	NA	6.5 to 8.5		7.16	6.87
Total Suspended Solids	mg/L	10	-		51	3800
Alkalinity (as CaCO3)	mg/L	5	-		98	193

Notes:

1 - Reproduced from the Ontario Ministry of Environment and Energy (MOEE, 1994) Water Management Policies, Guidelines, Provincial Water Quality Objectives
a - Value calculated using equation outlined in the PWQO and IPWQO Guidelines
b - Interim PWQO
c - Reported Detection Limit for samples collected at BH-100
d - Reported Detection Limit for samples collected at BH-102
RDL - Reported Detection Limit
PWQO - Provincial Water Quality Objectives
IPWQO - Interim Provincial Water Quality Objectives
123 - Exceeds Provinvial Water Quality or Interim Provincial Water Quality Objectives

E

Appendix E
Laboratory Certificate of Analysis

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: CIMA CANADA INC.
600-1400 BLAIR TOWERS PLACE
OTTAWA, ON K1J 9B8
(613) 860-1870
ATTENTION TO: Mathieu Klein
PROJECT: T001592B
AGAT WORK ORDER: 24Z224690
WATER ANALYSIS REVIEWED BY: Nivine Basily, Inorganic Team Lead
DATE REPORTED: Dec 03, 2024
PAGES (INCLUDING COVER): 7
VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*Notes

Disclaimer:

- *All work conducted herein has been done using accepted standard protocols, and generally accepted practices and methods. AGAT test methods may incorporate modifications from the specified reference methods to improve performance.*
- *All samples will be disposed of within 30 days after receipt unless a Long Term Storage Agreement is signed and returned. Some specialty analysis may be exempt, please contact your Client Project Manager for details.*
- *AGAT's liability in connection with any delay, performance or non-performance of these services is only to the Client and does not extend to any other third party. Unless expressly agreed otherwise in writing, AGAT's liability is limited to the actual cost of the specific analysis or analyses included in the services.*
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- *The test results reported herewith relate only to the samples as received by the laboratory.*
- *Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, warranties of merchantability, fitness for a particular purpose, or non-infringement. AGAT assumes no responsibility for any errors or omissions in the guidelines contained in this document.*
- *All reportable information is available on request from AGAT Laboratories, in accordance with ISO/IEC 17025:2017, ISO/IEC 17025:2005 (Quebec), DR-12-PALA and/or NELAP Standards.*
- *This document is signed by an authorized signatory who meets the requirements of the MELCCFP, CALA, CCN and NELAP.*
- *For environmental samples in the Province of Quebec: The analysis is performed on and results apply to samples as received. A temperature above 6°C upon receipt, as indicated in the Sample Reception Notification (SRN), could indicate the integrity of the samples has been compromised if the delay between sampling and submission to the laboratory could not be minimized.*

Member of: Association of Professional Engineers and Geoscientists of Alberta (APEGA)
Western Enviro-Agricultural Laboratory Association (WEALA)
Environmental Services Association of Alberta (ESAA)

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Certificate of Analysis

AGAT WORK ORDER: 24Z224690

PROJECT: T001592B

CLIENT NAME: CIMA CANADA INC.

SAMPLING SITE:

ATTENTION TO: Mathieu Klein

SAMPLED BY:Jeremy T.

Inorganic Chemistry (Water)

DATE RECEIVED: 2024-11-22

DATE REPORTED: 2024-12-03

		SAMPLE DESCRIPTION:		BH24-100		BH24-102
		SAMPLE TYPE:		Water		Water
		DATE SAMPLED:		2024-11-21		2024-11-21
Parameter	Unit	G / S	RDL	6357630	RDL	6357647
Total Antimony	mg/L	0.020	0.003	<0.003	0.003	<0.003
Total Arsenic	mg/L	0.1	0.003	<0.003	0.006	0.013
Total Barium	mg/L		0.002	0.016	0.004	0.197
Total Beryllium	mg/L	*	0.001	<0.001	0.002	<0.002
Total Boron	mg/L	0.2	0.010	0.052	0.020	0.080
Total Cadmium	mg/L	0.0002	0.0001	<0.0001	0.0002	<0.0002
Total Chromium	mg/L		0.003	0.011	0.006	0.019
Total Cobalt	mg/L	0.0009	0.0005	**0.0051**	**0.0010**	**0.0400**
Total Copper	mg/L	0.005	0.002	**0.007**	0.004	**0.033**
Total Lead	mg/L	*	0.0005	<0.0005	0.0010	0.0085
Total Molybdenum	mg/L	0.040	0.002	0.017	0.004	<0.004
Total Nickel	mg/L	0.025	0.003	0.016	0.006	0.019
Total Selenium	mg/L	0.1	0.002	<0.002	0.004	<0.004
Total Silver	mg/L	0.0001	0.0001	**0.0002**	**0.0002**	<0.0002
Total Thallium	mg/L	0.0003	0.0003	<0.0003	**0.0006**	<0.0006
Total Uranium	mg/L	0.005	0.0005	<0.0005	0.0010	0.0014
Total Vanadium	mg/L	0.006	0.002	<0.002	0.004	**0.037**
Total Zinc	mg/L	0.030	0.020	<0.020	**0.040**	<0.040
Chromium VI	mg/L	0.001	0.001	<0.001	0.001	**0.003**
Total Mercury	mg/L		0.0001	<0.0001	0.0001	<0.0001
Chloride	mg/L		0.10	78.0	0.12	160
Total Phosphorus	mg/L	*	0.02	<0.02	0.06	0.61
Phenols	mg/L	0.001	0.001	0.001	0.001	0.001
Cyanide, WAD	mg/L	0.005	0.002	<0.002	0.002	<0.002
Hardness (as CaCO3) (Calculated)	mg/L		0.5	33.7	0.5	85.7
Total Sodium	mg/L		0.10	49.5	0.20	78.8
Electrical Conductivity	uS/cm		2	388	2	838
pH	pH Units	6.5-8.5	NA	7.16	NA	6.87
Total Suspended Solids	mg/L		10	51	10	3800
Alkalinity (as CaCO3)	mg/L		5	98	5	193

Certified By:

Results relate only to the items tested. Results apply to samples as received.

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Certificate of Analysis

AGAT WORK ORDER: 24Z224690

PROJECT: T001592B

CLIENT NAME: CIMA CANADA INC.

ATTENTION TO: Mathieu Klein

SAMPLING SITE:

SAMPLED BY:Jeremy T.

Inorganic Chemistry (Water)

DATE RECEIVED: 2024-11-22

DATE REPORTED: 2024-12-03

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to PWQO * Variable - refer to guideline reference document
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

6357647 Dilution required, RDL has been increased accordingly.

Analysis performed at AGAT Toronto (unless marked by *)

Certified By:

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Exceedance Summary

AGAT WORK ORDER: 24Z224690

PROJECT: T001592B

CLIENT NAME: CIMA CANADA INC.

ATTENTION TO: Mathieu Klein

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
6357630	BH24-100	ON PWQO	Inorganic Chemistry (Water)	Total Cobalt	mg/L	0.0009	0.0051
6357630	BH24-100	ON PWQO	Inorganic Chemistry (Water)	Total Copper	mg/L	0.005	0.007
6357630	BH24-100	ON PWQO	Inorganic Chemistry (Water)	Total Silver	mg/L	0.0001	0.0002
6357647	BH24-102	ON PWQO	Inorganic Chemistry (Water)	Chromium VI	mg/L	0.001	0.003
6357647	BH24-102	ON PWQO	Inorganic Chemistry (Water)	Total Cobalt	mg/L	0.0009	0.0400
6357647	BH24-102	ON PWQO	Inorganic Chemistry (Water)	Total Copper	mg/L	0.005	0.033
6357647	BH24-102	ON PWQO	Inorganic Chemistry (Water)	Total Vanadium	mg/L	0.006	0.037

Results relate only to the items tested. Results apply to samples as received.

AGAT Laboratories

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Quality Assurance

CLIENT NAME: CIMA CANADA INC.

AGAT WORK ORDER: 24Z224690

PROJECT: T001592B

ATTENTION TO: Mathieu Klein

SAMPLING SITE:

SAMPLED BY:Jeremy T.

Water Analysis

RPT Date: Dec 03, 2024			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
Inorganic Chemistry (Water)															
Total Antimony	6354888		<0.003	<0.003	NA	< 0.003	104%	70%	130%	101%	80%	120%	102%	70%	130%
Total Arsenic	6354888		<0.003	<0.003	NA	< 0.003	100%	70%	130%	98%	80%	120%	103%	70%	130%
Total Barium	6354888		<0.002	<0.002	NA	< 0.002	105%	70%	130%	103%	80%	120%	107%	70%	130%
Total Beryllium	6354888		<0.001	<0.001	NA	< 0.001	105%	70%	130%	96%	80%	120%	94%	70%	130%
Total Boron	6354888		<0.010	<0.010	NA	< 0.010	103%	70%	130%	100%	80%	120%	99%	70%	130%
Total Cadmium	6354888		<0.0001	<0.0001	NA	< 0.0001	99%	70%	130%	97%	80%	120%	99%	70%	130%
Total Chromium	6354888		<0.003	<0.003	NA	< 0.003	99%	70%	130%	103%	80%	120%	104%	70%	130%
Total Cobalt	6354888		<0.0005	<0.0005	NA	< 0.0005	104%	70%	130%	98%	80%	120%	102%	70%	130%
Total Copper	6354888		<0.002	<0.002	NA	< 0.002	99%	70%	130%	99%	80%	120%	102%	70%	130%
Total Lead	6354888		<0.0005	<0.0005	NA	< 0.0005	96%	70%	130%	93%	80%	120%	98%	70%	130%
Total Molybdenum	6354888		<0.002	<0.002	NA	< 0.002	102%	70%	130%	82%	80%	120%	102%	70%	130%
Total Nickel	6354888		<0.003	<0.003	NA	< 0.003	94%	70%	130%	101%	80%	120%	100%	70%	130%
Total Selenium	6354888		<0.002	<0.002	NA	< 0.002	103%	70%	130%	103%	80%	120%	106%	70%	130%
Total Silver	6354888		<0.0001	<0.0001	NA	< 0.0001	100%	70%	130%	94%	80%	120%	104%	70%	130%
Total Thallium	6354888		<0.0003	<0.0003	NA	< 0.0003	108%	70%	130%	99%	80%	120%	104%	70%	130%
Total Uranium	6354888		<0.0005	<0.0005	NA	< 0.0005	102%	70%	130%	99%	80%	120%	108%	70%	130%
Total Vanadium	6354888		<0.002	<0.002	NA	< 0.002	99%	70%	130%	106%	80%	120%	107%	70%	130%
Total Zinc	6354888		<0.020	<0.020	NA	< 0.020	101%	70%	130%	99%	80%	120%	99%	70%	130%
Chromium VI	6358830		0.003	0.005	NA	< 0.001	98%	70%	130%	88%	80%	120%	92%	70%	130%
Total Mercury	6354888		<0.0001	<0.0001	NA	< 0.0001	100%	70%	130%	102%	80%	120%	101%	70%	130%
Chloride	6364160		365	360	1.4%	< 0.10	96%	70%	130%	101%	80%	120%	NA	70%	130%
Total Phosphorus	6356285		0.11	0.10	NA	0.03	100%	70%	130%	97%	80%	120%	NA	70%	130%
Phenols	6362562		<0.001	<0.001	NA	< 0.001	94%	90%	110%	94%	90%	110%	100%	80%	120%
Cyanide, WAD	6357630	6357630	<0.002	<0.002	NA	< 0.002	90%	70%	130%	94%	80%	120%	104%	70%	130%
Total Sodium	6354888		33.7	33.6	0.3%	< 0.10	105%	70%	130%	103%	80%	120%	121%	70%	130%
Electrical Conductivity	6361855		1600	1600	0.0%	< 2	98%	80%	120%						
pH	6361855		7.69	7.72	0.4%	NA	100%	90%	110%						
Total Suspended Solids	6362562		<10	<10	NA	< 10	102%	80%	120%						
Alkalinity (as CaCO3)	6361855		242	248	2.4%	< 5	100%	80%	120%						

Comments: NA signifies Not Applicable.
Duplicate NA: results are under 5X the RDL and will not be calculated.

Matrix spike NA: Spike level < native concentration. Matrix spike acceptance limits do not apply and are not calculated.

Certified By:

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Results relate only to the items tested. Results apply to samples as received.

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Method Summary

CLIENT NAME: CIMA CANADA INC.

AGAT WORK ORDER: 24Z224690

PROJECT: T001592B

ATTENTION TO: Mathieu Klein

SAMPLING SITE:

SAMPLED BY:Jeremy T.

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Water Analysis			
Total Antimony	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Arsenic	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Barium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Beryllium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Boron	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Cadmium	MET -93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Chromium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Cobalt	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Copper	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Lead	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Molybdenum	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Nickel	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Selenium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Silver	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Thallium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Uranium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Vanadium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Total Zinc	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP-MS
Chromium VI	INOR-93-6073	modified from SM 3500-CR B	SPECTROPHOTOMETER
Total Mercury	MET-93-6100	modified from EPA 245.2 and SM 3112 B	CVAAS
Chloride	INOR-93-6004	modified from SM 4110 B	ION CHROMATOGRAPH
Total Phosphorus	INOR-93-6022	modified from SM 4500-P B and SM 4500-P E	SPECTROPHOTOMETER
Phenols	INOR-93-6072	mod from SM 510C, EPA 420.2, ISO 3696, ASTM D1193	SEGMENTED FLOW ANALYSIS
Cyanide, WAD	INOR-93-6052	modified from ON MOECC E3015,SM 4500-CN- I, G-387	SEGMENTED FLOW ANALYSIS
Hardness (as CaCO3) (Calculated)	MET-93-6105	modified from EPA SW-846 6010C & 200.7 & SM 2340 B	CALCULATION
Total Sodium	MET-93-6103	modified from EPA 200.8, 3005A, 3010A & 6020B	ICP/MS
Electrical Conductivity	INOR-93-6000	SM 2510 B	PC TITRATE
pH	INOR-93-6000	modified from SM 4500-H+ B	PC TITRATE
Total Suspended Solids	INOR-93-6028	modified from EPA 1684,ON MOECC E3139,SM 2540B,C,D	BALANCE
Alkalinity (as CaCO3)	INOR-93-6000	Modified from SM 2320 B	PC TITRATE

Results relate only to the items tested. Results apply to samples as received.

AGAT Laboratories

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Mississauga, Ontario L4Z 1Y2
Ph: 905.712.5100 Fax: 905.712.5122
webearth.agatlabs.com

Chain of Custody Record

If this is a **Drinking Water sample, please use Drinking Water Chain of Custody Form** (potable water consumed by humans)

Laboratory Use Only

Work Order #: 24Z2241690

Cooler Quantity: one - bagged ice

Arrival Temperatures: 4.4 | 9.6 | 4.3

~~Depot~~ Temperatures: 2.3 | 2.5 | 2.9

Custody Seal Intact: ☐ Yes ☐ No ☐ N/A

Notes: B I I

Report Information:

Company: CIMA CANADA INC

Contact: Mathieu Klein

Address: 600-1400 Blair Towers Place
Ottawa, ON K1J 9B6

Phone: 613-860-2462 Fax:

Reports to be sent to:

1. Email: mathieu.klein@cima.ca

2. Email:

Regulatory Requirements:

(Please check all applicable boxes)

☐ Regulation 153/04
Table (Indicate One) ☐ Ind/Com ☐ Res/Park ☐ Agriculture
Soil Texture (Check One) ☐ Coarse ☐ Fine

☐ Regulation 406
Table (Indicate One) ☐ Ind/Com ☐ Res/Park ☐ Agriculture

☐ Regulation 558

☐ CCME

☐ Sewer Use ☐ Sanitary ☐ Storm
Region

☑ Prov. Water Quality Objectives (PWQO)

☐ Other
(Indicate One)

Is this submission for a **Record of Site Condition (RSC)**? ☐ Yes ☑ No

Report Guideline on *Certificate of Analysis* ☑ Yes ☐ No

Turnaround Time (TAT) Required:

Regular TAT ☑ 5 to 7 Business Days

Rush TAT (Rush Surcharges Apply)

☐ 3 Business Days ☐ 2 Business Days ☐ Next Business Day

OR Date Required (Rush Surcharges May Apply):

Please provide prior notification for rush TAT

*TAT is exclusive of weekends and statutory holidays

For 'Same Day' analysis, please contact your AGAT CSR

Project Information:

Project: T001592B

Site Location:

Sampled By: Jeremy T.

AGAT Quote #: PO:

Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes ☐ No ☐

Company: Bill to CIMA+ Ottawa

Contact:

Address:

Email:

Legal Sample ☐

Sample Matrix Legend

GW	Ground Water	SD	Sediment
O	Oil	SW	Surface Water
P	Paint	R	Rock/Shale
S	Soil		

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Field Filtered - Metals, Hg, CrVI, DOC Y/N	O. Reg 153: Metals & Inorganics	O. Reg 153: Metals - ☐ CrVI, ☐ Hg, ☐ HWSB	O. Reg 153: BTEX, F1-F4 PHCs	VOC	PAHs	PCBs: Aroclors ☐	O. Reg 406: Regulation 406 Characterization Package pH, Metals, BTEX, F1-F4	O. Reg 406: Nitrogen Species	O. Reg 406: Regulation 406 SPLP Rainwater Leach mSPLP: ☐ Metals ☐ VOCs ☐ SVOCs ☐ OC	O. Reg 558: Landfill Disposal Characterization TCLP: ☐ M&I ☐ VOCs ☐ ABNs ☐ B(a)P ☐ PCBs	O. Reg 558: TCLP: ☐ Moisture ☐ Sulphide	Corrosivity: ☐	93865	Phenols	Total Phosphorous	Unionized Ammonia	TSS	Hardness	Alkalinity
1. BH24-100	24/11/21	AM/PM	21	W	Hold VOC, PCB, PAH and Nitrogen Species (NO3, NO2, TKN, Ammonia) for Both samples.					✓	✓	✓		✓				✓	✓	✓	✓	✓	✓	✓
2. BH24-102	↓	↓	21	W						✓	✓	✓		✓				✓	✓	✓	✓	✓	✓	✓
3.		AM/PM																						
4.		AM/PM																						
5.		AM/PM																						
6.		AM/PM																						
7.		AM/PM																						
8.		AM/PM																						
9.		AM/PM																						
10.		AM/PM																						
11.		AM/PM																						

Samples Relinquished By (Print Name and Sign): Jeremy T	Date: 24/11/22	Time: 4h00	Samples Received By (Print Name and Sign): C. Cuthbertson	Date: 11/22/24	Time: 16h05
Samples Relinquished By (Print Name and Sign): Jeremy T	Date: 24/11/22	Time: 4h00	Samples Received By (Print Name and Sign):	Date: Nov 27	Time: 8:54 AM
Samples Relinquished By (Print Name and Sign): Cx to Pierre	Date: 11/25/24	Time: 15h00	Samples Received By (Print Name and Sign):	Date:	Time:

Page ____ of ____

N°: T - 164639

Pink Copy - Client | Yellow Copy - AGAT | White Copy - AGAT

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F

Appendix F
Dewatering Calculations

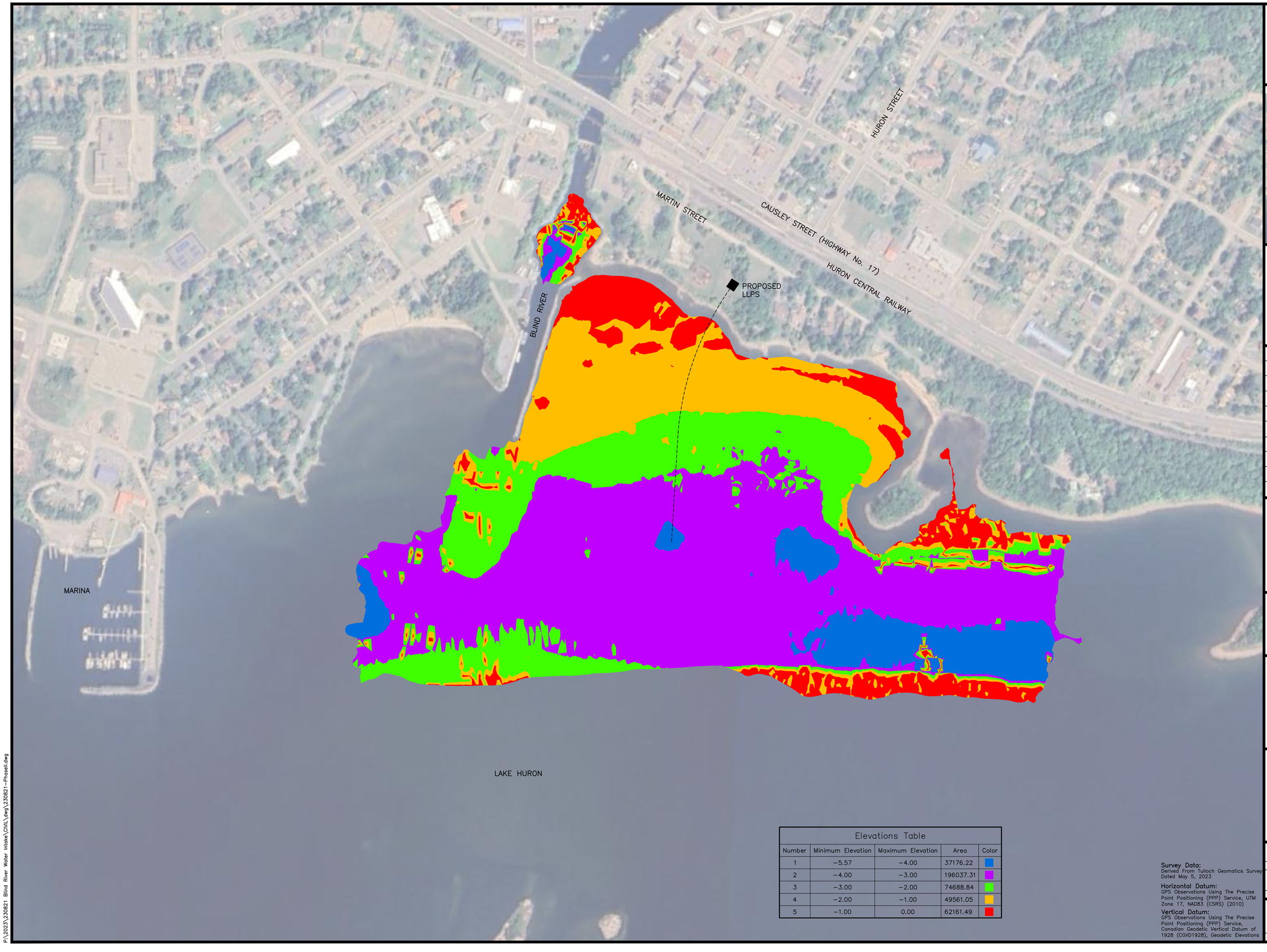
Appendix F.1: Infiltration Rates - Blind River LLPS

Overburden Unit			Bedrock Unit		
Datum			**Datum**		
Ground Surface Elevation (m asl)	180.56	m asl	Bedrock Surface Elevation (m asl)	175.01	m asl
Bottom excavation elevation (m asl)	175.01	m asl	Bottom excavation elevation (m asl)	173.39	m asl
Groundwater elevation (m)	179.56	masl	Groundwater elevation (m)	175.01	masl
Required drawdown from bottom of excavation (m)	0.0	m	Drawdown from bottom of excavation (m)	1	m
Elevation at required drawdown (m asl)	175.01	m asl	Elevation at required drawdown (m asl)	172.39	m asl
INPUTS			**INPUTS**		
Dimensions			**Dimensions**		
Length excavation (m):	13.5	m	Length excavation (m):	13.5	m
Width excavation (m):	13	m	Width excavation (m):	13	m
Area of excavation :	176	m^2	Area of excavation :	176	m^2
Hydraulic Conductivity			**Hydraulic Conductivity**		
hydraulic conductivity:	1.54E-05	m/s	hydraulic conductivity:	2.67E-07	m/s
Drawdown			Drawdown		
total drawdown (m)	4.55	m	total drawdown (m)	2.62	m
Radius of influence			**Radius of influence**		
Radius of influence (Ro1) :	53.6	m	Radius of influence (Ro1) :	4.1	m
Effective Radius			**Effective Radius**		
Effective radius of point source (rw1) :	7.5	m	Effective radius of point source (rw1) :	7.5	m
RESULTS			**RESULTS**		
Infiltration rates			**Infiltration rates**		
Infiltration rate in excavation:	4.77E-04	m^3/s	Infiltration rate in excavation:	1.33E-05	m^3/s
Infiltration rate in excavation :	41.21	m3/day	Infiltration rate in excavation :	1.15	m3/day
	28.6	L/min		0.8	L/min
Safety factor of 3 on K			**Safety factor of 3 on K**		
Safety factor on K :	3		Safety factor on K :	3	
Infiltration rate in excavation (Q) :	1.43E-03	m^3/s	Infiltration rate in excavation (Q) :	3.98E-05	m^3/s
Infiltration rate in excavation (Q) :	123.62	m3/day	Infiltration rate in excavation (Q) :	3.44	m3/day

Total Excavation Infiltration Rate	42.35	m3/day
	29.4	L/min
Safety factor of 3 on K	127.06	m3/day
	88.2	L/min

K

Appendix K: Bathymetric Survey



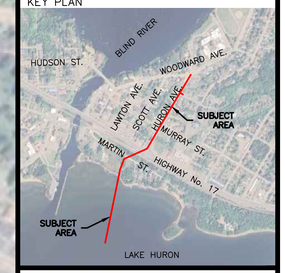
Elevations Table				
Number	Minimum Elevation	Maximum Elevation	Area	Color
1	−5.57	−4.00	37176.22	
2	−4.00	−3.00	196037.31	
3	−3.00	−2.00	74688.84	
4	−2.00	−1.00	49561.05	
5	−1.00	0.00	62161.49	

Survey Data:
Derived From Tulloch Geomatics Survey Dated May 5, 2023

Horizontal Datum:
GPS Observations Using The Precise Point Positioning (PPP) Service, UTM Zone 17, NAD83 (CSRS) (2010)

Vertical Datum:
GPS Observations Using The Precise Point Positioning (PPP) Service, Canadian Geodetic Vertical Datum of 1928 (CGVD1928), Geodetic Elevations

KEY PLAN



ENGINEER'S SEAL:

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AUGUST 6, 2024

DATE	REV.	REVISION	BY	APP'D
24/08/06	B	2024 Survey Update	DAS	CLK
24/02/22	A	Issued For Review	DAS	CLK

CLIENT:
Blind River

CONSULTANT:
TULLOCH

PROJECT TITLE:
NEW WATER INTAKE & HURON STREET RECONSTRUCTION

DRAWING TITLE:
BATHYMETRIC SURVEY WATER DEPTH SHADING PLAN

DRAWN	DESIGNED	CHECKED	APPROVED
DAS	DAS	CLK	CLK

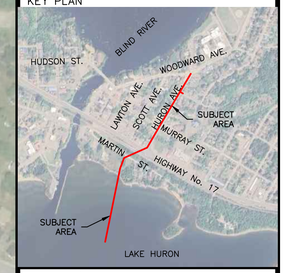
SCALE	DATE
1:2500	AUG. 6, 2024

PROJECT No.	REVISION	DRAWING
23-0821	B	B1

P:\2023\230821 Blind River Water Intake\DWL\dwg\230821-Phase1.dwg

N

KEY PLAN



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NOT FOR CONSTRUCTION
FEBRUARY 22, 2024

DATE	REV.	REVISION	BY	APP'D
24/02/22	A	Issued For Review	DAS	CLK

CLIENT:

Blind River

CONSULTANT:

TULLOCH

PROJECT TITLE:

NEW WATER INTAKE & HURON STREET RECONSTRUCTION

DRAWING TITLE:

BATHYMETRIC SURVEY WATER DEPTH CONTOURS PLAN

DRAWN	DESIGNED	CHECKED	APPROVED
DAS	DAS	JSS	CLK

SCALE	DATE
1:2500	FEB. 22, 2024

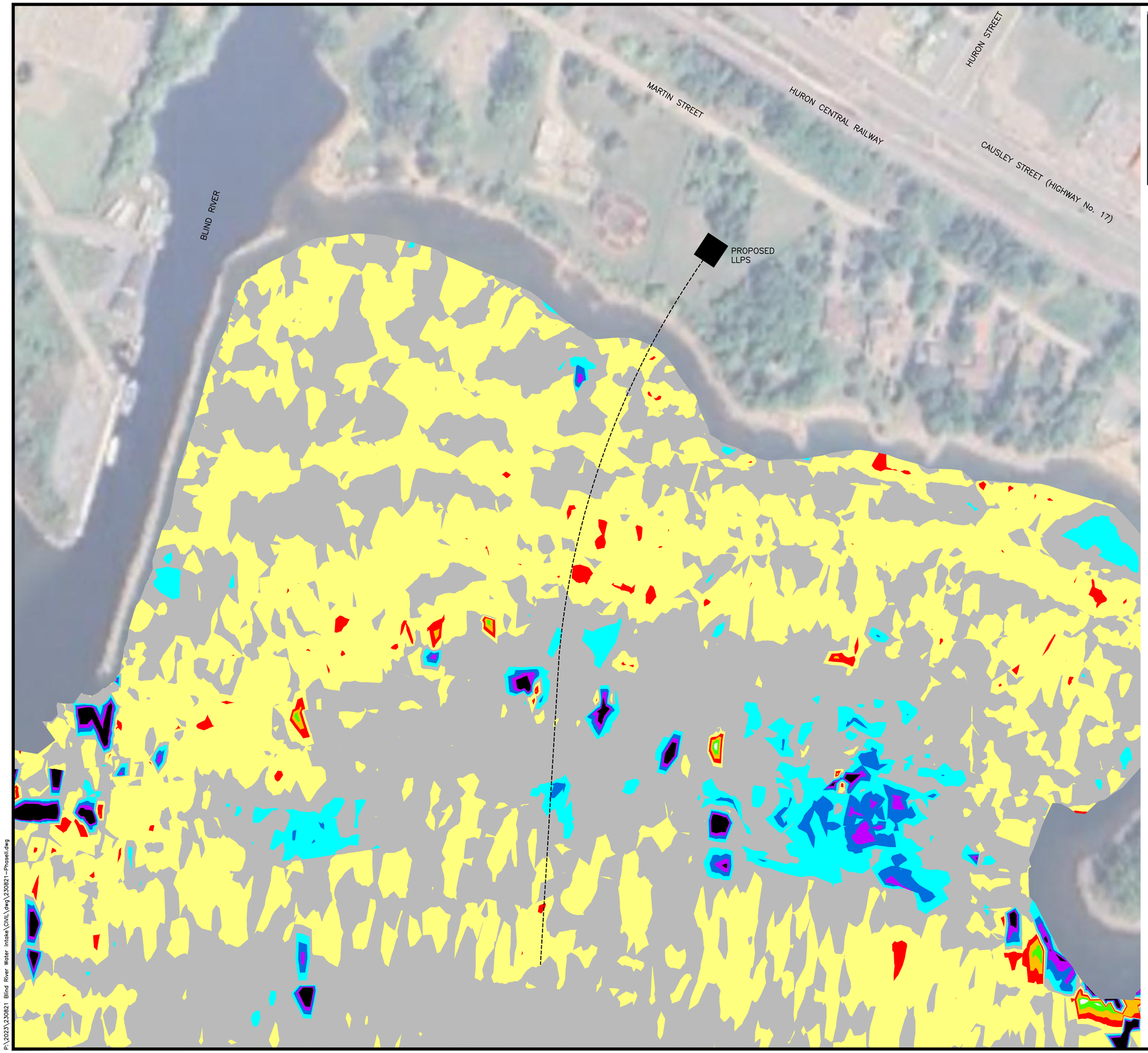
PROJECT No.	REVISION	DRAWING
23-0821	A	B2

Survey Data:
Derived From Tulloch Geomatics Survey Dated May 5, 2023

Horizontal Datum:
GPS Observations Using The Precise Point Positioning (PPP) Service, UTM Zone 17, NAD83 (CSRS) (2010)

Vertical Datum:
GPS Observations Using The Precise Point Positioning (PPP) Service, Canadian Geodetic Vertical Datum of 1928 (CGVD1928), Geodetic Elevations

G:\230821 Water Intake Blind River\dwg\230821.dwg



Elevations Table				
Number	Minimum Elevation	Maximum Elevation	Area	Color
1	−1.23	−0.80	52.23	
2	−0.80	−0.60	192.98	
3	−0.60	−0.40	551.99	
4	−0.40	−0.20	2967.08	
5	−0.20	0.00	121903.38	
6	0.00	0.20	198221.77	
7	0.20	0.40	27666.09	
8	0.40	0.60	16196.10	
9	0.60	0.80	8906.62	
10	0.80	4.10	32939.19	

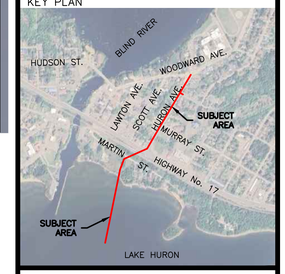
Survey Data:
Derived From Tulloch Geomatics Survey Dated May 5, 2023

Horizontal Datum:
GPS Observations Using The Precise Point Positioning (PPP) Service, UTM Zone 17, NAD83 (CSRS) (2010)

Vertical Datum:
GPS Observations Using The Precise Point Positioning (PPP) Service, Canadian Geodetic Vertical Datum of 1928 (CGVD1928), Geodetic Elevations

N

KEY PLAN



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AUGUST 6, 2024

DATE	REV.	REVISION	BY	APP'D
24/08/06	A	Issued For Review	DAS	CLK

CLIENT:

Blind River

CONSULTANT:

TULLOCH

PROJECT TITLE:

NEW WATER INTAKE & HURON STREET RECONSTRUCTION

DRAWING TITLE:

BATHYMETRIC SURVEY 2023 to 2024 COMPARISON PLAN

DRAWN	DESIGNED	CHECKED	APPROVED
DAS	DAS	CLK	CLK

SCALE	DATE
1:1000	AUG. 6, 2024

PROJECT No.	REVISION	DRAWING
23-0821	A	B3

P:\2023\23821 Blind River Water Intake\CIVIL\dwg\23821-Phase1.dwg

L

Appendix L: Source Water Vulnerability and Threats Assessment

TOWN OF BLIND RIVER
WATER TREATMENT PLANT
NEW INTAKE SURFACE WATER VULNERABILITY, ISSUES EVALUATION AND THREATS ASSESSMENT REPORT

Prepared for:

The Town of Blind River
11 Hudson Street
Blind River, ON P0R 1B0

Prepared by:

BluMetric Environmental Inc.
Unit 3B - 209 Frederick Street
Kitchener, ON N2H 2M7

Project Number: 240168-00
25 November 2024

TOWN OF BLIND RIVER
WATER TREATMENT PLANT NEW INTAKE
SURFACE WATER VULNERABILITY, ISSUES EVALUATION AND THREATS ASSESSMENT REPORT

Prepared for:

The Town of Blind River
11 Hudson Street
Blind River, ON P0R 1B0

Prepared by:

BluMetric Environmental Inc.
Unit 3B, 209 Frederick Street
Kitchener, ON N2H 2M7

Project Number: 240168-00

25 November 2024

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1 INTRODUCTION

1.1 BACKGROUND

A population of approximately 2,500 residents in the Town of Blind River is serviced with drinking water from the Blind River Water Treatment Plant (WTP). The WTP is supplied with water from five wells, drawing from groundwater under the direct influence of surface water (GUDI).

The GUDI wells have been exhibiting deteriorating water quality and yield despite having undergone multiple rehabilitation programs and are insufficient to meet the current demand. A Schedule C Municipal Class Environmental Assessment (Class EA) is currently underway to replace the current raw water supply to the Blind River WTP. The Class EA was initiated in the fall of 2023 in a process overseen by TULLOCH and CIMA+.

Alternative solutions considered during the Class EA included "Do Nothing", reducing water consumption, a lake-based raw water intake, a river-based raw water intake and a well-based raw water intake. The current recommended alternative is the lake-based raw water intake, namely to install an intake in the North Channel of Lake Huron.

BluMetric was retained by TULLOCH to complete a source water vulnerability and threats assessment in general accordance with the requirements of the *Clean Water Act, 2006*, and the *2021 technical rules under the Clean Water Act* set out by the Ministry of the Environment, Conservation and Parks (MECP). The present report details the methodology and findings of the vulnerability, issues evaluation and threats assessment of the proposed new Blind River WTP intake.

1.2 OBJECTIVES AND SCOPE

Municipal drinking water systems located within a drinking water source protection area (SPA) are subject to the requirements of the *Clean Water Act, 2006*. Typically, the area over which a Conservation Authority has jurisdiction is also designated as a drinking water SPA, and the Conservation Authority exercises and performs the powers and duties of a drinking water source protection authority. However, in accordance with Section 5 of the *Clean Water Act, 2006*, the Minister of the Environment, Conservation and Parks may make a regulation establishing a SPA in parts of Ontario without an established Conservation Authority. Examples of SPAs established by the Minister in this manner include the Northern Bruce Peninsula SPA and the Severn Sound SPA.

The drinking water system of the Town of Blind River is not located within a SPA and is therefore not subject to the requirements of the *Clean Water Act, 2006*. The Town is nonetheless voluntarily following the requirements of the *2021 technical rules under the Clean Water Act* in order to safeguard water quality at the new intake.

The objective of the present report is to complete a source water protection assessment of the proposed new Blind River WTP intake in general accordance with the *2021 technical rules under the Clean Water Act*. This was completed by way of the following tasks:

- Characterize the preferred option for the municipal drinking water intake and identify any gaps in information to confidently undertake the intake protection zone (IPZ) delineation and vulnerability scoring in a manner consistent with the 2021 technical rules;
- Delineate the IPZ for the preferred option by developing and using a 2D model approach;
- Assign Vulnerability Scores for the IPZ;
- Identify and confirm activities and conditions that are or would be drinking water threats within each IPZ;
- Enumerate existing significant, moderate and low drinking water threats to drinking water quality in the IPZ, including conditions resulting from past activities; and
- Prepare a data gap analysis to identify additional information that could be used to better define the IPZ or Vulnerability Scores, including sources of uncertainty and recommendations for future water sampling.

1.3 Existing Water Supply System and Proposed New Intake

The Blind River WTP is located at 47 Murray Street, approximately 360 m north-northeast of the North Channel of Lake Huron, and has a rated capacity of 6,000 m^3/day (Figure 1). The five source wells are located on Huron Avenue, approximately 400 m north of the WTP. The five wells operate under Permit to Take Water #3410-BV7S4M, which allows for a maximum combined taking of 5,785,200 L/day.

The Blind River WTP is operated by a contractor, the Public Utility Commission (PUC Inc.). The WTP typically treats approximately 1,000 m^3/day using chemically assisted coagulation and flocculation with direct filtration. Treated water is pumped into an elevated tank and then to the water distribution system, which is owned and operated by the Town. The maximum daily demand is approximately 1,600 m^3/day.

The recommended alternative for the WTP's new intake is located in the North Channel of Lake Huron, illustrated on Figure 1. The new intake is proposed to extend approximately 370 m into the lake, at a minimum and maximum depth of 3.4 m and 5.3 m, respectively, below water surface at low water level.

As per Rule 55 of the Technical Rules, the proposed new intake would be a Type A intake as it draws water from a Great Lake.

2 REGIONAL SETTING

The Blind River watershed is located within the Great Lakes-St. Lawrence Forest and consists largely of rugged and gently rolling uplands, interspersed with lakes and wetlands (MNR, 2007). Elevations in the lower Blind River watershed below Lake Duborne (located approximately 5 km north of the Town of Blind River) range from approximately 180 m above sea level (m asl) to 200 m asl.

The Ontario GeoHub Soil Survey Complex describes surficial geology in the Town of Blind River as consisting predominantly of sandy loam (Ontario GeoHub, 2015).

The Blind River WTP is mapped for bedrock geology as consisting of mafic and related intrusive rocks and mafic dikes (OGS, 2011). The existing wells are mapped for bedrock geology as the Mississage Formation, consisting of quartz-feldspar sandstone, argillite and conglomerate of the Huronian Supergroup (OGS, 2011).

The Blind River Dam, owned by the Ministry of Natural Resources, is located 300 m upstream of the Blind River's outlet into the north channel of Lake Huron. A 100-kilowatt generating station is located adjacent to the dam and is operated by the Town of Blind River. The Blind River Dam controls water levels for the lower Blind River and Lake Duborne.

The Town of Blind River occupies an area of approximately 514 km^2, with a population of 3,422 according to the 2021 Census (Statistics Canada, 2023). A notable industry in the area is the Blind River Refinery, located approximately 4.5 km west of the Town of Blind River's proposed new WTP intake (Figure 2). This industry refines uranium concentrates to produce uranium trioxide (UO_3), a product shipped and used as part of the nuclear fuel cycle (Cameco Corp., 2024).

3 SURFACE WATER VULNERABILITY ASSESSEMENT

3.1 INTAKE PROTECTION ZONE DELINEATION

In accordance with Technical Rules 61 and 62, the IPZ-1 of the proposed new intake was first delineated based on a radius of 1,000 m. Where the area within the 1,000 m radius intersected land, only a setback of 120 m of land was included in IPZ-1.

IPZ-2 was delineated based on:

- An in-water component, representing the area within Lake Huron in which contaminants could travel to the proposed new intake within a 2-hour timeframe;
- An up-tributary component, representing channels draining into Lake Huron in which contaminants could potentially be carried to the proposed new intake within a 2-hour timeframe; and
- An up-land component, representing transport pathways with the potential to carry contaminants to the intake. Such transport pathways include stormwater and tile drain networks with outfalls to the in-water or up-tributary components of the IPZ-2 and their respective catchments.

The delineated IPZ-1 and IPZ-2 of the proposed new intake have areas of approximately 247 and 252 hectares (ha), respectively, and are illustrated on Figure 3. A detailed methodology and discussion of the delineation results are provided in Appendix A.

3.2 INTAKE PROTECTION ZONE VULNERABILITY ANALYSIS

For each of IPZ-1 and IPZ-2, a vulnerability score must be determined in order to reflect the susceptibility of the intake to contaminants. The vulnerability score is a unitless value based on intake properties and attributes of the surrounding area, and is calculated from the following formula in accordance with the Technical Rules:

$$V = Vf_a \times Vf_s$$

Where V is the vulnerability score, Vf_a is the area vulnerability factor, and Vf_s is the source vulnerability factor. The calculation of these variables is described in the sections below.

3.2.1 Area Vulnerability Factor

For all intake types, the Technical Rules prescribe an area vulnerability factor of 10 for IPZ-1. For IPZ-2, the area vulnerability factor is to be a whole number of no less than 7 and no more than 9.

For an IPZ-2, the area vulnerability factor is to be based on:

- The percentage of the area of the IPZ that is composed of land;
- The land cover, soil type, permeability of the land and the slope of any setbacks; and
- The hydrological and hydrogeological conditions in the area that contribute water through transport pathways.

The Technical Rules do not prescribe a specific methodology for quantifying the components listed above, so BluMetric reviewed the methodology matrices used by other Source Protection Areas and Source Protection Regions in the province. The approach adopted by the Source Protection Areas within the Credit Valley – Toronto and Region – Central Lake Ontario Source Protection Region (CTC SPR), which encompasses sixteen municipal surface water intakes in Lake Ontario, was determined to be suitable.

The methodology matrix used in the CTC SPR (CTC SPC, 2015, 2019) for quantifying the area vulnerability factor is reproduced in Table 1.

Table 1: Area Vulnerability Factor Methodology Matrix (CTC SPC, 2015, 2019)

Factors	Component	Criteria		
		7 (Low)	8 (Moderate)	9 (High)
% Land	N/A	<33%	33% to 66%	>66%
Land Characteristics	Land Cover	Mainly forested	Agriculture and/or mixed vegetated & developed	Mainly developed
	Soil Type	Group A	Groups B & C	Group D
	Percent impervious	<33%	33% to 66%	>66%
	% Slope	<2%	2% to 5%	>5%
Transport Pathways	N/A	Limited presence of transport pathways	Mainly tile drainage and ditches	Mainly storm sewer

Group A – Low Runoff Potential (sands and gravels)
Groups B & C – Moderate Runoff Potential (sandy and silty loam soils)
Group D – High Runoff Potential (clay; soils in permanent high water table; shallow soils over nearly impervious material)

The IPZ-2 of the Town of Blind River's proposed new intake occupies an area of approximately 252 ha, of which approximately 70% is land-based, supporting an area vulnerability of High. Land cover in IPZ-2 was visually determined to consist of a mixture of agriculture, vegetated and developed land, while soils were identified as consisting predominantly of sandy loam (Ontario GeoHub, 2015); these land characteristics support an area vulnerability of Moderate. The surface area within IPZ-2 is occupied by large areas of open water and vegetated and agricultural land, which placed the percentage of impervious surface area below the threshold of 33% for Low area vulnerability.

The percent slope in IPZ-2 was estimated using the watershed relief-length ratio (a surrogate for watershed slope), an approach used in the Sault Ste. Marie Region Source Protection Area (SSMRCA, 2021). The maximum length of IPZ-2, following its longest flow path, was measured to be 2.4 km, while elevations in IPZ-2 were noted to range from 180 m to 200 m asl (MECP, 2024). A watershed relief-length ratio of 0.83% was estimated, supporting an area vulnerability of Low.

The Town of Blind River is known to be supported by storm sewer infrastructure, and no information on tile drains was identified on provincial agricultural mapping (MAFA, 2024). The Transport Pathways factor in Table 1 was therefore conservatively assumed to meet the criteria for High area vulnerability.

The overall area vulnerability factor for the proposed new intake was determined to be High, with a value of 9 (see Table 2).

Table 2: Proposed Town of Blind River WTP IPZ-2 Area Vulnerability Factor

Factors	Description	Supports a Vf_a of:
% Land	• Approx. 70% of the IPZ-2 is land	High
Land Characteristics	• Mixture of agriculture, vegetated and developed land • Groups B & C soil type • Percent impervious <33% • <2% slope	Moderate
Transport Pathways	• Mainly storm sewer	High
Overall Area Vulnerability Factor	**High (= 9)**	

3.2.2 Source Vulnerability Factor

For Type A intakes drawing water from a Great Lake, the Technical Rules prescribe a source vulnerability factor between 0.5 to 0.7, where a higher numerical value indicates a higher vulnerability. The source vulnerability factor must be determined based on:

- The depth of the intake from the top of the water surface;
- The distance of the intake from land; and
- The history of water quality concerns at the surface water intake.

As with the Area Vulnerability Factor, the methodology matrix used in the CTC SPR for calculating the Source Vulnerability Factor was applied for the Town of Blind River's proposed new intake (Table 3).

Table 3: Source Vulnerability Factor Methodology Matrix (CTC SPC, 2015, 2019)

Factor	Component		
	0.5 (Low)	0.6 (Moderate)	0.7 (High)
Depth of Intake	> 6.0 m	3.1 to 6.0 m	< 3.0 m
Distance from Land	> 500 m	300 to 500 m	< 300 m
History of raw water quality concerns	Excellent historical raw water quality at intake	Occasional historical raw water quality concerns at intake	Frequent historical raw water quality concerns at intake

Based on information provided by CIMA+, the proposed new intake is to be located approximately 370 m from shore at a minimum depth of 3.4 m at low water level, and no significant water quality concerns have been identified. The overall source vulnerability factor of the proposed new intake is therefore considered to be Moderate, with a score of 0.6. The rationale for the source vulnerability factor for the proposed new intake is summarized in Table 4.

Table 4: Town of Blind River WTP Proposed New Intake – Source Vulnerability Factor

Factors	Description	Supports a *Vf*, of:
Depth of intake	Minimum depth of 3.4 m below surface	Moderate
Distance of intake from land	Located 370 m from the shoreline	Moderate
Historical raw water quality concerns	None identified	Low
Overall Source Vulnerability Factor	**Moderate (=0.6)**	

3.2.3 Overall Vulnerability Scores

The calculated vulnerability scores for the proposed new intake's IPZ-1 and IPZ-2 were determined to be 6.0 and 5.4, respectively, as summarized in Table 5.

Table 5: Vulnerability Score Summary for the Proposed Blind River WTP Intake

Area Vulnerability Factor (Vf_a)		Source Vulnerability Factor (Vf_s)	Vulnerability Score (V)	
IPZ-1	IPZ-2		IPZ-1	IPZ-2
10	9	0.6	10 x 0.6 = 6.0	9 x 0.6 = 5.4

3.3 Evaluation of Drinking Water Quality Issues

As detailed in Part XI.1 of the *2021 technical rules under the Clean Water Act*, a drinking water issue may consist of either a pathogen or a parameter listed in Schedule 1, 2 or 3 of the Ontario Drinking Water Quality Standards or Table 4 of the Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines. The pathogen or water quality parameter is considered a drinking water issue if:

a. it is present at a concentration that may result in the deterioration of the quality of the water for use as a source of drinking water, or
b. there is a trend of increasing concentrations of the parameter/pathogen at the surface water intake, well or monitoring location and a continuation of that trend would result in the deterioration of the quality of the water for use as a source of drinking water.

No long-term water quality monitoring is known to have occurred in the vicinity of the proposed new intake of the Town of Blind River's WTP, precluding a proper evaluation of potential drinking water quality issues in accordance with the *2021 technical rules under the Clean Water Act*. However, the results from surface water sampling conducted by TULLOCH since May 2023 indicates an acceptable level of water quality in the lake (CIMA+, 2024). Samples have been collected at sites SW01 and SW05 (see Figure 2) since May 2023 and July 2023, respectively, on a regular to semi-regular basis of 1-2 times per month (excluding the winter months). Average concentrations of various parameters are detailed in Table 6.

Table 6: Average water quality measurements in the North Channel of Lake Huron based on samples collected from May 2023 – August 2024 (CIMA+, 2024)

Parameter	Average Value [1]	Ontario Drinking Water Standards, Objectives and Guidelines	
		Table 2 Chemical Standards (mg/L)	Table 4 Objectives and Guidelines (mg/L)
pH	7.92	N/A	6.5 – 8.5
Temperature (°C)	13.71	N/A	N/A
Conductivity (µS/cm)	120.58	N/A	N/A
Dissolved oxygen (%)	96.98	N/A	N/A
Dissolved oxygen (mg/L)	10.20	N/A	N/A
Clarity (m)	3.19	N/A	N/A

Parameter	Average Value [1]	Ontario Drinking Water Standards, Objectives and Guidelines	
		Table 2 Chemical Standards (mg/L)	Table 4 Objectives and Guidelines (mg/L)
Turbidity (NTU)	1.13	N/A	5
Hardness (mg/L)	52.17	N/A	80 - 100
Alkalinity (mg/L)	48.00	N/A	30 - 500
Dissolved organic carbon (mg/L)	4.40	N/A	5
Total organic carbon (mg/L)	3.85	N/A	N/A
UV Transmittance (%T)	72.97	N/A	N/A
UV Absorbency (cm^{-1})	0.07	N/A	N/A
Colour (TCU)	13.31	N/A	5
Total dissolved solids (mg/L)	71.08	N/A	500
Carbonaceous biochemical oxygen demand (mg/L)	ND	N/A	N/A
E. Coli (CFU/100 mL)	2.40	0	N/A
Total coliforms (CFU/100 mL)	74.60	0	N/A
Heterotrophic Plate Count (CFU/1 mL)	917.50	N/A	N/A
Nitrate (mg/L)	0.19	10	N/A
Nitrite (mg/L)	ND	1	N/A
Chloride (mg/L)	5.41	N/A	N/A
Ammonia (mg/L)	ND	N/A	N/A
Sulfate (mg/L)	11.90	1	N/A
Sodium (mg/L)	3.66	N/A	20
Phosphate (mg/L)	ND	N/A	N/A

[1] *Average values were calculated by merging the results from sites SW01 and SW05.*
ND = Non-detect
N/A = Not applicable

Limited water quality data was also collected by the Canadian Nuclear Safety Commission in Lake Huron and Blind River as part of an Independent Environmental Monitoring Program of the Blind River Refinery (CNSC, 2024). Water quality data from three of closest monitoring locations are listed in Table 7 below. The monitoring locations are illustrated on Figure 2.

Table 7: Water Quality Data collected by the Canadian Nuclear Safety Commission in Lake Huron and Blind River in the vicinity of the proposed new water supply intake

BR12-W08							
Sample Type	**2013**	**2014**	**2017**	**2018**	**2020**	**2023**	**Guideline / Screening Levels**
Nitrate	<0.38 mg/L	1.53 mg/L	0.11 mg/L	0.32 mg/L	<0.1 mg/L	<1.4 mg/L	13 mg/L
pH	6.85	7.33	7.3	7	7.4	7.7	6.5 - 9.0
Radium-226	-	-	-	-	<0.03 Bq/L	<0.09 Bq/L	0.5 Bq/L
Uranium	0.16 µg/L	0.15 µg/L	<0.10 µg/L	0.12 µg/L	0.15 µg/L	0.181 µg/L	15 µg/L
BR15-W09							
Sample Type	**2013**	**2014**	**2017**	**2018**	**2020**	**2023**	**Guideline / Screening Levels**
Nitrate	<0.38 mg/L	1.81 mg/L	-	-	-	-	13 mg/L
pH	6.48	6.87	-	-	-	-	6.5 - 9.0
Uranium	0.04 µg/L	0.05 µg/L	-	-	-	-	15 µg/L
BR16-W10							
Sample Type	**2013**	**2014**	**2017**	**2018**	**2020**	**2023**	**Guideline / Screening Levels**
Nitrate	<0.38 mg/L	0.97 mg/L	-	-	-	-	13 mg/L
pH	6.79	7.17	-	-	-	-	6.5 - 9.0
Uranium	0.05 µg/L	0.04 µg/L	-	-	-	-	15 µg/L

The limited data above do not indicate increasing trends or concentrations that would deteriorate the quality of the North Channel of Lake Huron as a source of drinking water.

3.4 Threats Assessment

3.4.1 Approach and Methodology

In accordance with the Technical Rules, the following activities and conditions were assessed for their potential risk to source water quality:

- Activities that are prescribed as drinking water threats in Ontario Regulation (O. Reg.) 287/07; and
- Conditions resulting from past land use activities.

Prescribed Activities

The following activities are prescribed as drinking water threats in O. Reg. 287/07 subsection 1.1(1):

1. The establishment, operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.
2. The establishment, operation or maintenance of a system that collects, stores, transmits, treats or disposes of sewage.
3. The application of agricultural source material to land.
4. The storage of agricultural source material.
5. The management of agricultural source material.
6. The application of non-agricultural source material to land.
7. The handling and storage of non-agricultural source material.
8. The application of commercial fertilizer to land.
9. The handling and storage of commercial fertilizer.
10. The application of pesticide to land.
11. The handling and storage of pesticide.
12. The application of road salt.
13. The handling and storage of road salt.
14. The storage of snow.
15. The handling and storage of fuel.
16. The handling and storage of a dense non-aqueous phase liquid (DNAPL).
17. The handling and storage of an organic solvent.
18. The management of runoff that contains chemicals used in the de-icing of aircraft.
19. An activity that takes water from an aquifer or a surface water body without returning the water taken to the same aquifer or surface water body.
20. An activity that reduces the recharge of an aquifer.
21. The use of land as livestock grazing or pasturing land, an outdoor confinement area or a farm-animal yard.
22. The establishment and operation of a liquid hydrocarbon pipeline.

Activities #19 and #20 are not considered in this assessment as they are not applicable to surface water quality.

The prescribed activities are further detailed in the tables of drinking water quality threats (TDWT) under Part XII of the *2021 technical rules under the Clean Water Act*. The tables list the circumstances under which each prescribed activity is either a significant, moderate or low drinking water threat (chemical or pathogen). To identify the activities that would constitute significant,

moderate or low drinking water threats if they were to occur within the proposed new intake's IPZs, the circumstances listed in the TDWT were cross-referenced against the vulnerability scores of IPZ-1 and IPZ-2 (6.0 and 5.4, respectively). The circumstances that are potentially applicable to the proposed new intake's IPZs are presented in Appendix B and summarized in Section 3.4.2.

Conditions Resulting From Past Land Use Activities

The Technical Rules state that conditions resulting from past land use activities may be considered drinking water threats. As per Technical Rule 126, the following conditions are considered drinking water threats in a surface water IPZ:

- The presence of a single mass of more than 100 litres of one or more dense non-aqueous phase liquids in surface water in a surface water intake protection zone;
- The presence of a contaminant in surface soil in a surface water IPZ if the contaminant is listed in Table 4 of the Soil, Ground Water and Sediment Standards (SCS), and is present at a concentration that exceeds the surface soil standard for industrial/commercial/community property use set out for the contaminant in that Table and the presence of the contaminant in surface soil could result in the deterioration of the surface water for use as a source of drinking water;
- The presence of a contaminant in sediment in an IPZ, if the contaminant is listed in Table 1 of the SCS and is present at a concentration that exceeds the sediment standard set out for the contaminant in that Table, and the presence of the contaminant in sediment could result in the deterioration of the surface water for use as a source of drinking water; and
- The presence of a contaminant in groundwater that is discharging into an IPZ, if the contaminant is listed in Table 2 of the SCS, the concentration of the contaminant exceeds the potable groundwater standard set out for that contaminant in the Table, and the presence of the contaminant in groundwater could result in the deterioration of the surface water for use as a source of drinking water.

A risk score must be determined for all identified conditions, based on the equation:

Hazard Rating x Vulnerability Score = Risk Score

Where:

- The hazard rating of a condition resulting from a past activity is assigned a value of either 10 or 6. A value of 10 is assigned if there is evidence that the condition is causing off-site contamination, and/or the condition is on a property where the intake of the drinking water system is located. Otherwise, the hazard rating is 6;

- The vulnerability score corresponds to the IPZ in which the condition is located;
- The risk score determines whether the condition represents a significant, moderate or low threat:
    - Significant threat: a risk score greater than or equal to 80;
    - Moderate threat: risk score greater than 60 and less than 80;
    - Low threat: risk score greater than 40 but less than 60;
    - Not a threat: risk score less than or equal to 40;
- A condition is also considered significant if it is associated with a drinking water quality issue, or if there is evidence that it may be causing off-site contamination.

In order to identify potential conditions for the proposed new intake, the following sources were consulted:

- MECP Spills database (Ontario, 2023a);
- Federal Contaminated Sites Inventory (Treasury Board of Canada Secretariat, undated); and
- Records of Site Condition databases (Ontario, 2023b).

The results of the data and records searches are discussed in Section 3.4.3.

3.4.2 Prescribed Activities

The TDWT was truncated to include only those circumstances that would be applicable to an IPZ-1 and an IPZ-2 with vulnerability scores of 6.0 and 5.4, respectively. The numbers of potential circumstances of significant, moderate and low threats are summarized in Table 8.

Table 8: Number of Potential Circumstances of Significant, Moderate and Low Threats for an IPZ-1 and an IPZ-2 with vulnerability scores of 6.0 and 5.4

IPZ	Vulnerability Score	Chemical Threats			Pathogen Threats		
		Significant	Moderate	Low	Significant	Moderate	Low
1	6.0	0	8	188	0	14	15
2	5.4	0	0	154	0	0	22

For an IPZ-1 with a vulnerability score of 6.0:

- There are no circumstances under which a prescribed activity would present a significant drinking water threat;
- Circumstances of moderate drinking water threats include activities involving waste disposal sites, sewage systems and snow storage;

- With the exception of prescribed drinking water threats #5 (management of agricultural source material) and #19 and #20 (not associated with surface water quality), circumstances exist for all prescribed activities to pose a low chemical threat;
- Activities that could pose a low or moderate pathogen threat are associated with agricultural and livestock activities, sewage systems and waste disposal sites.

For an IPZ-2 with a vulnerability score of 5.4:

- There are no circumstances under which a prescribed activity would present a significant or moderate drinking water threat;
- With the exception of prescribed drinking water threats #5 (management of agricultural source material), and #19 and #20 (not associated with surface water quality), circumstances exist for all prescribed activities to pose a low chemical threat;
- Activities that could pose a low pathogen threat are associated with agricultural and livestock activities, sewage systems and waste disposal sites.

The circumstances of low and moderate drinking water threats described above are detailed in Appendix B.

3.4.3 Conditions

The MECP Spills Database was accessed on September 11, 2024, and records of spills in the Town of Blind River from 2003 to 2022 were reviewed (Ontario, 2023a). The exact geographic locations of the spills are not reported in the database, however, none of the spills in the Town of Blind River that resulted in confirmed environmental impacts appeared to involve DNAPLs. Therefore, no conditions were identified from the spills database.

The Federal Contaminated Sites Inventory was accessed on September 11, 2024 (Treasury Board of Canada Secretariat, undated). No active or former contaminated sites were identified in IPZ-1 or IPZ-2.

A search for Records of Site Condition for properties located within the proposed new intake's IPZ-1 and IPZ-2 yielded no results (Ontario, 2023b).

Sediment quality data collected in Lake Huron in support of the Great Lakes Water Quality Agreement was reviewed (ECCC, 2023). While no sediment quality data was available within the IPZs, sediment quality was analyzed in the North Channel of Lake Huron in 2021 at a point approximately 17.2 km west of the proposed Blind River WTP intake. The available data indicates an exceedance of the Lowest Effect Level (LEL) for cadmium, chromium, iron and manganese, and

an exceedance of the Severe Effect Level (SEL) for nickel. A comparison of the LEL and the SEL under the Provincial Sediment Quality Guidelines (MOE, 2008) and Table 1 of the Soil, Ground Water and Sediment Standards (MOE, 2011) is provided in Table 9.

Table 9: Sediment Quality Data collected in 2021 in the North Channel of Lake Huron (ECCC, 2023)

Parameter	2021 Sediment Quality	Lowest Effect Level (LEL) [1]	Severe Effect Level (SEL) [1]	Table 1 SCS – Sediment [1]
Cadmium	> LEL	0.6	10	0.6
Chromium	> LEL	26	110	26
Iron	> LEL	2	4	N/A
Manganese	> LEL	460	1,100	N/A
Nickel	> SEL	16	75	16

N/A – Not applicable

[1] All units in µg/g dry weight

As noted previously, the above sediment quality results are for a location outside the IPZs, approximately 17.2 km west of the proposed intake. Had these exceedances been observed within the IPZ, further investigation would be needed to determine whether the presence of cadmium, chromium and nickel within sediment could result in the deterioration of surface water quality, in which case they may be considered drinking water threats.

Based on the review detailed above, no conditions resulting in drinking water threats were identified in the IPZs of the Town of Blind River WTP's proposed new intake.

3.5 Uncertainty Assessment

Technical Rule 9(2)(f) requires a description of every uncertainty analysis conducted as part of the surface water quality assessment. The sources of uncertainty that were considered for each major task are described in the table below. As per Technical Rule 13, the uncertainty is either "High" or "Low", though some Source Protection Areas (e.g., Credit Valley SPA (CTC SPC, 2019)) have opted to include "Moderate" as an option when assessing uncertainty.

Table 10: Evaluation of Sources of Uncertainty for the Proposed Town of Blind River WTP New Intake

Task	Description of Uncertainty	Uncertainty
Intake Classification	The Technical Rules prescribe Lake Huron to be a Great Lake.	Low
IPZ-1 Delineation	Dimensions for the IPZ-1 delineation are prescribed by the Technical Rules.	Low
IPZ-2 Delineation	Maximum flow had to be estimated using data spanning a short duration period. The ECOMSED model used in the IPZ delineation operates with a relatively coarse grid size of 200 m by 200 m. Sections of the storm sewer network had to be inferred from previous delineations, the open channel network, and property lines.	High
Vulnerability Scores	Insufficient historical raw water quality data was available for the proposed new intake.	Moderate
Issues Evaluation	Insufficient historical water quality data was available to conduct a proper evaluation of potential drinking water quality issues.	Moderate

The IPZ-2 delineation was assessed as having a High level of uncertainty. Such a rating is fairly common, as the IPZ-2 delineations within the Sault Ste. Marie Region SPA, Grey Sauble SPA, Credit Valley SPA and Central Lake Ontario SPA were also determined to have a High level of uncertainty.

3.5.1 Data Gaps

The available data was overall of sufficient quality and quantity to complete a general surface water quality assessment for the proposed new intake of the Blind River WTP. Opportunities nonetheless exist to further improve the accuracy of the assessment:

- No conditions resulting from past land use activities were identified that would present a drinking water threat to the proposed new WTP intake (Section 3.4.3). Exceedances of the sediment standards of Table 1 of the SCS were documented for cadmium, chromium and nickel within the North Channel of Lake Huron, at a point approximately 17.2 km west of the proposed Blind River WTP intake. However, no specific soil, groundwater and sediment quality data was available within the IPZs that could be compared to the applicable SCS tables. The collection and analysis of soil, groundwater and sediment data in the vicinity of historical contaminating activities may add more certainty regarding the existence or absence of conditions;
- No historical raw water quality data is available in the immediate vicinity of the proposed new intake, so the issues evaluation in Section 3.3 relied on limited historical data collected by other parties in Blind River and Lake Huron, and on recent (2023-2024) water quality data collected by TULLOCH and CIMA+ near the proposed new intake. Once the new intake is installed, water quality data should be collected in accordance with all applicable requirements;

- For the delineation of IPZ-2 (Appendix A), sections of the storm sewer network were deduced from previous delineations, the open channel network and property lines. The accuracy of the delineation could be improved by conducting a detailed account of the existing storm sewer network.

4 LIMITATIONS

This Report has been prepared for the exclusive use of TULLOCH, CIMA+ and the Town of Blind River in accordance with the scope of work detailed therein.

The opinions and recommendations provided by BluMetric in this report have relied in good faith on the information provided by others as noted in the report and have not been independently verified for accuracy or completeness. BluMetric has also assumed that the information provided is factual and accurate.

The limitations noted apply to the report body, appendices and all report tables and figures. BluMetric agrees that the report represents its professional judgement as described above and that the information has been prepared for the specific purpose and use described in the report.

The findings presented in this report are based on the conditions observed and reported by others at specified dates and locations, and for the types of analysis completed. Unless otherwise stated, the findings in this report cannot be extended to previous or future site conditions, portions of the study area that were not investigated directly, or types of analysis not performed.

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5 CLOSURE

We trust that the information provided herein is complete and contains sufficient detail. Please contact the undersigned should you have any concerns or questions.

Respectfully submitted,
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FIGURES

LEGEND

- Proposed new Intake
- Blind River Water Treatment Plant
- Existing water supply wells

REV.	DESCRIPTION	YY/MM/DD	BY	CHK
1				

REFERENCES

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CLIENT

TULLOCH

PROJECT

Blind River Water Treatment Plant New Intake Surface Water Vulnerability and Threats Assessment

TITLE

Site Map

BluMetric Environmental
Unit 3B - 209 Frederick St.,
Kitchener, Ontario, N2H 2M7
TEL: (519) 742-6685
Email: info@blumetric.ca
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PROJECT #	DATE
240168	September 12, 2024

DRAWN	CHECKED	FIG NO.	REV
PB	MKB	01	0

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LEGEND

- Proposed new Intake
- Canadian Nuclear Safety Commission surface water monitoring stations
- Refinery
- CIMA+/TULLOCH surface water monitoring stations

REV.	DESCRIPTION	YY/MM/DD	BY	CHK
1				

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TULLOCH

PROJECT

Blind River Water Treatment Plant New Intake Surface Water Vulnerability and Threats Assessment

TITLE

Regional Setting

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PROJECT #	DATE
240168	September 26, 2024

DRAWN	CHECKED	FIG NO.	REV
PB	MKB	02	0

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LEGEND

- IPZ-1
- IPZ-2

REV.	DESCRIPTION	YY/MM/DD	BY	CHK
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REFERENCES

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CLIENT

TULLOCH

PROJECT

Blind River Water Treatment Plant New Intake Surface Water Vulnerability and Threats Assessment

TITLE

IPZ Delineation

BluMetric Environmental

Unit 3B - 209 Frederick St., Kitchener, Ontario, N2H 2M7
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PROJECT #	DATE
240168	September 12, 2024

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APPENDIX A

Blind River Water Treatment Plant – Intake Protection Zone Delineation

1 INTRODUCTION

The Town of Blind River is currently conducting a Schedule 'B' Municipal Class Environmental Assessment (Class EA) Study to identify the best water supply solution for the Blind River Water Treatment Plant (WTP). The recommended alternative for the WTP's new intake is located in the North Channel of Lake Huron, illustrated on Figure 1. BluMetric was retained by TULLOCH to delineate the Intake Protection Zones (IPZs) for the proposed new intake in accordance with the *2021 technical rules under the Clean Water Act*.

1.1 INTAKE CLASSIFICATION

The Water Treatment Plant, which draws water directly from Lake Huron (one of the Great Lakes), features a Type A intake. As stipulated by the *2021 technical rules under the Clean Water Act*, it is necessary to establish two IPZs for Type A intakes.

Intake Protection Zones (IPZs) are regions surrounding water intakes that are susceptible to contamination. According to Technical Rules 55 - 74, a primary zone (IPZ-1) with a 1,000-meter radius around the intake and a secondary zone (IPZ-2), defined by the response time needed for a WTP operator to manage an event that could jeopardize water quality, must be established for the Blind River WTP intake. IPZ-2 is typically defined by a 2-hour travel time.

2 METHOD

2.1 IN-WATER COMPONENT

IPZ-2's in-water section was defined as the area where pollutants from a spill could reach the intake within a two-hour timeframe. To simulate contaminant movement, a hydrodynamic model was created using ECOMSED software, which was then coupled with the RCA (Row-Column AESOP) water quality modeling software. Created by Hydroqual in 2002, ECOMSED and RCA are open-source software designed for modeling water quality and sediment transport in lakes and rivers.

ECOMSED uses a range of modules to model hydrodynamic conditions, sediment movement, dissolved tracer paths, and water quality. To define the in-water portion of IPZ-2, the system employed both the three-dimensional hydrodynamic and wave modules to assess the conditions around the intake area in Lake Huron. These results were then transferred to RCA for simulating how contaminants spread.

The wave module in ECOMSED employs wave parameters to determine wave-induced bottom friction, which is crucial for calculating bed shear stresses at the sediment-water interface. This module is based on the GLERL wave model created by Donelan in 1977 and later refined by Schwab et al. in 1984. The hydrodynamic module offers data on advection and dispersion, aiding in the calculation of transport parameters.

RCA, a water quality simulation program, uses the transport fields from ECOMSED to calculate the movement of water quality variables. To establish the 2-hour travel time boundary, a saturated point source contamination, simulating a significant spill, was input into RCA at various points.

Where the in-water IPZ-2 zone intersects with the shoreline, a setback of 120 meters was implemented.

2.2 UP TRIBUTARY COMPONENT

The IPZ-2 upstream tributary component was delineated using the standardized methodology established for IPZ-2 delineation for the DeCrew Falls, Grimsby, and former Rosehill WTP plant intakes (Stantec 2009). The IPZ-2 was identified based on a 2-hour travel time for contaminants to move along a tributary to Lake Huron and then from the tributary mouth to the intake. The up-tributary component of IPZ-2 consists of two parts:

1- Blind River Channel and reservoir regulated by the Blind River dam. The Blind River Dam is located approximately 300 meters upstream of the Blind River outlet into the north channel of Lake Huron. It is owned by the Ministry of Natural Resources, and operated by the Town of Blind River. The dam plays a critical role in controlling water levels for the lower Blind River and Lake Duborne. Additionally, it is linked to a 100-kW hydroelectric generating station managed by the town.

2- In-land part, which includes the Town of Blind River.

The travel time was calculated based on the residual time of travel (RTOT), which measures the duration a contaminant takes to traverse a tributary, excluding the time it takes from the tributary's mouth to the intake. It is computed by subtracting the travel time from the tributary's mouth to the intake from the total 2-hour travel period.

2.2.1 Channel and Reservoir

Given the flow regulation by the Blind River dam, the flow velocity in the channel and in the upstream reservoir was modelled by a HEC-RAS 2D flow model. HEC-RAS (Hydrologic Engineering Center's River Analysis System) is developed by the U.S. Army Corps of Engineers for simulating water flow through natural rivers and other channels.

A 2D HEC-RAS model was used to compute flow velocity in the channel and reservoir upstream of dam. The process includes refining the reservoir and channel digital terrain model (DTM) to represent the bathymetry of the channel. Representing the Blind River Dam as a storage area connector, which was further refined to represent the detail of dam spillway gates. The distribution of velocity along the channel and reservoir was calculated, which was further used to account for the travel time to the mouth of river.

2.2.2 Town of Blind River

The land-based time of travel was estimated by GeoHEC-HMS model. GeoHEC-HMS is a stormwater modeling software that builds upon the HEC-HMS (Hydrologic Engineering Center - Hydrologic Modeling System) capabilities developed by the US Army Corps of Engineers. The model offers automated watershed delineation using high-resolution 3D digital elevation data.

GeoHEC-HMS can be used for the delineation of Intake Protection Zones (IPZ). The process involves setting up a hydrologic model of the watershed, which includes importing necessary data such as topographic maps, land use data, and hydrologic parameters. By defining the boundaries based on a specified travel time, typically a 2-hour window, the model can simulate the flow paths into the lake.

The process to calculate the flow paths included subbasin delineation of the entire Blind River region. This further was followed by calculating time of concentration (TOC) per flow path. Each flow path was adjusted based on land-use and topographic features of the system to compute a realistic TOC. Moreover, the intersections with the Storm Water Management (SWM) network have been considered for more accuracy. Finally, the TOC from the land through the lake and reservoir was considered as inland RTOT.

2.3 DATA

2.3.1 Digital Terrain Model

The Digital Terrain Models (DTMs) were retrieved from Open Maps Canada for the Blind River region. The DTMs were further merged and processed. The process includes burning channel and creeks into the DTM to have a realistic representation of the topography of the system. The DTM resolution was 1 m and was used in both hydraulic and hydrology models.

2.3.2 Bathymetry

The bathymetry of Lake Huron was downloaded from publicly available data from the National Oceanic and Atmospheric Administration. The resolution of the raster is 30 m, which was accurate enough for the lower resolution hydrodynamic model.

2.3.3 Water Level

Daily water level data was acquired from Environment Canada's Thessalon Station (46°15'14" N 83°33'03" W), which was the closest station to the Town of Blind River (approximately 50 km west of the town). The water level fluctuations were used to calculate the tidal amplitude and phase. In general, the Great Lakes are not influenced by tidal consequences except small diurnal fluctuations due to solar and lunar influence. The tidal amplitude and phase were calculated using Fast Fourier Transform (FFT). The water level was extracted from observations for FFT analysis.

The FFT was performed on the water level data to obtain the frequency and phase spectra and the phases of key tidal constituents were calculated. Figure 2-1 shows the frequency and phase spectrum analyses. The graph in the top panel illustrates the frequency spectrum of water levels, with the x-axis representing frequency in units of 1/minute and the y-axis showing magnitude. The figure shows a prominent spike at zero frequency, with the magnitude tapering off to near-zero for all other frequencies. This indicates that the water level data primarily consists of a constant or slowly varying signal, resulting in a strong DC component. The absence of significant magnitudes at higher frequencies suggests minimal fluctuations or rapid changes in the water levels over the observed time period.

The zero-frequency spike reflects the average value of the signal, while the flat magnitude at higher frequencies implies a lack of high-frequency variability. This pattern is expected as the water levels remain relatively stable during the measurement period.

Table 2-1 summarizes the identified tidal constituents, their frequencies, and the converted phases.

Table 2-1: Tidal Phase and Frequency

Tidal Constituent	Frequency (1/minute)	Phase (degrees)
M2	0.0027	359.6
S2	0.0028	78.5
N2	0.0026	108.7
K1	0.0007	222.2
O1	0.0006	46.8
P1	0.0007	222.2

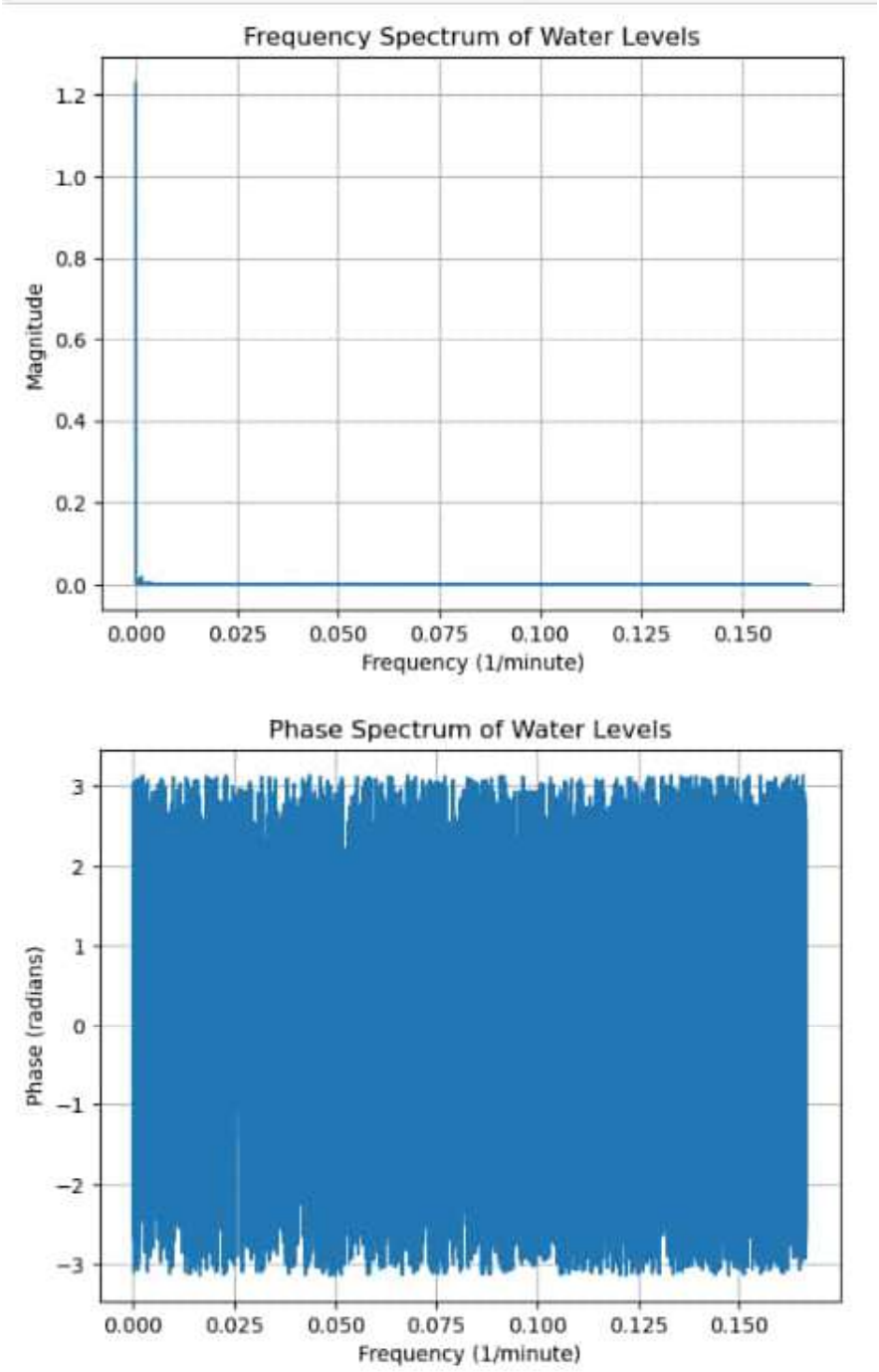

Figure 2-1: Phase and Frequency Spectrum of Water Level

2.3.4 Wind Data

Hourly wind speed and wind direction data were obtained from the Environment Canada SAULT STE MARIE A station, located approximately 120 kilometers from the Blind River intake (46°29'06.000" N, 84°30'35.000" W). Over a span of 10 years, data were utilized to calculate

the maximum wind speed for each of the eight primary compass directions (see Table below). The model was implemented for all wind directions to identify the critical wind in terms of spread of contamination.

Direction	Max Wind Speed (km/h)
N	39
NE	38
E	43
SE	25
S	26
SW	36
W	58
NW	52

2.3.5 Discharge

The flow boundary conditions for the study area were established using discharge data from the Blind River. Located adjacent to the river's mouth, the study area experiences significant water movement influenced by the river's outflow. The flow data was sourced from publicly available information on the Town of Blind River website (https://www.blindriver.ca/en/business-development/blind-river-dam.aspx#2019-water-level-reports), covering the period from 2018 to 2024. This data includes the storage level behind the dam and the number of logs removed, which correlates to flow in cubic meters per second (cms).

Due to the limited duration of the dataset and the presence of missing data, we opted to use the yearly maximum flow as a conservative estimate of the dam's output. For this study, the maximum flow was determined to be 35 cms.

3 RESULTS

3.1 IPZ-1

Figure 3-1 shows the location of the intake in Lake Huron. The intake has around 370 m of offshore length with a total length of 410 m. The diameter of the pipe is 400 mm, with raw water design flow of 6,800 m^3/s. The invert elevation of the pipe is 4 meters. The following figure also shows the IPZ-1 boundary. Based on the definition, IPZ-1 boundary is a 1,000 m circular area around the WTP intake. A 120 m setback was considered when the IPZ-1 boundary touches the land.

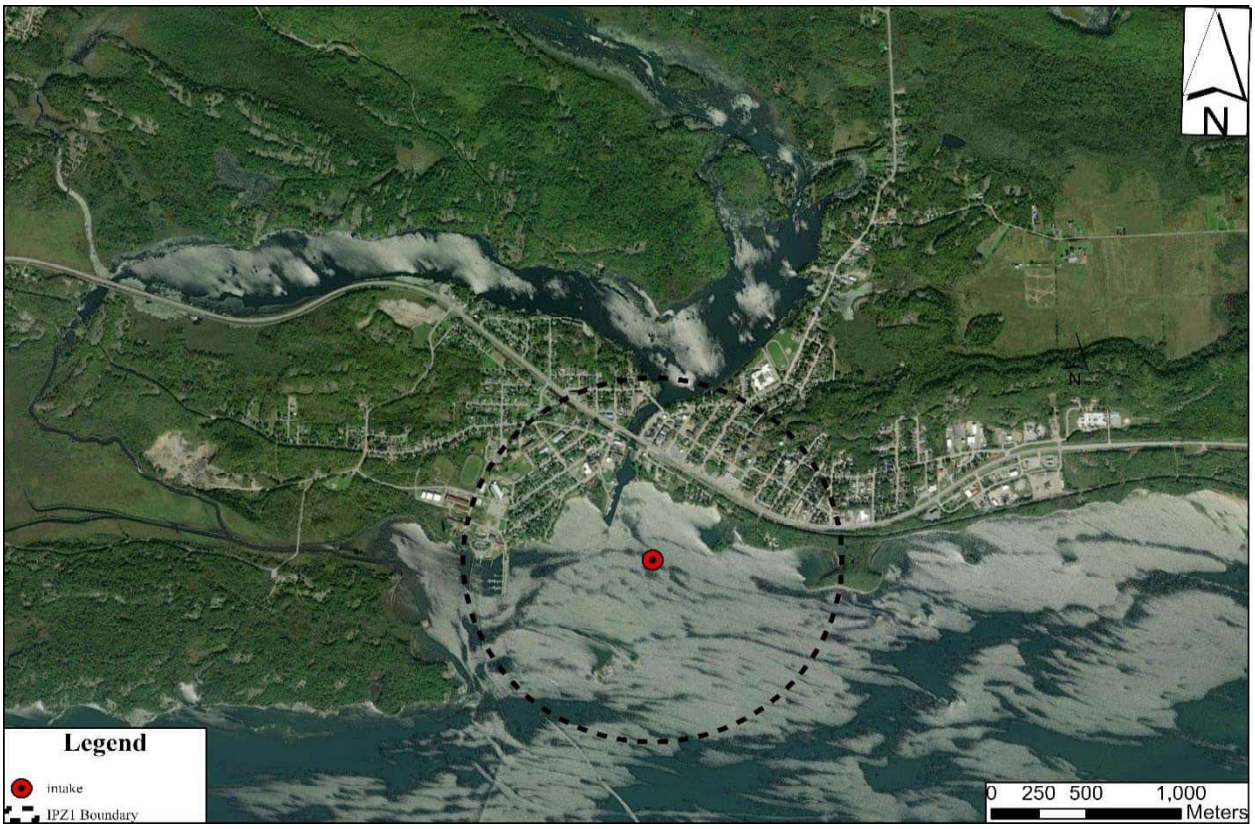

Figure 3-1: IPZ1 boundary

3.2 IPZ-2

3.2.1 Lake

The figure below illustrates the boundary of IPZ-2 within the lake. The different layers in the figure represent the travel time to the WTP intake. To determine the travel time, the output from the hydrodynamic model (ECOMSED) was used as input for the quality model (RCA). For each data point in the model, with a resolution of 200 m, a distinct high concentration load was assigned. RCA was then iteratively run to simulate the travel time to the intake. These results were subsequently aggregated and interpolated across the study area to calculate the overall travel time. The simulations were based on a scenario where contamination originates from a saturated point source, resulting in significant dispersion of tracer particles.

As seen, the travel time is mainly driven by advection under the effect of the river mouth (outflow of Blind River Dam) in the northern part of the lake. Additionally, strong southern winds and the high dispersion from the point source contribute to the fast northward movement of contaminants. At the start of a spill, contaminants spread rapidly through diffusion due to high concentration differences. As the contamination spreads, the concentration decreases and the rate of diffusion slows down, which is why there is a noticeable area of rapid travel (0 – 30 minutes) near the intake.

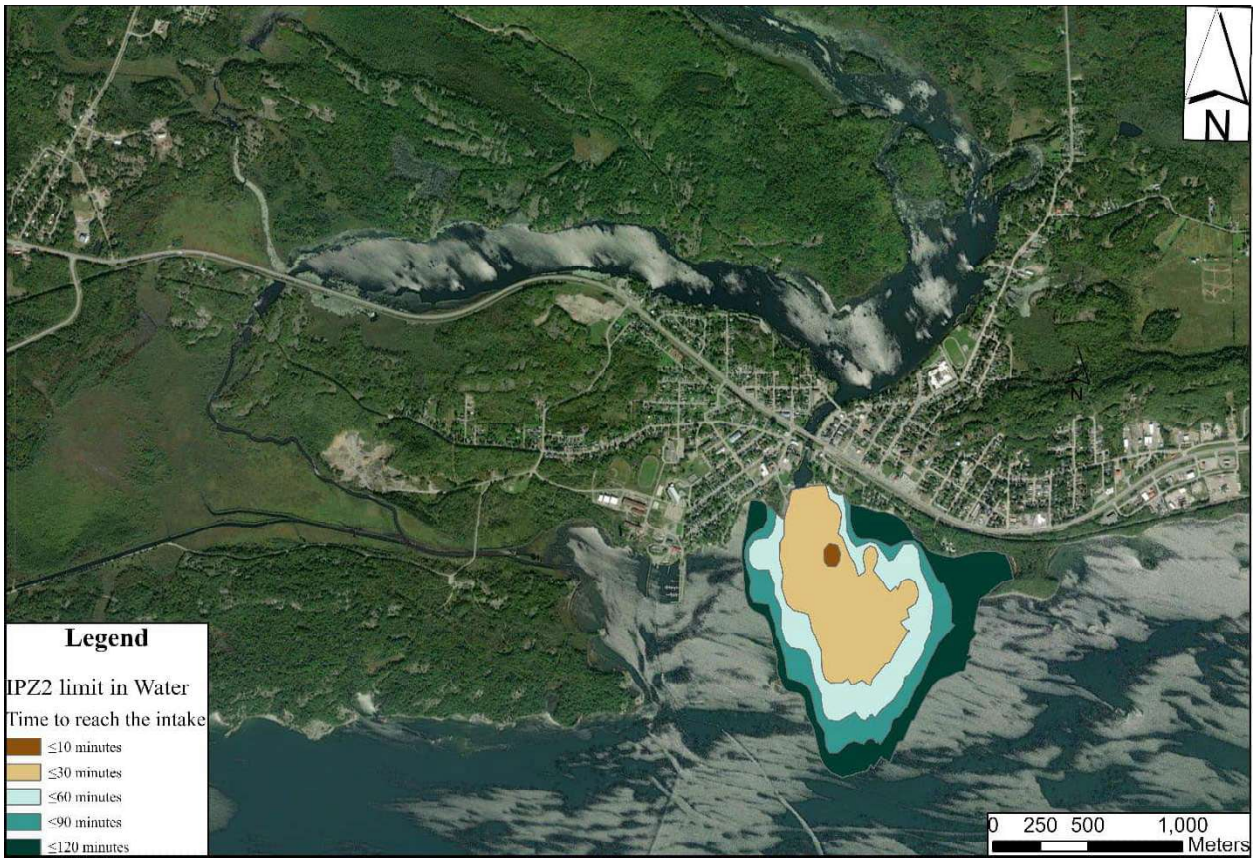

Figure 3-2: IPZ-2 boundary in lake

3.2.2 Channel/Reservoir dam upstream

Figure 3-3 illustrates the distribution of maximum velocity (in m/s) upstream of the Blind River dam during the simulation. The SA/2D Connections layer facilitated the linkage between storage areas and 2D flow areas and acted as a hydraulic connection within a 2D Flow Area. Within a single 2D Flow Area, hydraulic structures were utilized to adjust terrain elevations and define the equation set for calculating the water surface at the dam.

Additionally, the channel and storage area were modified by incorporating the channel into the reservoir, following guidance from knotty maps and the Hatch report, *Blind River Dam Generating Station - Surface Water Study Report For Blind River Dam GS Permit to Take Water* (Hatch, 2017). It was also assumed that all gates (logs) were open during the spring freshet flow, as confirmed by log data from the Town of Blind River. To accurately simulate the spring freshet flow, the model was run for 3 days to achieve an equilibrium state, as depicted in Figure 3-4. This figure shows that the maximum flow will reach 35 cms after 3 days, which is the maximum input flow to the system.

The maximum velocity occurs at the dam outlet, reaching approximately 2 m/s. Additionally, there is no overflow from the streamflow into the creeks situated in the western part of the system, which aligns with the observations reported by the authorities.

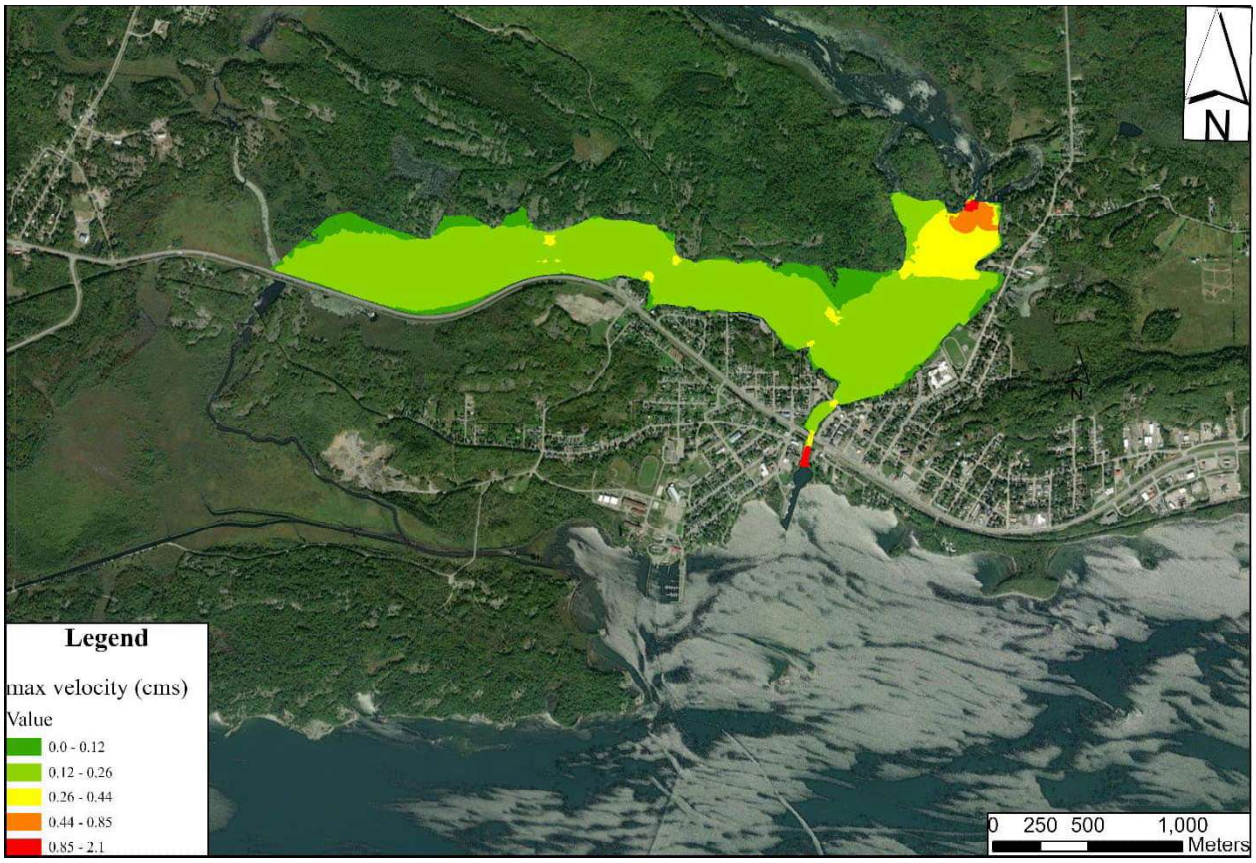

Figure 3-3 Maximum velocity distribution Blind River Channel and Reservoir

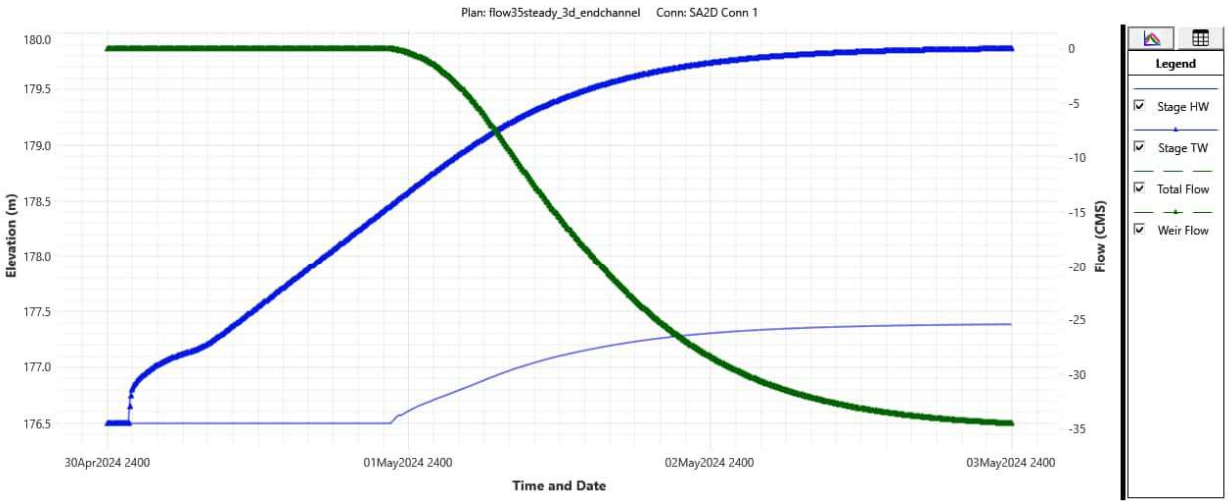

Figure 3-4: Stage Head Water (HW), Stage Tale Water (TW) and flow at the Blind River Dam.

To calculate the RTOT in the channel, the spatial average of the maximum velocity was iteratively computed to determine the maximum distance from the river mouth. This distance represents how far a particle can travel in 90 minutes to reach the river mouth. Previous observations indicated that the travel time from the river mouth to the intake is approximately 30 minutes. Therefore, the residual time for IPZ-2 delineation is 90 minutes, accounting for the two-hour travel time requirement. It is important to note that advection is assumed to be the primary mechanism driving contaminant transport across the dam reservoir and channel during the peak outflow of the spring freshet, which is considered a conservative estimate.

The figure below illustrates the *maximum distance* boundary for the channel and reservoir upstream of the dam. The spatially averaged velocity for the event is approximately 0.3 m/s, and the *maximum distance*, given a 90-minute RTOR, is 1,600 meters. The limit of the IPZ-2 for the channel and reservoir is defined by the intersection of a circular area with a radius of 1,600 meters, centered at the river mouth, and the channel polygon. Furthermore, a setback of 120 meters was considered for delineation of IPZ-2 as buffer zone, which can be seen in Figure 3-5.

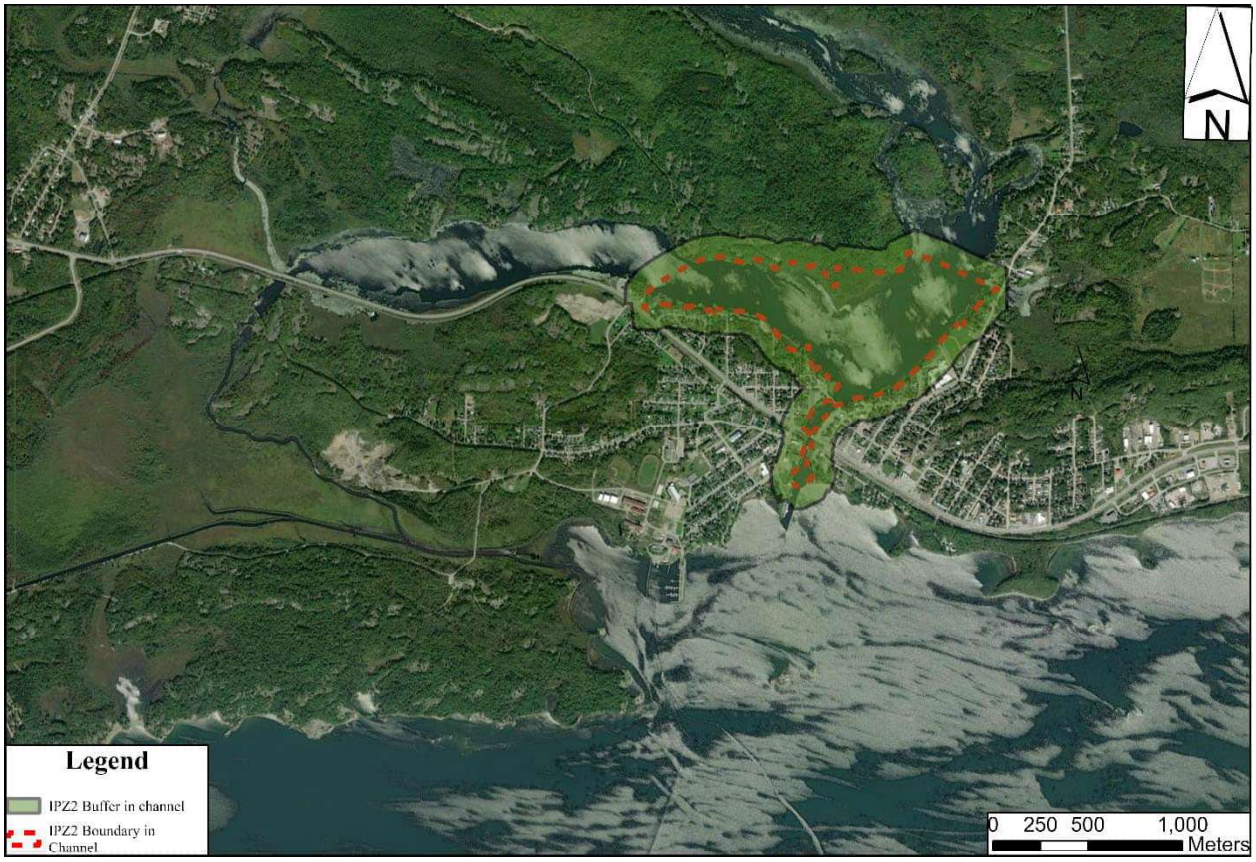

Figure 3-5: IPZ-2 boundary with 120 m setback as buffer for Blind River Channel and Reservoir

3.2.3 Land

Given the dearth of data regarding the stormwater system, a GeoHEC-HMS model was created to identify flow paths and associated time of concentration inside the system. The SWM system was adjusted according to observations from publicly available satellite images. The flow paths were further modified according to the existing stormwater SWM system. Each of the flow paths entering the SWM system or the reservoir/channel were identified, and the residual travel time was calculated based on time of concentration per flow path. The Figure below shows the inland IPZ-2 boundary delineation. Since a major part of the SWM system was included in the IPZ-1 boundaries, calculation of time of concentration was not necessary for those SWM pipes and flow paths inside the boundary. Figure 3-6 demonstrates the flow paths and SWM pipes releasing into the channel and IPZ-1 boundary with the total RTOT of less than 90 minutes. As per usual, a 120 m setback is considered for the IPZ-2 buffer zone.

It is important to note that the velocity is not uniformly distributed, being higher in the western part of the channel, especially upstream (Figure 3-3). Consequently, particles are likely to move faster towards the river mouth compared to those in the western part of the reservoir. This observation necessitated a more conservative approach for the IPZ in the eastern part of the channel within the Town to account for this difference.

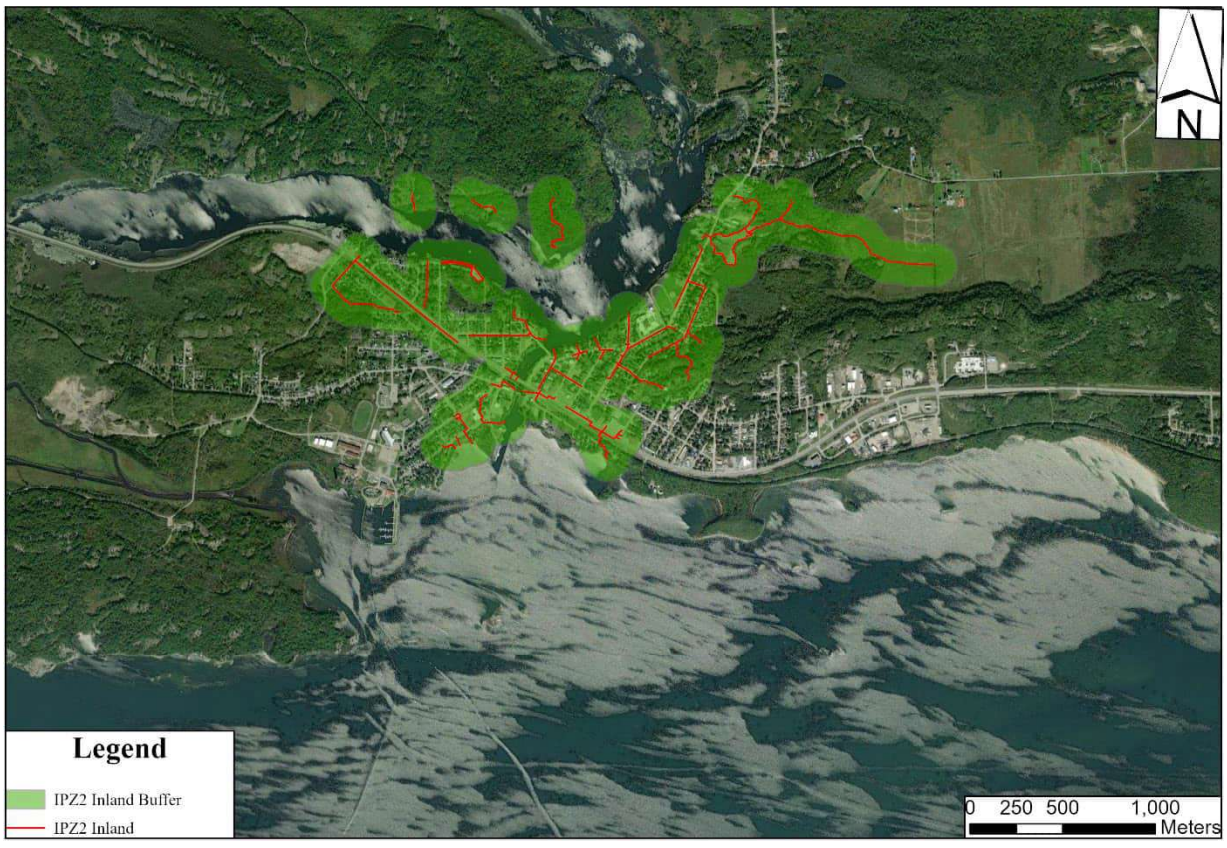

Figure 3-6- Inland IPZ-2 boundary with 120 m setback as buffer zone

3.2.4 Final IPZ Delineation

Figure 3-7 illustrates the final IPZ delineation. As shown, IPZ-1 occurs predominantly within the North Channel of Lake Huron, with a portion extending up Blind River and 120 m inland. In the northwestern and northeastern parts of the Town of Blind River, as well as north of the reservoir, IPZ-2 is the dominant zone. The western and eastern municipal areas do not impact the WTP intake and are not included in the protection zones. This also applies to the small creek originating from the reservoir in the northwestern part of the Town, which ultimately flows into Lake Huron.

Figure 3-7: Final IPZ-1 and IPZ-2 delineation

4 LIMITATIONS

The analysis applied the following limitations and assumptions, which could be refined with additional information or by adopting alternative approaches:

- The setup of the HEC-RAS model was based on 2D-flow area created on the available DTM, which was further modified based on available bathymetries. For a more accurate simulation, we suggest surveying of cross-sections and the Blind River Dam.

- The maximum flows were estimated using a rather short duration period. This seems adequate for this study but a longer duration can provide a better assessment of the system.
- The ECOMSED model operates with a grid size of 200 m by 200 m, which cannot capture microscale processes such as minor currents and temperature variations. For greater precision, a more sophisticated model should be used.
- Sections of the storm sewer network were inferred from previous delineations, the open channel network, and property lines. To achieve greater accuracy in the upland portion of the IPZ-2, a detailed survey and collection of the existing storm network could be undertaken.

Despite the limitations above, the methods used were adequate for the purpose of the delineating the IPZ.

5 CONCLUSION

In Ontario, the Clean Water Act (2006) governs source water protection, requiring the definition of intake protection zones (IPZs) around all surface water intakes to identify high priority vulnerable areas. The Blind River WTP is proposed to have a Type A intake in Lake Huron, necessitating the delineation of two IPZs. The primary zone (IPZ-1) has a fixed radius of 1,000 meters around the intake. The secondary zone (IPZ-2) is based on a timeframe sufficient for a WTP operator to respond to a potential water quality impairment event, typically set at two hours.

IPZ-1 was delineated using a fixed 1,000-meter radius; where this radius intersected land, only a 120 m setback on land was included. The delineation of IPZ-2 involved three components:

1. **In-Water Component:** This represents the area within Lake Huron where contaminants could reach the intake within two hours.
2. **Channel and dam reservoir component:** This includes channel and reservoir upstream of the Blind River Dam that could carry contaminants to the intake within two hours.
3. **Upland Component:** This encompasses transport pathways, such as stormwater networks, that have the potential to carry contaminants to the intake.

Using ECOMSED and RCA software, hydrodynamic modeling and contaminant tracing were utilized to define the in-water component of IPZ-2. To simulate a large spill, contaminants were modeled as originating from a saturated point source, and their travel time to the intake was computed. The outer boundaries of the in-water IPZ-2 were established based on a two-hour window for contaminants to reach the WTP intake.

The channel and dam reservoir component of IPZ-2 includes the upstream limits of tributaries that could carry contaminants to the intake within two hours. This extent was determined by multiplying the RTOT by the average velocity for each tributary. HEC-RAS hydraulic model was used to calculate the velocity distribution of dam upstream. Up-tributary extents used setbacks of

120 meters, and areas draining away from the tributaries were excluded using contour and drainage GIS files.

The upland extent of IPZ-2 was determined using GeoHEC-HMS. The flow paths were delineated by the software and adjusted based on land-cover and drainage system. The TOC was then computed to calculate RTOT. A setback of 120 meters was considered for the buffer zone.

6 REFERENCES

Ministry of the Environment, Conservation, and Parks (MECP) (2021). Technical Rules under the Clean Water Act. Rule 55 – 74.

Hatch (2017), Blind River Dam Generating Station - Surface Water Study Report For Blind River Dam GS Permit to Take Water, H355053-00000-121-066-0001, Rev. 0, July 27, 2017

Stantec (2009), Regional Municipality of Niagara Source Protection Planning Technical Study. Technical Memorandum 2. Riverine and Pathway, Vulnerability and Uncertainty Level Analysis for the DeCew Falls, Grimsby and Rosehill Water Treatment Plants

APPENDIX B

Circumstances of Chemical and Pathogen Drinking Water Threats in an IPZ-1 with a Vulnerability Score of 6.0 and in an IPZ-2 with a Vulnerability Score of 5.4

Table B.1 Circumstances of Chemical Drinking Water Threats in an IPZ-1 with a Vulnerability Score of 6.0 - Low Risk Level

Prescribed Threat	Threat SubCategory	Circumstance 1	Circumstance 2	Zone/Scores	Risk
The handling and storage of commercial fertilizer.	Fertilizer - Handling and Storage	Fertilizer storage.	The fertilizer stored is more than 25 but not more than 250 kg.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Disposal of Hauled Sewage to Land	Hauled sewage disposal to land by any method.	The disposal area is 1-10 ha	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The application of pesticide to land.	Pesticide - Application	Pesticide is applied to land	The disposal area is > 10 ha	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment and operation of a liquid hydrocarbon pipeline	Pipeline	Conveyance of a liquid hydrocarbon by way of a pipeline within the meaning of O. Reg. 210/01 or the CER Act where the pipeline is below ground and is crossing within or underneath a water body.	The pipeline is designated for transmitting or distributing to terminals and distribution centres.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Storm Water - Outfall (Residential/Institutional)	SWMF or storm water drainage system outfall that serves land where the predominant land use is residential or institutional or community use.	The % of impervious areas of the lands served by the facility draining to the SWMF or storm water drainage system is not more than 20% of the drainage area	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The application of commercial fertilizer to land.	Fertilizer - Application	Fertilizer is applied to land	where the managed land is 40 - 80% and the livestock density is 0.5 - 1 NU/acre	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The application of commercial fertilizer to land.	Fertilizer - Application	Fertilizer is applied to land	where the managed land is > 80% and the livestock density is 0.5 - 1 NU/acre.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Hauled Sewage - Storage	Hauled sewage storage in a lagoon in a stationary means of containment not including a site where it is produced before its collection by a hauled sewage system	-	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The handling and storage of fuel.	Fuel - Handling and Storage	Liquid fuel storage in a tank partially below grade at a facility as defined in section 1 of O. Reg. 213/01 a facility as defined in section 1 of O. Reg. 217/01 or a facility that manufacturers or refines fuel.	Fuel stored or handled in a quantity that is more than 250 but not more than 2 500 litres.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The application of agricultural source material to land.	Application of Agricultural Source Material (ASM) to Land	ASM is applied to land	where the managed land is > 80% and the livestock density is > 1 NU/acre.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low

Table B.1 Circumstances of Chemical Drinking Water Threats in an IPZ-1 with a Vulnerability Score of 6.0 - Low Risk Level

Prescribed Threat	Threat SubCategory	Circumstance 1	Circumstance 2	Zone/Scores	Risk
The application of road salt.	Road Salt - Application	Road salt application in an area	where the default % of impervious surface area is 30% or more in WHPA-A B C C1 D or HVA; or is 8% or more in IPZ-1 2 3 and WHPA-E.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Storm Water - Outfall (Residential/Institutional)	SWMF or storm water drainage system outfall that serves land where the predominant land use is residential or institutional or community use.	The % of impervious areas of the lands served by the facility draining to the SWMF or storm water drainage system is more than 20% but not more than 50% of the drainage area	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Storm Water - Outfall (Rural)	SWMF or storm water drainage system outfall that serves land where the predominant land use is rural agricultural outdoor recreational parkland or greenhouses.	The % of impervious areas of the lands served by the facility draining to the SWMF or storm water drainage system is not more than 20% of the drainage area	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Landfarming of Petroleum Refining Waste	Petroleum refining waste land disposal by means of landfarming.	The area where the land disposal is undertaken is more than 1 but not more than 10 ha.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Storm Water - Outfall (Residential/Institutional)	SWMF or storm water drainage system outfall that serves land where the predominant land use is residential or institutional or community use.	The % of impervious areas of the lands served by the facility draining to the SWMF or storm water drainage system is >50% of the drainage area	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Hauled Sewage - Storage	Hauled sewage storage in a tank in a stationary means of containment not including a site where it is produced before its collection by a hauled sewage system.	-	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Storm Water - Outfall (Rural)	SWMF or storm water drainage system outfall that serves land where the predominant land use is rural agricultural outdoor recreational parkland or greenhouses.	The % of impervious areas of the lands served by the facility draining to the SWMF or storm water drainage system is >50% of the drainage area	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	POW - Application	POW application to land that may result in a release to groundwater or surface water.	where the managed land is 40 - 80% and the livestock density is 0.5 - 1 NU/acre.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low

Table B.1 Circumstances of Chemical Drinking Water Threats in an IPZ-1 with a Vulnerability Score of 6.0 - Low Risk Level

Prescribed Threat	Threat SubCategory	Circumstance 1	Circumstance 2	Zone/Scores	Risk
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Storm Water - Outfall (Rural)	SWMF or storm water drainage system outfall that serves land where the predominant land use is rural agricultural outdoor recreational parkland or greenhouses.	The % of impervious areas of the lands served by the facility draining to the SWMF or storm water drainage system is more than 20% but not more than 50% of the drainage area	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Landfilling (Hazardous Waste or LIW)	Hazardous waste LIW or processed LIW land disposal.	The fill area is 1-10 ha.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	POW - Storage	POW or waste biomass storage partially below grade.	The mass of nitrogen in the POW or waste biomass stored is <0.5 tonne.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The handling and storage of fuel.	Fuel - Handling and Storage	Liquid fuel storage in a tank at or above grade at a facility as defined in section 1 of O. Reg. 213/01 a facility as defined in section 1 of O. Reg. 217/01 or a facility that manufactures or refines fuel.	Fuel stored or handled in a quantity that is more than 250 but not more than 2 500 litres.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The storage of snow.	Snow - Storage	A storm water drainage system outfall that serves a Snow Disposal Facility.	The snow storage area is <200 m2	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The storage of agricultural source material.	ASM - Storage	ASM storage at or above grade on a temporary field nutrient storage site.	The weight or volume of manure stored annually on a farm unit is sufficient to annually land apply agricultural source material at a rate that is more than 1.0 nutrient unit per acre of the farm units.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The storage of agricultural source material.	ASM - Storage	ASM storage at or above grade in a permanent nutrient storage facility	The weight or volume of manure stored annually on a farm unit is sufficient to annually land apply agricultural source material at a rate that is more than 1.0 nutrient unit per acre of the farm units.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The storage of agricultural source material.	ASM - Storage	ASM storage partially below grade in a permanent nutrient storage facility.	The weight or volume of manure stored annually on a farm unit is sufficient to annually land apply agricultural source material at a rate that is more than 0.5 but not more than 1.0 nutrient unit per acre of the farm units.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Disposal of Hauled Sewage to Land	Hauled sewage disposal to land by any method.	Total application area < 1 ha	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Disposal of Hauled Sewage to Land	Hauled sewage disposal to land by any method.	The disposal area is > 10 ha	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low

Table B.1 Circumstances of Chemical Drinking Water Threats in an IPZ-1 with a Vulnerability Score of 6.0 - Low Risk Level

Prescribed Threat	Threat SubCategory	Circumstance 1	Circumstance 2	Zone/Scores	Risk
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	LIW Injection into a well	LIW discharge into a geological formation by means of a well.	The combined rate of discharge of all wells located at the site is more than 3 800 000 but not more than 38 000 000 m3/year.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Wastewater Collection Facilities and Associated Parts: Sanitary Sewers	A forcemain or rising main not including its appurtenances	The wastewater collection facility is designed to convey > 100 000 m3 of sewage/day.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Transfer/Processing Site - Municipal Waste	Municipal waste storage partially below grade at a transfer/processing site approved to receive only municipal waste.	-	IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Transfer/Processing Site - Municipal Waste	Municipal waste storage entirely below grade at a transfer/processing site approved to receive only municipal waste.	-	IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Transfer/Processing Site - Hazardous Waste or LIW	Hazardous waste or LIW storage entirely below grade at a transfer/processing site approved to receive hazardous waste or LIW.	-	IPZ-1 IPZ-3 with a scores of 6	Low
The application of road salt.	Road Salt - Application	Road salt application in an area	where the default % of impervious surface area is < 1%.	IPZ-1 IPZ-3 with a scores of 6	Low
The handling and storage of road salt.	Road Salt - Handling & Storage - Potentially Exposed	Storage of road salt in an enclosure such as outdoor bins salt boxes tarps or containers 3-sided storage sheds or domes or by any other means where it has the potential to be exposed to precipitation or runoff from precipitation or snow melt.	The quantity stored is > 100 kg.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Storm Water - Infiltration (Industrial/Commercial)	A storm water infiltration facility that serves land where the predominant land use is commercial or industrial land uses.	Sum of impervious areas is more than 200 but not more than 2000 m2	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Storm Water - Infiltration (Industrial/Commercial)	A storm water infiltration facility that serves land where the predominant land use is commercial or industrial land uses.	Sum of impervious areas is > 2000 m2	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low

Table B.1 Circumstances of Chemical Drinking Water Threats in an IPZ-1 with a Vulnerability Score of 6.0 - Low Risk Level

Prescribed Threat	Threat SubCategory	Circumstance 1	Circumstance 2	Zone/Scores	Risk
The application of commercial fertilizer to land.	Fertilizer - Application	Fertilizer is applied to land	where the managed land is > 80% and the livestock density is < 0.5 NU/acre.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The handling and storage of a dense non-aqueous phase liquid.	DNAPL - Handling & Storage	DNAPL storage entirely below grade.	The engagement of an activity that may include but not limited to those provided in List 1 of Section 9 of the Glossary of Terms in the TDWTs.	IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Waste Generation Facility - Registration Exempt or Excluded	Wastes described in specific provisions of O. Reg. 347 - excluded or exempted from registration - and are stored partially below grade at a waste generation facility.	-	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Transfer/Processing Site - Municipal Waste	Municipal waste storage at or above grade at a transfer/processing site approved to receive only municipal waste.	-	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Landfarming of Petroleum Refining Waste	Petroleum refining waste land disposal by means of landfarming.	The area where the land disposal is undertaken is not more than 1 ha.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Landfarming of Petroleum Refining Waste	Petroleum refining waste land disposal by means of landfarming.	The area where the land disposal is undertaken is > 10 ha.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The application of commercial fertilizer to land.	Fertilizer - Application	Fertilizer is applied to land	where the managed land is > 80% and the livestock density is > 1 NU/acre.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Overflow - CSO or SSO	A combined sewer or partially separated sanitary sewer outfall that discharges CSO or a manhole that discharges SSO or a wet well outfall that discharges sanitary sewage PSO	The wastewater collection facility is designed to convey = < 250 m3 of sewage/day	IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Storm Water - Outfall (Industrial/Commercial)	SWMF or storm water drainage system outfall that serves land where the predominant land use is commercial or industrial land uses.	The % of impervious areas of the lands served by the facility draining to the SWMF or storm water drainage system is not more than 20% of the drainage area	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	POW - Storage	POW or waste biomass storage at or above grade.	The mass of nitrogen in the POW or waste biomass stored is more than 0.5 tonne but not more than 5 tonnes.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low

Table B.1 Circumstances of Chemical Drinking Water Threats in an IPZ-1 with a Vulnerability Score of 6.0 - Low Risk Level

Prescribed Threat	Threat SubCategory	Circumstance 1	Circumstance 2	Zone/Scores	Risk
The application of road salt.	Road Salt - Application	Road salt application in an area	where the default % of impervious surface area is at least 1% but less than 8% in WHPA-A B C C1 D or HVA; or is at least 1% but less than 6% in IPZ-1 2 3 and WHPA-E.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Overflow - CSO or SSO	A combined sewer or partially separated sanitary sewer outfall that discharges CSO or a manhole that discharges SSO or a wet well outfall that discharges sanitary sewage PSO	The wastewater collection facility is designed to convey more than 10 000 but not more than 100 000 m3 of sewage/day	IPZ-1 IPZ-3 with a scores of 6	Low
The application of agricultural source material to land.	Application of Agricultural Source Material (ASM) to Land	ASM is applied to land	where the managed land is 40 - 80% and the livestock density is > 1 NU/acre.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The application of agricultural source material to land.	Application of Agricultural Source Material (ASM) to Land	ASM is applied to land	where the managed land is > 80% and the livestock density is 0.5 - 1 NU/acre.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The storage of agricultural source material.	ASM - Storage	ASM storage partially below grade in a permanent nutrient storage facility.	The weight or volume of manure stored annually on a farm unit is sufficient to annually land apply agricultural source material at a rate that is more than 1.0 nutrient unit per acre of the farm units.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Wastewater Collection Facilities and Associated Parts: Sewage Pumping Station or Lift Station Wet Well a Holding Tank or a Tunnel	A holding tank or a tunnel below grade that forms part of a wastewater collection facility not including a wet well and stores sanitary sewage containing human waste.	The wastewater collection facility is designed to convey > 100 000 m3 of sewage/day.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Wastewater Collection Facilities and Associated Parts: Sewage Pumping Station or Lift Station Wet Well a Holding Tank or a Tunnel	A wet well that forms part of a wastewater collection facility as part of a sewage pumping station or lift station and stores sanitary sewage containing human waste	The wastewater collection facility is designed to convey > 100 000 m3 of sewage/day.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The application of road salt.	Road Salt - Application	Road salt application in an area	where the default % of impervious surface area is at least 8% but less than 30% in WHPA-A B C C1 D or HVA; or is at least 6% but less than 8% in IPZ-1 2 3 and WHPA-E.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The handling and storage of road salt.	Road Salt - Handling & Storage - Exposed	Storage of road salt exposed to precipitation runoff or snow melt.	The quantity stored is < 10 kg.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The handling and storage of road salt.	Road Salt - Handling & Storage - Exposed	Storage of road salt exposed to precipitation runoff or snow melt.	The quantity of road salt stored is > 20 kg.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The application of non-agricultural source material to land.	NASM - Application	Material from non-farm herbivorous animals (Category 1) Category 2 or Category 3 NASM is applied to land	where the managed land is > 80% and the livestock density is 0.5 - 1 NU/acre.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low

Table B.1 Circumstances of Chemical Drinking Water Threats in an IPZ-1 with a Vulnerability Score of 6.0 - Low Risk Level

Prescribed Threat	Threat SubCategory	Circumstance 1	Circumstance 2	Zone/Scores	Risk
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Landfilling (Hazardous Waste or LIW)	Hazardous waste LIW or processed LIW land disposal.	The fill area is < 1 ha.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Landfilling (Hazardous Waste or LIW)	Hazardous waste LIW or processed LIW land disposal.	The fill area is > 10 hectares.	IPZ-1 IPZ-3 with a scores of 6	Low
The handling and storage of fuel.	Fuel - Handling and Storage	Liquid fuel storage in a tank partially below grade at a facility as defined in section 1 of O. Reg. 213/01 a facility as defined in section 1 of O. Reg. 217/01 or a facility that manufacturers or refines fuel.	Fuel stored or handled in a quantity that is not more than 25 litres.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The handling and storage of fuel.	Fuel - Handling and Storage	Liquid fuel storage in a tank at or above grade at a facility as defined in section 1 of O. Reg. 213/01 a facility as defined in section 1 of O. Reg. 217/01 or a facility that manufactures or refines fuel.	Fuel stored or handled in a quantity that is not more than 25 litres.	IPZ-1 IPZ-3 with a scores of 6	Low
The handling and storage of commercial fertilizer.	Fertilizer - Handling and Storage	Fertilizer storage.	The fertilizer stored is > 2 500 kg.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	POW - Storage	POW or waste biomass storage at or above grade.	The mass of nitrogen in the POW or waste biomass stored is <0.5 tonne.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	POW - Storage	POW or waste biomass storage at or above grade.	The mass of nitrogen in the POW or waste biomass stored is >5 tonnes.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The application of non-agricultural source material to land.	NASM - Application	Material from non-farm herbivorous animals (Category 1) Category 2 or Category 3 NASM is applied to land	where the managed land is > 80% and the livestock density is > 1 NU/acre.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	WWTF and Associated Parts	A sewage lagoon that may discharge sewage to groundwater	WWTF discharges treated sanitary sewage at an average daily rate that is more than 50 000 m3/year.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The handling and storage of a dense non-aqueous phase liquid.	DNAPL - Handling & Storage	DNAPL storage at or above grade	The engagement of an activity that may include but not limited to those provided in List 1 of Section 9 of the Glossary of Terms in the TDWTs.	IPZ-1 IPZ-3 with a scores of 6	Low

Table B.1 Circumstances of Chemical Drinking Water Threats in an IPZ-1 with a Vulnerability Score of 6.0 - Low Risk Level

Prescribed Threat	Threat SubCategory	Circumstance 1	Circumstance 2	Zone/Scores	Risk
The application of commercial fertilizer to land.	Fertilizer - Application	Fertilizer is applied to land	where the managed land is < 40% and the livestock density is > 1 NU/acre.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Overflow - CSO or SSO	A combined sewer or partially separated sanitary sewer outfall that discharges CSO or a manhole that discharges SSO or a wet well outfall that discharges sanitary sewage PSO	The wastewater collection facility is designed to convey more than 1 000 but not more than 10 000 m3 of sewage/day	IPZ-1 IPZ-3 with a scores of 6	Low
The application of commercial fertilizer to land.	Fertilizer - Application	Fertilizer is applied to land	where the managed land is < 40% and the livestock density is 0.5 - 1 NU/acre.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment and operation of a liquid hydrocarbon pipeline	Pipeline	Conveyance of a liquid hydrocarbon by way of a pipeline within the meaning of O. Reg. 210/01 or the CER Act where the pipeline is below ground and is not crossing underneath a water body	The pipeline is designated for transmitting or distributing to terminals and distribution centres.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The handling and storage of non-agricultural source material.	NASM - Handling & Storage	Material from non-farm herbivorous animals (Category 1) Category 2 or Category 3 NASM is stored at or above grade in or on a permanent or a temporary nutrient storage facility.	The mass of nitrogen in the NASM stored is > 5 tonnes.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The handling and storage of an organic solvent.	Organic Solvent - Handling & Storage	Organic solvent storage partially below grade.	The quantity of organic solvent stored is > 2 500 litres.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The handling and storage of commercial fertilizer.	Fertilizer - Handling and Storage	Fertilizer storage.	The fertilizer stored is more than 250 but not more than 2 500 kg.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The application of non-agricultural source material to land.	NASM - Application	Material from non-farm herbivorous animals (Category 1) Category 2 or Category 3 NASM is applied to land	where the managed land is 40 - 80% and the livestock density is < 0.5 NU/acre.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The application of non-agricultural source material to land.	NASM - Application	Material from non-farm herbivorous animals (Category 1) Category 2 or Category 3 NASM is applied to land	where the managed land is 40 - 80% and the livestock density is > 1 NU/acre.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Tailings From Mines	Mine tailing storage using a surface impoundment structure.	The site is part of a facility for which the NPRI Notice requires a person to report and the report must include information in relation to a substance listed in Group 1 2 3 or 4 of Part 1 of Schedule 1 or Part 2 of Schedule 1 of the notice.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low

Table B.1 Circumstances of Chemical Drinking Water Threats in an IPZ-1 with a Vulnerability Score of 6.0 - Low Risk Level

Prescribed Threat	Threat SubCategory	Circumstance 1	Circumstance 2	Zone/Scores	Risk
The handling and storage of fuel.	Fuel - Handling and Storage	Liquid fuel storage in a tank partially below grade at a facility as defined in section 1 of O. Reg. 213/01 a facility as defined in section 1 of O. Reg. 217/01 or a facility that manufacturers or refines fuel.	Fuel stored or handled in a quantity that is >2 500 litres.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	WWTF and Associated Parts	STP process or holding tank that may discharge sewage to groundwater.	WWTF discharges treated sanitary sewage at an average daily rate that is more than 50 000 m3/year.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Waste Generation Facility - Requiring Registration	Subject waste storage below grade at a waste generation facility requiring generator registration excluding a waste disposal site that requires an ECA under Part V of the EPA.	-	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The handling and storage of fuel.	Fuel - Handling and Storage	Liquid fuel storage in a tank at or above grade at a facility as defined in section 1 of O. Reg. 213/01 a facility as defined in section 1 of O. Reg. 217/01 or a facility that manufactures or refines fuel.	Fuel stored or handled in a quantity that is >2 500 litres.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The storage of snow.	Snow - Storage	A storm water drainage system outfall that serves a Snow Disposal Facility.	The snow storage area is 200-2000 m2.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The handling and storage of road salt.	Road Salt - Handling & Storage - Not Exposed	Storage of road salt inside an area facility or structure where it does not have the potential to be exposed to precipitation or runoff from precipitation or snow melt.	The quantity stored is > 500 000 kg.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The application of commercial fertilizer to land.	Fertilizer - Application	Fertilizer is applied to land	where the managed land is < 40% and the livestock density is < 0.5 NU/acre.	IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Landfilling (Municipal Waste)	Municipal waste land disposal.	The fill area is < 1 ha.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Landfilling (Municipal Waste)	Municipal waste land disposal.	The fill area is > 10 hectares.	IPZ-1 IPZ-3 with a scores of 6	Low

Table B.1 Circumstances of Chemical Drinking Water Threats in an IPZ-1 with a Vulnerability Score of 6.0 - Low Risk Level

Prescribed Threat	Threat SubCategory	Circumstance 1	Circumstance 2	Zone/Scores	Risk
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Storm Water - Infiltration (Rural)	A storm water infiltration facility that serves land where the predominant land use is rural agricultural outdoor recreational parkland or greenhouses.	Sum of impervious areas is more than 200 but not more than 2000 m2	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The handling and storage of an organic solvent.	Organic Solvent - Handling & Storage	Organic solvent storage at or above grade.	The quantity of organic solvent stored is more than 250 but not more than 2 500 litres.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The handling and storage of road salt.	Road Salt - Handling & Storage - Potentially Exposed	Storage of road salt in an enclosure such as outdoor bins salt boxes tarps or containers 3-sided storage sheds or domes or by any other means where it has the potential to be exposed to precipitation or runoff from precipitation or snow melt.	The quantity stored is 50-100 kg.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	WWTF and Associated Parts	STP process or holding tank that may discharge sewage to groundwater.	WWTF discharges treated sanitary sewage at an average daily rate that is more than 17 500 but not more than 50 000 m3/year.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The application of non-agricultural source material to land.	NASM - Application	Material from non-farm herbivorous animals (Category 1) Category 2 or Category 3 NASM is applied to land	where the managed land is < 40% and the livestock density is < 0.5 NU/acre.	IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Industrial Effluent Discharges	Industrial sewage discharge to surface water or land	The site is not part of a facility for which the NPRI Notice requires a person to report.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The application of non-agricultural source material to land.	NASM - Application	Material from non-farm herbivorous animals (Category 1) Category 2 or Category 3 NASM is applied to land	where the managed land is > 80% and the livestock density is < 0.5 NU/acre.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The application of commercial fertilizer to land.	Fertilizer - Application	Fertilizer is applied to land	where the managed land is 40 - 80% and the livestock density is < 0.5 NU/acre.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The application of commercial fertilizer to land.	Fertilizer - Application	Fertilizer is applied to land	where the managed land is 40 - 80% and the livestock density is > 1 NU/acre.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The handling and storage of an organic solvent.	Organic Solvent - Handling & Storage	Organic solvent storage partially below grade.	The quantity of organic solvent stored is more than 25 but not more than 250 litres.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low

Table B.1 Circumstances of Chemical Drinking Water Threats in an IPZ-1 with a Vulnerability Score of 6.0 - Low Risk Level

Prescribed Threat	Threat SubCategory	Circumstance 1	Circumstance 2	Zone/Scores	Risk
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Landfilling (Municipal Waste)	Municipal waste land disposal.	The fill area is 1-10 ha.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The use of land as livestock grazing or pasturing land an outdoor confinement area or a farm-animal yard. O. Reg. 385/08 s. 3.	ASM Generation - Livestock Grazing	The use of land as livestock grazing or pasturing land.	The number of nutrient units generated in the farm unit divided by the number of acres of land that is used for livestock grazing or pasturing land is sufficient to generate nutrients at an annual rate that is 0.5-1.0 nutrient unit/acre.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The handling and storage of non-agricultural source material.	NASM - Handling & Storage	Material from non-farm herbivorous animals (Category 1) Category 2 or Category 3 NASM is stored partially below grade in a permanent nutrient storage facility.	The mass of nitrogen in the NASM stored is < 0.5 tonnes. Â	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The use of land as livestock grazing or pasturing land an outdoor confinement area or a farm-animal yard. O. Reg. 385/08 s. 3.	ASM Generation - OCA or Farm Animal Yard	The use of land as an OCA or a farm-animal yard.	The number of animals confined in the area at any time is sufficient to generate ASM at a rate of 120-300 nutrient units/ha of the area annually.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The application of non-agricultural source material to land.	NASM - Application	Material from non-farm herbivorous animals (Category 1) Category 2 or Category 3 NASM is applied to land	where the managed land is < 40% and the livestock density is > 1 NU/acre.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The handling and storage of non-agricultural source material.	NASM - Handling & Storage	Material from non-farm herbivorous animals (Category 1) Category 2 or Category 3 NASM is stored below grade in or on a permanent nutrient storage facility.	The mass of nitrogen in the NASM stored is > 5 tonnes.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The handling and storage of non-agricultural source material.	NASM - Handling & Storage	Material from non-farm herbivorous animals (Category 1) Category 2 or Category 3 NASM is stored partially below grade in a permanent nutrient storage facility.	The mass of nitrogen in the NASM stored is > 5 tonnes.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The handling and storage of non-agricultural source material.	NASM - Handling & Storage	Material from non-farm herbivorous animals (Category 1) Category 2 or Category 3 NASM is stored partially below grade in a permanent nutrient storage facility.	The mass of nitrogen in the NASM stored is at 0.5-5 tonnes. Â	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The handling and storage of non-agricultural source material.	NASM - Handling & Storage	Material from non-farm herbivorous animals (Category 1) Category 2 or Category 3 NASM is stored at or above grade in or on a permanent or a temporary nutrient storage facility.	The mass of nitrogen in the NASM stored is < 0.5 tonnes. Â	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low

Table B.1 Circumstances of Chemical Drinking Water Threats in an IPZ-1 with a Vulnerability Score of 6.0 - Low Risk Level

Prescribed Threat	Threat SubCategory	Circumstance 1	Circumstance 2	Zone/Scores	Risk
The handling and storage of an organic solvent.	Organic Solvent - Handling & Storage	Organic solvent storage at or above grade.	The quantity of organic solvent stored is more than 25 but not more than 250 litres.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The handling and storage of an organic solvent.	Organic Solvent - Handling & Storage	Organic solvent storage partially below grade.	The quantity of organic solvent stored is more than 250 but not more than 2 500 litres.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	WWTF and Associated Parts	An STP final effluent outfall or an STP overflow outfall.	WWTF discharges treated sanitary sewage at an average daily rate that is not more than 500 m3/year.	IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	PCB Waste Storage	PCB waste storage in uncontained piles.	The PCB waste is stored at a PCB waste disposal site or was delivered to a site under written instructions of a Director.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	POW - Application	POW application to land that may result in a release to groundwater or surface water.	where the managed land is < 40% and the livestock density is > 1 NU/acre.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The storage of snow.	Snow - Storage	Infiltration or discharge of snowmelt from the storage of snow on commercial or industrial sites.	The snow storage area is 200-2000 m2.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Overflow - CSO or SSO	A combined sewer or partially separated sanitary sewer outfall that discharges CSO or a manhole that discharges SSO or a wet well outfall that discharges sanitary sewage PSO	The wastewater collection facility is designed to convey more than 250 but not more than 1 000 m3 of sewage/day	IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Storm Water - Infiltration (Residential/Institutional)	A storm water infiltration facility that serves land where the predominant land use is residential or institutional or community use.	Sum of impervious areas is <= 200 m2	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Waste Generation Facility - Registration Exempt or Excluded	Wastes described in specific provisions of O. Reg. 347 - excluded or exempted from registration - and are stored at or above grade at a waste generation facility.	-	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	PCB Waste Storage	PCB waste storage below grade in a facility or engineered cell.	The PCB waste is stored at a PCB waste disposal site or was delivered to a site under written instructions of a Director.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low

Table B.1 Circumstances of Chemical Drinking Water Threats in an IPZ-1 with a Vulnerability Score of 6.0 - Low Risk Level

Prescribed Threat	Threat SubCategory	Circumstance 1	Circumstance 2	Zone/Scores	Risk
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	PCB Waste Storage	PCB waste storage in tanks partially below grade.	The PCB waste is stored at a PCB waste disposal site or was delivered to a site under written instructions of a Director.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	WWTF and Associated Parts	STP process or holding tank that may discharge sewage to groundwater.	WWTF discharges treated sanitary sewage at an average daily rate that is more than 2 500 but not more than 17 500 m3/year.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	WWTF and Associated Parts	A sewage lagoon that may discharge sewage to groundwater	WWTF discharges treated sanitary sewage at an average daily rate that is more than 17 500 but not more than 50 000 m3/year.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	WWTF and Associated Parts	An STP final effluent outfall or an STP overflow outfall.	WWTF discharges treated sanitary sewage at an average daily rate that is more than 2 500 but not more than 17 500 m3/year.	IPZ-1 IPZ-3 with a scores of 6	Low
The handling and storage of pesticide.	Pesticide - Handling & Storage	The storage of pesticide on a site.	The pesticide stored is more than 25 but not more than 250 kg.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Onsite Sewage Works	Onsite sewage system holding tank.	The system is a sewage works within the meaning of the Ontario Water Resources Act.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	POW - Application	POW application to land that may result in a release to groundwater or surface water.	where the managed land is > 80% and the livestock density is 0.5 - 1 NU/acre.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	POW - Application	POW application to land that may result in a release to groundwater or surface water.	where the managed land is 40 - 80% and the livestock density is < 0.5 NU/acre.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	POW - Application	POW application to land that may result in a release to groundwater or surface water.	where the managed land is 40 - 80% and the livestock density is > 1 NU/acre.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	WWTF and Associated Parts	An STP final effluent outfall or an STP overflow outfall.	WWTF discharges treated sanitary sewage at an average daily rate that is more than 500 but not more than 2 500 m3/year.	IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Onsite Sewage Works	Onsite sewage system (earth pit privy privy vault greywater system cesspool or a leaching bed system and its associated treatment unit).	The system is a sewage works within the meaning of the Ontario Water Resources Act.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low

Table B.1 Circumstances of Chemical Drinking Water Threats in an IPZ-1 with a Vulnerability Score of 6.0 - Low Risk Level

Prescribed Threat	Threat SubCategory	Circumstance 1	Circumstance 2	Zone/Scores	Risk
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Storm Water - Infiltration (Rural)	A storm water infiltration facility that serves land where the predominant land use is rural agricultural outdoor recreational parkland or greenhouses.	Sum of impervious areas is <= 200 m2	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Storm Water - Infiltration (Rural)	A storm water infiltration facility that serves land where the predominant land use is rural agricultural outdoor recreational parkland or greenhouses.	Sum of impervious areas is > 2000 m2	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Storm Water - Infiltration (Residential/Institutional)	A storm water infiltration facility that serves land where the predominant land use is residential or institutional or community use.	Sum of impervious areas is more than 200 but not more than 2000 m2	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Storm Water - Infiltration (Residential/Institutional)	A storm water infiltration facility that serves land where the predominant land use is residential or institutional or community use.	Sum of impervious areas is > 2000 m2	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The handling and storage of pesticide.	Pesticide - Handling & Storage	The storage of pesticide on a site.	The pesticide stored is more than 250 but not more than 2 500 kg.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The handling and storage of pesticide.	Pesticide - Handling & Storage	The storage of pesticide on a site.	The pesticide stored is <= 25kg	IPZ-1 IPZ-3 with a scores of 6	Low
The handling and storage of pesticide.	Pesticide - Handling & Storage	The storage of pesticide on a site.	The pesticide stored is > 2 500 kg.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The use of land as livestock grazing or pasturing land an outdoor confinement area or a farm-animal yard. O. Reg. 385/08 s. 3.	ASM Generation - OCA or Farm Animal Yard	The use of land as an OCA or a farm-animal yard.	The number of animals confined in the area at any time is sufficient to generate ASM at a rate of < 120 nutrient units/ha of the area annually.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The use of land as livestock grazing or pasturing land an outdoor confinement area or a farm-animal yard. O. Reg. 385/08 s. 3.	ASM Generation - OCA or Farm Animal Yard	The use of land as an OCA or a farm-animal yard.	The number of animals confined in the area at any time is sufficient to generate ASM at a rate of > 300 nutrient units/ha of the area annually.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The handling and storage of road salt.	Road Salt - Handling & Storage - Exposed	Storage of road salt exposed to precipitation runoff or snow melt.	The quantity of road salt stored is 10-20 kg.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The handling and storage of road salt.	Road Salt - Handling & Storage - Not Exposed	Storage of road salt inside an area facility or structure where it does not have the potential to be exposed to precipitation or runoff from precipitation or snow melt.	The quantity stored is at 250 000-500 000 kg.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low

Table B.1 Circumstances of Chemical Drinking Water Threats in an IPZ-1 with a Vulnerability Score of 6.0 - Low Risk Level

Prescribed Threat	Threat SubCategory	Circumstance 1	Circumstance 2	Zone/Scores	Risk
The application of non-agricultural source material to land.	NASM - Application	Material from non-farm herbivorous animals (Category 1) Category 2 or Category 3 NASM is applied to land	where the managed land is < 40% and the livestock density is 0.5 - 1 NU/acre.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The storage of snow.	Snow - Storage	Infiltration or discharge of snowmelt from the storage of snow on commercial or industrial sites.	The snow storage area is <200 m2	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Waste Generation Facility - Requiring Registration	Subject waste storage at or above grade or partially below grade at a waste generation facility requiring generator registration excluding a waste disposal site that requires an ECA under Part V of the EPA.	-	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Storm Water - Outfall (Industrial/Commercial)	SWMF or storm water drainage system outfall that serves land where the predominant land use is commercial or industrial land uses.	The % of impervious areas of the lands served by the facility draining to the SWMF or storm water drainage system is more than 20% but not more than 50% of the drainage area	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The handling and storage of an organic solvent.	Organic Solvent - Handling & Storage	Organic solvent storage entirely below grade.	The quantity of organic solvent stored is > 2 500 litres.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The handling and storage of road salt.	Road Salt - Handling & Storage - Potentially Exposed	Storage of road salt in an enclosure such as outdoor bins salt boxes tarps or containers 3-sided storage sheds or domes or by any other means where it has the potential to be exposed to precipitation or runoff from precipitation or snow melt.	The quantity stored is < 50 kg.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment and operation of a liquid hydrocarbon pipeline	Pipeline	Conveyance of a liquid hydrocarbon by a pipeline within the meaning of O. Reg. 210/01 or the CER Act where the pipeline is above ground or above a water body.	The pipeline is designated for transmitting or distributing to terminals and distribution centres.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The handling and storage of non-agricultural source material.	NASM - Handling & Storage	Material from non-farm herbivorous animals (Category 1) Category 2 or Category 3 NASM is stored at or above grade in or on a permanent or a temporary nutrient storage facility.	The mass of nitrogen in the NASM stored is at 0.5-5 tonnes. Â	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low

Table B.1 Circumstances of Chemical Drinking Water Threats in an IPZ-1 with a Vulnerability Score of 6.0 - Low Risk Level

Prescribed Threat	Threat SubCategory	Circumstance 1	Circumstance 2	Zone/Scores	Risk
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	WWTF and Associated Parts	An STP final effluent outfall or an STP overflow outfall.	WWTF discharges treated sanitary sewage at an average daily rate that is more than 17 500 but not more than 50 000 m3/year.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The application of non-agricultural source material to land.	NASM - Application	Material from non-farm herbivorous animals (Category 1) Category 2 or Category 3 NASM is applied to land	where the managed land is 40 - 80% and the livestock density is 0.5 - 1 NU/acre.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Storm Water - Infiltration (Industrial/Commercial)	A storm water infiltration facility that serves land where the predominant land use is commercial or industrial land uses.	Sum of impervious areas is <= 200 m2	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	POW - Storage	POW or waste biomass storage below grade.	The mass of nitrogen in the POW or waste biomass stored is >5 tonnes.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	POW - Storage	POW or waste biomass storage partially below grade.	The mass of nitrogen in the POW or waste biomass stored is >5 tonnes.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The handling and storage of fuel.	Fuel - Handling and Storage	Liquid fuel storage in a tankÂ entirelyÂ below grade at a facility as defined in section 1 of O. Reg. 213/01 a facility as defined in section 1 of O. Reg. 217/01 or a facility that manufactures or refines fuel.	Fuel stored or handled in a quantity that is >2 500 litres.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	PCB Waste Storage	PCB waste storage in drums above or at grade.	The PCB waste is stored at a PCB waste disposal site or was delivered to a site under written instructions of a Director.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	PCB Waste Storage	PCB waste storage in tanks below grade.	The PCB waste is stored at a PCB waste disposal site or was delivered to a site under written instructions of a Director.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The handling and storage of an organic solvent.	Organic Solvent - Handling & Storage	Organic solvent storage at or above grade.	The quantity of organic solvent stored is > 2 500 litres.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The handling and storage of a dense non-aqueous phase liquid.	DNAPL - Handling & Storage	DNAPL storage partially below grade	The engagement of an activity that may include but not limited to those provided in List 1 of Section 9 of the Glossary of Terms in the TDWTs.	IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Tailings From Mines	Mine tailing storage in a pit.	The site is part of a facility for which the NPRI Notice requires a person to report and the report must include information in relation to a substance listed in Group 1 2 3 or 4 of Part 1 of Schedule 1 or Part 2 of Schedule 1 of the notice.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low

Table B.1 Circumstances of Chemical Drinking Water Threats in an IPZ-1 with a Vulnerability Score of 6.0 - Low Risk Level

Prescribed Threat	Threat SubCategory	Circumstance 1	Circumstance 2	Zone/Scores	Risk
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Tailings From Mines	Mine tailing storage using a surface impoundment structure.	The site is not part of a facility for which the NPRI Notice requires a person to report.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Wastewater Collection Facilities and Associated Parts: Sanitary Sewers	A gravity sanitary sewer not including its appurtenances	The wastewater collection facility is designed to convey > 100 000 m3 of sewage/day.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	POW - Application	POW application to land that may result in a release to groundwater or surface water.	where the managed land is > 80% and the livestock density is < 0.5 NU/acre.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The application of pesticide to land.	Pesticide - Application	Pesticide is applied to land	Total application area < 1 ha	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The application of pesticide to land.	Pesticide - Application	Pesticide is applied to land	The disposal area is 1-10 ha	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The storage of agricultural source material.	ASM - Storage	ASM storage partially below grade in a permanent nutrient storage facility.	The weight or volume of manure stored annually on a farm unit is sufficient to annually land apply agricultural source material at a rate that is not more than 0.5 nutrient units per acre of the farm units.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The storage of agricultural source material.	ASM - Storage	ASM storage at or above grade on a temporary field nutrient storage site.	The weight or volume of manure stored annually on a farm unit is sufficient to annually land apply agricultural source material at a rate that is not more than 0.5 nutrient units per acre of the farm units.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The storage of agricultural source material.	ASM - Storage	ASM storage at or above grade on a temporary field nutrient storage site.	The weight or volume of manure stored annually on a farm unit is sufficient to annually land apply agricultural source material at a rate that is more than 0.5 but not more than 1.0 nutrient unit per acre of the farm units.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The management of runoff that contains chemicals used in the de-icing of aircraft.	Aircrafts - De-icing Runoff	De-icing materials runoff discharge to land or water.	The runoff originates at a national airport.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The management of runoff that contains chemicals used in the de-icing of aircraft.	Aircrafts - De-icing Runoff	De-icing materials runoff discharge to land or water.	The runoff originates at a remote airport.	IPZ-1 IPZ-3 with a scores of 6	Low
The management of runoff that contains chemicals used in the de-icing of aircraft.	Aircrafts - De-icing Runoff	De-icing materials runoff discharge to land or water.	The runoff originates at a small airport.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The management of runoff that contains chemicals used in the de-icing of aircraft.	Aircrafts - De-icing Runoff	De-icing materials runoff discharge to land or water.	The runoff originates at a regional airport.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The application of agricultural source material to land.	Application of Agricultural Source Material (ASM) to Land	ASM is applied to land	where the managed land is > 80% and the livestock density is < 0.5 NU/acre.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low

Table B.1 Circumstances of Chemical Drinking Water Threats in an IPZ-1 with a Vulnerability Score of 6.0 - Low Risk Level

Prescribed Threat	Threat SubCategory	Circumstance 1	Circumstance 2	Zone/Scores	Risk
The application of agricultural source material to land.	Application of Agricultural Source Material (ASM) to Land	ASM is applied to land	where the managed land is < 40% and the livestock density is > 1 NU/acre.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The application of agricultural source material to land.	Application of Agricultural Source Material (ASM) to Land	ASM is applied to land	where the managed land is < 40% and the livestock density is 0.5 - 1 NU/acre.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The application of agricultural source material to land.	Application of Agricultural Source Material (ASM) to Land	ASM is applied to land	where the managed land is < 40% and the livestock density is < 0.5 NU/acre.	IPZ-1 IPZ-3 with a scores of 6	Low
The application of agricultural source material to land.	Application of Agricultural Source Material (ASM) to Land	ASM is applied to land	where the managed land is 40 - 80% and the livestock density is 0.5 - 1 NU/acre.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The application of agricultural source material to land.	Application of Agricultural Source Material (ASM) to Land	ASM is applied to land	where the managed land is 40 - 80% and the livestock density is < 0.5 NU/acre.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The storage of agricultural source material.	ASM - Storage	ASM storage at or above grade in a permanent nutrient storage facility	The weight or volume of manure stored annually on a farm unit is sufficient to annually land apply agricultural source material at a rate that is not more than 0.5 nutrient units per acre of the farm units.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The storage of agricultural source material.	ASM - Storage	ASM storage below grade in a permanent nutrient storage facility.	The weight or volume of manure stored annually on a farm unit is sufficient to annually land apply agricultural source material at a rate that is more than 1.0 nutrient unit per acre of the farm units.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The storage of agricultural source material.	ASM - Storage	ASM storage at or above grade in a permanent nutrient storage facility	The weight or volume of manure stored annually on a farm unit is sufficient to annually land apply agricultural source material at a rate that is more than 0.5 but not more than 1.0 nutrient unit per acre of the farm units.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The use of land as livestock grazing or pasturing land an outdoor confinement area or a farm-animal yard. O. Reg. 385/08 s. 3.	ASM Generation - Livestock Grazing	The use of land as livestock grazing or pasturing land.	The number of nutrient units generated in the farm unit divided by the number of acres of land that is used for livestock grazing or pasturing land is sufficient to generate nutrients at an annual rate that is < 0.5 nutrient unit/acre.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The use of land as livestock grazing or pasturing land an outdoor confinement area or a farm-animal yard. O. Reg. 385/08 s. 3.	ASM Generation - Livestock Grazing	The use of land as livestock grazing or pasturing land.	The number of nutrient units generated in the farm unit divided by the number of acres of land that is used for livestock grazing or pasturing land is sufficient to generate nutrients at an annual rate that is > 1.0 nutrient units/acre.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The handling and storage of fuel.	Fuel - Handling and Storage	Liquid fuel storage in a tank partially below grade at a facility as defined in section 1 of O. Reg. 213/01 a facility as defined in section 1 of O. Reg. 217/01 or a facility that manufacturers or refines fuel.	Fuel stored or handled is more than 25 but not more than 250 litres.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low

Table B.1 Circumstances of Chemical Drinking Water Threats in an IPZ-1 with a Vulnerability Score of 6.0 - Low Risk Level

Prescribed Threat	Threat SubCategory	Circumstance 1	Circumstance 2	Zone/Scores	Risk
The handling and storage of fuel.	Fuel - Handling and Storage	Liquid fuel storage in a tank at or above grade at a facility as defined in section 1 of O. Reg. 213/01 a facility as defined in section 1 of O. Reg. 217/01 or a facility that manufactures or refines fuel.	Fuel stored or handled is more than 25 but not more than 250 litres.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	LIW Injection into a well	LIW discharge into a geological formation by means of a well.	The combined rate of discharge of all wells located at the site is > 38 000 000 m3/year.	IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	POW - Application	POW application to land that may result in a release to groundwater or surface water.	where the managed land is > 80% and the livestock density is > 1 NU/acre.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	POW - Application	POW application to land that may result in a release to groundwater or surface water.	where the managed land is < 40% and the livestock density is < 0.5 NU/acre.	IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	POW - Application	POW application to land that may result in a release to groundwater or surface water.	where the managed land is < 40% and the livestock density is 0.5 - 1 NU/acre.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	POW - Storage	POW or waste biomass storage partially below grade.	The mass of nitrogen in the POW or waste biomass stored is more than 0.5 tonne but not more than 5 tonnes.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	WWTF and Associated Parts	A sewage lagoon that may discharge sewage to groundwater	WWTF discharges treated sanitary sewage at an average daily rate that is more than 2 500 but not more than 17 500 m3/year.	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Low

Table B.2 Circumstances of Chemical Drinking Water Threats in an IPZ-2 with a Vulnerability Score of 5.4 - Low Risk Level

Prescribed Threat	Threat SubCategory	Circumstance 1	Circumstance 2	Zone/Scores	Risk
The use of land as livestock grazing or pasturing land an outdoor confinement area or a farm-animal yard. O. Reg. 385/08 s. 3.	ASM Generation - Livestock Grazing	The use of land as livestock grazing or pasturing land.	The number of nutrient units generated in the farm unit divided by the number of acres of land that is used for livestock grazing or pasturing land is sufficient to generate nutrients at an annual rate that is > 1.0 nutrient units/acre.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The use of land as livestock grazing or pasturing land an outdoor confinement area or a farm-animal yard. O. Reg. 385/08 s. 3.	ASM Generation - OCA or Farm Animal Yard	The use of land as an OCA or a farm-animal yard.	The number of animals confined in the area at any time is sufficient to generate ASM at a rate of > 300 nutrient units/ha of the area annually.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The application of pesticide to land.	Pesticide - Application	Pesticide is applied to land	Total application area < 1 ha	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment and operation of a liquid hydrocarbon pipeline	Pipeline	Conveyance of a liquid hydrocarbon by way of a pipeline within the meaning of O. Reg. 210/01 or the CER Act where the pipeline is below ground and is crossing within or underneath a water body.	The pipeline is designated for transmitting or distributing to terminals and distribution centres.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Storm Water - Outfall (Residential/Institutional)	SWMF or storm water drainage system outfall that serves land where the predominant land use is residential or institutional or community use.	The % of impervious areas of the lands served by the facility draining to the SWMF or storm water drainage system is not more than 20% of the drainage area	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The application of commercial fertilizer to land.	Fertilizer - Application	Fertilizer is applied to land	where the managed land is > 80% and the livestock density is 0.5 - 1 NU/acre.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The application of commercial fertilizer to land.	Fertilizer - Application	Fertilizer is applied to land	where the managed land is < 40% and the livestock density is > 1 NU/acre.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The handling and storage of fuel.	Fuel - Handling and Storage	Liquid fuel storage in a tank partially below grade at a facility as defined in section 1 of O. Reg. 213/01 a facility as defined in section 1 of O. Reg. 217/01 or a facility that manufacturers or refines fuel.	Fuel stored or handled in a quantity that is more than 250 but not more than 2 500 litres.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Industrial Effluent Discharges	Industrial sewage discharge to surface water or land	The site is part of a facility for which the NPRI Notice requires a person to report and the report must include information in relation to a substance listed in Group 1 2 3 or 4 of Part 1 of Schedule 1 or Part 2 of Schedule 1 of the notice.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Industrial Effluent Discharges	Industrial sewage discharge to surface water or land	The site is not part of a facility for which the NPRI Notice requires a person to report.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The application of agricultural source material to land.	Application of Agricultural Source Material (ASM) to Land	ASM is applied to land	where the managed land is > 80% and the livestock density is > 1 NU/acre.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The application of agricultural source material to land.	Application of Agricultural Source Material (ASM) to Land	ASM is applied to land	where the managed land is > 80% and the livestock density is 0.5 - 1 NU/acre.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low

Table B.2 Circumstances of Chemical Drinking Water Threats in an IPZ-2 with a Vulnerability Score of 5.4 - Low Risk Level

Prescribed Threat	Threat SubCategory	Circumstance 1	Circumstance 2	Zone/Scores	Risk
The establishment and operation of a liquid hydrocarbon pipeline	Pipeline	Conveyance of a liquid hydrocarbon by a pipeline within the meaning of O. Reg. 210/01 or the CER Act where the pipeline is above ground or above a water body.	The pipeline is designated for transmitting or distributing to terminals and distribution centres.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The application of road salt.	Road Salt - Application	Road salt application in an area	where the default % of impervious surface area is at least 8% but less than 30% in WHPA-A B C C1 D or HVA; or is at least 6% but less than 8% in IPZ-1 2 3 and WHPA-E.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Landfarming of Petroleum Refining Waste	Petroleum refining waste land disposal by means of landfarming.	The area where the land disposal is undertaken is > 10 ha.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Storm Water - Outfall (Rural)	SWMF or storm water drainage system outfall that serves land where the predominant land use is rural agricultural outdoor recreational parkland or greenhouses.	The % of impervious areas of the lands served by the facility draining to the SWMF or storm water drainage system is more than 20% but not more than 50% of the drainage area	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Hauled Sewage - Storage	Hauled sewage storage in a lagoon in a stationary means of containment not including a site where it is produced before its collection by a hauled sewage system	-	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Tailings From Mines	Mine tailing storage in a pit.	The site is part of a facility for which the NPRI Notice requires a person to report and the report must include information in relation to a substance listed in Group 1 2 3 or 4 of Part 1 of Schedule 1 or Part 2 of Schedule 1 of the notice.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The use of land as livestock grazing or pasturing land an outdoor confinement area or a farm-animal yard. O. Reg. 385/08 s. 3.	ASM Generation - Livestock Grazing	The use of land as livestock grazing or pasturing land.	The number of nutrient units generated in the farm unit divided by the number of acres of land that is used for livestock grazing or pasturing land is sufficient to generate nutrients at an annual rate that is 0.5-1.0 nutrient unit/acre.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	POW - Application	POW application to land that may result in a release to groundwater or surface water.	where the managed land is > 80% and the livestock density is 0.5 - 1 NU/acre.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	POW - Application	POW application to land that may result in a release to groundwater or surface water.	where the managed land is > 80% and the livestock density is < 0.5 NU/acre.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low

Table B.2 Circumstances of Chemical Drinking Water Threats in an IPZ-2 with a Vulnerability Score of 5.4 - Low Risk Level

Prescribed Threat	Threat SubCategory	Circumstance 1	Circumstance 2	Zone/Scores	Risk
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Transfer/Processing Site - Hazardous Waste or LIW	Hazardous waste or LIW storage above grade at a transfer/processing site approved to receive hazardous waste or LIW.	-	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Transfer/Processing Site - Hazardous Waste or LIW	Hazardous waste or LIW storage partially below grade at a transfer/processing site approved to receive hazardous waste or LIW.	-	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The use of land as livestock grazing or pasturing land an outdoor confinement area or a farm-animal yard. O. Reg. 385/08 s. 3.	ASM Generation - OCA or Farm Animal Yard	The use of land as an OCA or a farm-animal yard.	The number of animals confined in the area at any time is sufficient to generate ASM at a rate of 120-300 nutrient units/ha of the area annually.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Disposal of Hauled Sewage to Land	Hauled sewage disposal to land by any method.	The disposal area is > 10 ha	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Landfilling (Hazardous Waste or LIW)	Hazardous waste LIW or processed LIW land disposal.	The fill area is 1-10 ha.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Transfer/Processing Site - Municipal Waste	Municipal waste storage partially below grade at a transfer/processing site approved to receive only municipal waste.	-	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Transfer/Processing Site - Municipal Waste	Municipal waste storage entirely below grade at a transfer/processing site approved to receive only municipal waste.	-	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Storm Water - Infiltration (Industrial/Commercial)	A storm water infiltration facility that serves land where the predominant land use is commercial or industrial land uses.	Sum of impervious areas is > 2000 m2	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Storm Water - Infiltration (Residential/Institutional)	A storm water infiltration facility that serves land where the predominant land use is residential or institutional or community use.	Sum of impervious areas is more than 200 but not more than 2000 m2	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low

Table B.2 Circumstances of Chemical Drinking Water Threats in an IPZ-2 with a Vulnerability Score of 5.4 - Low Risk Level

Prescribed Threat	Threat SubCategory	Circumstance 1	Circumstance 2	Zone/Scores	Risk
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Waste Generation Facility - Registration Exempt or Excluded	Wastes described in specific provisions of O. Reg. 347 - excluded or exempted from registration - and are stored partially below grade at a waste generation facility.	-	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Storm Water - Infiltration (Industrial/Commercial)	A storm water infiltration facility that serves land where the predominant land use is commercial or industrial land uses.	Sum of impervious areas is more than 200 but not more than 2000 m2	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Waste Generation Facility - Registration Exempt or Excluded	Wastes described in specific provisions of O. Reg. 347 - excluded or exempted from registration - and are stored at or above grade at a waste generation facility.	-	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Transfer/Processing Site - Municipal Waste	Municipal waste storage at or above grade at a transfer/processing site approved to receive only municipal waste.	-	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Waste Generation Facility - Requiring Registration	Subject waste storage at or above grade or partially below grade at a waste generation facility requiring generator registration excluding a waste disposal site that requires an ECA under Part V of the EPA.	-	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Landfarming of Petroleum Refining Waste	Petroleum refining waste land disposal by means of landfarming.	The area where the land disposal is undertaken is more than 1 but not more than 10 ha.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The application of commercial fertilizer to land.	Fertilizer - Application	Fertilizer is applied to land	where the managed land is > 80% and the livestock density is > 1 NU/acre.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The application of commercial fertilizer to land.	Fertilizer - Application	Fertilizer is applied to land	where the managed land is 40 - 80% and the livestock density is < 0.5 NU/acre.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The application of commercial fertilizer to land.	Fertilizer - Application	Fertilizer is applied to land	where the managed land is 40 - 80% and the livestock density is 0.5 - 1 NU/acre	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The storage of snow.	Snow - Storage	A storm water drainage system outfall that serves a Snow Disposal Facility.	The area upon which snow is stored is more than 2000 m2	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	POW - Storage	POW or waste biomass storage at or above grade.	The mass of nitrogen in the POW or waste biomass stored is more than 0.5 tonne but not more than 5 tonnes.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low

Table B.2 Circumstances of Chemical Drinking Water Threats in an IPZ-2 with a Vulnerability Score of 5.4 - Low Risk Level

Prescribed Threat	Threat SubCategory	Circumstance 1	Circumstance 2	Zone/Scores	Risk
The application of road salt.	Road Salt - Application	Road salt application in an area	where the default % of impervious surface area is at least 1% but less than 8% in WHPA-A B C C1 D or HVA; or is at least 1% but less than 6% in IPZ-1 2 3 and WHPA-E.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The storage of agricultural source material.	ASM - Storage	ASM storage partially below grade in a permanent nutrient storage facility.	The weight or volume of manure stored annually on a farm unit is sufficient to annually land apply agricultural source material at a rate that is more than 0.5 but not more than 1.0 nutrient unit per acre of the farm units.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Overflow - CSO or SSO	A combined sewer or partially separated sanitary sewer outfall that discharges CSO or a manhole that discharges SSO or a wet well outfall that discharges sanitary sewage PSO	The wastewater collection facility is designed to convey more than 10 000 but not more than 100 000 m3 of sewage/day	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The storage of agricultural source material.	ASM - Storage	ASM storage partially below grade in a permanent nutrient storage facility.	The weight or volume of manure stored annually on a farm unit is sufficient to annually land apply agricultural source material at a rate that is more than 1.0 nutrient unit per acre of the farm units.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Landfarming of Petroleum Refining Waste	Petroleum refining waste land disposal by means of landfarming.	The area where the land disposal is undertaken is not more than 1 ha.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The application of non-agricultural source material to land.	NASM - Application	Material from non-farm herbivorous animals (Category 1) Category 2 or Category 3 NASM is applied to land	where the managed land is < 40% and the livestock density is 0.5 - 1 NU/acre.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Storm Water - Infiltration (Rural)	A storm water infiltration facility that serves land where the predominant land use is rural agricultural outdoor recreational parkland or greenhouses.	Sum of impervious areas is > 2000 m2	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The application of non-agricultural source material to land.	NASM - Application	Material from non-farm herbivorous animals (Category 1) Category 2 or Category 3 NASM is applied to land	where the managed land is < 40% and the livestock density is > 1 NU/acre.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Landfilling (Hazardous Waste or LIW)	Hazardous waste LIW or processed LIW land disposal.	The fill area is > 10 hectares.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The handling and storage of road salt.	Road Salt - Handling & Storage - Exposed	Storage of road salt exposed to precipitation runoff or snow melt.	The quantity of road salt stored is > 20 kg.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The handling and storage of commercial fertilizer.	Fertilizer - Handling and Storage	Fertilizer storage.	The fertilizer stored is > 2 500 kg.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The handling and storage of commercial fertilizer.	Fertilizer - Handling and Storage	Fertilizer storage.	The fertilizer stored is more than 250 but not more than 2 500 kg.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low

Table B.2 Circumstances of Chemical Drinking Water Threats in an IPZ-2 with a Vulnerability Score of 5.4 - Low Risk Level

Prescribed Threat	Threat SubCategory	Circumstance 1	Circumstance 2	Zone/Scores	Risk
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	POW - Storage	POW or waste biomass storage at or above grade.	The mass of nitrogen in the POW or waste biomass stored is >5 tonnes.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The application of non-agricultural source material to land.	NASM - Application	Material from non-farm herbivorous animals (Category 1) Category 2 or Category 3 NASM is applied to land	where the managed land is > 80% and the livestock density is < 0.5 NU/acre.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The handling and storage of a dense non-aqueous phase liquid.	DNAPL - Handling & Storage	DNAPL storage at or above grade	The engagement of an activity that may include but not limited to those provided in List 1 of Section 9 of the Glossary of Terms in the TDWTs.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Overflow - CSO or SSO	A combined sewer or partially separated sanitary sewer outfall that discharges CSO or a manhole that discharges SSO or a wet well outfall that discharges sanitary sewage PSO	The wastewater collection facility is designed to convey more than 1 000 but not more than 10 000 m3 of sewage/day	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	PCB Waste Storage	PCB waste storage in tanks partially below grade.	The PCB waste is stored at a PCB waste disposal site or was delivered to a site under written instructions of a Director.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The application of commercial fertilizer to land.	Fertilizer - Application	Fertilizer is applied to land	where the managed land is < 40% and the livestock density is 0.5 - 1 NU/acre.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Disposal of Hauled Sewage to Land	Hauled sewage disposal to land by any method.	The disposal area is 1-10 ha	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The handling and storage of pesticide.	Pesticide - Handling & Storage	The storage of pesticide on a site.	The pesticide stored is more than 250 but not more than 2 500 kg.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The application of non-agricultural source material to land.	NASM - Application	Material from non-farm herbivorous animals (Category 1) Category 2 or Category 3 NASM is applied to land	where the managed land is 40 - 80% and the livestock density is 0.5 - 1 NU/acre.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Storm Water - Outfall (Rural)	SWMF or storm water drainage system outfall that serves land where the predominant land use is rural agricultural outdoor recreational parkland or greenhouses.	The % of impervious areas of the lands served by the facility draining to the SWMF or storm water drainage system is >50% of the drainage area	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low

Table B.2 Circumstances of Chemical Drinking Water Threats in an IPZ-2 with a Vulnerability Score of 5.4 - Low Risk Level

Prescribed Threat	Threat SubCategory	Circumstance 1	Circumstance 2	Zone/Scores	Risk
The handling and storage of fuel.	Fuel - Handling and Storage	Liquid fuel storage in a tank at or above grade at a facility as defined in section 1 of O. Reg. 213/01 a facility as defined in section 1 of O. Reg. 217/01 or a facility that manufactures or refines fuel.	Fuel stored or handled in a quantity that is >2 500 litres.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The handling and storage of fuel.	Fuel - Handling and Storage	Liquid fuel storage in a tank partially below grade at a facility as defined in section 1 of O. Reg. 213/01 a facility as defined in section 1 of O. Reg. 217/01 or a facility that manufacturers or refines fuel.	Fuel stored or handled in a quantity that is >2 500 litres.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The use of land as livestock grazing or pasturing land an outdoor confinement area or a farm-animal yard. O. Reg. 385/08 s. 3.	ASM Generation - Livestock Grazing	The use of land as livestock grazing or pasturing land.	The number of nutrient units generated in the farm unit divided by the number of acres of land that is used for livestock grazing or pasturing land is sufficient to generate nutrients at an annual rate that is < 0.5 nutrient unit/acre.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The storage of snow.	Snow - Storage	Infiltration or discharge of snowmelt from the storage of snow on commercial or industrial sites.	The snow storage area is <200 m2	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	WWTF and Associated Parts	An STP final effluent outfall or an STP overflow outfall.	WWTF discharges treated sanitary sewage at an average daily rate that is more than 17 500 but not more than 50 000 m3/year.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The handling and storage of road salt.	Road Salt - Handling & Storage - Not Exposed	Storage of road salt inside an area facility or structure where it does not have the potential to be exposed to precipitation or runoff from precipitation or snow melt.	The quantity stored is > 500 000 kg.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The storage of agricultural source material.	ASM - Storage	ASM storage at or above grade in a permanent nutrient storage facility	The weight or volume of manure stored annually on a farm unit is sufficient to annually land apply agricultural source material at a rate that is more than 1.0 nutrient unit per acre of the farm units.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The storage of snow.	Snow - Storage	Infiltration or discharge of snowmelt from the storage of snow on commercial or industrial sites.	The snow storage area is 200-2000 m2.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The use of land as livestock grazing or pasturing land an outdoor confinement area or a farm-animal yard. O. Reg. 385/08 s. 3.	ASM Generation - OCA or Farm Animal Yard	The use of land as an OCA or a farm-animal yard.	The number of animals confined in the area at any time is sufficient to generate ASM at a rate of < 120 nutrient units/ha of the area annually.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	WWTF and Associated Parts	A sewage lagoon that may discharge sewage to groundwater	WWTF discharges treated sanitary sewage at an average daily rate that is more than 50 000 m3/year.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low

Table B.2 Circumstances of Chemical Drinking Water Threats in an IPZ-2 with a Vulnerability Score of 5.4 - Low Risk Level

Prescribed Threat	Threat SubCategory	Circumstance 1	Circumstance 2	Zone/Scores	Risk
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Landfilling (Municipal Waste)	Municipal waste land disposal.	The fill area is > 10 hectares.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Storm Water - Infiltration (Rural)	A storm water infiltration facility that serves land where the predominant land use is rural agricultural outdoor recreational parkland or greenhouses.	Sum of impervious areas is more than 200 but not more than 2000 m2	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The handling and storage of an organic solvent.	Organic Solvent - Handling & Storage	Organic solvent storage at or above grade.	The quantity of organic solvent stored is more than 250 but not more than 2 500 litres.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	WWTF and Associated Parts	An STP final effluent outfall or an STP overflow outfall.	WWTF discharges treated sanitary sewage at an average daily rate that is more than 500 but not more than 2 500 m3/year.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The handling and storage of road salt.	Road Salt - Handling & Storage - Potentially Exposed	Storage of road salt in an enclosure such as outdoor bins salt boxes tarps or containers 3-sided storage sheds or domes or by any other means where it has the potential to be exposed to precipitation or runoff from precipitation or snow melt.	The quantity stored is 50-100 kg.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	POW - Storage	POW or waste biomass storage at or above grade.	The mass of nitrogen in the POW or waste biomass stored is <0.5 tonne.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	WWTF and Associated Parts	STP process or holding tank that may discharge sewage to groundwater.	WWTF discharges treated sanitary sewage at an average daily rate that is more than 17 500 but not more than 50 000 m3/year.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Storm Water - Outfall (Industrial/Commercial)	SWMF or storm water drainage system outfall that serves land where the predominant land use is commercial or industrial land uses.	The % of impervious areas of the lands served by the facility draining to the SWMF or storm water drainage system is >50% of the drainage area	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The handling and storage of non-agricultural source material.	NASM - Handling & Storage	Material from non-farm herbivorous animals (Category 1) Category 2 or Category 3 NASM is stored partially below grade in a permanent nutrient storage facility.	The mass of nitrogen in the NASM stored is < 0.5 tonnes. Â	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low

Table B.2 Circumstances of Chemical Drinking Water Threats in an IPZ-2 with a Vulnerability Score of 5.4 - Low Risk Level

Prescribed Threat	Threat SubCategory	Circumstance 1	Circumstance 2	Zone/Scores	Risk
The handling and storage of non-agricultural source material.	NASM - Handling & Storage	Material from non-farm herbivorous animals (Category 1) Category 2 or Category 3 NASM is stored at or above grade in or on a permanent or a temporary nutrient storage facility.	The mass of nitrogen in the NASM stored is < 0.5 tonnes. Â	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The handling and storage of road salt.	Road Salt - Handling & Storage - Exposed	Storage of road salt exposed to precipitation runoff or snow melt.	The quantity stored is < 10 kg.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The handling and storage of non-agricultural source material.	NASM - Handling & Storage	Material from non-farm herbivorous animals (Category 1) Category 2 or Category 3 NASM is stored at or above grade in or on a permanent or a temporary nutrient storage facility.	The mass of nitrogen in the NASM stored is > 5 tonnes.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The handling and storage of an organic solvent.	Organic Solvent - Handling & Storage	Organic solvent storage partially below grade.	The quantity of organic solvent stored is more than 250 but not more than 2 500 litres.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	WWTF and Associated Parts	STP process or holding tank that may discharge sewage to groundwater.	WWTF discharges treated sanitary sewage at an average daily rate that is more than 50 000 m3/year.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	PCB Waste Storage	PCB waste storage in uncontained piles.	The PCB waste is stored at a PCB waste disposal site or was delivered to a site under written instructions of a Director.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	WWTF and Associated Parts	An STP final effluent outfall or an STP overflow outfall.	WWTF discharges treated sanitary sewage at an average daily rate that is more than 50 000 m3/year.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	WWTF and Associated Parts	A sewage lagoon that may discharge sewage to groundwater	WWTF discharges treated sanitary sewage at an average daily rate that is more than 17 500 but not more than 50 000 m3/year.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Transfer/Processing Site - Hazardous Waste or LIW	Hazardous waste or LIW storage entirely below grade at a transfer/processing site approved to receive hazardous waste or LIW.	-	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	POW - Application	POW application to land that may result in a release to groundwater or surface water.	where the managed land is < 40% and the livestock density is > 1 NU/acre.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low

Table B.2 Circumstances of Chemical Drinking Water Threats in an IPZ-2 with a Vulnerability Score of 5.4 - Low Risk Level

Prescribed Threat	Threat SubCategory	Circumstance 1	Circumstance 2	Zone/Scores	Risk
The storage of snow.	Snow - Storage	Infiltration or discharge of snowmelt from the storage of snow on commercial or industrial sites.	The area upon which snow is stored is more than 2000 m2	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Overflow - CSO or SSO	A combined sewer or partially separated sanitary sewer outfall that discharges CSO or a manhole that discharges SSO or a wet well outfall that discharges sanitary sewage PSO	The wastewater collection facility is designed to convey > 100 000 m3 of sewage/day.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Storm Water - Outfall (Residential/Institutional)	SWMF or storm water drainage system outfall that serves land where the predominant land use is residential or institutional or community use.	The % of impervious areas of the lands served by the facility draining to the SWMF or storm water drainage system is more than 20% but not more than 50% of the drainage area	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The handling and storage of pesticide.	Pesticide - Handling & Storage	The storage of pesticide on a site.	The pesticide stored is more than 25 but not more than 250 kg.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The handling and storage of an organic solvent.	Organic Solvent - Handling & Storage	Organic solvent storage at or above grade.	The quantity of organic solvent stored is > 2 500 litres.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The handling and storage of non-agricultural source material.	NASM - Handling & Storage	Material from non-farm herbivorous animals (Category 1) Category 2 or Category 3 NASM is stored partially below grade in a permanent nutrient storage facility.	The mass of nitrogen in the NASM stored is > 5 tonnes.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Overflow - CSO or SSO	A combined sewer or partially separated sanitary sewer outfall that discharges CSO or a manhole that discharges SSO or a wet well outfall that discharges sanitary sewage PSO	The wastewater collection facility is designed to convey more than 250 but not more than 1 000 m3 of sewage/day	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Storm Water - Infiltration (Residential/Institutional)	A storm water infiltration facility that serves land where the predominant land use is residential or institutional or community use.	Sum of impervious areas is > 2000 m2	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The handling and storage of pesticide.	Pesticide - Handling & Storage	The storage of pesticide on a site.	The pesticide stored is > 2 500 kg.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The handling and storage of road salt.	Road Salt - Handling & Storage - Exposed	Storage of road salt exposed to precipitation runoff or snow melt.	The quantity of road salt stored is 10-20 kg.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low

Table B.2 Circumstances of Chemical Drinking Water Threats in an IPZ-2 with a Vulnerability Score of 5.4 - Low Risk Level

Prescribed Threat	Threat SubCategory	Circumstance 1	Circumstance 2	Zone/Scores	Risk
The handling and storage of non-agricultural source material.	NASM - Handling & Storage	Material from non-farm herbivorous animals (Category 1) Category 2 or Category 3 NASM is stored partially below grade in a permanent nutrient storage facility.	The mass of nitrogen in the NASM stored is at 0.5-5 tonnes. Â	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The application of non-agricultural source material to land.	NASM - Application	Material from non-farm herbivorous animals (Category 1) Category 2 or Category 3 NASM is applied to land	where the managed land is 40 - 80% and the livestock density is > 1 NU/acre.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Storm Water - Outfall (Rural)	SWMF or storm water drainage system outfall that serves land where the predominant land use is rural agricultural outdoor recreational parkland or greenhouses.	The % of impervious areas of the lands served by the facility draining to the SWMF or storm water drainage system is not more than 20% of the drainage area	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The handling and storage of non-agricultural source material.	NASM - Handling & Storage	Material from non-farm herbivorous animals (Category 1) Category 2 or Category 3 NASM is stored at or above grade in or on a permanent or a temporary nutrient storage facility.	The mass of nitrogen in the NASM stored is at 0.5-5 tonnes. Â	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The handling and storage of an organic solvent.	Organic Solvent - Handling & Storage	Organic solvent storage partially below grade.	The quantity of organic solvent stored is > 2 500 litres.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Storm Water - Outfall (Residential/Institutional)	SWMF or storm water drainage system outfall that serves land where the predominant land use is residential or institutional or community use.	The % of impervious areas of the lands served by the facility draining to the SWMF or storm water drainage system is >50% of the drainage area	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The handling and storage of road salt.	Road Salt - Handling & Storage - Potentially Exposed	Storage of road salt in an enclosure such as outdoor bins salt boxes tarps or containers 3-sided storage sheds or domes or by any other means where it has the potential to be exposed to precipitation or runoff from precipitation or snow melt.	The quantity stored is > 100 kg.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The storage of snow.	Snow - Storage	A storm water drainage system outfall that serves a Snow Disposal Facility.	The snow storage area is 200-2000 m2.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low

Table B.2 Circumstances of Chemical Drinking Water Threats in an IPZ-2 with a Vulnerability Score of 5.4 - Low Risk Level

Prescribed Threat	Threat SubCategory	Circumstance 1	Circumstance 2	Zone/Scores	Risk
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Tailings From Mines	Mine tailing storage using a surface impoundment structure.	The site is part of a facility for which the NPRI Notice requires a person to report and the report must include information in relation to a substance listed in Group 1 2 3 or 4 of Part 1 of Schedule 1 or Part 2 of Schedule 1 of the notice.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	POW - Storage	POW or waste biomass storage partially below grade.	The mass of nitrogen in the POW or waste biomass stored is more than 0.5 tonne but not more than 5 tonnes.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Landfilling (Municipal Waste)	Municipal waste land disposal.	The fill area is 1-10 ha.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The application of road salt.	Road Salt - Application	Road salt application in an area	where the default % of impervious surface area is 30% or more in WHPA-A B C C1 D or HVA; or is 8% or more in IPZ-1 2 3 and WHPA-E.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	POW - Application	POW application to land that may result in a release to groundwater or surface water.	where the managed land is 40 - 80% and the livestock density is 0.5 - 1 NU/acre.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The application of non-agricultural source material to land.	NASM - Application	Material from non-farm herbivorous animals (Category 1) Category 2 or Category 3 NASM is applied to land	where the managed land is 40 - 80% and the livestock density is < 0.5 NU/acre.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The application of non-agricultural source material to land.	NASM - Application	Material from non-farm herbivorous animals (Category 1) Category 2 or Category 3 NASM is applied to land	where the managed land is > 80% and the livestock density is > 1 NU/acre.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The application of non-agricultural source material to land.	NASM - Application	Material from non-farm herbivorous animals (Category 1) Category 2 or Category 3 NASM is applied to land	where the managed land is > 80% and the livestock density is 0.5 - 1 NU/acre.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Storm Water - Outfall (Industrial/Commercial)	SWMF or storm water drainage system outfall that serves land where the predominant land use is commercial or industrial land uses.	The % of impervious areas of the lands served by the facility draining to the SWMF or storm water drainage system is not more than 20% of the drainage area	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	POW - Storage	POW or waste biomass storage partially below grade.	The mass of nitrogen in the POW or waste biomass stored is >5 tonnes.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The handling and storage of a dense non-aqueous phase liquid.	DNAPL - Handling & Storage	DNAPL storage partially below grade	The engagement of an activity that may include but not limited to those provided in List 1 of Section 9 of the Glossary of Terms in the TDWTs.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low

Table B.2 Circumstances of Chemical Drinking Water Threats in an IPZ-2 with a Vulnerability Score of 5.4 - Low Risk Level

Prescribed Threat	Threat SubCategory	Circumstance 1	Circumstance 2	Zone/Scores	Risk
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Storm Water - Outfall (Industrial/Commercial)	SWMF or storm water drainage system outfall that serves land where the predominant land use is commercial or industrial land uses.	The % of impervious areas of the lands served by the facility draining to the SWMF or storm water drainage system is more than 20% but not more than 50% of the drainage area	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Disposal of Hauled Sewage to Land	Hauled sewage disposal to land by any method.	Total application area < 1 ha	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Tailings From Mines	Mine tailing storage using a surface impoundment structure.	The site is not part of a facility for which the NPRI Notice requires a person to report.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The storage of snow.	Snow - Storage	A storm water drainage system outfall that serves a Snow Disposal Facility.	The snow storage area is <200 m2	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The application of commercial fertilizer to land.	Fertilizer - Application	Fertilizer is applied to land	where the managed land is 40 - 80% and the livestock density is > 1 NU/acre.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The handling and storage of fuel.	Fuel - Handling and Storage	Liquid fuel storage in a tank partially below grade at a facility as defined in section 1 of O. Reg. 213/01 a facility as defined in section 1 of O. Reg. 217/01 or a facility that manufacturers or refines fuel.	Fuel stored or handled is more than 25 but not more than 250 litres.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The application of commercial fertilizer to land.	Fertilizer - Application	Fertilizer is applied to land	where the managed land is > 80% and the livestock density is < 0.5 NU/acre.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The handling and storage of fuel.	Fuel - Handling and Storage	Liquid fuel storage in a tank at or above grade at a facility as defined in section 1 of O. Reg. 213/01 a facility as defined in section 1 of O. Reg. 217/01 or a facility that manufactures or refines fuel.	Fuel stored or handled in a quantity that is more than 250 but not more than 2 500 litres.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	POW - Application	POW application to land that may result in a release to groundwater or surface water.	where the managed land is 40 - 80% and the livestock density is < 0.5 NU/acre.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The application of pesticide to land.	Pesticide - Application	Pesticide is applied to land	The disposal area is 1-10 ha	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The application of pesticide to land.	Pesticide - Application	Pesticide is applied to land	The disposal area is > 10 ha	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low

Table B.2 Circumstances of Chemical Drinking Water Threats in an IPZ-2 with a Vulnerability Score of 5.4 - Low Risk Level

Prescribed Threat	Threat SubCategory	Circumstance 1	Circumstance 2	Zone/Scores	Risk
The storage of agricultural source material.	ASM - Storage	ASM storage partially below grade in a permanent nutrient storage facility.	The weight or volume of manure stored annually on a farm unit is sufficient to annually land apply agricultural source material at a rate that is not more than 0.5 nutrient units per acre of the farm units.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The storage of agricultural source material.	ASM - Storage	ASM storage at or above grade in a permanent nutrient storage facility	The weight or volume of manure stored annually on a farm unit is sufficient to annually land apply agricultural source material at a rate that is not more than 0.5 nutrient units per acre of the farm units.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The storage of agricultural source material.	ASM - Storage	ASM storage at or above grade on a temporary field nutrient storage site.	The weight or volume of manure stored annually on a farm unit is sufficient to annually land apply agricultural source material at a rate that is not more than 0.5 nutrient units per acre of the farm units.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The storage of agricultural source material.	ASM - Storage	ASM storage at or above grade on a temporary field nutrient storage site.	The weight or volume of manure stored annually on a farm unit is sufficient to annually land apply agricultural source material at a rate that is more than 0.5 but not more than 1.0 nutrient unit per acre of the farm units.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The management of runoff that contains chemicals used in the de-icing of aircraft.	Aircrafts - De-icing Runoff	De-icing materials runoff discharge to land or water.	The runoff originates at a national airport.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The management of runoff that contains chemicals used in the de-icing of aircraft.	Aircrafts - De-icing Runoff	De-icing materials runoff discharge to land or water.	The runoff originates at a regional airport.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The management of runoff that contains chemicals used in the de-icing of aircraft.	Aircrafts - De-icing Runoff	De-icing materials runoff discharge to land or water.	The runoff originates at a small airport.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The application of agricultural source material to land.	Application of Agricultural Source Material (ASM) to Land	ASM is applied to land	where the managed land is > 80% and the livestock density is < 0.5 NU/acre.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The application of agricultural source material to land.	Application of Agricultural Source Material (ASM) to Land	ASM is applied to land	where the managed land is 40 - 80% and the livestock density is > 1 NU/acre.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The application of agricultural source material to land.	Application of Agricultural Source Material (ASM) to Land	ASM is applied to land	where the managed land is < 40% and the livestock density is > 1 NU/acre.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The application of agricultural source material to land.	Application of Agricultural Source Material (ASM) to Land	ASM is applied to land	where the managed land is < 40% and the livestock density is 0.5 - 1 NU/acre.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The application of agricultural source material to land.	Application of Agricultural Source Material (ASM) to Land	ASM is applied to land	where the managed land is 40 - 80% and the livestock density is 0.5 - 1 NU/acre.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The application of agricultural source material to land.	Application of Agricultural Source Material (ASM) to Land	ASM is applied to land	where the managed land is 40 - 80% and the livestock density is < 0.5 NU/acre.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The storage of agricultural source material.	ASM - Storage	ASM storage at or above grade on a temporary field nutrient storage site.	The weight or volume of manure stored annually on a farm unit is sufficient to annually land apply agricultural source material at a rate that is more than 1.0 nutrient unit per acre of the farm units.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The storage of agricultural source material.	ASM - Storage	ASM storage at or above grade in a permanent nutrient storage facility	The weight or volume of manure stored annually on a farm unit is sufficient to annually land apply agricultural source material at a rate that is more than 0.5 but not more than 1.0 nutrient unit per acre of the farm units.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low

Table B.2 Circumstances of Chemical Drinking Water Threats in an IPZ-2 with a Vulnerability Score of 5.4 - Low Risk Level

Prescribed Threat	Threat SubCategory	Circumstance 1	Circumstance 2	Zone/Scores	Risk
The handling and storage of fuel.	Fuel - Handling and Storage	Liquid fuel storage in a tank at or above grade at a facility as defined in section 1 of O. Reg. 213/01 a facility as defined in section 1 of O. Reg. 217/01 or a facility that manufactures or refines fuel.	Fuel stored or handled is more than 25 but not more than 250 litres.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	PCB Waste Storage	PCB waste storage in drums above or at grade.	The PCB waste is stored at a PCB waste disposal site or was delivered to a site under written instructions of a Director.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	POW - Application	POW application to land that may result in a release to groundwater or surface water.	where the managed land is > 80% and the livestock density is > 1 NU/acre.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	POW - Application	POW application to land that may result in a release to groundwater or surface water.	where the managed land is < 40% and the livestock density is 0.5 - 1 NU/acre.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	POW - Application	POW application to land that may result in a release to groundwater or surface water.	where the managed land is 40 - 80% and the livestock density is > 1 NU/acre.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	POW - Storage	POW or waste biomass storage partially below grade.	The mass of nitrogen in the POW or waste biomass stored is <0.5 tonne.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	WWTF and Associated Parts	An STP final effluent outfall or an STP overflow outfall.	WWTF discharges treated sanitary sewage at an average daily rate that is more than 2 500 but not more than 17 500 m3/year.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low

Table B.3 Circumstances of Chemical Drinking Water Threats in an IPZ-1 with a Vulnerability Score of 6.0 - Moderate Risk Level

Prescribed Threat	Threat SubCategory	Circumstance 1	Circumstance 2	Zone/Scores	Risk
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Industrial Effluent Discharges	Industrial sewage discharge to surface water or land	The site is part of a facility for which the NPRI Notice requires a person to report and the report must include information in relation to a substance listed in Group 1 2 3 or 4 of Part 1 of Schedule 1 or Part 2 of Schedule 1 of the notice.	IPZ-1 IPZ-3 with a scores of 6	Moderate
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Transfer/Processing Site - Hazardous Waste or LIW	Hazardous waste or LIW storage above grade at a transfer/processing site approved to receive hazardous waste or LIW.	-	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Moderate
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Transfer/Processing Site - Hazardous Waste or LIW	Hazardous waste or LIW storage partially below grade at a transfer/processing site approved to receive hazardous waste or LIW.	-	WHPA-B WHPA-C WHPA-D HVA IPZ-1 IPZ-3 with a scores of 6	Moderate
The storage of snow.	Snow - Storage	A storm water drainage system outfall that serves a Snow Disposal Facility.	The area upon which snow is stored is more than 2000 m2	IPZ-1 IPZ-3 with a scores of 6	Moderate
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Overflow - CSO or SSO	A combined sewer or partially separated sanitary sewer outfall that discharges CSO or a manhole that discharges SSO or a wet well outfall that discharges sanitary sewage PSO	The wastewater collection facility is designed to convey > 100 000 m3 of sewage/day.	IPZ-1 IPZ-3 with a scores of 6	Moderate
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Storm Water - Outfall (Industrial/Commercial)	SWMF or storm water drainage system outfall that serves land where the predominant land use is commercial or industrial land uses.	The % of impervious areas of the lands served by the facility draining to the SWMF or storm water drainage system is >50% of the drainage area	IPZ-1 IPZ-3 with a scores of 6	Moderate
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	WWTF and Associated Parts	An STP final effluent outfall or an STP overflow outfall.	WWTF discharges treated sanitary sewage at an average daily rate that is more than 50 000 m3/year.	IPZ-1 IPZ-3 with a scores of 6	Moderate
The storage of snow.	Snow - Storage	Infiltration or discharge of snowmelt from the storage of snow on commercial or industrial sites.	The area upon which snow is stored is more than 2000 m2	IPZ-1 IPZ-3 with a scores of 6	Moderate

Table B.4 Circumstances of Pathogen Drinking Water Threats in an IPZ-1 with a Vulnerability Score of 6.0 - Low Risk Level

Prescribed Threat	Threat SubCategory	Circumstance 1	Circumstance 2	Zone/Scores	Risk
The handling and storage of non-agricultural source material.	NASM - Handling & Storage	Category 3 non-agricultural source material other than Category B compost and that contains material from a meat plant or sewage biosolid or material from non-farm herbivorous animals (Category 1) and the material is stored entirely below grade.	A spill of the material or runoff from an area where the material is stored may result in the presence of one or more pathogens in groundwater or surface water.	IPZ-1 IPZ-3 WHPA-B with a scores of 6	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Storm Water - Outfall (Residential/Institutional)	A storm water management facility outfall or a storm water drainage system outfall.	The discharge may result in the presence of one or more pathogens in groundwater or surface water.	IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Storm Water - Outfall (Industrial/Commercial)	A storm water management facility outfall or a storm water drainage system outfall.	The discharge may result in the presence of one or more pathogens in groundwater or surface water.	IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Industrial Effluent Discharges	The system discharges to surface water or land and its primary functions include conveying sewage from a seafood processing operation a dairy producer a dairy product manufacturing operation an animal food manufacturing operation that manufactures food from animal sources or a pulp and paper mill.	The discharge may result in the presence of one or more pathogens in surface water.	IPZ-1 IPZ-3 with a scores of 6	Low
The management of agricultural source material.	Management of ASM - Aquaculture	The use of land or water for aquaculture.	The land use may result in the presence of one or more pathogens in surface water.	IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Storm Water - Outfall (Rural)	A storm water management facility outfall or a storm water drainage system outfall.	The discharge may result in the presence of one or more pathogens in groundwater or surface water.	IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	POW - Storage	The processed organic waste is stored on a site entirely below grade.	The storage may result in the presence of one or more pathogens in groundwater or surface water.	IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Wastewater Collection Facilities and Associated Parts: Sewage Pumping Station or Lift Station Wet Well a Holding Tank or a Tunnel	A wet well a holding tank or a tunnel that forms part of a wastewater collection facility as part of a sanitary sewage pumping station or lift station and stores sanitary sewage containing human waste.	A spill may result in the presence of one or more pathogens in groundwater or surface water.	IPZ-1 IPZ-3 WHPA-B with a scores of 6	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	WWTF and Associated Parts	A sewage treatment plant process tank or a sewage treatment plant holding tank that forms part of a wastewater treatment facility.	A discharge may result in the presence of one or more pathogens in groundwater or surface water.	IPZ-1 IPZ-3 with a scores of 6	Low

Table B.4 Circumstances of Pathogen Drinking Water Threats in an IPZ-1 with a Vulnerability Score of 6.0 - Low Risk Level

Prescribed Threat	Threat SubCategory	Circumstance 1	Circumstance 2	Zone/Scores	Risk
The application of non-agricultural source material to land.	NASM - Application	The land application of any quantity of Category 3 non-agricultural source material other than Category B compost and excluding materials from organic waste matter derived from the production of biodiesel organic waste matter from grease traps and interceptors a meat plant or sewage biosolid.	The application may result in the presence of one or more pathogens in groundwater or surface water.	IPZ-1 IPZ-3 with a scores of 6	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Wastewater Collection Facilities and Associated Parts: Sanitary Sewers	A forcemain a combined sewer or partially separated sanitary sewer a rising main or a gravity sanitary sewer that forms part of a wastewater collection facility not including its appurtenances.	The discharge from the system may result in the presence of one or more pathogens in groundwater or surface water.	IPZ-1 IPZ-3 WHPA-B with a scores of 6	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Onsite Sewage Works	The system is an earth pit privy privy vault cesspool or a leaching bed system and its associated treatment unit and is a sewage system as defined in section 1 of O. Reg. 350/06 (Building Code) made under the Building Code Act 1992 or a sewage works as defined in section 1 of the Ontario Water Resources Act.	A discharge from the system may result in the presence of one or more pathogens in groundwater or surface water.	IPZ-1 IPZ-3 WHPA-B with a scores of 6	Low
The handling and storage of non-agricultural source material.	NASM - Handling & Storage	Category 3 non-agricultural source material other than Category B compost and excluding materials from organic waste matter derived from the production of biodiesel organic waste matter from grease traps and interceptors a meat plant or sewage biosolid and any portion of the material is stored at or above grade.	A spill of the material or runoff from an area where the material is stored may result in the presence of one or more pathogens in groundwater or surface water.	IPZ-1 IPZ-3 with a scores of 6	Low
The storage of agricultural source material.	ASM - Storage	The agricultural source material is stored entirely below grade in or on a permanent nutrient storage facility as defined under the Nutrient Management Act (O.Reg 267).	A spill of the material or runoff from an area where the material is stored may result in the presence of one or more pathogens in groundwater or surface water.	IPZ-1 IPZ-3 WHPA-B with a scores of 6	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Onsite Sewage Works	The system requires or uses a holding tank for the retention of hauled sewage at the site where it is produced before its collection by a hauled sewage system.	A spill from the tank may result in the presence of one or more pathogens in groundwater or surface water.	IPZ-1 IPZ-3 WHPA-B with a scores of 6	Low

Table B.5 Circumstances of Pathogen Drinking Water Threats in an IPZ-1 with a Vulnerability Score of 6.0 - Moderate Risk Level

Prescribed Threat	Threat SubCategory	Chemical Rim	Chemical Qty	Zone/Scores	Risk
The storage of agricultural source material.	ASM - Storage	The agricultural source material is stored at a temporary field nutrient storage site as defined under the Nutrient Management Act (O.Reg 267).	A spill of the material or runoff from an area where the material is stored may result in the presence of one or more pathogens in groundwater or surface water.	IPZ-1 IPZ-3 with a scores of 6	Moderate
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Disposal of Hauled Sewage to Land	Land disposal of hauled sewage in any quantity by any method.	The disposal may result in the presence of one or more pathogens in groundwater or surface water.	IPZ-1 IPZ-3 with a scores of 6	Moderate
The application of non-agricultural source material to land.	NASM - Application	The land application of any quantity of Category 3 non-agricultural source material other than Category B compost and that contains material from a meat plant or sewage biosolids or material from non-farm herbivorous animals (Category 1).	The application may result in the presence of one or more pathogens in groundwater or surface water.	IPZ-1 IPZ-3 with a scores of 6	Moderate
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	POW - Application	Land application of any quantity of processed organic waste.	The application may result in the presence of one or more pathogens in groundwater or surface water.	IPZ-1 IPZ-3 with a scores of 6	Moderate
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	POW - Storage	The process organic waste is stored on a site and any portion of the material is stored at or above grade.	The storage may result in the presence of one or more pathogens in groundwater or surface water.	IPZ-1 IPZ-3 with a scores of 6	Moderate
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	WWTF and Associated Parts	A final effluent outfall or a sewage treatment plant overflow outfall that is part of a wastewater treatment facility.	A discharge may result in the presence of one or more pathogens in groundwater or surface water.	IPZ-1 IPZ-3 with a scores of 6	Moderate
The use of land as livestock grazing or pasturing land an outdoor confinement area or a farm-animal yard. O. Reg. 385/08 s. 3.	ASM Generation - Livestock Grazing	The use of land as livestock grazing or pasturing land for one or more animals.	The land use may result in the presence of one or more pathogens in groundwater or surface water.	IPZ-1 IPZ-3 with a scores of 6	Moderate
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Hauled Sewage - Storage	The hauled sewage is stored in a tank or in a lagoon on site in a stationary means of containment for hauled sewage.	The storage may result in the presence of one or more pathogens in groundwater or surface water.	IPZ-1 IPZ-3 with a scores of 6	Moderate
The application of agricultural source material to land.	Application of Agricultural Source Material (ASM) to Land	Agricultural source material is applied to land in any quantity.	The application may result in the presence of one or more pathogens in groundwater or surface water.	IPZ-1 IPZ-3 with a scores of 6	Moderate

Table B.5 Circumstances of Pathogen Drinking Water Threats in an IPZ-1 with a Vulnerability Score of 6.0 - Moderate Risk Level

Prescribed Threat	Threat SubCategory	Chemical Rim	Chemical Qty	Zone/Scores	Risk
The storage of agricultural source material.	ASM - Storage	Any portion of the agricultural source material is stored at or above grade in or on a permanent nutrient storage facility as defined under the Nutrient Management Act (O.Reg 267).	A spill of the material or runoff from an area where the material is stored may result in the presence of one or more pathogens in groundwater or surface water.	IPZ-1 IPZ-3 with a scores of 6	Moderate
The use of land as livestock grazing or pasturing land an outdoor confinement area or a farm-animal yard. O. Reg. 385/08 s. 3.	ASM Generation - OCA or Farm Animal Yard	The use of land as an outdoor confinement area or a farm-animal yard for one or more animals.	The land use may result in the presence of one or more pathogens in groundwater or surface water.	IPZ-1 IPZ-3 with a scores of 6	Moderate
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Industrial Effluent Discharges	The system discharges to surface water or land and its primary functions include conveying sewage from a meat plant.	The discharge may result in the presence of one or more pathogens in surface water.	IPZ-1 IPZ-3 with a scores of 6	Moderate
The handling and storage of non-agricultural source material.	NASM - Handling & Storage	Category 3 non-agricultural source material other than Category B compost and that contains material from a meat plant or sewage biosolid or material from non-farm herbivorous animals (Category 1) and any portion of the material is stored at or above grade.	A spill of the material or runoff from an area where the material is stored may result in the presence of one or more pathogens in groundwater or surface water.	IPZ-1 IPZ-3 with a scores of 6	Moderate
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Overflow - CSO or SSO	A combined sewer or partially separated sanitary sewer outfall that discharges combined sewer overflow (CSO) or a manhole that discharges sanitary sewer overflow (SSO) or a wet well outfall that discharges sanitary sewage pumping station overflow (PSO) and forms part of a wastewater collection facility.	The discharge may result in the presence of one or more pathogens in groundwater or surface water.	IPZ-1 IPZ-3 with a scores of 6	Moderate

Table B.6 Circumstances of Pathogen Drinking Water Threats in an IPZ-2 with a Vulnerability Score of 5.4 - Low Risk Level

Prescribed Threat	Threat SubCategory	Circumstance 1	Circumstance 2	Zone/Scores	Risk
The storage of agricultural source material.	ASM - Storage	The agricultural source material is stored at a temporary field nutrient storage site as defined under the Nutrient Management Act (O.Reg 267).	A spill of the material or runoff from an area where the material is stored may result in the presence of one or more pathogens in groundwater or surface water.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The use of land as livestock grazing or pasturing land an outdoor confinement area or a farm-animal yard. O. Reg. 385/08 s. 3.	ASM Generation - OCA or Farm Animal Yard	The use of land as an outdoor confinement area or a farm-animal yard for one or more animals.	The land use may result in the presence of one or more pathogens in groundwater or surface water.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Disposal of Hauled Sewage to Land	Land disposal of hauled sewage in any quantity by any method.	The disposal may result in the presence of one or more pathogens in groundwater or surface water.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The handling and storage of non-agricultural source material.	NASM - Handling & Storage	Category 3 non-agricultural source material other than Category B compost and that contains material from a meat plant or sewage biosolid or material from non-farm herbivorous animals (Category 1) and the material is stored entirely below grade.	A spill of the material or runoff from an area where the material is stored may result in the presence of one or more pathogens in groundwater or surface water.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	WWTF and Associated Parts	A sewage treatment plant process tank or a sewage treatment plant holding tank that forms part of a wastewater treatment facility.	A discharge may result in the presence of one or more pathogens in groundwater or surface water.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	POW - Storage	The process organic waste is stored on a site and any portion of the material is stored at or above grade.	The storage may result in the presence of one or more pathogens in groundwater or surface water.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	Hauled Sewage - Storage	The hauled sewage is stored in a tank or in a lagoon on site in a stationary means of containment for hauled sewage.	The storage may result in the presence of one or more pathogens in groundwater or surface water.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	POW - Storage	The processed organic waste is stored on a site entirely below grade.	The storage may result in the presence of one or more pathogens in groundwater or surface water.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low

Table B.6 Circumstances of Pathogen Drinking Water Threats in an IPZ-2 with a Vulnerability Score of 5.4 - Low Risk Level

Prescribed Threat	Threat SubCategory	Circumstance 1	Circumstance 2	Zone/Scores	Risk
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Wastewater Collection Facilities and Associated Parts: Sewage Pumping Station or Lift Station Wet Well a Holding Tank or a Tunnel	A wet well a holding tank or a tunnel that forms part of a wastewater collection facility as part of a sanitary sewage pumping station or lift station and stores sanitary sewage containing human waste.	A spill may result in the presence of one or more pathogens in groundwater or surface water.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a waste disposal site within the meaning of Part V of the Environmental Protection Act.	POW - Application	Land application of any quantity of processed organic waste.	The application may result in the presence of one or more pathogens in groundwater or surface water.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The application of non-agricultural source material to land.	NASM - Application	The land application of any quantity of Category 3 non-agricultural source material other than Category B compost and that contains material from a meat plant or sewage biosolids or material from non-farm herbivorous animals (Category 1).	The application may result in the presence of one or more pathogens in groundwater or surface water.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Wastewater Collection Facilities and Associated Parts: Sanitary Sewers	A forcemain a combined sewer or partially separated sanitary sewer a rising main or a gravity sanitary sewer that forms part of a wastewater collection facility not including its appurtenances.	The discharge from the system may result in the presence of one or more pathogens in groundwater or surface water.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Overflow - CSO or SSO	A combined sewer or partially separated sanitary sewer outfall that discharges combined sewer overflow (CSO) or a manhole that discharges sanitary sewer overflow (SSO) or a wet well outfall that discharges sanitary sewage pumping station overflow (PSO) and forms part of a wastewater collection facility.	The discharge may result in the presence of one or more pathogens in groundwater or surface water.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	WWTF and Associated Parts	A final effluent outfall or a sewage treatment plant overflow outfall that is part of a wastewater treatment facility.	A discharge may result in the presence of one or more pathogens in groundwater or surface water.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The use of land as livestock grazing or pasturing land an outdoor confinement area or a farm-animal yard. O. Reg. 385/08 s. 3.	ASM Generation - Livestock Grazing	The use of land as livestock grazing or pasturing land for one or more animals.	The land use may result in the presence of one or more pathogens in groundwater or surface water.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The application of agricultural source material to land.	Application of Agricultural Source Material (ASM) to Land	Agricultural source material is applied to land in any quantity.	The application may result in the presence of one or more pathogens in groundwater or surface water.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low

Table B.6 Circumstances of Pathogen Drinking Water Threats in an IPZ-2 with a Vulnerability Score of 5.4 - Low Risk Level

Prescribed Threat	Threat SubCategory	Circumstance 1	Circumstance 2	Zone/Scores	Risk
The storage of agricultural source material.	ASM - Storage	The agricultural source material is stored entirely below grade in or on a permanent nutrient storage facility as defined under the Nutrient Management Act (O.Reg 267).	A spill of the material or runoff from an area where the material is stored may result in the presence of one or more pathogens in groundwater or surface water.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The storage of agricultural source material.	ASM - Storage	Any portion of the agricultural source material is stored at or above grade in or on a permanent nutrient storage facility as defined under the Nutrient Management Act (O.Reg 267).	A spill of the material or runoff from an area where the material is stored may result in the presence of one or more pathogens in groundwater or surface water.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Industrial Effluent Discharges	The system discharges to surface water or land and its primary functions include conveying sewage from a meat plant.	The discharge may result in the presence of one or more pathogens in surface water.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The handling and storage of non-agricultural source material.	NASM - Handling & Storage	Category 3 non-agricultural source material other than Category B compost and that contains material from a meat plant or sewage biosolid or material from non-farm herbivorous animals (Category 1) and any portion of the material is stored at or above grade.	A spill of the material or runoff from an area where the material is stored may result in the presence of one or more pathogens in groundwater or surface water.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Onsite Sewage Works	The system requires or uses a holding tank for the retention of hauled sewage at the site where it is produced before its collection by a hauled sewage system.	A spill from the tank may result in the presence of one or more pathogens in groundwater or surface water.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low
The establishment operation or maintenance of a system that collects stores transmits treats or disposes of sewage.	Onsite Sewage Works	The system is an earth pit privy privy vault cesspool or a leaching bed system and its associated treatment unit and is a sewage system as defined in section 1 of O. Reg. 350/06 (Building Code) made under the Building Code Act 1992 or a sewage works as defined in section 1 of the Ontario Water Resources Act.	A discharge from the system may result in the presence of one or more pathogens in groundwater or surface water.	WHPA-E IPZ-2 IPZ-3 with a scores of 5.4	Low

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M

Appendix M: Natural Environment Investigation

January 30, 2025
P230821

Chris Zagar – *Director of Public Works*
The Town of Blind River
11 Hudson Street
P.O. Box 640
Blind River, Ontario
P0R 1B0

Attention: Chris Zagar – *Director of Public Works*

> Re: Natural Environment Assessment and Mitigations Memo – Blind River Water Intake 2024 Construction

Dear Chris Zagar,

TULLOCH Environmental, a division of TULLOCH Engineering Inc. (TULLOCH) was retained by the Town of Blind River ('the Town') to provide environmental support for the construction of a water intake pipeline. The proposed infrastructure will pump source water directly from Lake Huron to the Water Treatment Plant in Blind River, Ontario.

1. INTRODUCTION

The water intake pipe installation (the 'Project') will occur in three (3) phases. The first phase ('Phase 1') began in May 2024, and included the installation of the watermain along Huron Street, beginning from Woodward Avenue and extending toward Causley Street, including the connection to Berthelot Street. The second phase ('Phase 2') will occur in 2025, which will involve directional drilling under Causley Street, Martin Street and the railway to extend the watermain toward a designated water intake location. The water intake location will be determined in the third phase ('Phase 3'), planned for 2026, which will include the installation of the water intake line approximately 400m into Lake Huron, and the construction of a Low Lift Pumping Station ('LLPS') approximately 50m inland. The contents of this Memo include review and consideration of all three (3) construction phases. A detailed review of environmental constraints, impacts, mitigations, and associated permits for these phases will be completed by TULLOCH upon receipt of final designs. The construction plans for Phase 3 are currently unknown, thus the impact assessment and mitigations presented are generalized, and should be re-considered following detailed design completion.

The Phases 1 – 3 construction footprint (the 'Site') is shown in Figure 1. A pumphouse (LLPS) will be built adjacent the Lake Huron shoreline (UTM 17T 0349240 5116263). A watermain pipe will then be trenched from the pumphouse north across Martin Street extending along the side of Woodward Avenue until the intersection with Huron Street for the connection to Berthelot Street, Blind River, ON.

To support the Town in reviewing all natural environmental constraints associated with the Phase 1 – 3 construction and identifying mitigation efforts to reduce or eliminate environmental impacts, TULLOCH has compiled this Natural Environmental Assessment and Mitigations Memo. In addition to this memo, a Municipal Class Environmental Assessment is being undertaken for Phases 1 – 3 of construction.

Blind River Water Intake Pipeline

Phases 1 3 Construction

Legend

- Study Area (120m)
- Water Intake Line Location
- Pumphouse (Proposed LLPS)
- Phase 1 and 2 Recommended 30m Setback

0 75 150 m

Projection: UTM (NAD83)
1:5,000

TULLOCH ENVIRONMENTAL

Figure 1

2025-01-20T11:41:37.000

Project: 230821

Notes: Data updated March 2021. Asterisk (*) denotes retired / discontinued data (may be 3 or more years old).

\\sud-filer\tul-proj-aws\Sud-Local\No Lock\2023\230821 Blind River Water Intake\6_Mapping (No Locks)\230821 Field Visit Map 06Nov2023.qgz - Sasha Losier

2. DESKTOP BACKGROUND REVIEW

A background records review was conducted for the Site and areas within 1000m. To avoid duplicating effort, TULLOCH completed the background review and associated regulatory consultation on the entire Project (Phases 1 – 3). This review, including sources reviewed and information obtained, is summarized in Table 1. The letter provided to the Ministry of Natural Resources (MNR) outlining the results of the background review investigation is provided in Attachment I.

Table 1 – Desktop review of Natural Heritage information, including records of features known to exist, or have the potential to exist, within the Site and its general vicinity.

Feature	Description	Source(s) Reviewed	Records Obtained
Provincial Policy Statement 'PPS'			
Natural Heritage Systems	a) A natural heritage system is an ecologically based delineation of nature and natural function – a system of connected or to be connected green and natural areas that provide ecological functions over a longer period of time and enable movement of species. Natural heritage systems encompass or incorporate natural features, functions, and linkages (also referred to as "corridors") as component parts within them and across the landscape. They also enable the linking of different landscapes. b) Only applies to Ecoregions 6E and 7E.	• Land Information Ontario: '*Natural Heritage Systems Area*' database. • Natural Heritage Information Centre web application ('NHIC'; https://www.ontario.ca/page/natural-heritage-information-centre)	• No records within 1000m of the Site. • The Site is located within Ecodistrict 5E-8 of Ecoregion 5E (the Georgian Bay Ecoregion). • The Site is not located within Ecoregions 6E or 7E and therefore would not qualify for this feature.
Significant Wetlands	• "Significant wetlands," as defined by the PPS, are referred to as "Provincially Significant Wetlands" (PSWs) when identified, mapped, and scored using a scientific point-based ranking system known as the Ontario Wetland Evaluation System (OWES).	• Land Information Ontario: '*Wetlands'* database. • Natural Heritage Information Centre web application ('NHIC'; https://www.ontario.ca/page/natural-heritage-information-centre) • Ministry of Natural Resources (MNR) Information Request (response received October 30, 2023) • Review of aerial imagery.	• No wetlands exist within the Site boundaries.
Coastal Wetlands	• Any wetland that is located on one of the Great Lakes or their connecting channels (Lake St. Clair, St. Mary's, St. Clair, Detroit, Niagara, and St. Lawrence Rivers) • Any other wetland that is on a tributary to any of the above-specified water bodies and lies, either wholly or in part, downstream of a line located 2km upstream of the 1:100-year flood line (plus wave run-up) of the large water body to which the tributary is connected.	• Land Information Ontario: '*Wetlands'* database. • Natural Heritage Information Centre web application ('NHIC'; https://www.ontario.ca/page/natural-heritage-information-centre)	• No wetlands exist within the Site boundaries. • A coastal wetland exists 400m northwest of the southern extent of the Site.
Significant Woodlands	• Defined under the PPS as an area which is ecologically important in terms of features such as species composition, age of trees and stand history; functionally important due to its contribution to the broader landscape because of its location, size or due to the amount of forest cover in the planning area; or economically important due to site quality, species composition, or past management history. • Only applies to Ecoregions 6E and 7E.	• Land Information Ontario: *'Natural Heritage Systems Area'* database. • Natural Heritage Information Centre web application ('NHIC'; https://www.ontario.ca/page/natural-heritage-information-centre) • Review of aerial imagery.	• The Site is not located within Ecoregions 6E or 7E and therefore would not qualify for this feature.
Significant Valleylands	• A natural area that occurs in a valley or other landform depression that has water flowing through or standing for some period of the year.	• Land Information Ontario: *'Natural Heritage Systems Area'* database.	• The Site is not located within Ecoregions 6E or 7E and therefore would not qualify for this feature.

	• Ecologically important in terms of features, functions, representation, or amount, and contributing to the quality and diversity of an identifiable geographic area or natural heritage system. • Only applies to Ecoregions 6E and 7E.	• Natural Heritage Information Centre web application ('NHIC'; https://www.ontario.ca/page/natural-heritage-information-centre) • Review of aerial imagery.	
Significant Wildlife Habitat (SWH)	• Significant Wildlife Habitat (SWH) is defined in the MNR's Significant Wildlife Habitat Technical Guide as natural heritage areas that are "*ecologically important in terms of features, functions, representation and amount and contributing to the quality and diversity of an identifiable geographic area or Natural Heritage System*." They include a verity of seasonal concentration areas, rare vegetation communities, specialized habitat for wildlife, habitat of species of conservation concern, and animal movement corridors.	• Land Information Ontario: *'Wildlife Values Area'* database. • Land Information Ontario: *'Wildlife Values Site'* database. • Natural Heritage Information Centre web application ('NHIC'; https://www.ontario.ca/page/natural-heritage-information-centre) • Ministry of Natural Resources (MNR) Information Request (response received October 30, 2023) • Review of aerial imagery.	• Records of a Colonial Waterbird Nesting Wildlife Concentration exists within 1000m of the Site.
Significant Areas of Natural and Scientific Interest (ANSI)	• Features (as defined by the MNR) that represent land and water containing important natural landscapes or features that are important for natural heritage, protection, appreciation, scientific study, or education.	• Review of Land Information Ontario '*Areas of Natural and Scientific Interest (ANSI)*' database. • Natural Heritage Information Centre web application ('NHIC'; https://www.ontario.ca/page/natural-heritage-information-centre)	• No records within 1000m of the Site.
Fish Habitat and the *Fisheries Act*	• The Fisheries Act applies protections to fish (or all body sizes) and fish habitat. Fish habitat includes any area that supports fish spawning, rearing, feeding, and migration at any time of year. It includes permanent, intermittent, and ephemeral waters on which fish depend directly or indirectly to carry out these life processes.	• Land Information Ontario: *'Ontario Hydro Network'* database. • Land Information Ontario: *'Aquatic Resource Area'* database. • Ontario Fish ON-line (https://www.ontario.ca/page/how-use-fish-line) • Ministry of Natural Resources (MNR) Information Request (response received October 30, 2023) • Fisheries and Oceans Canada (the 'DFO'): SAR Distribution Data	• Fish habitat exists within the Site boundary. The southern extent of the Site overlaps with Lake Huron, and Blind River is located to the west of the Site. • Blind River is a Rainbow Smelt (*Osmerus mordax*), Pink Salmon (*Oncorhynchus gorbuscha*), and Walleye (*Sander vitreus*) Spawning Area. • Records of Shortnose Cisco (*Coregonus reighardi;* Endangered) exist within 1000m of the Blind River outlet abutting the Site.
Threatened or Endangered Species and the *Endangered Species Act*	• Applies to species that is listed or categorized as an "Endangered Species" and "Threatened Species" within the regulations of Ontario's Endangered Species Act (ESA). • Under the ESA, no person shall harm or harass Threatened or Endangered species, nor shall they undertake any activity that would damage or destroy their habitat. Habitat is variously defined by ESA regulations, provincial policies (such as General Habitat Descriptions) and the species' Recovery Strategies.	• Natural Heritage Information Centre web application ('NHIC'; https://www.ontario.ca/page/natural-heritage-information-centre) • Atlas of the Breeding Birds of Ontario ('ABBO;' https://www.birdsontario.org/) • Ontario Reptile and Amphibian Atlas ('ORAA'; https://ontarionature.org/programs/citizen-science/reptile-amphibian-atlas/) • Global Biodiversity Information Facility ('GBIF;' www.gbif.org) • Bat Conservation International ('BCI;' https://www.batcon.org/about-bats/bat-profiles/) • Ontario Fish ON-line (https://www.ontario.ca/page/how-use-fish-line)	• NHIC records of Barn Swallow (*Hirundo rustica*; Special Concern), Bobolink (*Dolichonyx oryzivorus*; Threatened), Eastern Meadowlark (*Sturnella magna*; Threatened), Eastern Whip-poor-will (*Antrostomus vociferus*; Threatened), Eastern Wood-pewee (*Contopus virens*; Special Concern), Lake Sturgeon (*Acipenser fulvescens* pop. 3; Threatened), Snapping Turtle (*Chelydra serpentina*; Special Concern), and Wood Thrush (*Hylocichla mustelina*; Special Concern) occur within 1000m of the Site. • Authoritative atlases identified records of 18 SAR within the 10x10km provincial grid square 17TPK49 of the ABBO, OBAO and ORAA associated with this

Land use, Parks, Conservation Reserves, and other Protected Areas	• Protected areas are defined to protect natural and cultural features, maintain biodiversity, and provide opportunities for compatible recreation. These areas may contain:
	  ○ Old-growth Forest
	  ○ Lakes, rivers, and wetlands
	  ○ Archaeological sites or other cultural values
	  ○ Habitat for rare or endangered plants and animals
	• Conservation Authorities are empowered to regulate development and activities around rivers or stream valleys, watercourses, wetlands, and hazardous lands (e.g., unstable soils, unstable bedrock). Development taking place within (or adjacent to) these regulated areas may require professional studies, Conservation Authority consultations, and potentially permitting under the Conservation Authorities Act.
		• eBird (www.ebird.org)
		• iNaturalist (www.iNaturalist.org)
		• Ontario Butterfly Atlas Online Review ('OBAO;' https://www.ontarioinsects.org/atlas/)
		• Fisheries and Oceans Canada Species at Risk Distribution (https://open.canada.ca/data/en/dataset/e0fabad5-9379-4077-87b9-5705f28c490b)
		• Crown Land Use Policy Atlas ('CLUPA;' https://www.ontario.ca/page/crown-land-use-policy-atlas)
		• Ministry of Natural Resources (MNR) Information Request (response received October 30, 2023)
			• The Massasauga River 8 First Nation land claim is located approximately northwest of the Site.
			• A Traditional Land Use Area is located southwest of the Site.
			• Various Great Lakes Coastal Enhanced Management Areas (E39g-4 (Sudbury District) and E39g-7 (Sault Ste Marie District)) occur to the south, west and east of the Site.

Conservation Authorities Act		• Land Information Ontario: *'Conservation Authority Administrative Area'* database.	• The Site is not within the administrative area of any Conservation Authority.
Migratory Birds Convention Act	• The Migratory Birds Convention Act protects and conserves migratory birds — as populations and individuals — and their active nests. Most bird species in Ontario are considered migratory.	• Environment and Climate Chance Canada Nesting Periods (https://www.canada.ca/en/environment-climate-change/services/avoiding-harm-migratory-birds/general-nesting-periods/nesting-periods.html)	• The Site is in Nesting Zone C3 and has a general nesting period of April 12 to August 27 for forests, April 17 to August 27 for open habitats and April 12 to August 15 for wetlands.

Other Acts

Site. Citizen science records from eBird identified eight (8) additional SAR records within vicinity to the Site. BCI results indicate endangered Myotis bats range overlap with the Site. DFO SAR Distribution mapping data indicated one (1) SAR in vicinity to the Site. These results are provided in Table 2.
- In addition to those records in Table 2, TULLOCH identified additional SAR with ranges that overlap with the Site. The following species were considered in this EIS: Black Ash (*Fraxinus nigra;* Endangered).

Table 2 - Species at risk (SAR) with records associated with this Site and vicinity.

ESA Status	Common Name	Scientific Name
Endangered	Eastern Small-footed Myotis	*Myotis leibii*
	Little Brown Myotis	*Myotis lucifugus*
	Northern Myotis	*Myotis septentrionalis*
	Eastern Red Bat*	*Lasiurus borealis*
	Hoary Bat*	*Lasiurus cinereus*
	Silver-haired Bat*	*Lasionycteris noctivagans*
	Shortnose Cisco	*Coregonus reighard*
	Red-headed Woodpecker	*Melanerpes erythrocephalus*
	Yellow-breasted Chat	*Icteria virens*
	Golden Eagle	*Aquila chrysaetos*
Threatened	American White Pelican	*Pelecanus erythrorhynchos*
	Bank Swallow	*Riparia riparia*
	Bobolink	*Dolichonyx oryzivorus*
	Blanding's Turtle	*Emydoidea blandingii*
	Eastern Meadowlark	*Sturnella magna*
	Chimney Swift	*Chaetura pelagica*
	Northern Map Turtle	*Graptemys geographica*
	Massasauga Rattlesnake	*Sistrurus catenatus*
	Lake Sturgeon	*Acipenser fulvescens* pop.3
	Least Bittern	*Ixobruchus exilis*
Special Concern	Bald Eagle	*Haliaeetus leucocephalus*
	Barn Swallow	*Hirundo rustica*
	Canada Warbler	*Cardellina canadensis*
	Common Nighthawk	*Chordeiles minor*
	Eastern Wood-Pewee	*Contopus virens*
	Eastern Whip-poor-will*	*Antrostomus vociferus*
	Olive-sided Flycatcher	*Contopus cooperi*
	Wood Thrush	*Hylocichla mustelina*
	Monarch	*Danaus plexippus*
	Rusty Blackbird	*Euphagus carolinus*
	Snapping Turtle	*Chelydra serpentina*
	Black Tern	*Chlidonias niger*
	Evening Grosbeak	*Coccothraustes vespertinus*
	Golden-winged Warbler	*Vermivora chrysoptera*
	Horned Grebe	*Podiceps auratus*
	Peregrine Falcon	*Falco peregrinus*

*The status of these species has been updated in the Committee on the Status of Species at Risk in Ontario ('COSSARO') 2023 annual report. Changes to the status of these species will be amended into ESA regulations in early 2025.

3. SITE INVESTIGATIONS

The Site overlapping with the Phase 1 and Phase 2 work was visited on November 07, 2023. Field investigations were led by Sasha Losier B.Sc. EPt, Terrestrial Ecologist and Edward Kellaway M.Sc. EPt, Terrestrial Ecologist with TULLOCH. Existing environmental conditions and the presence / potential for Natural Heritage features within the Site boundary were assessed. This assessment included walking all accessible portions of the Site. In support of the EA, TULLOCH completed periodic monitoring during open-water periods between 2023 and 2024 at areas within the Phase 3 work footprint. While completing water and sediment monitoring, the presence of Natural Heritage features were assessed and documented by Qualified Aquatic Biologists and Environmental Technicians. Laboratory results associated with the EA monitoring will not be discussed further in this report.

TULLOCH assessed whether the Site supported any of the natural features identified in the background review (Table 2), and whether any additional natural features were associated with the Site. TULLOCH staff have extensive experience in the identification of flora and fauna (including Species at Risk and their habitat), as well as the identification of SWH as described in the Significant Wildlife Habitat Technical Guide (MNR 2000) and the classification natural ecosystems according to Ontario's Ecological Land Classification ('ELC') system and the Ontario Wetland Evaluation System ('OWES'). All photographs from field investigations are provided in Attachment II.

3.1. Terrestrial Habitat

Terrestrial areas of the Project include residentially developed neighborhoods associated with Huron Avenue and manicured lawns south of Martin Street; no naturalised terrestrial habitat was encountered. The Lake Huron coastline (outside of Phase 1 and Phase 2 construction footprint) was searched for habitat suitable to support Blanding's Turtle (Endangered) and Northern Map Turtle (Special Concern) overwintering and nesting sites. The Lake Huron coastline is devoid of vegetation and consists of a rocky bottom that does not provide adequate substrate to support the life functions of a pond turtle species such as the Blanding's Turtle (Photo 1). This habitat is, however, suitable for the Northern Map Turtle as they inhabit large and open bodies of water.

The shoreline (within Phase 3 construction footprint) consists of sandy and cobble substrate, with areas of manicured lawn extending 30m north from the shoreline (Photo 2 and 3). These areas could support nesting for Northern Map Turtle. The northern portion of the Site is residential and does not provide suitable turtle habitat (Photo 4).

Some scattered low trees and tall shrubs exist along the Lake Huron coastline and the Martin Street corridor. All woody vegetation on Site has the potential to support nesting by migratory bird species (Photo 5). Migratory birds and their active nests and broods and protected under the federal *Migratory Birds Convention Act.*

3.2. Aquatic Habitat

Phase 1 and Phase 2 field investigations at the Site did not identify fish habitat, or potential for fish habitat. Roadside ditches and drainage features have the potential to drain to fish habitat, but provide barriers to movement, preventing direct fish habitat (Photo 6). Site investigations overlapping with the Phase 3 footprint included water quality monitoring, sediment composition grabs, underwater photography, bathymetry, and shoreline monitoring for algal growth in support of the EA. The date and monitoring event components for all monitoring and assessment programs which were undertaken in the Phase 3 footprint are listed below:

- **29 May 2023**: Sediment composition grabs, water sampling, stratified in-situ water quality monitoring, underwater photography, general habitat notes, bathymetry, water clarity and depth monitoring. Bathymetry mapping is shown in Attachment III.
- **10 April 2024**: water sampling, stratified in-situ water quality monitoring, underwater photography, general habitat notes, water clarity and depth monitoring.
- **24 April 2024**: water sampling, stratified in-situ water quality monitoring, underwater photography, general habitat notes, water clarity and depth monitoring.
- **13 May 2024:** water sampling, stratified in-situ water quality monitoring, underwater photography, general habitat notes, water clarity and depth monitoring.
- **31 May 2024**: stratified in-situ water quality monitoring, underwater photography, general habitat notes, water clarity and depth monitoring.
- **12 June 2024**: stratified in-situ water quality monitoring, underwater photography, general habitat notes, water clarity and depth monitoring.
- **28 June 2024**: stratified in-situ water quality monitoring, underwater photography, general habitat notes, water clarity and depth monitoring.
- **11 July 2024:** stratified in-situ water quality monitoring, underwater photography, general habitat notes, water clarity and depth monitoring.
- **02 August 2024**: stratified in-situ water quality monitoring, underwater photography, general habitat notes,
- **07 August 2024**: water sampling, stratified in-situ water quality monitoring, underwater photography, general habitat notes, water clarity and depth monitoring.
- **29 August 2024:** underwater photography, general habitat notes, water clarity and depth monitoring.

The Phase 3 work area is located in a bay of Lake Huron along the shoreline of Blind River, directly east of the Blind River Marina (Photo 7). The outlet of Blind River is west of the Phase 3 area. The depth at the proposed water intake location is 4.0m, and secchi depth was consistently recorded at the same depth as the Site (4.0m; Attachment IV Table 1). During monitoring at the proposed water intake location, minimal (<1%) aquatic vegetation was identified in the area (Photo 8). No in-water structure or cover was recorded in the area. In May 2023, three (3) discrete sediment grabs were collected using a petite ponar and the sediment was visually determined to be composed of 100% sand (Attachment IV Table 2; Photo 9).

Results from the water quality sampling programs are not included in this report and will be presented in the final EA document. *In-situ* measurements within the Phase 3 footprint were recorded using a YSI at both the proposed water intake location, and along the shoreline in the vicinity of the proposed intake line. The results of this monitoring are presented in Attachment IV Figures 1 – 6.

At the proposed water intake location pH ranged between 7.3 and 8.8. The pH, conductivity, dissolved oxygen, turbidity and temperature varied little between monitoring depths at the Site. Turbidity varied greatly depending on how much wind / wave action was documented in the bay during the time of assessment (between 0 NTU and 3.22 NTU). Variations in TDS mimicked those in turbidity closely and showed variance depending on the sampling conditions (25.1 mg/L to 106.1 mg/L). Dissolved oxygen remained around 8.0 mg/L and above throughout each monitoring event.

Along the shoreline the pH ranged between 7.5 and 8.7. Conductivity showed little variation between sampling dates, ranging from 135.9 to 169.3 µS/cm. Variations in Turbidity and Total Dissolved Solids coincided with the weather patterns from the sampling day and day previous. Heavy rains and windy conditions increased both Turbidity and TDS concentrations. Dissolved Oxygen concentrations remained above 8.75 mg/L.

No fish have been documented at the Site, and fishing efforts have not been undertaken, but it is appropriate to assume that any fish species which inhabits Lake Huron could be present at the Site. Critical or limiting habitat for species at risk identified in the area was not identified within the Phase 3 work area.

4. IMPACTS AND MITIGATIONS

The following potential impacts and associated mitigations have been developed for the works associated with the Phases 1 – 3 of construction. Based on the desktop review and field investigations, TULLOCH has identified potential impacts from the Phases 1 – 2 of construction and is confident that if the mitigations presented are adopted, negative impacts can be avoided and/or reduced. General in-water work mitigations for Phase 3 of construction are provided, however additional reviews are required upon final construction plans.

TULLOCH considered whether environmental permitting would be required for the Phases 1 and 2 of construction, and has determined that, so long as all mitigations presented are adopted during construction, environmental permits under the *Public Lands Act,* the *Fisheries Act,* the *Endangered Species Act,* the *Canadian Navigable Waters Act,* the *Conservation Authorities Act,* the *Migratory Birds Convention Act,* the *Crown Land Use Policy Act,* or the *Provincial Policy Statement* are not required. Future Phase 3 construction will require environmental permitting, and all applicable environmental legislation should be reviewed to ensure compliance prior to initiating work. At a minimum, Phase 3 construction will require permitting under the *Fisheries Act, the Canadian Navigable Water Act,* and the *Public Lands Act.* Once plans are finalized,

discussions and permit submissions should be completed to the MNR, the DFO and Transport Canada.

4.1. Potential Impacts

Desktop and on-site assessments observed the following habitat features associated with the Project that must be considered and safeguarded:

- **Water Quality.** Water quality is protected by the Ministry of Environment Conservation and Parks and the DFO. Sediment or other worksite contaminants which may be disturbed and enter the watercourse during construction must be contained.
- **Northern Map Turtle.** This species does not receive protections under the *Endangered Species Act*; however, its habitat is candidate Significant Wildlife Habitat for Turtle Nesting defined as per MNR's *Significant Wildlife Habitat Criteria Schedules for Ecoregion 5E* (MNRF 2015).
- **Migratory Birds.** The Site is located within Nesting Zone C3. Most bird species in this nesting zone are considered migratory and they, their broods and their active nest are protected from harm federally under the *Migratory Birds Convention Act* (S.C. 1994, c. 22). A full list of protected species is available at https://www.canada.ca/en/environment-climate-change/services/migratory-birds-legal-protection/list.html.
- **Fish and Fish Habitat.** Phase 3 construction footprint extends 400m into Lake Huron. Fish and their habitat are protected under the DFO and work below the high-water mark is subject to DFO permitting.

4.2. Mitigations

The following mitigations are required to avoid the requirement for environmental permitting during the Phase 1 and 2 construction Project:

- **30m setback from high-water mark.** All work, including earthworks, equipment operation, stockpiles, and travel corridors should set-back at least 30m from the high-water mark along the shores of Lake Huron.
- **Bird Timing Window.** Avoid woody vegetation (i.e., trees and shrubs) should be retained while bird species are nesting on Site (**April 8 and August 28**) to ensure bird reproduction is not interrupted and active nests are safeguarded. This timing window conforms to Environment and Climate Change Canada's General Nesting Period for forests in Nesting Zone C3. Alternatively, a nesting sweep may be performed to ensure no active nests exist on Site. If the proponent is unable to perform nesting sweeps, an environmental professional is to be acquired.
- **Maintain water quality and fish habitat.** Work could potentially increase erosion and sediment transport draining from the work site and subsequently impact fish habitat. A

detailed sediment and erosion control plan should be developed specifically to address any works adjacent ditches, or along the southern extent of the project in vicinity to Lake Huron. These measures should include provisions for working close to a watercourse or ditch and include a plan to address inadvertent disruptions to infrastructure. Structure installation must be conducted in a manner to avoid entrance of deleterious substances (dust, paint, construction waste, etc.) into the ditches or surrounding areas which could result in transport to waterbodies. Stabilize any waste materials removed from the work site to prevent them from entering the environment. This could include covering stockpiles with biodegradable mats or tarps if necessary.

- **Prevent contamination and spills at the worksite.** All construction equipment should arrive on Site clean and be mechanically sound to avoid leakage of oil, gasoline, hydraulic fluids, and grease. All filling and storage of equipment fluids (hydraulic fluid, grease, fuel, etc.) should be >30 m from any high-water mark, and in an area that would not drain directly to any watercourse should a spill occur. A Spills Management Plan (including materials, instructions regarding their use, education of contract personnel, emergency contact numbers, etc.) is to be always on Site for implementation in the event of a spill. All spills must be immediately reported by phone to the Ontario Ministry of the Environment Spills Action Centre (24-hours a day) at 1-800-268-6060.

- **Remove all project refuse following work completion**. When work is completed and areas are deemed stable, all temporary erosion control measures (silt fencing, straw bales, etc.) will be removed from the work site. These devices can negatively impact wildlife and can cause long term instability.

- **Minimize vegetation removal.** Where vegetation removal is necessary, minimize clearing, protect adjacent vegetation, and use proper clearing techniques. Clearly delineate the boundaries of areas to be cleared using flagging or stakes. Where possible, use techniques that allow the root system to stay intact; this helps bind the soil and encourages rapid recolonization of low-growing plant species. If vegetated riparian areas are disturbed during construction, the habitat should be planted with native vegetation.

- **Turtle Nesting Sweep.** A turtle nesting sweep is recommended prior to the commencement of wok. If a Species at Risk turtle (or any other SAR) is encountered within / adjacent a work area, all work that could harm or harass the species must stop and the species must be allowed to leave on its own accord.

The following measures are recommended in addition to the above to mitigate the impacts of the works associated with the Phase 3 construction Project:

- **Isolate in-water work.** It is recommended that in-water work areas are isolated using a turbidity barrier or silt curtain to contain sediments from entering Lake Huron. If possible, a fish salvage should be undertaken in these isolated areas.

- **Timing of in-water window.** Lake Huron is a cold-water system. All in-water work must be completed between **16 June and 01 September** of any year to avoid sensitive periods such as fish spawning or migration seasons.

- **Fish protection.** Isolate the work area and salvage fish if possible. Monitor the area for any mortalities during construction and stop work and consult with a Fisheries Professional if fish mortalities are being recorded in vicinity of the Project. Design the water intake structure appropriately to protect fish from entrapment. Use fish screens according to DFO Standards if pumping is required.

- **Maintain water quality and fish habitat.** It is recommended that construction equipment use biodegradable hydraulic fluid to avoid contamination from potential spills. Equipment should be inspected regularly. In-water structure disturbance should be avoided as much as possible. The Site supervisor will hold a meeting of all equipment operators working at the site to make them aware of the environmental concerns and measures set out in this plan to control hazardous substances. Monitor for negative impacts to water quality adjacent the Site works during construction. If possible, avoid altering substrate composition during and following construction works.

- **Post-construction Restoration.** Rehabilitate disturbed lakebed areas by replanting aquatic vegetation or replacing disturbed substrate. Restore shoreline to pre-disturbance conditions if possible.

- **Erosion and Sediment Controls alone the Shoreline.** Use riprap or light duty silt fence barrier along 30m from the Lake Huron shoreline to prevent bank destabilization and sediment seepage into the lake. The Site supervisor will hold a meeting of all equipment operators working at the site to make them aware of the environmental concerns and measures set out in this plan to control hazardous substances. A detailed spill response plan will be completed prior to beginning of work.

- **Sediment control within the lake.** Contain suspended sediments and disturbed areas during construction. Monitor water quality adjacent the disturbed areas to quickly identify potential impacts or containment issues. A detailed spill response plan will be completed prior to beginning of work, which contains a monitoring schedule and response measures for elevated turbidity concentrations adjacent isolated disturbed areas. Allow sediment to settle prior to removing any isolation measures. Avoid work during windy or rainy conditions.

- **Permitting.** MNR Work Permits under the Private Lands Act are required for work on shorelines. Permitting must be obtained for in-water work to ensure compliance with the Fisheries Act under the DFO. Approvals from Transport Canada may be required for work within navigable waters to ensure compliance with the Canadian Navigable Waters Act.

4.2.1. Best Management Practices

In addition to the provided mitigation measures above, the following Best Management Practices are suggested to eliminate or reduce negative impacts from the Phases 1 – 3 construction Project.

- **Restore native vegetation**: Restorative plantings and seed mixes of native species common to the region should be used for erosion control and rehabilitation of disturbed areas.
- **Use original site vegetation**: Where possible, retain and reuse original vegetation and topsoil for restorative planting.
- **Work site containment**: Design and implement a plan to isolate all work thereby preventing entry of potentially deleterious materials (e.g., dust, fuel, eroded soils, etc.) into any watercourse or natural area. The design should include the regular inspection, removal and timely disposal of materials generated. Equipment shall be cleaned of all contaminates prior to being brought on site.
- **Avoid use of erosion control products with plastic netting**: The "gillnet-like" mesh associated with erosion control products can pose an entanglement hazard to wildlife such as snakes, turtles, birds, and other wildlife. The use of erosion control products containing any type of plastic mesh will be avoided. Rock, rip rap, various mulches, and polyethylene sheeting may be effective alternatives. Alternative rolled erosion control products are available without plastic mesh.
- **Stabilize temporary materials:** Temporary storage and stockpiling of materials should take place at a safe distance from any waterbody (not within 30 m); these materials must be stabilized or otherwise contained. If stored long term, these areas will be sloped appropriately and vegetated.
- **Clearly define work areas**: Access and activity will be limited to the designated work areas to minimize disturbance to adjacent wildlife habitat. These areas will be clearly marked within the site using fencing, stakes, flagging tape, signs etc.
- **Safe Use of Chemicals:** Use only specified amounts and types of fertilizer in areas draining to waterbodies. Avoid use of chemical dust suppressants and pesticides/herbicides in areas near or draining to water bodies.

5. ASSUMPTIONS AND LIMITATIONS

The following assumptions and limitations apply to this document:

1. The Proponent is responsible for reviewing this document to ensure that it accurately reflects the Site and Project. Any inaccuracies should be identified to TULLOCH immediately upon receipt of the report.

2. It remains the responsibility of the Proponent to undertake this project in a manner that is compliant with the environmental legislation. This includes the proper implementation of mitigations, such as those described in the *Impacts and Mitigations Section*, the maintenance of these mitigations, and the monitoring of these mitigations for effectiveness. The Proponent is responsible for ensuring that the intent of the mitigations is achieved and for modifying or improving these mitigations if there is reason to believe they are not being effective.

3. The Proponent is responsible for ensuring that information contained in this report is accurately communicated and implemented, as necessary, by persons undertaking work on the Site on the Proponent's behalf.

4. The observations, results and conclusions provided in this report represent the conditions of the Site at the time of the assessment. Habitat changes over time and species can move with varying degrees of annual habitat fidelity.

5. The construction plans for Phase 3 are currently unknown, thus the impact assessment and mitigations presented above are generalized, and should be re-considered following detailed design completion.

6. CONCLUSION

TULLOCH was retained by the Town of Blind River to conduct a review of environmental natural heritage features associated with the Phase 1 – 3 Project, which includes the installation of a watermain pipe along Huron Road, the construction of a LLPS inland and a water intake line up to Lake Huron. TULLOCH has completed a background review and Site investigations in support of this Natural Environment Assessment and Mitigation Memo, which assesses anticipated environmental impacts from the Phase 1 – 3 Project. It also provides mitigation strategies to avoid or minimize Project impacts.

The undersigned is pleased to provide this report as a record of TULLOCH's services and findings. If you have any questions or if TULLOCH can be of further assistance in this matter, please do not hesitate to contact the undersigned

Sincerely yours,

Emelia Myles-Gonzalez, M.Sc., E.P.
Aquatic Biologist
Sudbury

Sasha Losier, B.Sc., E.Pt.
Terrestrial Biologist
Sudbury

Attachment I: Natural Heritage Background Review

TULLOCH
ENVIRONMENTAL

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03 November 2023

Jim Trottier | Management Biologist
62 Queen Ave, PO Box 190,
Blind River, ON, P0R 1B0
Tel: 705-261-1563

Dear Jim Trottier,

Re: Natural Heritage Background Information Request: Blind River Water Intake, the Town of Blind River, Ontario, Canada.

Tulloch Environmental, a division of Tulloch Engineering Inc. (TULLOCH), has been retained by the Town of Blind River ('the Town') to conduct a review of Natural Heritage Background Information available for areas surrounding their proposed new water intake pipe project (the 'Site'). The water intake pipe project will include the installation of a new water intake pipe trenched along the lakebed of Lake Huron in the bay directly south of Blind River, Ontario. Construction includes an intake which will be fastened with timber cribs and rock piles approximately 250m offshore (UTM NAD 83 17U 349268 5115860). The pipe will be trenched from the intake area to the shoreline where a pumphouse will be built (UTM NAD 83 0349240 5116263). The pipe will then run from the pumphouse, north across Martin Street, and be trenched along the side of Huron Avenue until the intersection with Berthelot Street, Blind River, ON. In addition to the construction scheduled for 2024, the Town also requires a winter drill program to ensure the bedrock geology at the water intake location is suitable for the proposed works. This review is in support of the entire Project, inclusive of the initial drill program requirements and the proposed water intake structure and pipe installation. A map of the project Site is provided in the attachments. The scope of this review includes the Site and areas within 1000m (the 'Study Area').

This review focused on the Study Area surrounding all construction works proposed (Attachment Maps). The Study Area size totaled 486ha, and encompasses the following proposed works:

- The proposed water intake pipe in Lake Huron, approximately 250m south of Blind River, Ontario.
- The proposed trenching and pipe laying path along the Lake Huron lakebed, extending from the water intake location to the shoreline at the proposed pumphouse.
- The proposed pumphouse location along the shoreline of Lake Huron, located on the Town's property.
- The proposed upland trenching and pipe laying path extending from the pumphouse on the shoreline of Lake Huron, north up Huron Street for approximately 500m.

TULLOCH has reviewed information obtained from Land Information Ontario (LIO) regarding land uses and natural heritage features known (or believed) to occur within 1000m of the Site, unless otherwise stated. These data included sites of domestic, recreational, commercial and industrial land uses as well as known environmental sensitives (e.g. Significant Wildlife Habitat, nesting sites, fish spawning sites) and areas of enhanced protection (e.g. parks, conservation reserves, ANSI). A series of maps indicating LIO findings are provided in the attachments.

TULLOCH has also reviewed natural heritage information provided by the Ministry of Natural Resources and Forestry (MNRF) via the Natural Heritage Information Centre (NHIC) Make-a-map, Crown Land Use Atlas and Fish ON-Line web applications. This information was supplemented with records obtained from authoritative atlases, including: the Atlas of the Breeding Birds of Ontario (ABBO), Bat Conservation International (BCI), the Ontario Butterfly Atlas Online (OBAO) and the Ontario Reptiles and Amphibians Atlas (ORAA). The DFO SAR Distribution Map was reviewed for aquatic species at risk (SAR) and critical habitat. Selected public science atlases were also reviewed, such as eBird.org, iNaturalist and the Global Biodiversity Information Facility (GBIF). A summary of notable information is provided below:

- NHIC indicated there are records of nine (9) Colonial Waterbird Nesting Wildlife Concentration Areas within 1000m of the Site.

- NHIC indicated eight (8) records of SAR within 1000m of the Site:
    - Barn Swallow (*Hirundo rustica*; Special Concern)
    - Bobolink (*Dolichonyx oryzivorus*; Threatened)
    - Eastern Meadowlark (*Sturnella magna*; Threatened)
    - Eastern Whip-poor-will (*Antrostomus vociferus*; Threatened)
    - Eastern Wood-pewee (*Contopus virens*; Special Concern)
    - Lake Sturgeon (*Acipenser fulvescens pop. 3*; Threatened)
    - Snapping Turtle (*Chelydra serpentina*; Special Concern)
    - Wood Thrush (*Hylocichla mustelina*; Special Concern)

- ABBO records indicated 13 SAR species have been observed within the 10km x 10km atlas block associated with this Site:
    - Bald Eagle (*Haliaeetus leucocephalus*; Special Concern)
    - Bank Swallow (*Ripari riparia*; Threatened)
    - Barn Swallow
    - Bobolink
    - Canada Warbler (*Cardellina canadensis*; Special Concern)
    - Chimney Swift (*Chaetura pelagica*; Threatened)
    - Common Nighthawk (*Chordeiles minor*; Special Concern)
    - Eastern Meadowlark
    - Eastern Wood-pewee
    - Least Bittern (*Ixobruchus exilis*; Threatened)
    - Olive-sided Flycatcher (*Contopus cooperi*; Special Concern)
    - Red-headed Woodpecker (*Melanerpes erythrocephalus*; Endangered)
    - Yellow-breasted Chat (*Icteria virens*; Endangered)

- Queries of Cornell Lab's eBird atlas identified records of the following 21 SAR birds:
    - American White Pelican (*Pelecanus erythrorhynchos*; Threatened; Records within 1km)
    - Bald Eagle (Records within 100m)
    - Bank Swallow (Records within (200m)
    - Barn Swallow (Records within 200m)
    - Black Tern (*Chlidonias niger*; Special Concern; Records within 2km)
    - Bobolink (Records within 200m)

  - Canada Warbler (Records within 11km)
  - Chimney Swift (Records within 400m)
  - Common Nighthawk (Records within 1km)
  - Eastern Meadowlark (Records within 2km)
  - Eastern Whip-poor-will (Records within 1.6km)
  - Eastern Wood-pewee (Records within 1.6km)
  - Evening Grosbeak (*Coccothraustes vespertinus*; Special Concern; Records within 300m)
  - Golden Eagle (*Aquila chrysaetos*; Endangered; Records within 4.6km)
  - Golden-winged Warbler (*Vermivora chrysoptera*; Special Concern; Records within 3km)
  - Horned Grebe (*Podiceps auritus*; Special Concern; Records within 2km)
  - Olive-sided Flycatcher (Records within 3km)
  - Peregrine Falcon (*Falco peregrinus*; Special Concern; Records within 300m)
  - Red-headed Woodpecker (Records within 2km)
  - Rusty Blackbird (*Euphagus carolinus*; Special Concern; Records within 500m)
  - Wood Thrush (Records within 2km)

- BCI indicated that three (3) Endangered bat species have ranges that include the Site:
  - Eastern-Small Footed Bat (*Myotis leibii*)
  - Little Brown Bat (*Myotis lucifugus*)
  - Northern Long-Eared Bat (*Myotis serpentrionalis*)
- ORAA records indicated four (4) SAR herptile species with records within the 10 x 10km atlas block associated with the Site:
  - Blanding's Turtle (*Emydoidea blandingii*; Threatened)
  - Massasauga Rattlesnake (*Sistrurus catenatus*; Threatened)
  - Northern Map Turtle (*Graptemys geographica*; Threatened)
  - Snapping Turtle

- A review of GBIF returned two (2) records of SAR in vicinity to the Site:
  - Barn Swallow
  - Monarch (*Danaus plexippus*; Special Concern)

- OBAO records indicated one (1) SAR butterfly species have been observed within the 10km x 10km atlas block associated with this Site:
  - Monarch

Review of aerial imagery, MNRF Fish ON-Line and ARA data show that the Site is adjacent to three (3) bodies of water. The water intake pipe installation and trenching is proposed within **Lake Huron.** Lake Huron has a cold-water thermal regime and was most recently stocked in 2023 with 12,500 yearling Rainbow Trout (*Oncorhynchus mykiss*). Brown Trout (*Salvelinus fontinalis*), Chinook Salmon (*Oncorhynchus tshawytscha*), Lake Trout (*Salvelinus namaycush*), and Walleye (*Sander vitreus*) have also historically stocked in Lake Huron. **Lake Huron** is known to support:

- Atlantic Salmon (*Salmo salar*)
- Banded Killifish (*Fundulus diaphanous*)
- Black Bullhead (*Ameiurus melas*)
- Black Crappie (*Pomoxis negromaculatus*)
- Lake Whitefish (*Coregonus clupeaformis*)
- Largemouth Bass (*Micropterus salmoides*)
- Longnose Gar (*Lepisosteus osseus*)
- Longnose Sucker (*Catostomus*

- Blacknose Dace (*Rhinichthys atratulus*)
- Bloater (*Coregonus hoyi*)
- Bluegill (*Lepomis macrochirus*)
- Bluntnose Minnow (*Pimephales notatus*)
- Bowfin (*Amia calva*)
- Brook Silverside (*Labidesthes sicculus*)
- Brook Stickleback (*Culaea inconstans*)
- Brook Trout
- Brown Bullhead (*Ameiurus nebulosus*)
- Brown Trout (*Salmo trutta*)
- Burbot (*Lota lota*)
- Central Mudminnow (*Umbra limi*)
- Channel Catfish (*Ictalurus punctatus*)
- Chinook Salmon
- Coho Salmon (*Oncorhynchus kisutch*)
- Common Carp (*Cyprinus carpio*)
- Common Shiner (*Luxilus cornutus*)
- Creek Chub (*Semotilus atromaculatus*)
- Fathead Minnow (*Pimephales promelas*)
- Finescale Dace (*Chrosomus neogaeus*)
- Freshwater Drum (*Ameiurus nebulosus*)
- Golden Shiner (*Notemigonus crysoleucas*)
- Johnny Darter (*Etheostoma nigrum*)
- Lake Sturgeon
- Lake Trout
- Longnose Sucker (*Catostomus catostomus*)
- Mottled Sculpin (*Cottus bairdii*)
- Muskellunge (*Esox masquinongy*)
- Northern Pike (*Esox Lucius*)
- Northern Redbelly Dace (*Chrosomus eos*)
- Pink Salmon (*Oncorhynchus gorbuscha*)
- Pumpkinseed (*Lepomis gibbosus*)
- Rainbow Darter (*Etheostoma caeruleum*)
- Rainbow Smelt (*Osmerus mordax*)
- Rainbow Trout
- Rock Bass (*Ambloplites rupestris*)
- Round Goby (*Neogobius melanostomus*)
- Round Whitefish (*Prosopium cylindraceum*)
- Sauger (*Sander canadensis*)
- Shorthead Redhorse (*Moxostoma macrolepidotum*)
- Smallmouth Bass (*Micropterus dolomieui*)
- Splake (*Salvelinus namaycush x Salvelinus fontinalis*)
- Spottail Shiner (*Notropis hudsonius*)
- Walleye
- White Bass (*Morone chrysops*)
- White Perch (*Morone americana*)
- White Sucker (*Catostomus commersonii*)
- Yellow Perch (*Perca flavescens*)

    - **Blind River** is located to the west of the Site. It has a warm-water thermal regime. **Blind River** is known to support:
        - Northern Pike
        - Smallmouth Bass
        - Walleye
    - An **Unnamed Creek** is located to the north of the Site. It has a cool-water thermal regime and is known to support:
        - Finescale Dace

- DFO SAR Distribution Data indicate distributions of one (1) aquatic SAR in vicinity to the Site:
    - Shortnose Cisco (*Coregonus reighardi*; Endangered)

- Environment and Climate Change Canada considers the General Nesting Periods for this area (Nesting Zone C3) to be April 12 to August 27 for forests, April 17 to August 27 for open habitats and April 12 to August 15 for wetlands.

- LIO data (see attachments) indicate the following records:

- The Massasauga River 8 First Nation land claim is located approximately 800m northwest of the proposed water pipe outlet (Map 2).
- A Traditional Land Use Area is located approximately 800m southwest of the proposed water intake pipe (Map 2).
- Various Great Lakes Coastal Enhanced Management Areas (E39g-4 (Sudbury District) and E39g-7 (Sault Ste Marie District)) occur to the south, west and east of the Site, within 150m (Map 3).
- A Rainbow Smelt, Pink Salmon, and Walleye Spawning Area occurs approximately 200m west of the proposed water intake pipe (Map 5).
- A Walleye Migration Route is located approximately 150m west of the proposed water pipe (Map 5).
- A coastal wetland is located 400m to the east of the proposed water intake pipe (Map 5).

TULLOCH welcomes any supplemental information and guidance from the MNRF regarding:

- Terrestrial data pertaining to the Site and areas within 1000m, beyond the data included above, such as:
  - Records of provincially tracked species associate with the planning areas.
  - Known Significant Wildlife Habitat and other areas of critical habitat associate with the planning areas.
  - The General Nesting Periods for the area (if different from that recommended by Environment and Climate Change Canada, above)
  - Other terrestrial timing windows and restrictions

- Fishery data for water bodies adjacent to the project area, beyond the data summarized above, including:
  - Known fish community species
  - Thermal regimes (if different than above)
  - Areas of known critical habitat (spawning, etc.)
  - Aquatic species at risk (records, local knowledge)
  - Barriers to passage

- MNRF fishery management information:
  - In-water work timing window
  - Areas of concern (e.g. known sources of sediment and erosion, sources of pollution)
  - Fishery management objectives (e.g. rehabilitation or protection goals, etc.)
  - Known commercial fishing licenses (i.e. commercial baitfish licenses) in the area

- Adjacent areas of protection not listed above (ANSI, Parks, Conservation Reserves, etc.)

If you have any questions or require additional information, please do not hesitate to contact the undersigned at (705) 522-6303.

Thank you for your time and assistance.

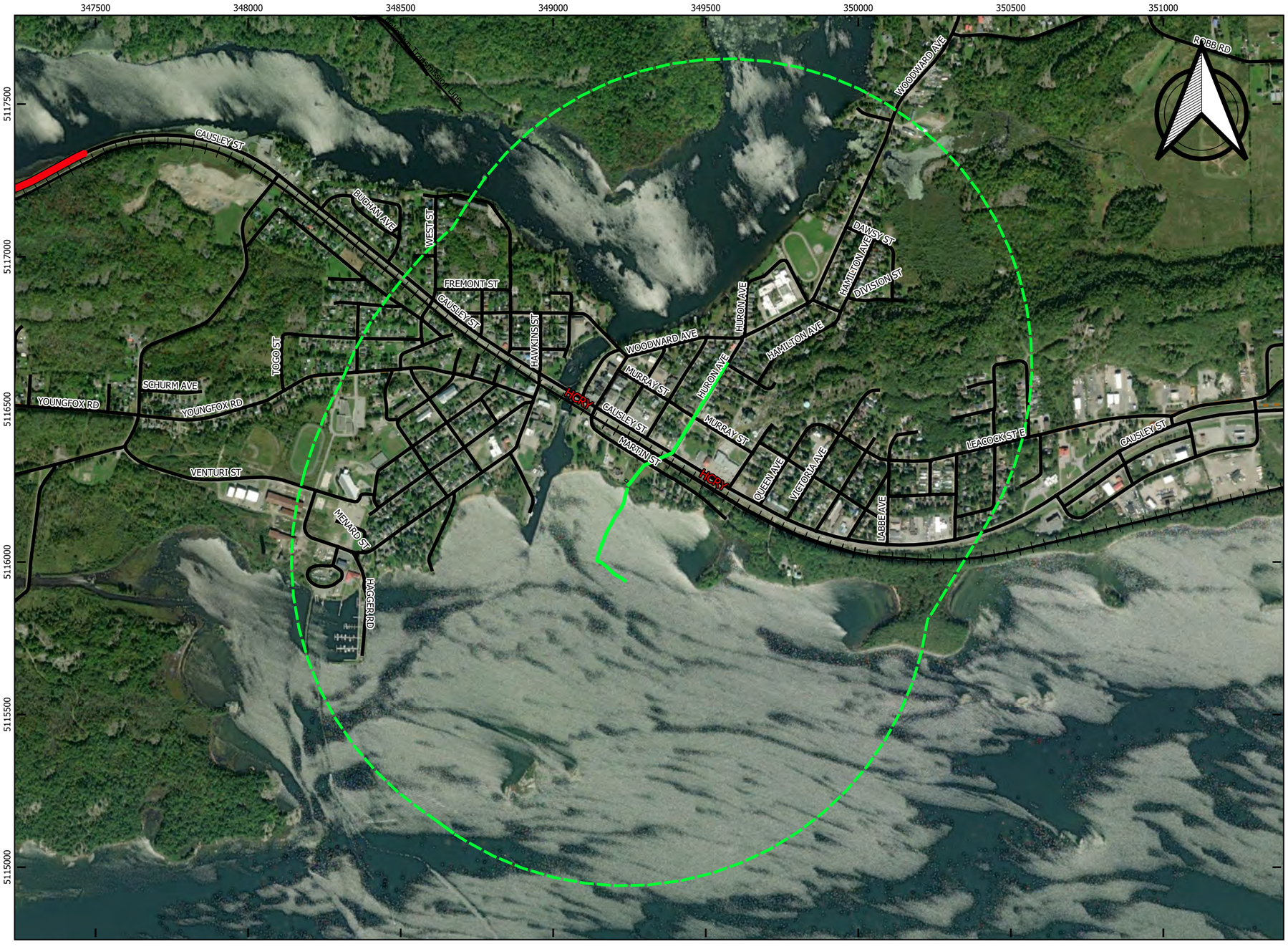
Sincerely,

Ed Kellaway
Terrestrial Ecologist
TULLOCH Environmental, a division of TULLOCH Engineering
edward.kellaway@tulloch.ca
(705) 522-6303 x 614

Attachments

Blind River Water Intake
Town of Blind River

Natural Heritage Data Review



Legend

Project Data

- Water Intake Line
- Pumphouse
- NH Review AOI (1000m)
- OTN_TRAIL_SEGMENT
- ORWN_TRACK
- UTILITY_LINE

Map 1 - Area of Interest

- Highway
- Local Road

200 0 200 400 600 800 m

Projection: UTM (NAD83)
1:14,000

TULLOCH ENVIRONMENTAL

Figure 1
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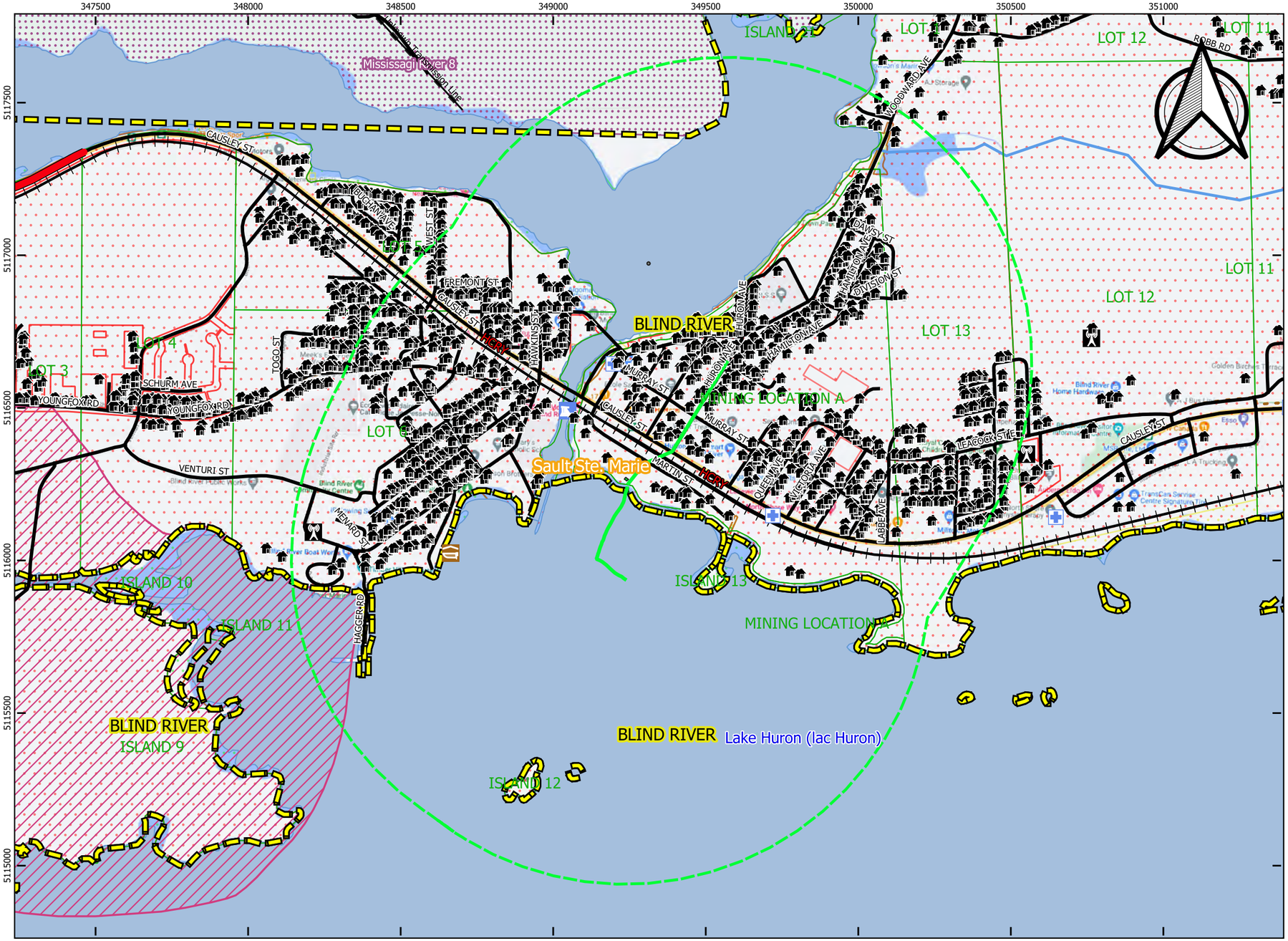
Project: 230821

Notes: Data updated March 2021. Asterisk (*) denotes retired / discontinued data (may be 3 or more years old).

\\sud-filer\Tul-Proj-AWS\Sud-Local\No Lock\230821 Blind River Water Intake\6_Mapping (No Locks)\LIO NH Mapping Tool v1.1 (Internal Pathed to Storage).qgz - Edward Kellaway

Blind River Water Intake
Town of Blind River

Natural Heritage Data Review



Legend

Project Data

- Water Intake Line
- Pumphouse
- NH Review AOI (1000m)

Map 2 - Land Use Features

- BUILDING_AS_SYMBOL
- Boathouse
- MOH_SERVICE_LOCATION
- TOWER
- ONTARIO_DAM_INVENTORY
- Highway
- Local Road
- OTN_TRAIL_SEGMENT
- ORWN_TRACK
- UTILITY_LINE
- AIRPORT_OTHER
- MNR_DISTRICT
- MUNIC_BND_LOWER_AND_SINGLE
- TRADITIONAL_LAND_USE_AREA
- GEOGRAPHIC_LOT_FABRIC
- OHN_100K_WATERBODY
- OHN_100K_WATERCOURSE
- PATENT_LAND_EXTERNAL
- CL_UNPATENTED
- CL_NON_FREEHOLD_DISPOSITION
- INDIAN_RESERVE

200 0 200 400 600 800 m

Projection: UTM (NAD83)
1:14,000

TULLOCH ENVIRONMENTAL

Figure 2
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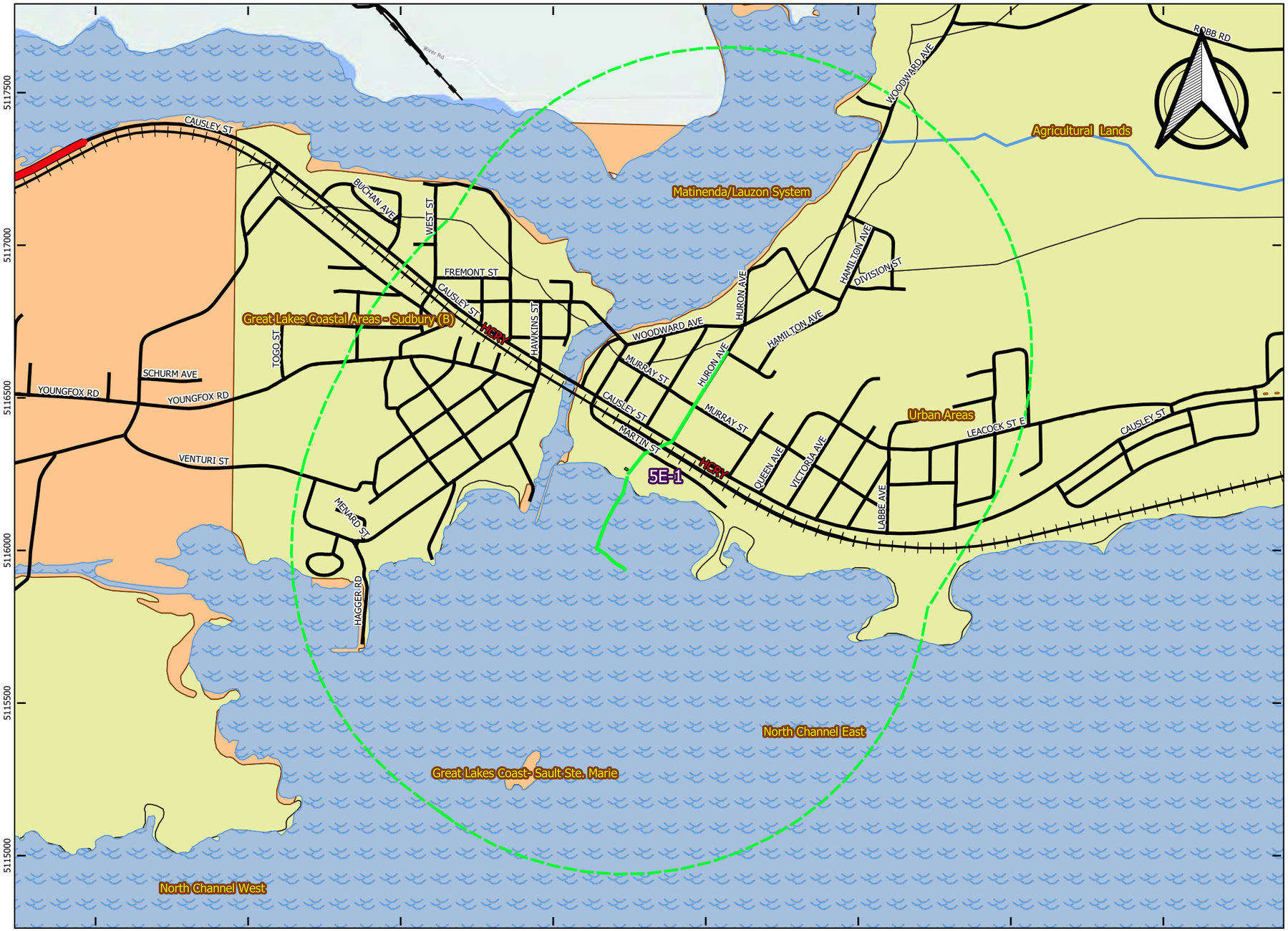
Project: 230821

Notes: Data updated March 2021. Asterisk (*) denotes retired / discontinued data (may be 3 or more years old).

\\sud-filer\Tul-Proj-AWS\Sud-Local\No Lock\230821 Blind River Water Intake\6_Mapping (No Locks)\LIO NH Mapping Tool v1.1 (Internal Pathed to Storage).qgz - Edward Kellaway

Blind River Water Intake
Town of Blind River

Natural Heritage Data Review



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Projection: UTM (NAD83)
1:14,000

Legend

Project Data

- Water Intake Line
- Pumphouse
- NH Review AOI (1000m)

Map 3 - Protected Areas

- Highway
- Local Road
- OTN_TRAIL_SEGMENT
- ORWN_TRACK
- UTILITY_LINE
- ECODISTRICT
- OHN_100K_WATERBODY
- OHN_100K_WATERCOURSE
- Enhanced Management Area
- General Use Area

Figure 3
2023-11-03T09:47:22.000

Project: 230821

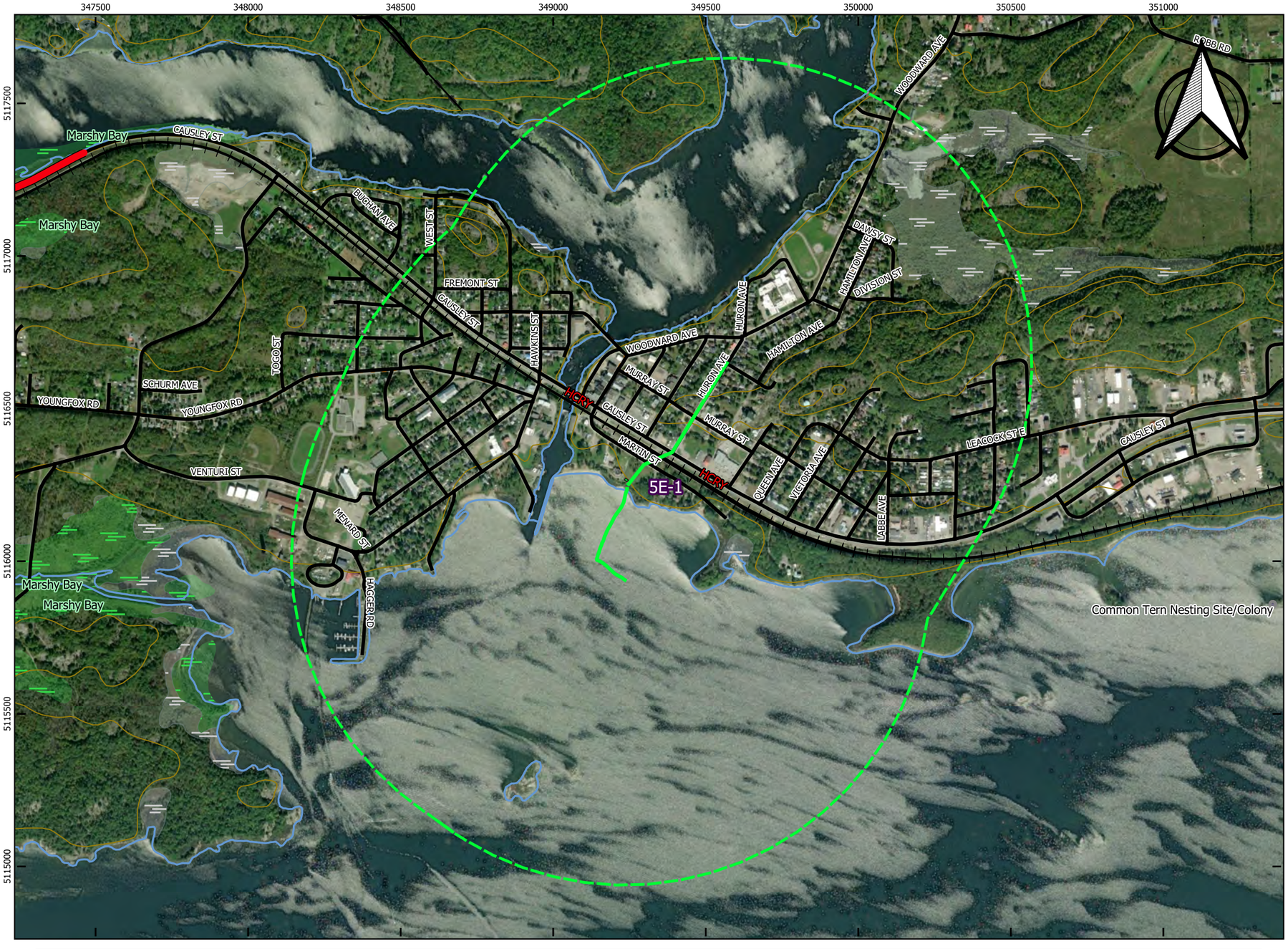
Notes: Data updated March 2021. Asterisk (*) denotes retired / discontinued data (may be 3 or more years old).

TULLOCH ENVIRONMENTAL

\\sud-filer\Tul-Proj-AWS\Sud-Local\No Lock\230821 Blind River Water Intake\6_Mapping (No Locks)\LIO NH Mapping Tool v1.1 (Internal Pathed to Storage).qgz - Edward Kellaway

Blind River Water Intake
Town of Blind River

Natural Heritage Data Review



Legend

Project Data

- Water Intake Line
- Pumphouse
- NH Review AOI (1000m)

Map 4 - Terrestrial Habitat

- Highway
- Local Road
- OTN_TRAIL_SEGMENT
- ORWN_TRACK
- UTILITY_LINE
- ECODISTRICT
- Contour

Wildlife_Values_Area

- Not Specified
- Common Tern Nesting Site/Colony
- OHN_100K_WATERBODY*

WETLAND

- Evaluated-Provincial
- Not OWES Evaluated

200 0 200 400 600 800 m

Projection: UTM (NAD83)
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TULLOCH ENVIRONMENTAL

Figure 4
2023-11-03T09:47:22.000

Project: 230821

Notes: Data updated March 2021. Asterisk (*) denotes retired / discontinued data (may be 3 or more years old).

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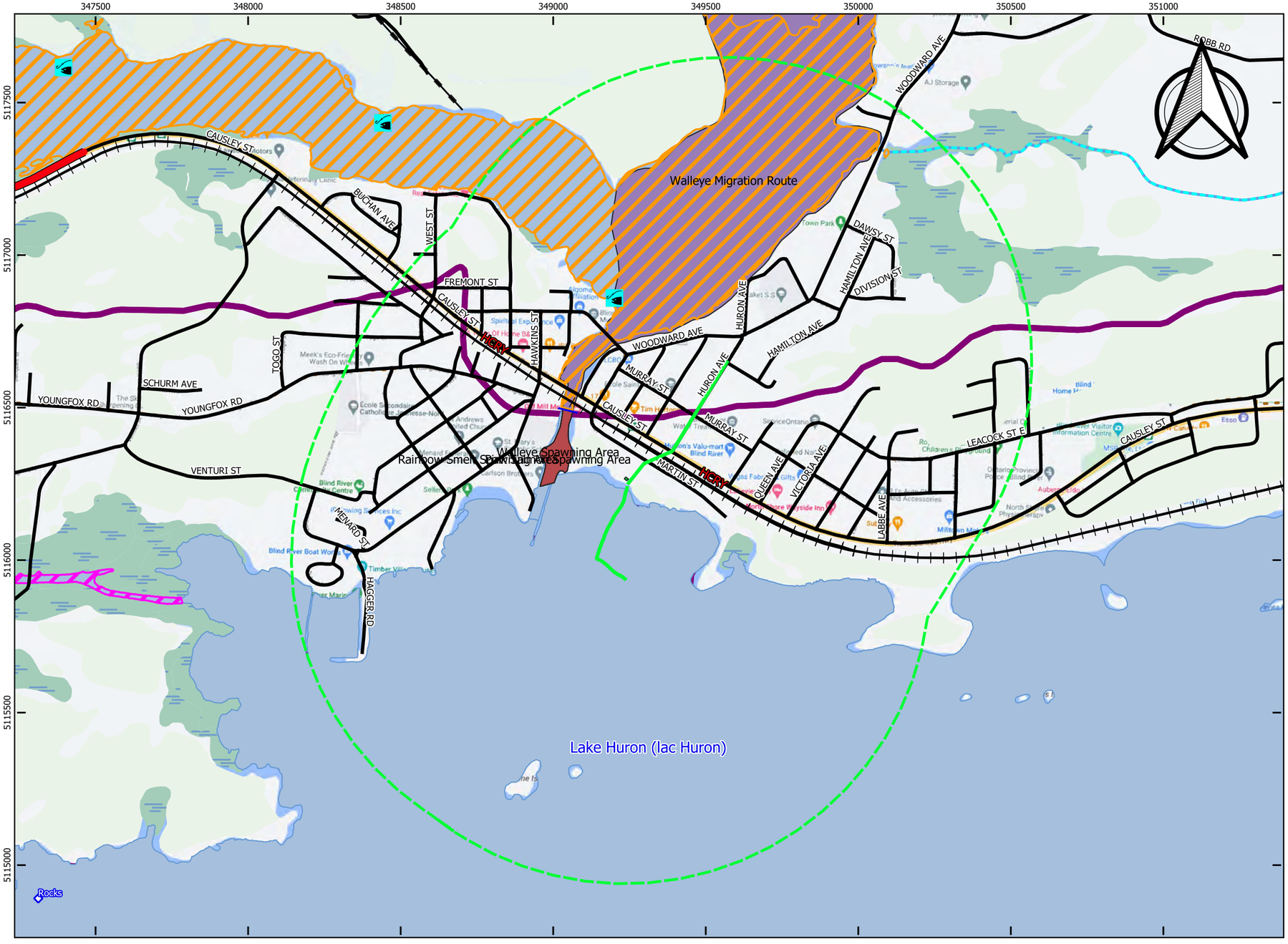
Blind River Water Intake
Town of Blind River

Natural Heritage Data Review



Legend

Project Data

- Water Intake Line
- Pumphouse
- NH Review AOI (1000m)

Map 5 - Aquatic Habitat

- ARA_SURVEY_POINT
- Highway
- Local Road
- OTN_TRAIL_SEGMENT
- ORWN_TRACK
- UTILITY_LINE
- OHN_HYDROGRAPHIC_LINE
- Coolwater Ecosystem
- Coldwater Ecosystem
- Warmwater Ecosystem
- OHN_HYDROGRAPHIC_POINT
- SPAWNING_AREA
- TRAVEL_CORRIDOR_FISH
- OHN_WATERBODY
- OHN_WATERCOURSE
- WETLAND
- ONT_WSHED_BDRY_PRI_DERIVED
- ONT_WSHED_BDRY_SEC_DERIVED
- ONT_WSHED_BDRY_TERT_DERIVED
- ONT_WSHED_BDRY_QUAT_DERIVED
- WOODED_AREA

200 0 200 400 600 800 m

Projection: UTM (NAD83)
1:14,000

TULLOCH ENVIRONMENTAL

Figure 5

2023-11-03T09:47:22.000

Project: 230821

Notes: Data updated March 2021. Asterisk (*) denotes retired / discontinued data (may be 3 or more years old).

\\sud-filer\Tul-Proj-AWS\Sud-Local\No Lock\230821 Blind River Water Intake\6_Mapping (No Locks)\LIO NH Mapping Tool v1.1 (Internal Pathed to Storage).qgz - Edward Kellaway

Attachment II: Field Photographs

Photo 1. The Lake Huron coastline unsuitable for pond turtle species such as Blanding's Turtle. South of Project footprint).

Photo 2. Shoreline dominated by sandy and cobble substrate suitable for Northern Map Turtle Nesting. South of Project footprint.

Photo 3. Manicured lawn extending 30m north of the shoreline. Southern extent of Project footprint.

Photo 4. Northern portion of the Site is residential and unsuitable turtle habitat.

Photo 5. Woody vegetation within the Project construction footprint that is suitable for migratory bird nesting.

Photo 6. ATV and railway providing a barrier to movement between Lake Huron and any drains associated with the municipal roadway.

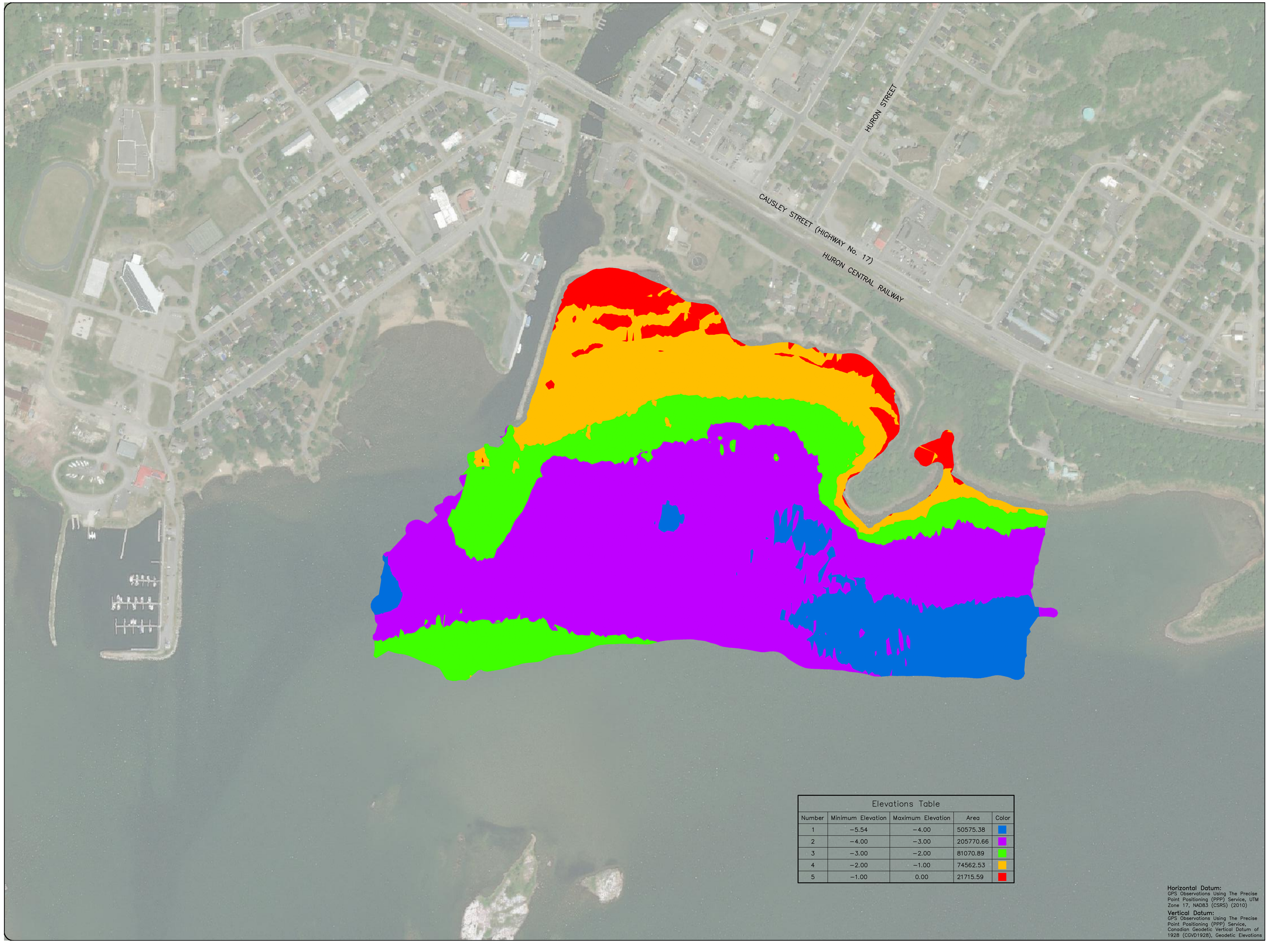
Photo 7. Water intake location (Phase 3) facing north.

Photo 8. Underwater photo of substrate at approximate water intake location in July 2024.

Photo 9. Substrate from Ponar Grab at the water intake location.

Attachment III: Bathymetry Maps

HURON STREET
CAUSLEY STREET (HIGHWAY No. 17)
HURON CENTRAL RAILWAY
Horizontal Datum:
GPS Observations Using The Precise Point Positioning (PPP) Service, UTM Zone 17, NAD83 (CSRS) (2010)
Vertical Datum:
GPS Observations Using The Precise Point Positioning (PPP) Service, Canadian Geodetic Vertical Datum of 1928 (CGVD1928), Geodetic Elevations



Elevations Table				
Number	Minimum Elevation	Maximum Elevation	Area	Color
1	−5.54	−4.00	50575.38	
2	−4.00	−3.00	205770.66	
3	−3.00	−2.00	81070.89	
4	−2.00	−1.00	74562.53	
5	−1.00	0.00	21715.59	

Horizontal Datum:
GPS Observations Using The Precise Point Positioning (PPP) Service, UTM Zone 17, NAD83 (CSRS) (2010)

Vertical Datum:
GPS Observations Using The Precise Point Positioning (PPP) Service, Canadian Geodetic Vertical Datum of 1928 (CGVD1928), Geodetic Elevations

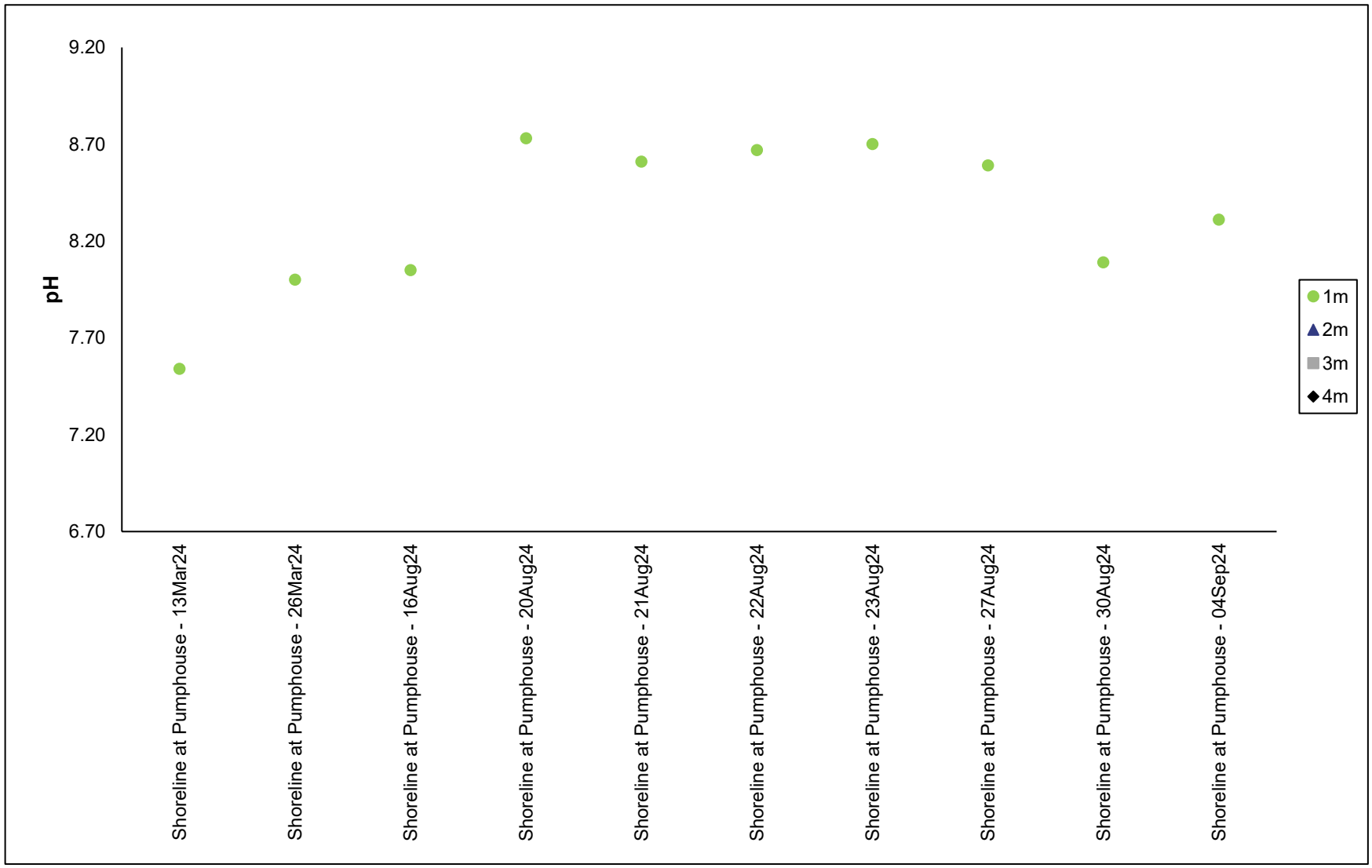
Attachment IV: Aquatic Habitat Monitoring Results

Attachment III Table 1 – Water Depth and Clarity Recorded at the Proposed Water Intake Location Within the Phase 3 Construction Footprint During Monitoring Associated with EA Requirements

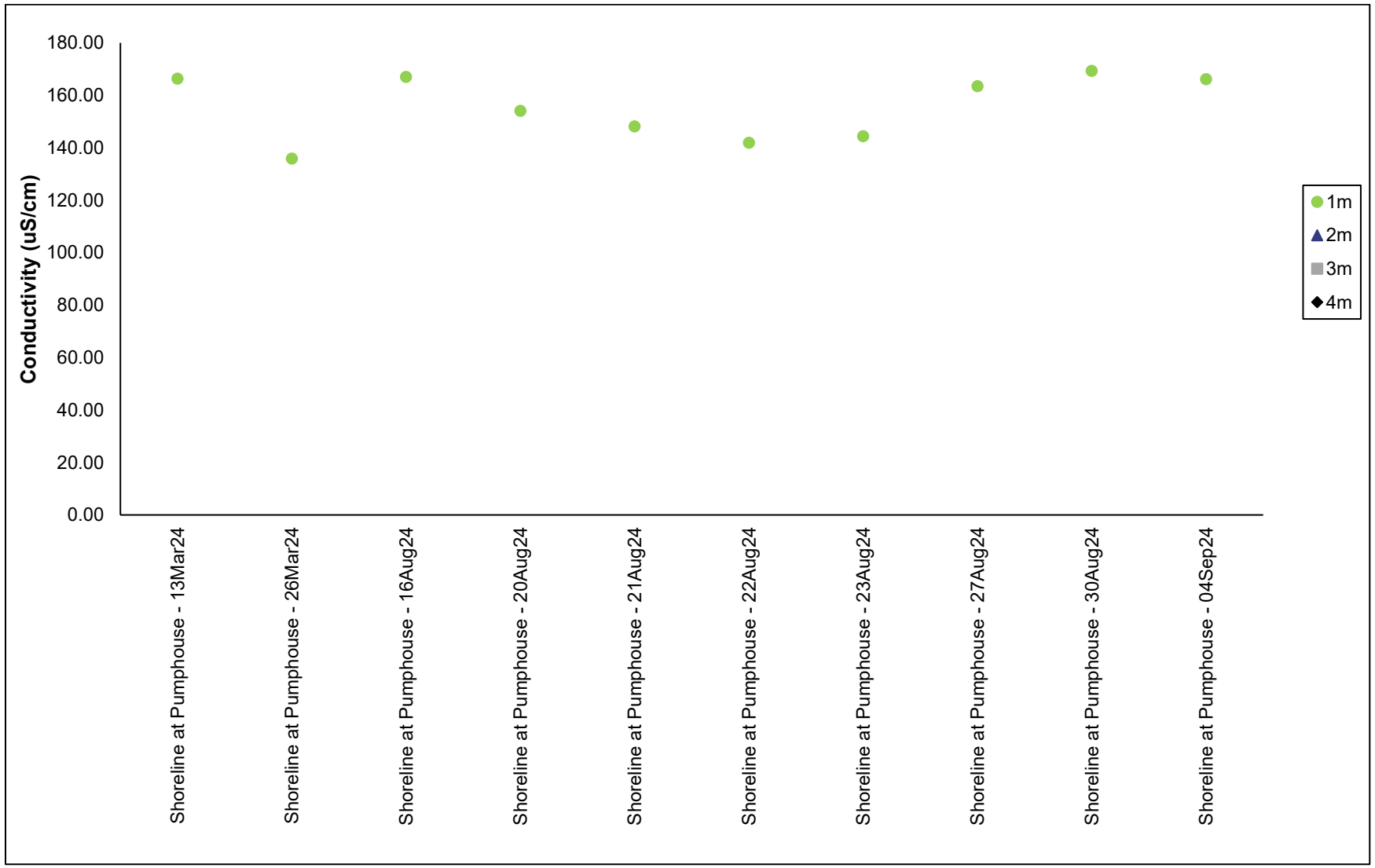
	Water Depth and Clarity	
	Water Depth (m)	Secchi Depth (m)
29-May-23	3.80	3.00
10-Apr-24	4.40	4.20
24-Apr-24	3.80	3.00
13-May-24	3.90	3.20
31-May-24	3.90	3.50
12-Jun-24	3.60	3.20
28-Jun-24	1.00	1.00
11-Jul-24	3.80	3.00
07-Aug-24	3.3	2.75
29-Aug-24	3.9	-

Attachment III Table 2 – Visual Sediment Composition Recorded from Three (3) Petite Ponar Grabs Collected at the Proposed Water Intake Location Within the Phase 3 Construction Footprint During Monitoring Associated with EA Requirements

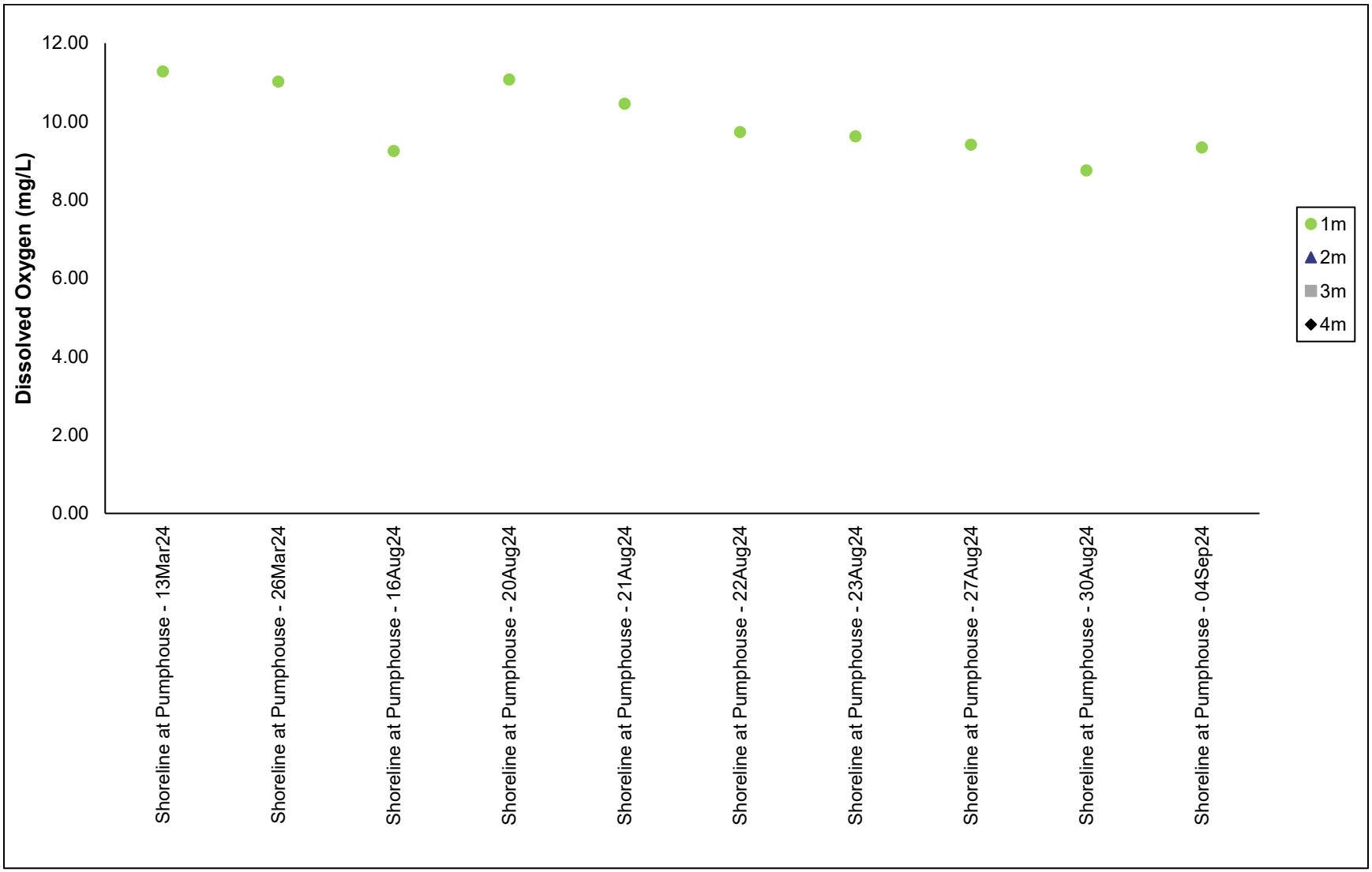
	Location: BR SW 01		
	Sed Sample: BR-SED-01		
	Sample Date: 29-May-2023		
	UTM: 17U 0349145 5115900		
	Sed 1	**Sed 2**	**Sed 3**
Percent Fullness (%)	20	20	10
Water Depth (m)	3.0	3.0	3.0
Composition (% Silt)	0	0	0
Composition (% Sand)	100	100	100
Composition (% Gravel)	0	0	0
Compositions (% Organic)	0	0	0
Notes	Black mottling throughout sand. Hard packed sand on bottom.		



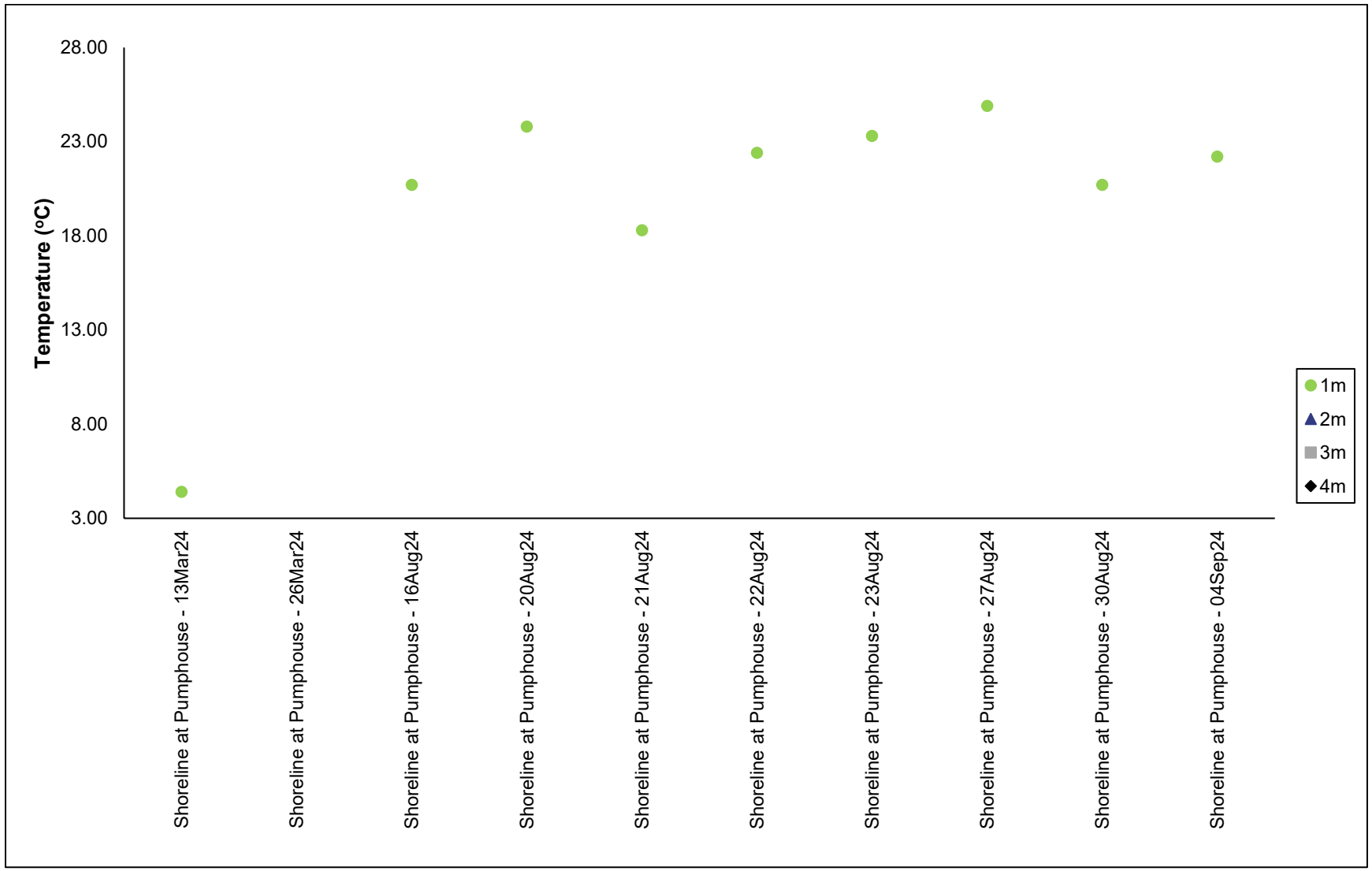
Attachment III Figure 1 – Recorded pH Concentrations Via YSI During *In-situ* Monitoring at the Proposed Water Intake Location and the Proposed Area of Shoreline Disturbance Within the Phase 3 Construction Footprint During Monitoring Associated with EA Requirements



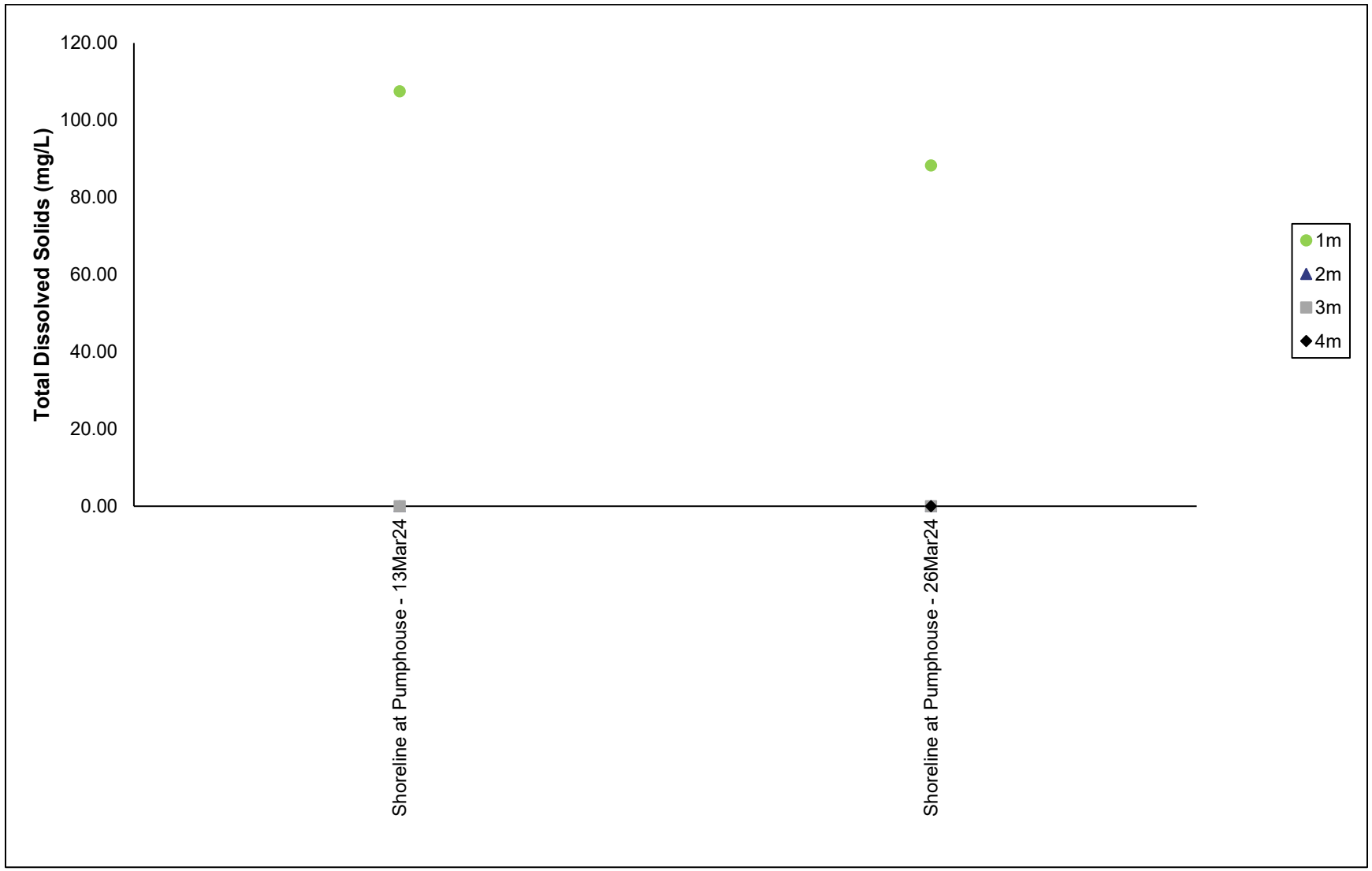
Attachment III Figure 2 – Recorded Conductivity Concentrations Via YSI During *In-situ* Monitoring at the Proposed Water Intake Location and the Proposed Area of Shoreline Disturbance Within the Phase 3 Construction Footprint During Monitoring Associated with EA Requirements



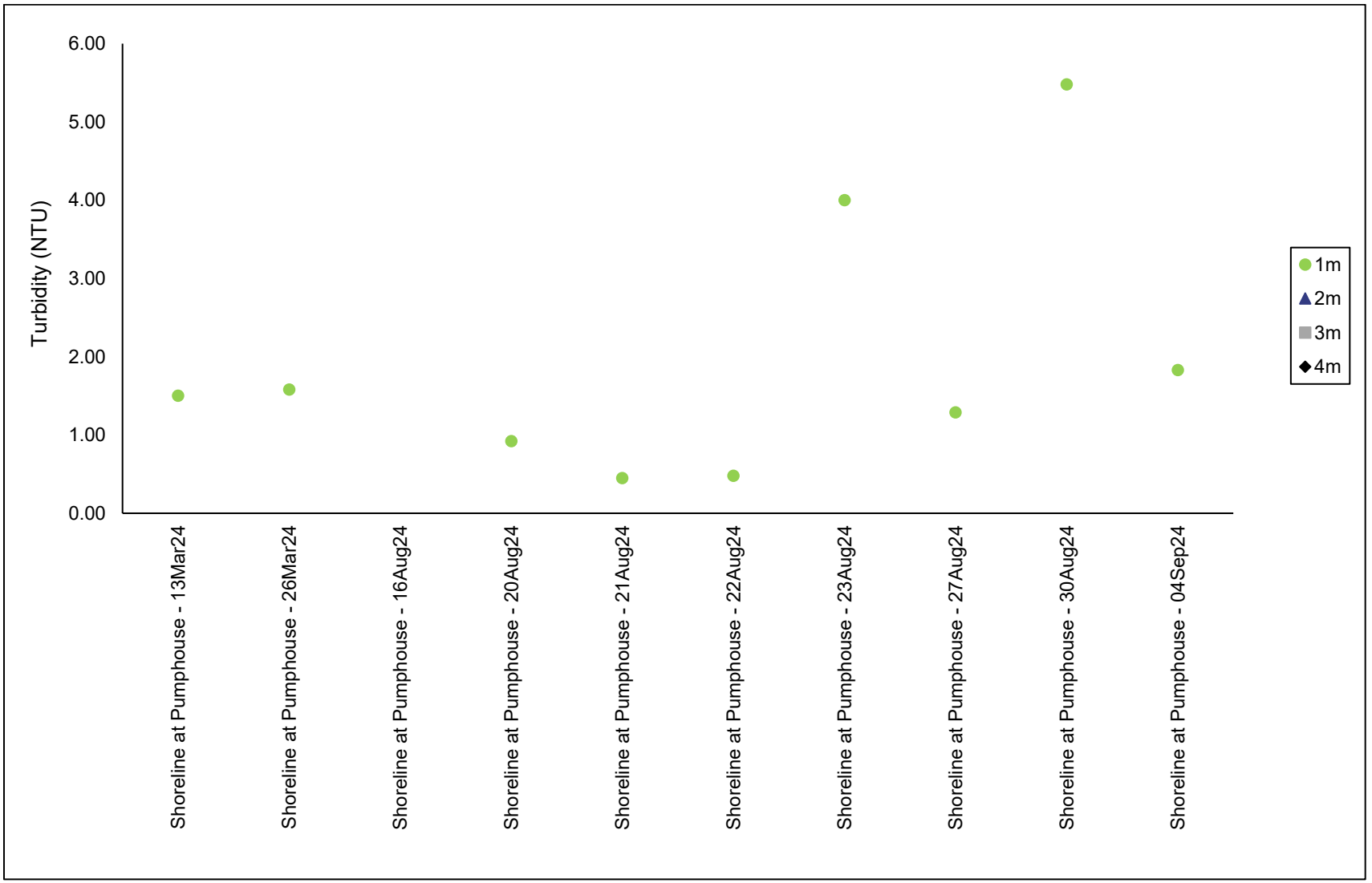
Attachment III Figure 3 – Recorded Dissolved Oxygen Concentrations Via YSI During *In-situ* Monitoring at the Proposed Water Intake Location and the Proposed Area of Shoreline Disturbance Within the Phase 3 Construction Footprint During Monitoring Associated with EA Requirements



Attachment III Figure 4 – Recorded Temperatures Via YSI During *In-situ* Monitoring at the Proposed Water Intake Location and the Proposed Area of Shoreline Disturbance Within the Phase 3 Construction Footprint During Monitoring Associated with EA Requirements



Attachment III Figure 5 – Recorded Total Dissolved Solids Concentration Via YSI During *In-situ* Monitoring at the Proposed Water Intake Location and the Proposed Area of Shoreline Disturbance Within the Phase 3 Construction Footprint During Monitoring Associated with EA Requirements



Attachment III Figure 6 – Recorded Turbidity Concentrations Via YSI During *In-situ* Monitoring at the Proposed Water Intake Location and the Proposed Area of Shoreline Disturbance Within the Phase 3 Construction Footprint During Monitoring Associated with EA Requirements

N

Appendix N: Stage 1 & 2 Archaeological Investigation

ARCHAEOLOGY | HERITAGE | OUTREACH | CONSERVATION

Stage 1 Archaeological Assessment
Blind River Raw Water Intake and Low Lift Pumping Station
Class Environmental Assessment
Town of Blind River
Lot 5 and 6, Range B and Mining Location A
Geographic Township of Cobden
Lot 13, Concession 1
Geographic Township of Striker
District of Algoma, Ontario

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PIF #P1106-0038-2024
ARA File #2023-0571

14/06/2024

Original Report

EXECUTIVE SUMMARY

Under a contract awarded in December 2023, Archaeological Research Associates Ltd. (ARA) carried out a Stage 1 archaeological assessment as part of a Schedule 'C' Municipal Class Environmental Assessment for the development of a new raw water intake and low lift pumping station in the Town of Blind River, Algoma District, Ontario in accordance with the *Environmental Assessment Act*. This report documents the background research and potential modelling involved in the investigation and presents conclusions and recommendations pertaining to archaeological concerns.

The Stage 1 assessment (desktop evaluation) was conducted in January 2024 under PIF #P1106-0038-2024. The investigation encompassed the entire study area. A property inspection did not occur; accordingly, no permissions were required for property access. At the time of assessment, the study area primarily consisted of a mixture of primarily residential, commercial, infrastructural, wood lots, and open areas of the east arm of the Town of Blind River encapsulated by the several waterbodies and watercourses.

The Stage 1 assessment determined that the study area comprises a mixture of areas of archaeological potential, areas of no archaeological potential and previously assessed lands of no further archaeological concern. It is recommended that all areas of archaeological potential that could be impacted by the project be subject to a Stage 2 property assessment in accordance with Section 2.1 of the 2011 *S&Gs*. The previously assessed lands of no further concern do not require any additional assessment. If any in-water work is planned within the North Channel of Lake Huron or Blind River, the Criteria for Evaluating Marine Archaeological Potential checklist should be consulted, and a separate Marine Archaeological Assessment may be required.

As no property inspection was completed, no areas of the study area can be fully exempted from further archaeological work in accordance with Section 1.4 of the 2011 S&Gs. Areas of no archaeological potential, such as the roadways and railway corridor, will need to be confirmed to be disturbed by visual inspection and photo-documentation during any subsequent Stage 2 property survey.

Areas of archaeological potential (e.g. the grassed, overgrown and wooded areas) must be assessed using the test pit survey method. In accordance with Section 2.1.5 of the S&Gs, a survey interval of 5 m or 10 m will be required based on the proximity of the lands to identified features of archaeological potential. Areas of no archaeological potential due to distance from features of potential (> 150 m) must be subject to visual inspection to confirm there are no additional possible pockets of archaeological potential or other unidentified features of potential.

Given the likelihood that areas around parking lots, building footprints (residential and commercial/industrial) and other infrastructure were previously impacted but may contain smaller areas of archaeological potential within the surrounding landscape, a combination of visual inspection and test pit survey should be utilized to confirm the extent of disturbance in accordance with Section 2.1.8 of the 2011 *S&Gs*. This will allow for the empirical evaluation of the integrity of the soils and the depth of any impacts. If these areas are determined to have archaeological

potential, then a test pit survey interval of 5 m or 10 m must be maintained based on proximity to features of potential.

Each test pit must be excavated into at least the first 5 cm of subsoil, and the resultant pits must be examined for stratigraphy, potential features and/or evidence of fill. The soil from each test pit must be screened through mesh with an aperture of no greater than 6 mm and examined for archaeological materials. If archaeological materials are encountered, all positive test pits must be documented, and intensification may be required.

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ABBREVIATIONS

ARA – Archaeological Research Associates Ltd.
MCM – Ministry of Citizenship and Multiculturalism
PIF – Project Information Form
S&Gs – Standards and Guidelines for Consultant Archaeologists

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1.0 PROJECT CONTEXT

1.1 Development Context

Under a contract awarded in December 2023, Archaeological Research Associates Ltd. (ARA) carried out a Stage 1 archaeological assessment as part of a Schedule 'C' Municipal Class Environmental Assessment for the development of a new raw water intake and low lift pumping station in the Town of Blind River, Algoma District, Ontario in accordance with the *Environmental Assessment Act*. This report documents the background research and potential modelling involved in the investigation and presents conclusions and recommendations pertaining to archaeological concerns.

The study area consists of a circular area covering 159.63 ha (394.45 ac) (Map 1). This parcel is generally bounded by the Blind River to the northwest, a woodlot and wetland to the northeast, Town of Blind River urban areas to the east and west and the North Channel of Lake Huron to the south. In legal terms, the study area falls on part of Lots 5 and 6, Range B and Mining Location A in the Geographic Township of Cobden, and part of Lot 13, Concession 1 in the Geographic Township of Striker, Algoma District. The Crown obtained these lands as part of the Robinson-Huron Treaty (Treaty 61) in 1850.

The investigation encompassed the entire study area. A property inspection did not occur; accordingly, no permissions were required for property access. As set out in Section 1.0 of the 2011 *Standards and Guidelines for Consultant Archaeologists* (*S&G*s), the investigation was carried out to achieve the following objectives:

- Provide information about geography, history and current land conditions;
- Determine whether any previous archaeological fieldwork has been completed;
- Evaluate in detail the study area's archaeological potential; and
- Recommend appropriate strategies for a Stage 2 assessment, if necessary.

The Ministry of Citizenship and Multiculturalism (MCM) is asked to review the results and recommendations presented herein and enter the report into the Ontario Public Register of Archaeological Reports. A Record of Indigenous Engagement is included in the project report package in accordance with the requirements set out in Section 7.6.2 of the 2011 *S&Gs*.

1.2 Historical Context

While archaeological work has been conducted in northern Ontario for several decades, the scope of work remains limited. Scholarly understanding of human occupation of boreal forests has improved but remains a developing field guided by incomplete predictive modelling with unclear efficacy. Large areas of northern Ontario remain largely undeveloped and unexplored by archaeological study (Hamilton 2000). With occupation beginning in the Archaic period approximately 8,000 years ago, the greater vicinity of the study area comprises a complex set of land-use patterns and chronologies of Indigenous and Euro-Canadian occupation. Section 1.2.1 summarizes the region's settlement history, whereas Section 1.2.2 documents the study area's past

and present land uses. No previous archaeological reports containing relevant background information were identified during the research component of the study.

1.2.1 Settlement History

1.2.1.1 Pre-Contact

The Pre-Contact history of the region is lengthy and rich, and a variety of Indigenous groups inhabited the landscape. Archaeologists generally divide this vibrant history into three main periods: Palaeo, Archaic and Woodland. Each of these periods comprises a range of discrete sub-periods characterized by identifiable trends in material culture and settlement patterns, which are used to interpret past lifeways. The principal characteristics of these sub-periods are summarized in Table 1.

Table 1: Pre-Contact Settlement History
(Wright 1972a, 1972b; Ellis and Ferris 1990; Hinshelwood 2004; Munson and Jamieson 2013)

Sub-Period	Timeframe	Characteristics
Early Palaeo	9000–8400 BC	Small bands move into southern Ontario; Mobile hunters and gatherers; Utilization of seasonal resources and large territories; Gainey, Barnes and Crowfield traditions; Fluted points; Northern Ontario virtually unoccupied due to retreating glaciers and associated glacial lakes (e.g., Lake Algonquin)
Late Palaeo	8400–7500 BC	Majority of northern Ontario remained uninhabited until Plano peoples; Plano tradition restricted mainly to areas northwest of Lake Superior (e.g., Lakehead Complex); Unfluted lanceolate points; Palynological research indicates the newly exposed interior lands of northwestern Ontario were, for a time, sub-artic tundra/taiga (e.g., mainly treeless) that would have supported herds of caribou; Sites from this period are typically found near relict shorelines (e.g., Lake Minong and Lake Agassiz) and inland river terraces
Early Archaic	7500–6000 BC	As the glaciers melted and retreated, people expanded into the emerging landscape of the Canadian Shield; During the Nakina Phase (ca. 7000 BC) and Driftwood Stadial (ca. 6100 BC), glaciers, glacial lakes and post-glacial environmental factors would have provided an unattractive setting for early hunters and gatherers in northern Ontario
Middle and Late Archaic	6000–700 BC	As the land rebounded and became fertile (e.g., modern boreal forest environment), new traditions emerged (e.g., Shield Archaic in the north and Laurentian Archaic in the south); Shield Archaic peoples best understood as caribou hunters and fisherman; Material culture is marked by the appearance of copper tools and the likely manufacture of the birch bark canoe; Copper tool manufacture is largely linked to the 'Old Copper Culture' of the western Lake Superior basin; Far-reaching trade relations also emerged during the Archaic period, which likely played a major role in the spread of later Woodland technologies and lifeways
Early and Middle Woodland	700 BC–AD 900	Primarily distinguished from the earlier Shield Archaic by the widespread appearance of pottery; Some argue that pottery did not appear until ca. 200 BC; Laurel tradition dominant in northern Ontario; Pottery is often cone-shaped, with plain bodies and stamp impressions on the shoulder and rim; Moose and beaver were important sources of food and secondary goods; Seasonal campsites were utilized; Material culture consisted of a variety of stone and bone tools, including scrapers, arrowheads, knives, net-sinkers, awls, harpoons and beaver incisor knives; Some evidence of the consumption of wild rice and domesticated plant foods such as maize during the Middle Woodland, but the origin and extent of this development is unclear

Sub-Period	Timeframe	Characteristics
Late Woodland	AD 900–1600	Area occupied by Algonquian-speaking peoples; Traditions in this region developed alongside those of the Iroquoian-speaking Huron-Petun of southern Ontario; Ceramic styles predominantly derived from the south, but also influences from Lake Superior; Adopted smoking pipes and ossuary burials from the Huron-Petun, but tool traditions and houses were dissimilar; Engaged in frequent dog burials; Practised corn horticulture in a partial way

1.2.1.2 Post-Contact

The arrival of European explorers and traders at the beginning of the 17th century triggered widespread shifts in Indigenous lifeways and set the stage for the ensuing Euro-Canadian settlement process. Documentation for this period is abundant, ranging from the first sketches of Upper Canada and the written accounts of early explorers to detailed township maps and lengthy histories. The Post-Contact period can be effectively discussed in terms of major historical events, and the principal characteristics associated with these events are summarized in Table 2.

Table 2: Post-Contact Settlement History
(Kirkwood and Murphy 1878; ODCL 1884; Hardy 1894; Coyne 1895; Anderson 1898; Dobie 1909; Howard 1917; Mika and Mika 1977; Mika and Mika 1983; Shragge and Bagnato 1984; Ellis and Ferris 1990; AO 2022; Town of Blind River 2022; Lavallé 2023)

Historical Event	Timeframe	Characteristics
Early Exploration	Early 17th century	Contact with European fur traders began in late 1500s or early 1600s; Brûlé explores southern Ontario in 1610; Champlain visits in 1613 and 1615/1616; Iroquoian-speakers (Huron, Petun and Neutral) and Algonquian-speakers (Anishinabeg) encountered; Anishinabeg were primarily seasonal hunters and had few fixed settlements, unlike the more sedentary Iroquoian-speakers of southern Ontario; Extensive trade relations in place with their Huron neighbours, where furs and meat were traded for corn and fish-nets
Increased Contact and Conflict	Mid- to late 17th century	Conflicts between various First Nations during the Beaver Wars result in numerous population shifts; European explorers continue to document the area, and many Indigenous groups trade directly with the French and English; 'The Great Peace of Montreal' treaty established between roughly 39 different First Nations and New France in 1701
Fur Trade Development	Late 17th to mid-18th century	The French established and maintained trading posts along the Upper Great Lakes, offering enticements to attract fur traders from the First Nations; Peace between the French and English with the Treaty of Utrecht in 1713; The fur trade introduced new technologies and economic relationships into the forager lifestyle of the Anishinabeg, and European-manufactured goods replaced some traditional technologies; Ethnogenesis of the Métis; Hostilities between French and British lead to the Seven Years' War in 1754; French surrender in 1760
British Control	Mid-18th century	*Royal Proclamation* of 1763 recognizes the title of the First Nations to the land; Numerous treaties subsequently arranged by the Crown; First land cession under the new protocols is the Seneca surrender of the west side of the Niagara River in August 1764; The Niagara Purchase (Treaty 381) in 1781 included this area; Fur trade continued to develop, eventually dominated by the Hudson's Bay Company
Loyalist Influx	Late 18th century	United Empire Loyalist influx into southern Ontario after the American Revolutionary War (1775–1783); British develop interior communication routes and acquire additional lands; *Constitutional Act* of 1791 creates Upper and Lower Canada; Many new counties and townships created in southern Ontario; Northern Ontario remained in the hands of the First Nations

Historical Event	Timeframe	Characteristics
District Formation	Mid-19th to early 20th century	Euro-Canadian interest in lands along the north shores of Lake Superior and Lake Huron increased in the 1840s, as mining companies began to send prospectors, surveyors and engineers into the area; Robinson-Superior Treaty (Treaty 60) and Robinson-Huron Treaty (Treaty 61) completed in 1850; Algoma District created in 1858, with Sault Ste. Marie as the district seat; Michipicoten Post administered posts at Pic, Long Lake and Red Rock before its closure ca. 1904; Wawa surveyed by J. Cozens in 1897; Algoma Central Railway chartered in 1899 to transport iron ore from the Helen Mine to Sault Ste. Marie; James Bay Treaty (Treaty 9) completed in 1905 and 1906
District Development	Early to mid-20th century	Employment opportunities included agriculture, logging, transporting goods, mining and continued railway construction; Algoma Central Railway opened to Michipicoten in 1911 and Hearst in 1914, crossing the Canadian Pacific Railway at Franz and the Canadian National Railway at Oba; The portion of the Trans-Canada Highway between Sault Ste. Marie and Wawa was completed in 1960; The closing of this 'Big Gap' facilitated further development in northern Ontario, connecting isolated communities and providing transportation options; International bridge crossing at Sault Ste. Marie opened in 1962

1.2.1.3 Town of Blind River

The general location of Blind River was believed to have been noted by Samuel De Champlain in 1632 as a yearly gathering place for drying berries for the surrounding Indigenous Nations (Mika and Mika 1977). Sustained Euro-Canadian activity in the area was not until 1789 when the Northwest Company established a Fur Trading post at the mouth of the Mississaugi River to the west. Following its purchase by the Hudson Bay Company, business slowed and many fur traders settled in the surrounding area (Town of Blind River 2022). The river was named as it was difficult for early voyageurs to see from the lake (Mika and Mika 1977).

By the mid-19th century, the discovery of copper in the Bruce mines spurred further settlement in the area. In order to supply the lumber demands of the mine, the Savoie family established the first sawmill at the mouth of the Blind River. It was located on the eastern arm of the river mouth and is said to be at the current location of the Old Mill Motel (Town of Blind River, 2022). Subsequent arrivals were predominantly of French origin, attracted by the growing lumber industry. Others were encouraged to migrate by reports of abundant farmland (Kirkwood and Murphy 1878). By 1877, the first post office was established, followed by the arrival of the Canadian Pacific Railway in 1885 and the first school in 1897 (Mika and Mika 1977; Lavallé 2023).

By 1906, Blind River had been incorporated as a town and a second sawmill had been built on the western arm of the town. Early supporting industries included Diagles Power House, two general stores, and the McFadden Lumber Company sawmill, built by Carpenter Hixon Company in 1929 (Mika and Mika 1977). The Great Mississauga Fire in 1948 destroyed many easily accessible timber stocks. A depression in the lumber industry followed which led to the eventual closure of the McFadden Lumber Company in 1969 (Town of Blind River, 2022). Despite these setbacks, it remains a thriving community supported by the lumber industry, the discovery of uranium in 1955 and the arrival of the Trans-Canada Highway in 1960 (Mika and Mika 1977; Shragge and Bagnato 1984).

1.2.2 Past and Present Land Use

1.2.2.1 Overview

During Pre-Contact and Early Contact times, the vicinity of the study area would have comprised a mixture of coniferous trees, mixed-wood forests and open areas. Indigenous communities likely managed the landscape to some degree, but in general, Anishinaabeg populations lived lightly on the land and practised sustainable lifeways. During the mid-19th century, Euro-Canadian settlers arrived in the area and began to clear the forests for agricultural, logging, mining, and settlement purposes. The study area was located within the historical limits of Blind River. The land use at the time of assessment can be classified as a mixture of residential, commercial, infrastructural, wooded areas, water courses and water bodies.

1.2.2.2 Mapping and Imagery Analysis

In order to gain a general understanding of the study area's past land uses, four historical settlement maps, one geological map and one aerial image were examined during the research component of the study. Specifically, the following resources were consulted:

- The *Atlas of the Dominion District of Nipissing* (1874) (MU 2024);
- The *Family Atlas of the World* (1890) (UA 2024a);
- The *Unrivaled Atlas of the World* (1905) (UA 2024b);
- A fire insurance plan from 1915 (LAC 2024);
- A geological map from 1964 (MNDMNF 2024);
- An aerial image from 2005 (GE 2024).

The limits of the study area are shown on georeferenced versions of the consulted historical resources in Map 2–Map 6.

Tackabury and Walling's *Atlas of the Dominion District of Nipissing* (1874) has limited information but identifies several key details including the outline of the Township of Cobden and the location of Blind River with a labelled "Salvaile's Mills" likely referencing the sawmill established by the Savoie family on the east arm at the mouth of the Blind River (Map 2). No other details are recorded about the Town of Blind River. Rand McNally and Co.'s *The Family Atlas of the World* (1890) and *The Unrivaled Atlas of the World* (1905) both illustrated the previous establishment of the Canadian Pacific Railway directly through the community of Blind River (Map 3 and Map 4).

Charles E. Goad's *Blind River, Algoma District, Ontario, 77 miles east of Sault St. Marie on Canadian Pacific Railway, October 1915* (1915), the Fire Insurance Plan for the Town of Blind River, provided details regarding the historical composition of the now Town of Blind River (Map 5). Pertinent details on the key plan include the prior establishment of many of the roadways of the present-day Town including Woodward Avenue, Lawton Avenue, Scott Avenue, Huron Avenue, Hamilton Avenue, Cobden Avenue, Victoria Avenue, Laborne Avenue, Causley Street, Murray Street, Leacock Street and Park Street. It should be noted that the lack of structures on these streets should not be taken as evidence that the parcels were unoccupied, however, as key

plans are for reference and not detail. In the southwest of the study area on Sheet 2, additional structures include a wooden bridge, dam and powerhouse at the mouth of Blind River; the piling ground of the White Pine Lumber Company; the Canadian Pacific Railway train station and several other wood and stone structures. Sheet 5 of the Fire Insurance Plan could not be obtained but the key plan illustrates several structures along Woodward Avenue.

The geological map indicates numerous structures have been established along all the streets within the study area by 1964 with a high density bounded by Victoria Avenue in the east and present-day Dawsy Street in the north (Map 6). Additionally, there are concentrations east at Leacock Avenue and present-day Trunk Road, along the northern extent of Woodward Avenue, and along present-day Martin Road in the south. The 21st-century town retained a similar outline with heavy disturbance associated with the recent construction of a new water treatment plant (Map 7)

1.3 Archaeological Context

The Stage 1 assessment (desktop evaluation) was conducted in January 2024 under PIF #P1106-0038-2024. The limits of the study area were confirmed using aerial imagery showing physical features in relation to the subject lands.

The archaeological context of any given study area must be informed by 1) the condition of the property as found (Section 1.3.1), 2) a summary of registered or known archaeological sites located within a minimum 1 km radius (Section 1.3.2) and 3) descriptions of previous archaeological fieldwork carried out within the limits of, or immediately adjacent to the property (Section 1.3.3).

1.3.1 Condition of the Property

The study area lies within the Great Lakes–St. Lawrence forest region, which is a transitional zone between the southern deciduous forest and the northern boreal forest. This region extends along the St. Lawrence River across central Ontario to Lake Huron and west of Lake Superior along the border with Minnesota, and its southern portion extends into the more populated areas of Ontario. It is dominated by hardwood forests, although coniferous trees such as white pine, red pine, hemlock and white cedar commonly mix with deciduous broad-leaved species like yellow birch, sugar and red maples, basswood and red oak (MNRF 2024).

The study area is situated within the Thessalon Ecodistrict (5E-1) of the Georgian Bay Ecoregion (5E). Located on the north shores of the North Channel of Lake Huron, it extends from Elliot Lake in the east, the Ontario-United States border in the west and Wakomata Lake in the north. The Ecodistrict is comprised mainly of acidic Precambrian bedrock material with a rolling landscape and areas of morainal material. Cambrian sandstone and shale bedrock can be found along St. Mary's River. The undulating topography in the Ecodistrict was a result of remnant glaciolacustrine material deposited when the area was submerged by the glacial lakes Algonquin, Mattawa and the Nipissing Great Lakes. In larger river valleys like the Mississagi River, glacial meltwater has deposited glaciofluvial material (Wester et al. 2018).

Surficial materials and landforms within the Thessalon Ecodistrict are primarily bedrock (71%), while Humo-Ferric Podzols have developed in the better-drained and deeper glaciolacustrine,

glaciofluvial and morainal deposits. Smaller amounts of Gleysols, Mesisols, and Humisols have formed in areas of poor drainage or where water accumulates along the shore. One-third of the forests in this area are dominated by deciduous Maple trees (Wester et al. 2018)

According to the Ontario Soil Survey, the study area consists of primarily Monteagle and Medette sandy loam. Both are noncalcareous, orthic humo-ferric podzols. Specifically, Monteagle is a very stony glacial till that drains well while Medette is a fine sand outwash with imperfect drainage. The northeast study area has areas consisting of Ouellete Orthic Gleysol Clay Lacustrine soil with poor drainage (Gillespie et al. 1983).

The subject lands fall within the Blind River and Lake Huron drainage basins. Specifically, the study area is traversed by the Blind and Potomac Rivers in the northwest, by an unnamed watercourse and wetland in the northeast and by the North Channel of Lake Huron in the south. At the time of assessment, the study area primarily consisted of a mixture of primarily residential, commercial, infrastructural, wood lots, and open areas of the east arm of the Town of Blind River encapsulated by several waterbodies and watercourses. Soil conditions were not documented, as a property inspection did not occur.

1.3.2 Registered or Known Archaeological Sites

The Ontario Archaeological Sites Database (OASD) and the Ontario Public Register of Archaeological Reports were consulted to determine whether any registered or known archaeological resources occur within a 7 km radius of the study area. The available search facility returned 21 registered sites located within at least a 7 km radius (the facility returns sites in a rectangular area rather than a radius, potentially resulting in returns beyond the specified distance). Communication with Mississauga First Nation identified an additional unregistered site in the vicinity of the study area. The sites are summarized in Table 3.

Table 3: Registered and Unregistered Archaeological Sites within 7 km

Borden No.	Site Name / Identifier	Time Period	Affinity	Site Type	Distance from Study Area
CbHr-1	Poissette	Archaic	Indigenous	Camp/campsite	> 1 km
CbHr-2	Blind River	Pre-Contact	Indigenous	Camp/campsite	> 1 km
CbHr-4	Cataract River	Archaic, Pre-Contact	Indigenous	Camp/campsite, fishing	> 1 km
CbHs-1	Mouth	Other	Unspecified	Findspot	> 1 km
CbHs-2	Chiblow 1	Post-Contact	Indigenous	Findspot	> 1 km
CbHs-3	Mississagi (Chiblow 2)	Post-Contact, Woodland, Late	Ojibwa	Camp / campsite, house	> 1 km
CbHs-4	Bridge (Chiblow 3)	Late Woodland, Post-Contact	Indigenous	Findspot	> 1 km
CbHs-5	Renard	Late Woodland	Indigenous	Camp / campsite	> 1 km
CbHs-6	Swimming Bear	Late Woodland, Post-Contact	Indigenous	Large camp / campsite	> 1 km
CbHs-7	Falls	Late Woodland, Post-Contact	Indigenous, Euro-Canadian	Burial ground, Fur Trade Post	> 1 km
CbHs-8	Wood	Late Woodland	Indigenous	Camp / campsite	> 1 km

Borden No.	Site Name / Identifier	Time Period	Affinity	Site Type	Distance from Study Area
CbHs-9	Poor Little Tree Site	Late Woodland	Indigenous	Unspecified	> 1 km
CbHs-10	Kor Rock Structure	Unspecified	Unspecified	Rock structure, Puckasaw Pit	> 1 km
CbHs-11	Contemporary Bear	Pre-Contact, Post-contact	Indigenous	Camp / campsite	> 1 km
CbHs-12	Sayer's	Pre-Contact, Post-Contact	Indigenous	Unspecified	> 1 km
CbHs-13	Tippecanoe	Post-Contact	Indigenous	Unspecified	> 1 km
CbHs-14	Patrick Point Rock Structure	Unspecified	Indigenous	Rock structure	> 1 km
CbHs-15	Boom Camp	Late Woodland	Indigenous	Camp / campsite	> 1 km
CbHs-16	Whippoorwill Rock Structure	Unspecified	Indigenous	Rock structure	> 1 km
CbHs-17	East Terrace 1	Woodland, Late	Algonkian	Camp/campsite	> 1 km
CbHs-18	East Terrace 2	Woodland, Late	Algonkian	Camp/campsite	> 1 km
CbHs-23*	Mary Bonefant	Late Woodland	Indigenous	Unspecified	> 1 km
CbHs-24*	Rock Cut	Late Woodland	Indigenous	Unspecified	> 1 km
CbHs-25*	White Tail Deer	Late Woodland	Indigenous	Unspecified	> 1 km
CbHs-26*	Flying Hawk	Post-Contact	Euro-Canadian	Unspecified	> 1 km
CbHs-27*	Thomas Farm	Post-Contact	Euro-Canadian	Unspecified	> 1 km
CbHs-28*	Sweet Marie	Late Woodland	Indigenous	Unspecified	> 1 km
CbHs-29*	Moonlight Beach	Late Woodland	Indigenous	Unspecified	> 1 km
CbHs-30*	Cormorant	Late Woodland	Indigenous	Unspecified	> 1 km
CbHs-31*	Warren Neufeld	Late Woodland	Indigenous	Unspecified	> 1 km
CbHs-32*	Ruby Rouge	Post-Contact	Euro-Canadian	Unspecified	> 1 km
-	99HPGCC-1	Unspecified	Unspecified	Mound Structures	> 1 km
-	99HPGCC-2	Woodland	Indigenous	Unspecified	> 1 km
-	99HPGCC-3	Woodland, Post-Contact	Indigenous, Euro-Canadian	Unspecified	> 1 km
-	27 Centre Street	Post-Contact	Euro-Canadian	Homestead	300 m – 1 km

* Recorded in reporting with associated Borden but not registered with MCM

None of the previously identified sites are located within 300 m of the subject land, and they are not direct features of potential. The site identified as 27 Centre Street was subject to limited excavations by avocational archaeologist Lois Jones on the property briefly associated with Norman Bethune, an innovative Canadian thoracic surgeon from the early 20th century. Finds were limited, and the site was never registered with the OASD (A. Hawkins pers. Communication). Additionally, on the northern bank of the Blind River, across from the Town Hall, a member of the Mississauga First Nation recovered two Early Woodland projectile points: a Kramer style and a Kramer/Meadowood cross (J. Cousineau, pers. communication).

The absence of sites near Blind River reflects a lack of assessment in the area rather than an absence of archaeological potential. A review of archaeological sites within the wider area provides insights into the site types potentially within the study area and the surrounding landscape. Nineteen registered and ten unregistered archaeological sites are located within the Mississagi River delta between 3 to 7 km to the west of the current study area. All were identified prior to the current *S&Gs* or as part of research projects and do not adhere to the current standards of archaeological assessment.

Archaeological work in this area began with the archaeologist J. V. Wright in 1961 when he identified the Chiblow 1 (CbHs-2), Chiblow 2 (CbHs-3), Chiblow 3 (CbHs-4) and Mouth (CbHs-1) sites. Helen Devereux conducted excavations of the Chiblow 1 (CbHs-2) and Chiblow 2 (CbHs-3) sites in 1962 and 1963 while also identifying the Contemporary Bear (CbHs-11) site. All of these sites were notably identified on the east bank of the Mississagi River (Bertulli and Kilpatrick 1977; Archéologie Illimitée Inc. 1981).

Wright returned with W. C. Noble to conduct work on the Chiblow 3 (CbHs-4) site and identified the Falls (CbHs-7) site in 1964 and 1968. A more extensive survey was conducted by Morris Brizinski and Helen Devereux of Laurentian University in 1975 on behalf of the Ontario Ministry of Natural Resources. Their work focused on Fox Island, Weber Island and Island No. 5 within the delta. They identified the Renard (CbHs-5), the Wood (CbHs-8), Poor Little Tree (CbHs-9) and Kor Rock Structure (CbHs-10) sites on Fox Island as well as the Swimming Bear Site (CbHs-6) on Island No. 5 (Brizinksi 1975). Salvage excavations were completed for the Renard (CbHs-5) due to the erosion of the site into the river. A trench consisting of 27 1 m^2 units was excavated along the bank, yielding Indigenous ceramics, lithics, and copper artifacts with features including pits and several hearths/possible hearths (Bertulli and Kilpatrick 1977).

Laurentian University returned in 1977 under M. M. Bertulli, identifying an additional six sites including the Boom Camp (CbHs-15), Sayer's (CbHs-12), Tippecanoe (CbHs-13), Patrick Point Rock Structure (CbHs-14) and Whippoorwill Rock Structure (CbHs-16) sites. Further survey was completed at the Boom Camp Site simultaneously with excavations at the Renard (CbHs-5), Falls (CbHs-7), and Chiblow 3 (CbHs-3) sites (Bertulli 1981).

Further work in the area was completed by Archéologie Illimitée Inc. in 1980, prior to the development of a uranium hexafluoride refinery by Eldorado Nuclear Ltd. Alongside several sites related to the early logging activity and domestic occupation of the area, they identified the East Terrace 1 (CbHs-17) and East Terrace 2 (CbHs-18) sites (Archéologie Illimitée Inc. 1981). CbHr-2 was noted in the OASD as identified in advance of the impacts of Eldorado Nuclear. However, the Archéologie Illimitée Inc. report does not provide additional information on this site.

Brizinksi later returned to the area in 1995 to conduct a survey of lands previously impacted by the Huron Among the Pines Golf Course, motivated by a site discovery during the earlier field school. The goal of the survey was to determine the intensity of habitation by Indigenous and early Euro-Canadian peoples along an extinct beach ridge of the Mississagi River. The survey of surface debris resulted in the identification of an additional ten sites including seven Late Woodland Indigenous and three Euro-Canadian sites, all in varying degrees of disturbance aside from Mary Bonenfant (CbHs-23). Site types were not provided, but the presence of Indigenous ceramic, lithic tools, and fire-cracked rock suggest at least seasonal occupation campsites, with Late Woodland being a particularly optimal time for this now-extinct beach ridge. Borden numbers were provided for the sites, but they were never formally registered with the MCM and listed in the OASD. Further historical research on the Euro-Canadian sites and protection of the undisturbed portion of the Indigenous sites was recommended (Brizinski and Wood 1995).

Woodland Heritage Services Limited (WHS) later returned in 1999 prior to a proposed expansion of the now Huron Pines Golf & Country Club to the north from a 9-hole course to an 18-hole course (WHS 1999). The assessment determined that large sections of the golf course area had been heavily landscaped and or completely stripped of top soils. They conducted a pedestrian survey with intervals of 3 m for areas previously cleared of top soils. Areas where original soils were intact were subject to test pit survey with intervals of 10 m and reduced to 5 m when archaeological resources were identified. The goal of the assessment was to relocate the ten archaeological sites identified in 1995 along with Chiblow 1 (CbHs-2) and Chiblow 2 (CbHs-3) sites to evaluate the potential for development impacts of the golf course expansion.

The Mary Bonenfant (CbHs-23), Rock Cut (CbHs-24), Thomas Farm/Four (CbHs-27), Ruby Rouge (CbHs-32), Moonlight Beach (CbHs-29), Chiblow 1 (CbHs-2) and Chiblow 2 (CbHs-3) sites remained outside of the development impacts and were subjected only to a limited pedestrian survey. Of these six sites, only Ruby Rouge (CbHs-32) yielded additional artifacts which included primarily scrap metal and broken glass. White Tail Deer (CbHs-25) was relocated by pedestrian and test pit survey, while Warren Neufeld (CbHs-31) was relocated by just a test pit survey. Additional artifacts recovered included Indigenous ceramics along with quartz and chert tools, but these were all recovered from disturbed contexts. Similarly, the test pit survey recovered several chert flakes in a heavily disturbed context potentially related to the Cormorant Site (CbHs-30). Flying Hawk (CbHs-26) appeared to have since been completely destroyed. The original location of the Sweet Marie site (CbHs-28) and Moonlight Beach (CbHs-29) sites was subject to a test pit survey, but no additional artifacts were recovered, and their locations could not be confirmed (WHS 1999).

The 1999 investigations identified an additional three sites. The 99HPGCC-1 site was associated with a series of mounds between the Ruby Rouge (CbHs-32) and Thomas Farm/Four (CbHs-27) sites. Test pits around the mounds did not yield any artifacts, so it remains unclear to which period and/or nearby site these mounds may have been associated. Test pits near the Sweet Marie site (CbHs-29) recovered fire-cracked rock and Indigenous ceramic within a buried cultural layer. These finds were identified as the 99HPGCC-2 site. The 99HPGCC-3 site was a larger multi-component Indigenous and Euro-Canadian site. The Euro-Canadian component comprised foundations of potentially three buildings with a large amount of domestic and architectural refuse in the area. It was determined to be historical with a potential fur-trade period component. Test pits in the area yielded flakes, Indigenous ceramic, fire-cracked rock, lithic cores and an assortment of lithic tools. Additional Indigenous artifacts were recovered from eroded sediments along the Mississaugi River but lacked clear contextual information to be associated with a site (WHS 1999).

The assessment determined many of the sites identified by Brizinksi were likely more consolidated archaeological resources separated by more recent activites. The Rock Cut (CbHs-24) and Cormorant (CbHs-30) sites were recommended to be consolidated with the White Tail Deer site (CbHs-25). Similarly, the Ruby Rouge (CbHs-32), 99HPGCC-2, and 99HPGCC-3 sites were proposed to be all part of the Warren Neufeld site (CbHs-31). Areas of the two consolidated sites potentially impacted by the expansion were recommended to be capped by a layer of sterile soil, and no development was to occur outside of the previously assessed areas. If development was to directly impact the Warren Neufeld site (CbHs-31), Stage 4 archaeological assessment was recommended (WHS 1999).

Sites within 7 km of the study area were not limited to the Mississagi Delta. Further north are two additional sites. CbHr-1 was situated northwest of Lake Duborne and noted as identified by Laurentian University but no further information could be obtained. The area is noted by the Mississauga First Nation as an area where projectile points continue to be identified by members of the community and their ancestors had long farmed and fished along these waters. Battle Point, a small peninsula along the lake, was recorded by the Mississauga First Nation as the site of a battle between the Haudenosaunee and Mississauga Ojibway. Local elders note that Haudenosaunee had previously travelled to capture women, and on this occasion, the Ojibway ambushed and defeated them before pushing the remnants down the Penewabecong to the mouth of Blind River. The remnants attempted to hold out on an island at the mouth, and all but one individual was killed. They were spared in order to report the story of the conflict (White 2013). A similar battle was recorded by Bacqueville de La Potherie, the French Royal Commissioner to Canada in the 1690s, in 1653 when a Haudenosaunee force of 120 was defeated north of Manitoulin Island by a combined force of 'Nikikouek, Mississaga, and Saulteurs,' with one survivor left alive (Schmalz 1991: 19). Northwest of CbHr-1, CbHr-2 was identified by Thor Conway in 1991, but only limited information was obtained regarding of the site.

An additional test pit survey on the Chiblow 2 (CbHs-3) site was conducted as part of an Indigenous Archaeological Monitor training project in 2019, yielding artifacts from the 16th and 17th centuries through to the 20th century. Notably, the area remained in use as a boat launch and hunting area until the present (Hawkins 2020). Altogether, these sites demonstrate the potential for archaeological resources within the Blind River area. They also document tangible evidence of the landscape's past and continued importance to the Indigenous peoples of the area and their descendant communities, including the Mississauga First Nation. Additionally, several of the identified sites document the key importance of the Fur Trade and the lumber industry to the development of the area as it presently stands, including a potential Northwest/Hudson Bay Company trading post and several lumber campsites.

1.3.3 Previous Archaeological Work

Reports documenting assessments conducted within the subject lands and assessments that resulted in the discovery of sites within adjacent lands were also sought during the research component of the study. In order to ensure that all relevant past work was identified, an investigation was launched to identify reports involving assessments within 50 m of the study area. The investigation determined that there is one available report documenting previous archaeological fieldwork within the specified distance.

1.3.3.1 Eight Residential Building Lots (Stage 1-2)

In August 2015, Stage 1-2 archaeological assessments were carried out for eight residential building lots in advance of possible disposal by Infrastructure Ontario under PIF #P415-0050-2015 (Stantec 2016). The assessed area traverses a small rectilinear parcel within the study area. It was determined to have archaeological potential and was subject to test pit survey at intervals of 5 m. No archaeological resources were identified, and no further work was recommended. The property was considered of no further archaeological concern.

2.0 STAGE 1 BACKGROUND STUDY

2.1 Background

The Stage 1 assessment involved background research to document the geography, history, previous archaeological fieldwork and current land condition of the study area. This desktop examination included research from archival sources, archaeological publications and online databases. It also included the analysis of a variety of historical maps and aerial imagery. The results of the research conducted for the background study are summarized below.

With occupation beginning approximately 11,000 years ago, the greater vicinity of the study area comprises a complex chronology of Pre-Contact and Post-Contact histories (Section 1.2.1). Artifacts associated with Indigenous traditions are well-attested in the Algoma District, and Euro-Canadian archaeological sites dating to pre-1900 and post-1900 contexts are likewise common (Section 1.3.2). The absence of documented sites in the surrounding area is likely related to a lack of local archaeological exploration and should not be taken as an indicator that the area was unattractive or undesirable for occupation. A review of sites within the Mississauga River Delta demonstrated the potential for archaeological resources within the Blind River area. They document tangible evidence of the past and the continued importance of the landscape to past Indigenous peoples and their descendant communities, including the Mississauga First Nation, with several Indigenous campsites with both pre-contact and post-contact components. Several of the identified sites also document the key importance of the Fur Trade and the lumber industry to the development of the area by way of a potential Northwest/Hudson Bay Company trading post and lumber campsites. Background research identified one area of previous assessment within the study area (Section 1.3.3).

The natural environment of the study area would have been attractive to both Indigenous and Euro-Canadian populations as a result of its proximity to the north channel of Lake Huron and Blind River. The study area was submerged by Glacial Lake Algonquin, Glacial Lake Mattawa and the Nipissing Great Lakes, however, which would have disturbed many Indigenous sites dating prior to the Late Archaic period. The areas of well-drained soils would have been ideal for agriculture, and the diverse local vegetation would also have encouraged settlement throughout Ontario's lengthy history.

In summary, the background study included an up-to-date listing of sites from the Ontario Archaeological Sites Database (within at least a 1 km radius), the consideration of previous local archaeological fieldwork (within at least a 50 m radius), the analysis of historical maps (at the most detailed scale available) and the study of aerial imagery. ARA therefore confirms that the standards for background research set out in Section 1.1 of the 2011 *S&Gs* were met.

2.2 Field Methods (Property Inspection)

The study area was not subject to a property inspection, as the corpus of available imagery, topographic mapping and digital environmental data provided abundant information concerning current land conditions. This information was of a scale and detail that allowed for the accurate evaluation of the presence and character of features of potential, and no greater level of detail was needed to make appropriate Stage 2 recommendations. The results of ARA's archaeological potential modelling are discussed below.

2.3 Analysis and Conclusions

In addition to relevant historical sources and the results of past archaeological assessments, the archaeological potential of a property can be assessed using its soils, hydrology and landforms as considerations. Section 1.3.1 of the 2011 *S&Gs* recognizes the following features or characteristics as indicators of archaeological potential: previously identified sites, water sources (past and present), elevated topography, pockets of well-drained sandy soil, distinctive land formations, resource areas, areas of Euro-Canadian settlement, early transportation routes, listed or designated properties, historic landmarks or sites, and areas that local histories or informants have identified with possible sites, events, activities or occupations.

The Stage 1 assessment resulted in the identification of several features of archaeological potential in the vicinity of the study area (Map 8). The closest and most relevant indicators of archaeological potential (i.e., those that would affect survey interval requirements) include three primary water sources (North Channel of Lake Huron, Blind River, and Blind River tributary), one secondary water source (unnamed wetland), one historical community (Blind River), twelve historical roadways (Woodward Avenue, Lawton Avenue, Scott Avenue, Huron Avenue, Hamilton Avenue, Cobden Avenue, Victoria Avenue, Laborne Avenue, Causley Street, Murray Street, Leacock Street and Park Street) and multiple historical structure localities (Powerhouse, White Pine Lumber Company, etc.). Background research did not identify any features indicating that the study area has the potential for deeply buried archaeological resources.

Although proximity to a feature of archaeological potential is a significant factor in the potential modelling process, current land conditions must also be considered. Section 1.3.2 of the 2011 *S&Gs* emphasizes that 1) quarrying, 2) major landscaping involving grading below topsoil, 3) building footprints and 4) sewage/infrastructure development can result in the removal of archaeological potential, and Section 2.1 states that 1) permanently wet areas, 2) exposed bedrock and 3) steep slopes (> 20°) in areas unlikely to contain pictographs or petroglyphs can also be evaluated as having no or low archaeological potential. Areas previously assessed and not recommended for further work also require no further assessment.

One previously assessed area of no further concern was identified within the study area, which does not warrant additional assessment. The subject lands also include part of the North Channel of Lake Huron and Blind River, but archaeological potential modelling for waterbodies and watercourses is beyond the purview of any land-based assessment.

ARA's desktop evaluation, coupled with the analysis of historical sources and digital environmental data, resulted in the identification of areas of no archaeological potential within the

remaining lands. Specifically, deep land alterations have resulted in the removal of archaeological potential from the various roadways and the railway corridor that traverse the study area. These areas have clearly been impacted by past earth-moving/construction activities, resulting in the disturbance of the original soils. Additionally, the wetlands in the northeast are likely permanently wet. Conditions of these lands will need to be confirmed during subsequent property assessments.

The remainder of the study area has potential for Indigenous and Euro-Canadian archaeological materials or requires test pit survey to confirm that they have no archaeological potential. The areas of archaeological potential include grassed areas, overgrown/wooded areas, and the Blind River urban area. It seems likely that parking areas, building footprints (residential and commercial/industrial) and other infrastructure-related areas were previously impacted, but the presence or absence of areas of archaeological potential interspersed within these lands could not be made based on the desktop survey alone. Accordingly, these lands have been categorized as areas of archaeological potential and must be empirically tested and inspected to confirm that archaeological potential has been removed.

In summary, the Stage 1 assessment determined that the study area comprises a mixture of areas of archaeological potential, areas of no archaeological potential and previously assessed lands of no further archaeological concern. The potential modelling results are presented in Map 9-Map 12. The study area is depicted as a layer in these maps.

3.0 RECOMMENDATIONS

The Stage 1 assessment determined that the study area comprises a mixture of areas of archaeological potential, areas of no archaeological potential and previously assessed lands of no further archaeological concern. It is recommended that all areas of archaeological potential that could be impacted by the project be subject to a Stage 2 property assessment in accordance with Section 2.1 of the 2011 *S&Gs*. The previously assessed lands of no further concern do not require any additional assessment. If any in-water work is planned within the North Channel of Lake Huron or Blind River, the Criteria for Evaluating Marine Archaeological Potential checklist should be consulted, and a separate Marine Archaeological Assessment may be required.

As no property inspection was completed, no areas of the study area can be fully exempted from further archaeological work in accordance with Section 1.4 of the 2011 S&Gs. Areas of no archaeological potential, such as the roadways and railway corridor, will need to be confirmed to be disturbed by visual inspection and photo-documentation during any subsequent Stage 2 property survey.

Areas of archaeological potential (e.g. the grassed, overgrown and wooded areas) must be assessed using the test pit survey method. In accordance with Section 2.1.5 of the S&Gs, a survey interval of 5 m or 10 m will be required based on the proximity of the lands to identified features of archaeological potential. Areas of no archaeological potential due to distance from features of potential (> 150 m) must be subject to visual inspection to confirm there are no additional possible pockets of archaeological potential or other unidentified features of potential.

Given the likelihood that areas around parking lots, building footprints (residential and commercial/industrial) and other infrastructure were previously impacted but may contain smaller areas of archaeological potential within the surrounding landscape, a combination of visual inspection and test pit survey should be utilized to confirm the extent of disturbance in accordance with Section 2.1.8 of the 2011 *S&Gs*. This will allow for the empirical evaluation of the integrity of the soils and the depth of any impacts. If these areas are determined to have archaeological potential, then a test pit survey interval of 5 m or 10 m must be maintained based on proximity to features of potential.

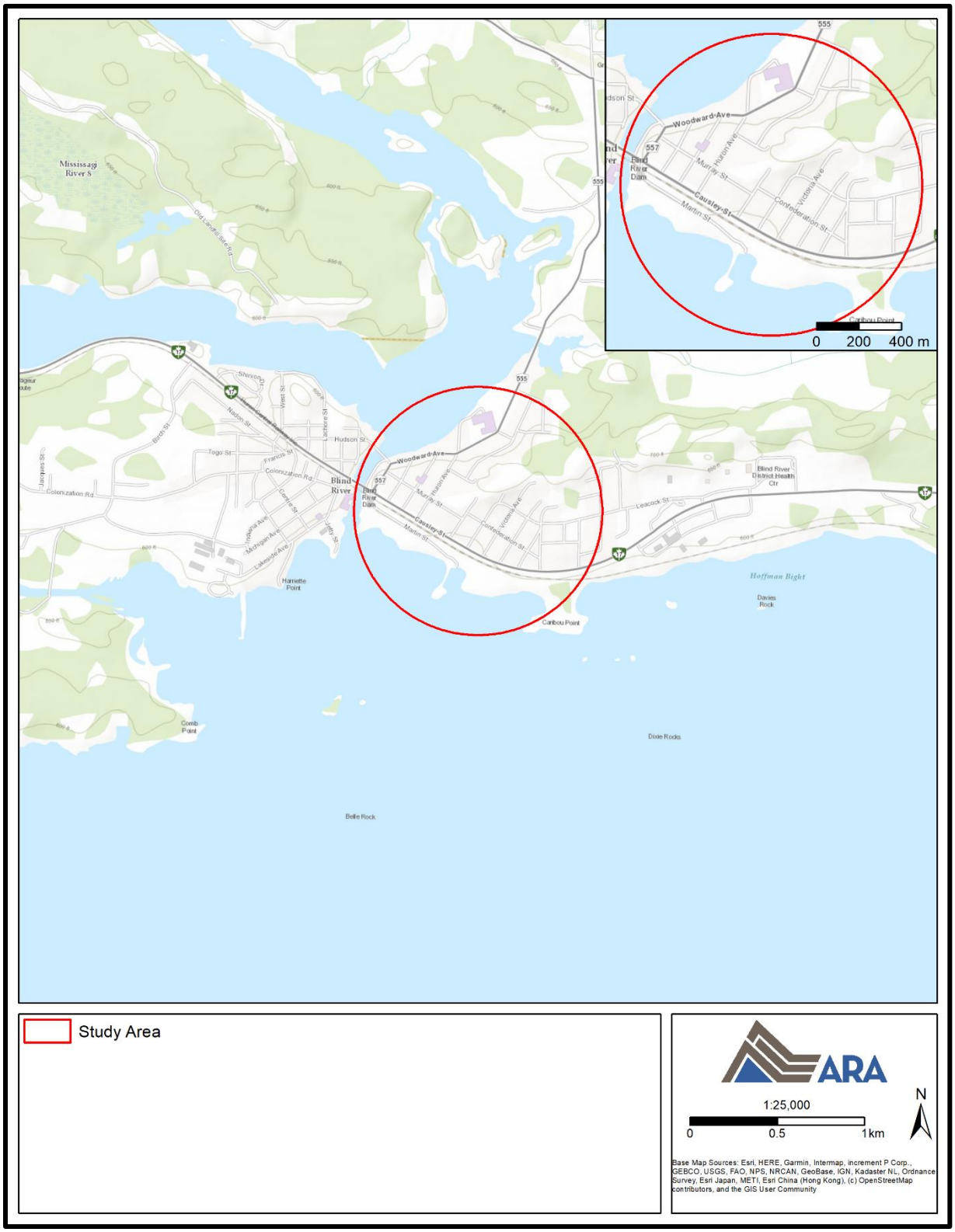
Each test pit must be excavated into at least the first 5 cm of subsoil, and the resultant pits must be examined for stratigraphy, potential features and/or evidence of fill. The soil from each test pit must be screened through mesh with an aperture of no greater than 6 mm and examined for archaeological materials. If archaeological materials are encountered, all positive test pits must be documented, and intensification may be required.

4.0 ADVICE ON COMPLIANCE WITH LEGISLATION

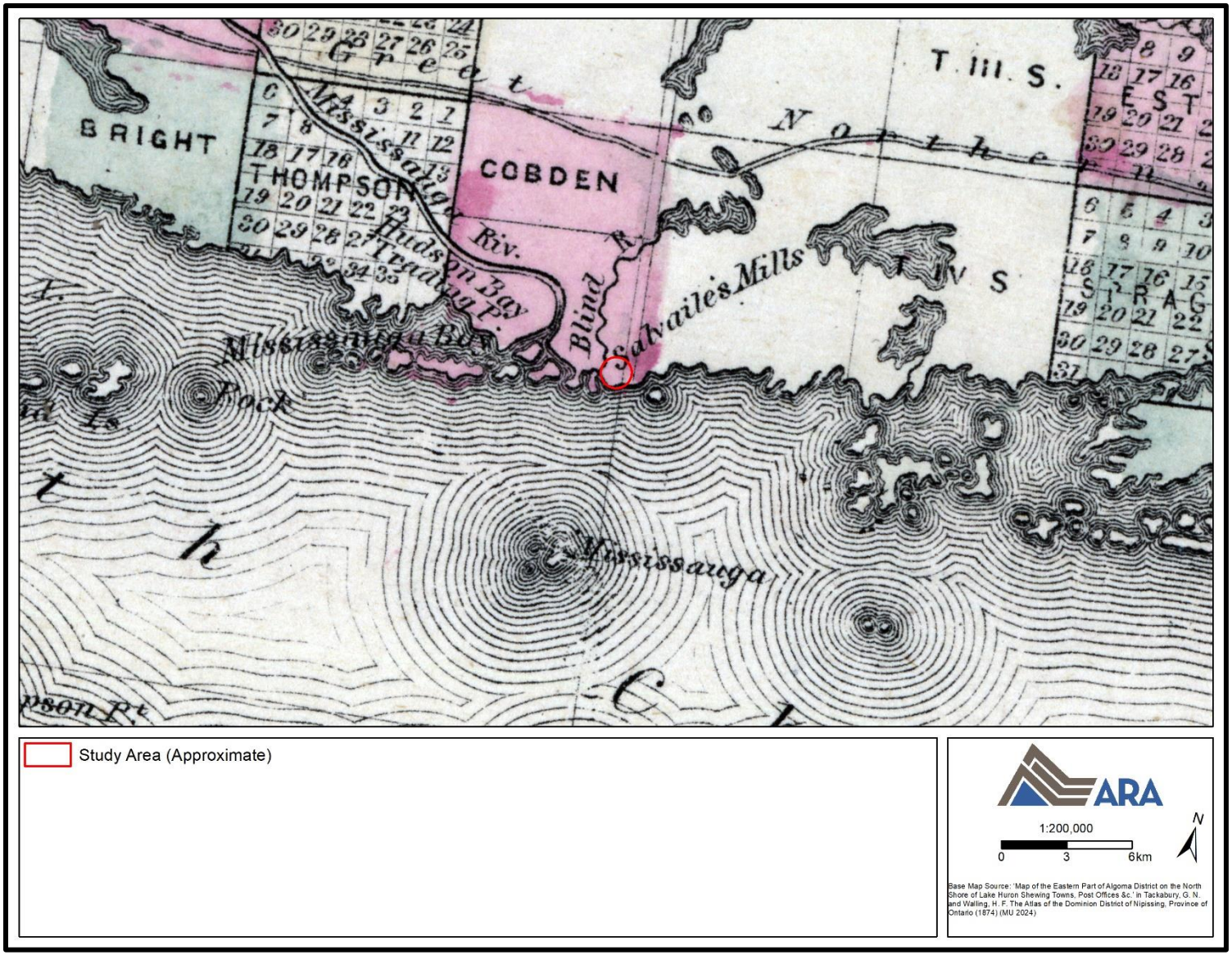
Section 7.5.9 of the 2011 *S&Gs* requires that the following information be provided for the benefit of the proponent and approval authority in the land use planning and development process:

- This report is submitted to the Minister of Citizenship and Multiculturalism as a condition of licensing in accordance with Part VI of the *Ontario Heritage Act*, R.S.O. 1990, c 0.18. The report is reviewed to ensure that it complies with the standards and guidelines that are issued by the Minister, and that the archaeological fieldwork and report recommendations ensure the conservation, protection and preservation of the cultural heritage of Ontario. When all matters relating to archaeological sites within the project area of a development proposal have been addressed to the satisfaction of the MCM, a letter will be issued by the ministry stating that there are no further concerns with regard to alterations to archaeological sites by the proposed development.
- It is an offence under Sections 48 and 69 of the *Ontario Heritage Act* for any party other than a licensed archaeologist to make any alteration to a known archaeological site or to remove any artifact or other physical evidence of past human use or activity from the site, until such time as a licensed archaeologist has completed archaeological fieldwork on the site, submitted a report to the Minister stating that the site has no further cultural heritage value or interest, and the report has been filed in the Ontario Public Register of Archaeology Reports referred to in Section 65.1 of the *Ontario Heritage Act*.
- Should previously undocumented archaeological resources be discovered, they may be a new archaeological site and therefore subject to Section 48 (1) of the *Ontario Heritage Act*. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out archaeological fieldwork, in compliance with Section 48 (1) of the *Ontario Heritage Act*.
- The *Funeral, Burial and Cremation Services Act*, 2002, S.O. 2002, c.33 requires that any person discovering human remains must notify the police or coroner and the Registrar at the Ministry of Public and Business Service Delivery.

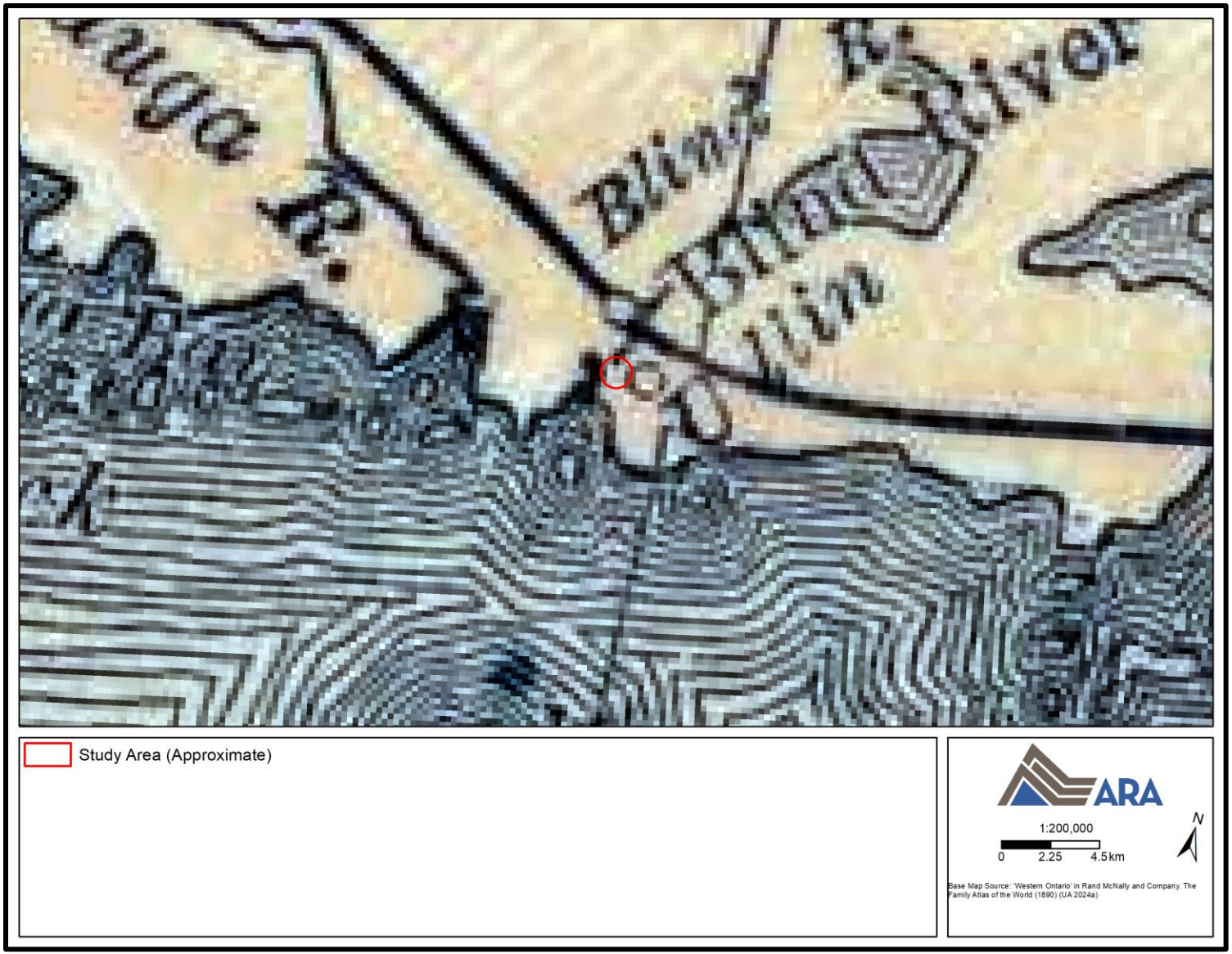
5.0 MAPS



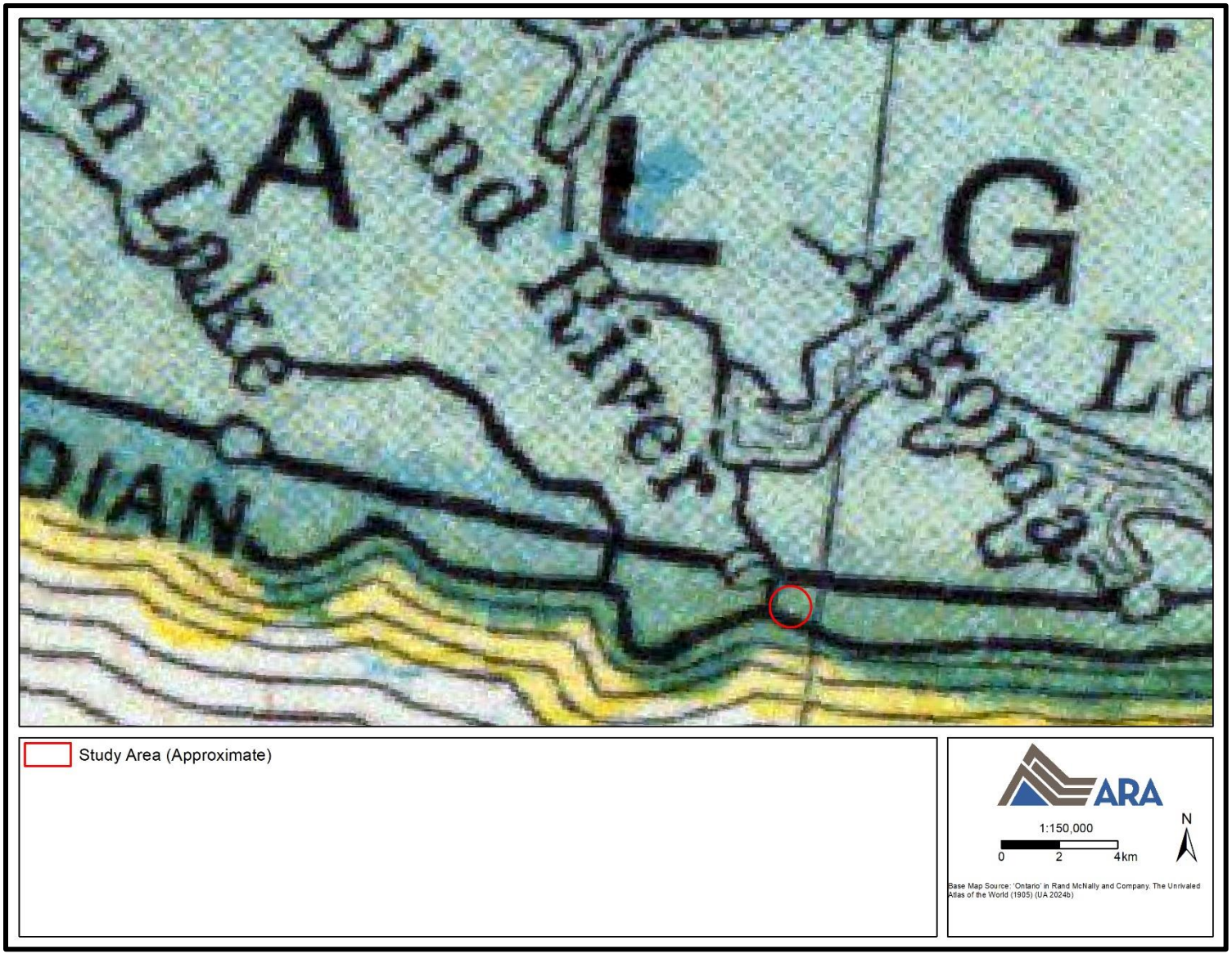
Map 1: Location of the Study Area
(Produced under licence using ArcGIS® software by Esri, © Esri)



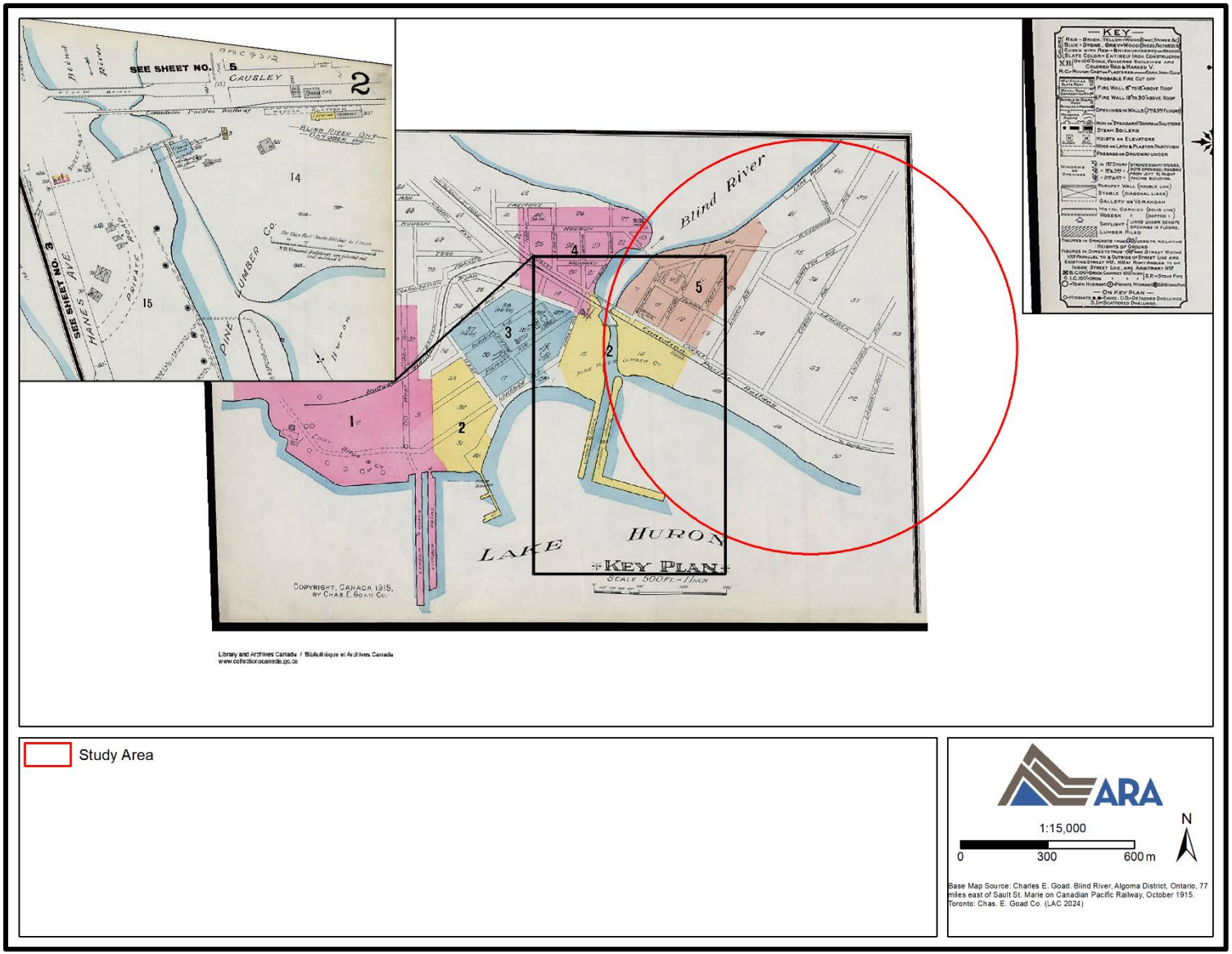
Map 2: *Atlas of the Dominion District of Nippissing* (1874)
(Produced under licence using ArcGIS® software by Esri, © Esri; MU 2024)



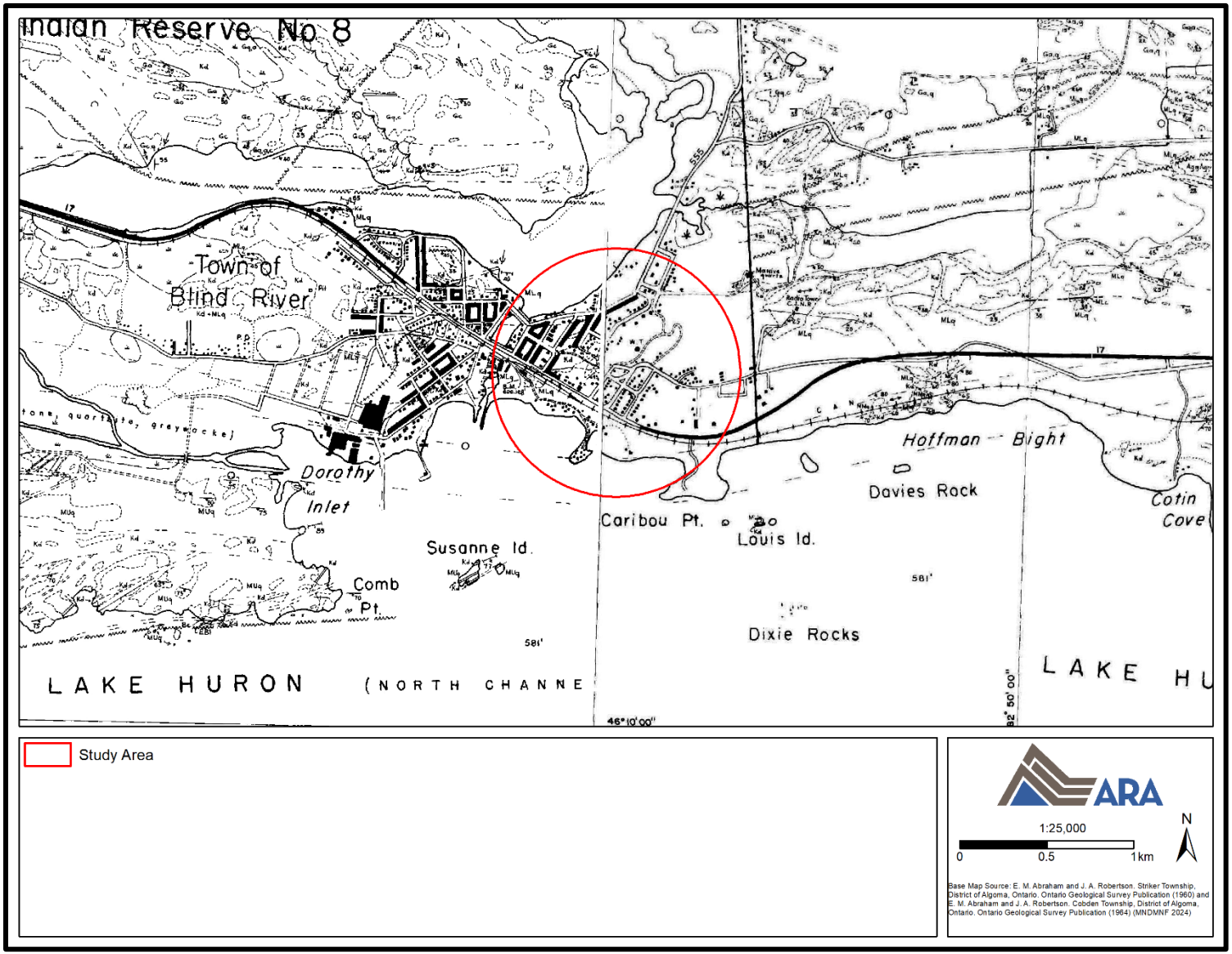
Map 3: *The Family Atlas of the World (1890)*
(Produced under licence using ArcGIS® software by Esri, © Esri; UA 2024 a)



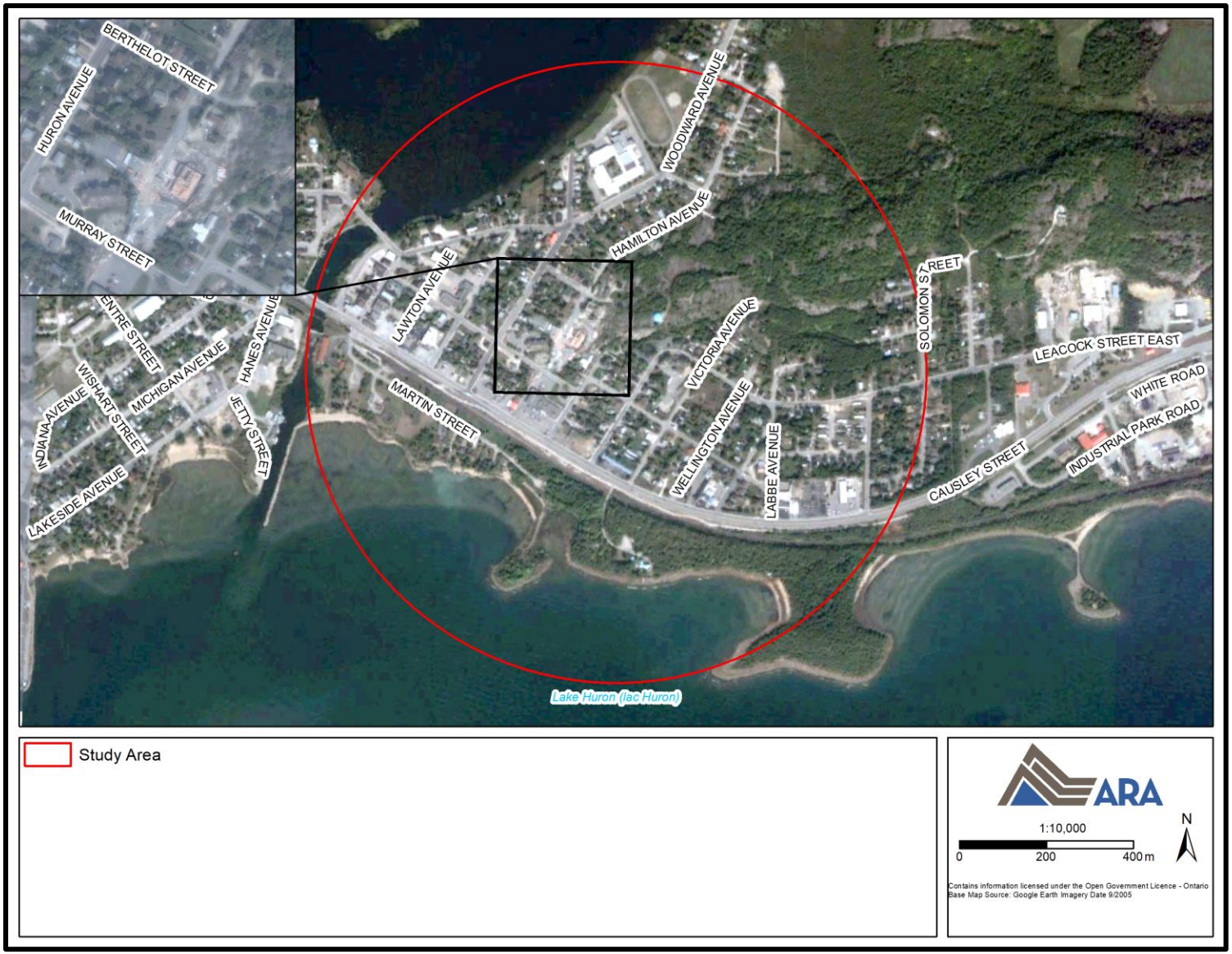
Map 4: The Unrivaled Atlas of the World (1905)
(Produced under licence using ArcGIS® software by Esri, © Esri; UA 2024b)



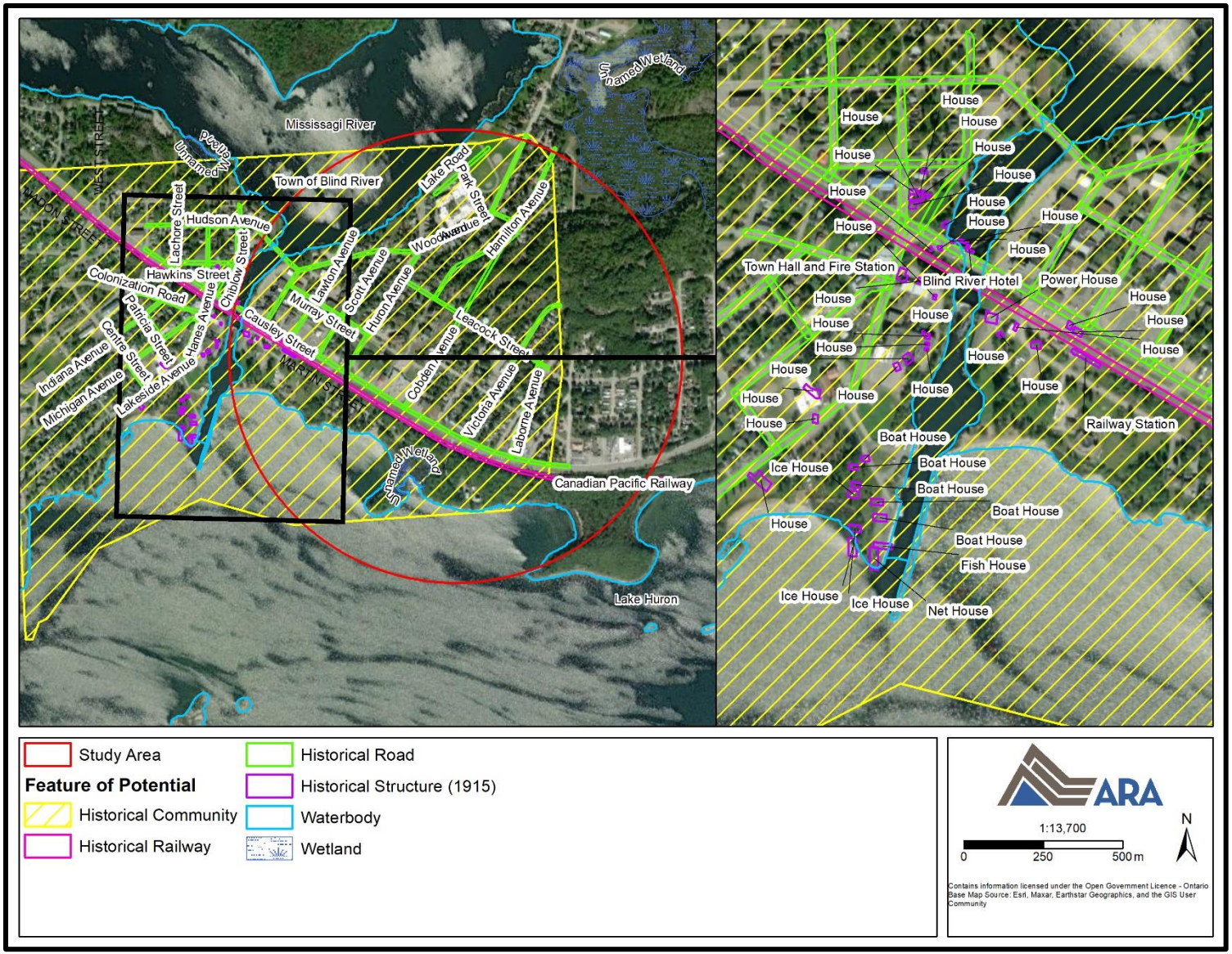
Map 5: Fire Insurance Plan (1915)
(Produced under licence using ArcGIS® software by Esri, © Esri; LAC 2024)



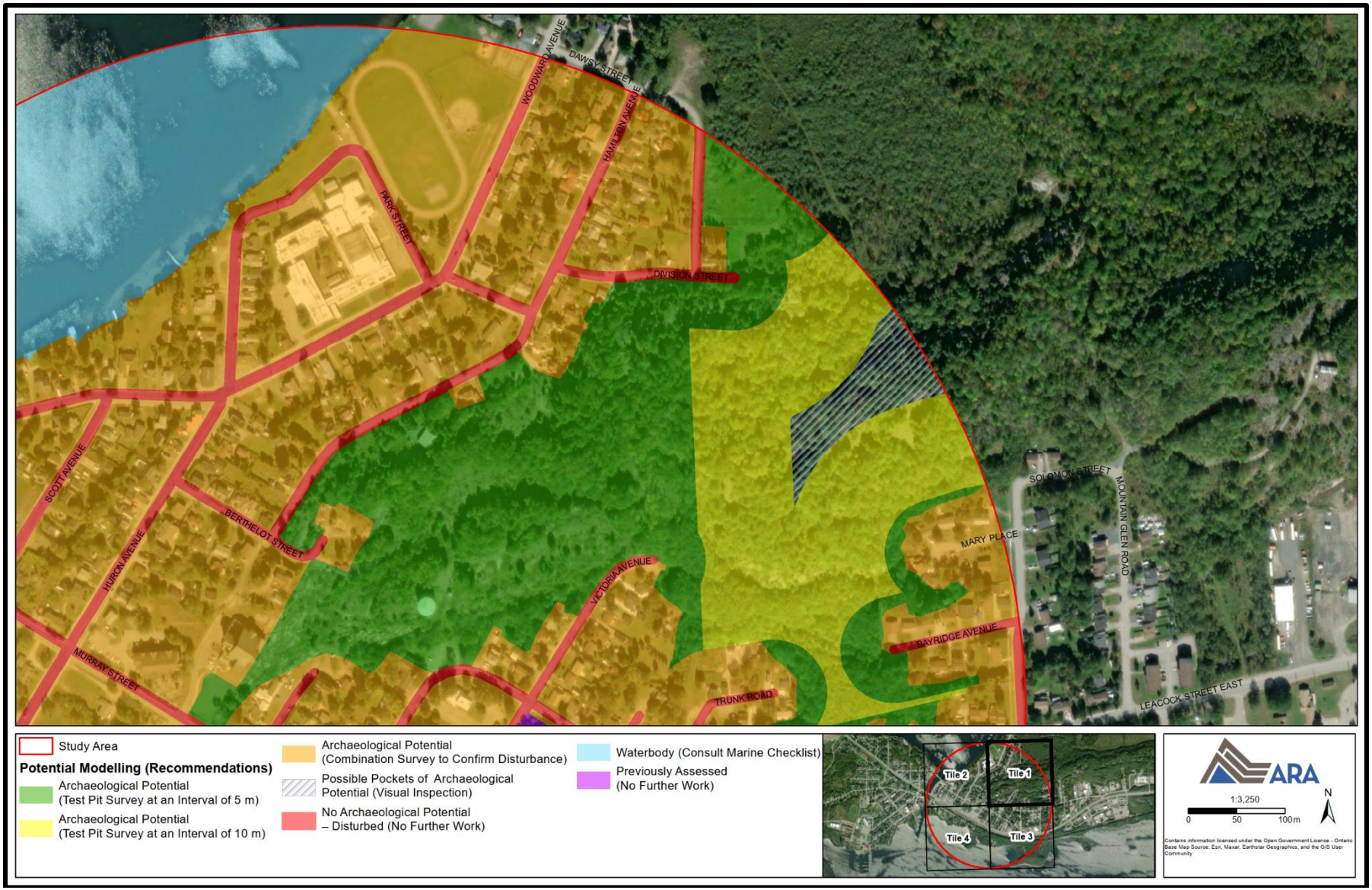
Map 6: Ontario Geological Survey (1960)
(Produced under licence using ArcGIS® software by Esri, © Esri; MNDMNF 2024)



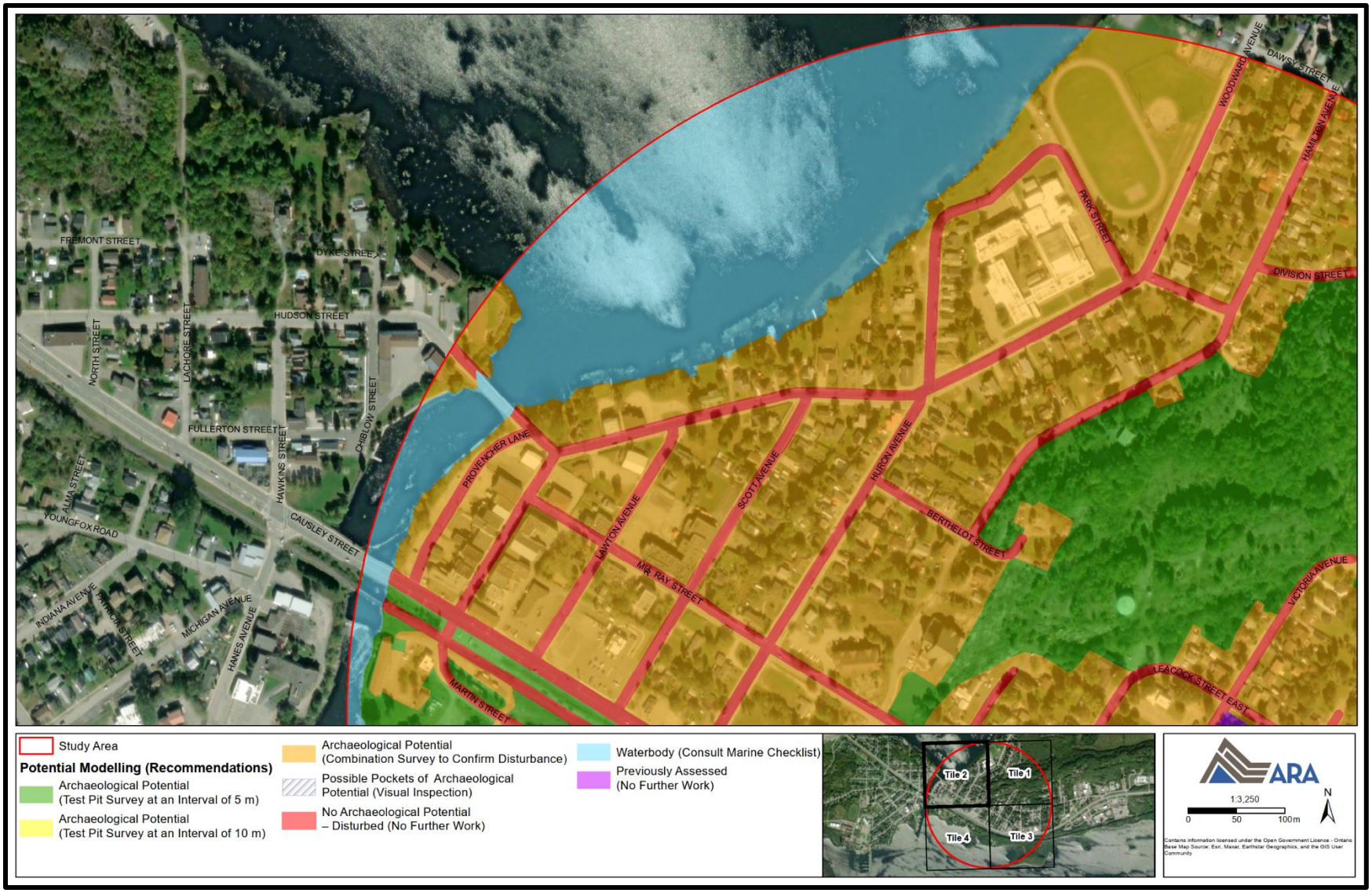
Map 7: Google Earth 9/10/2005 (2005)
(Produced under licence using ArcGIS® software by Esri, © Esri; GE 2024)



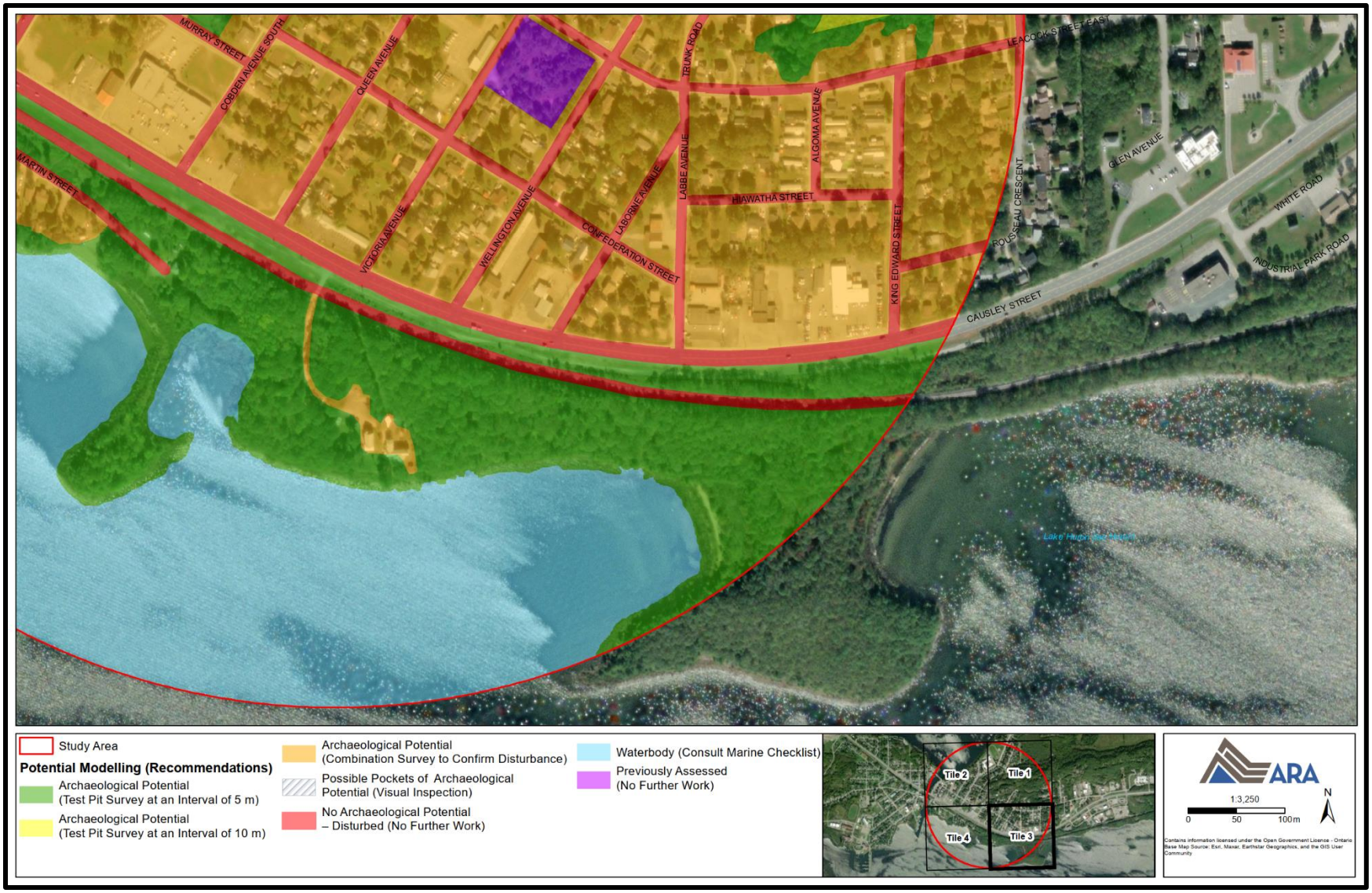
Map 8: Features of Potential
(Produced under licence using ArcGIS® software by Esri, © Esri)



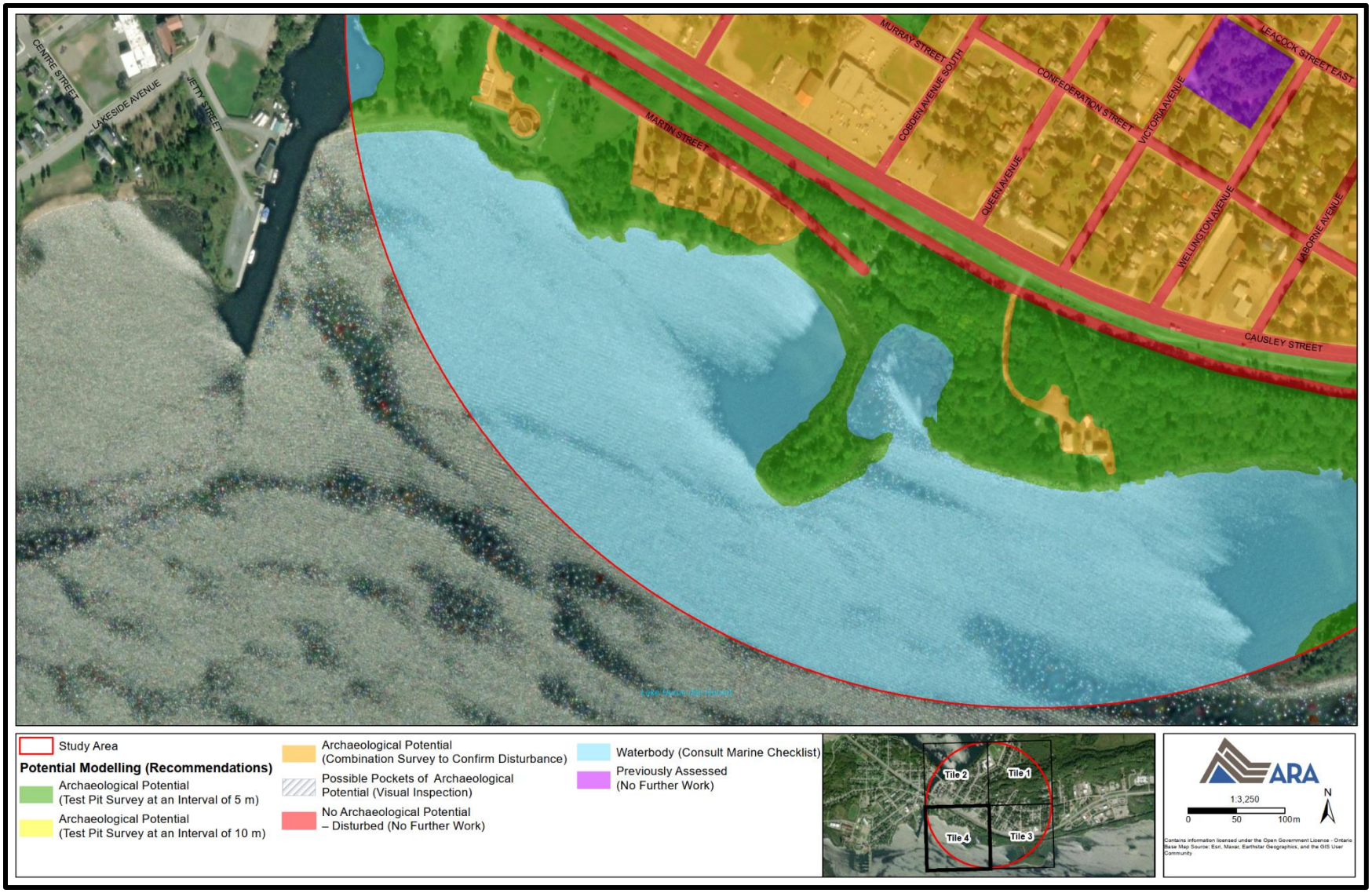
Map 9: Assessment Results Map – Tile 1
(Produced under licence using ArcGIS® software by Esri, © Esri)



Map 10: Assessment Results Map – Tile 2
(Produced under licence using ArcGIS® software by Esri, © Esri)



Map 11: Assessment Results Map – Tile 3
(Produced under licence using ArcGIS® software by Esri, © Esri)



Map 12: Assessment Results Map – Tile 4
(Produced under licence using ArcGIS® software by Esri, © Esri)

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ARCHAEOLOGY | HERITAGE | OUTREACH | EDUCATION

Stage 1 Archaeological Assessment
Blind River Raw Water Intake and Low Lift Pumping Station
Class Environmental Assessment
Town of Blind River
Lot 5 and 6, Range B and Mining Location A
Geographic Township of Cobden
Lot 13, Concession 1
Geographic Township of Striker
District of Algoma, Ontario

Prepared for
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Licensed under
C. Ramsoomair
MCM Licence #P1106
PIF #P1106-0038-2024
ARA File #2023-0571

14/06/2024

Supplementary Documentation

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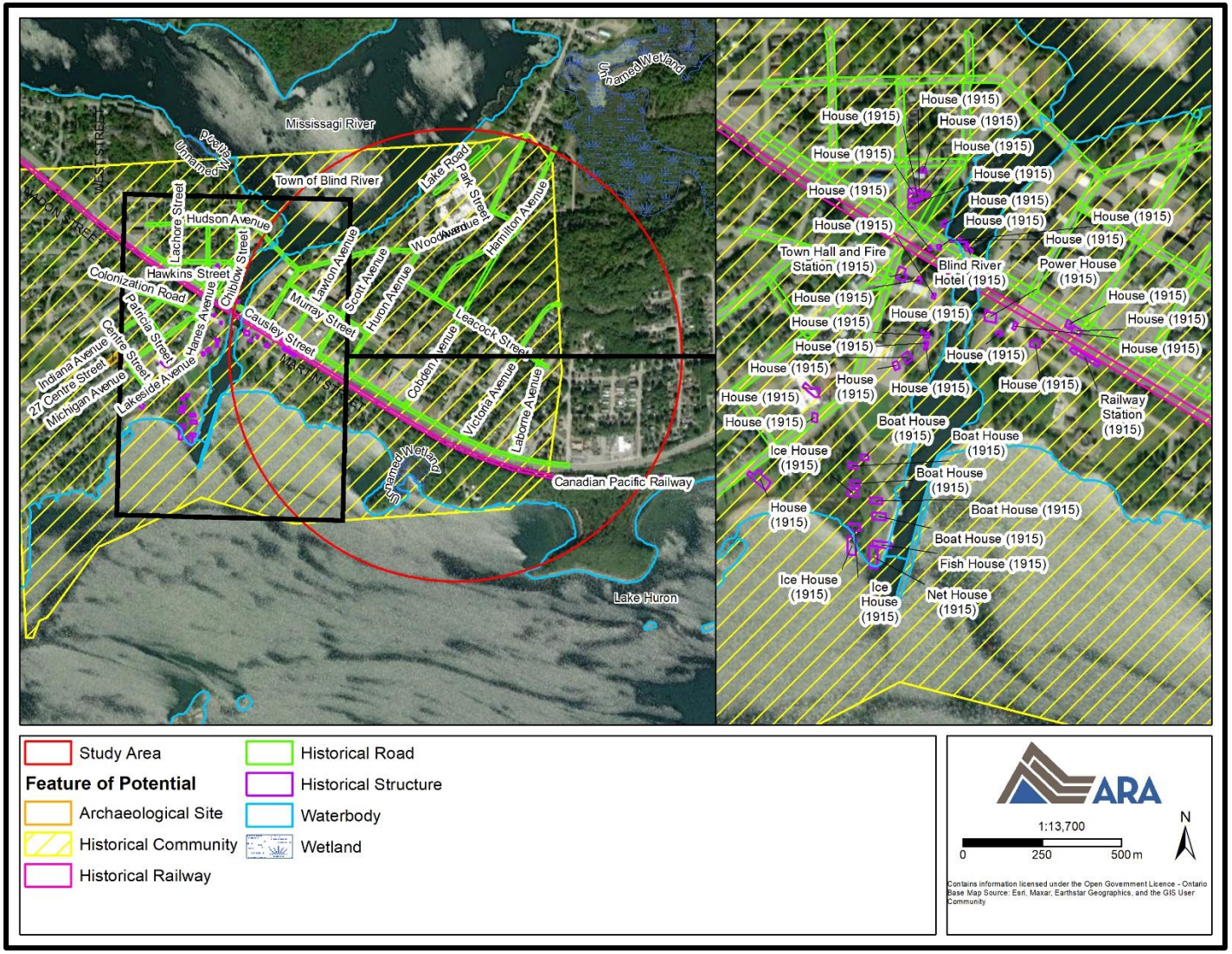
1.0 SUPPLEMENTARY DOCUMENTATION

1.1 Detailed Site Location Information

In keeping with Section 7.6.1 of the 2011 *Standards and Guidelines for Consultant Archaeologists*, detailed site location information was not included within the project report. The previously identified archaeological sites falling within 300 m of the study area are shown in SD Map 1. These data should be excluded from the Ontario Public Register of Archaeological Reports.

2.0 SD MAPS



SD Map 1: Features of Potential with Site Information
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ARCHAEOLOGY | HERITAGE | OUTREACH | CONSERVATION

Stage 2 Archaeological Assessment
Blind River Raw Water Intake and Low Lift Pumping Station
Town of Blind River
Mining Location A
Geographic Township of Cobden
District of Algoma, Ontario

Prepared for
Town of Blind River
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Licensed under
P. Racher
MCM Licence #P007
PIF # P007-1631-2025
ARA File #2024-0141

23/07/2025

Original Report

EXECUTIVE SUMMARY

Under a contract awarded in September 2024, Archaeological Research Associates Ltd. (ARA) carried out a Stage 2 archaeological assessment of lands with the potential to be impacted by the development of a new raw water intake and low lift pumping station in the Town of Blind River, District of Algoma, Ontario. The Town of Blind River is current supported by the Blind River Water Treatment Plant which draws from five groundwater wells. A well field capacity evaluation indicated long-term declining water yields and quality underlining the need for a new source of drinking water for the town. The archaeological assessment was carried out in support of a Schedule 'C' Municipal Class Environmental Assessment in accordance with the *Environmental Assessment Act*. This report documents the background research and potential modelling involved in the investigation and presents conclusions and recommendations pertaining to archaeological concerns.

In 2024, ARA conducted a Stage 1 archaeological assessment of the wider eastern bank of the Town of Blind River to review alternatives for the Class EA (ARA 2024). Completed under PIF #P1106-0038-2024, the assessment determined that the current study area was a mixture of areas of archaeological potential and no archaeological potential. Areas of no archaeological potential were recommended for photo-documentation. Areas of archaeological potential were recommended for Stage 2 assessment. The report also recommended the C*riteria for Evaluating Marine Archaeological Potential* checklist should be consulted for in-water impacts to the North Channel of Lake Huron, and a separate Marine Archaeological Assessment may be required.

Following the recommendations of the Stage 1 assessment, a Marine Archaeological Assessment under Licence #2024-37 was conducted in 2024 as it was determined that the North Channel of Lake Huron had the potential for marine archaeological resources, in part due to the historical association of Blind River as a center of lumber processing and shipping (ARA 2025 [forthcoming]). The impacts of the intake with a buffer of at least 20 m was assessed by shallow water assessment with aquascope, underwater drone survey as well as side scan sonar and magnetometer survey. The latter identified eight cultural features primarily related to the use of the waters for log boom cribs. Three of these features were potentially directly impacted by the project and were recommended for either avoidance or further detailed studies. The path of the intake was altered to avoid all identified features. The current study area of the present Stage 2 reflects the updated design of the intake.

The investigation encompassed the entire study area. Legal permission to enter and conduct all necessary fieldwork activities within the assessed lands was granted by the Town. At the time of assessment, the study area primarily consisted of Huron Avenue, flanked by residential homes in the north and Causley Street, a railway and open fields in the south.

The Stage 2 assessment did not result in the identification of any archaeological materials. It is recommended that no further assessment be required within the study area. Lands beyond the study area were not fully assessed and require further assessment if development is contemplated in the future as per the potential modelling and recommendations in the Stage 1 assessment report (ARA 2024). In-water impacts are anticipated for this project for which the Marine Archaeological Report under Licence #2024-37 should be consulted (ARA 2025 [forthcoming]). Should impacts to the North Channel of Lake Ontario extend beyond the scope of this report be planned, the *Criteria for Evaluating Marine Archaeological Potential* checklist should be consulted.

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ABBREVIATIONS

ARA – Archaeological Research Associates Ltd.
MCM – Ministry of Citizenship and Multiculturalism
PIF – Project Information Form
S&Gs – Standards and Guidelines for Consultant Archaeologists

PERSONNEL

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Sheguiandah First Nation
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Sheshegwaning First Nation
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Zhiibaahaasing First Nation
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1.0 PROJECT CONTEXT

1.1 Development Context

Under a contract awarded in September 2024, Archaeological Research Associates Ltd. (ARA) carried out a Stage 2 archaeological assessment of lands with the potential to be impacted by the development of a new raw water intake and low lift pumping station in the Town of Blind River, District of Algoma, Ontario. The Town of Blind River is currently supported by the Blind River Water Treatment Plant, which draws from five groundwater wells. A well-field capacity evaluation indicated long-term declining water yields and quality, underlining the need for a new source of drinking water for the town. The archaeological assessment was carried out in support of a Schedule 'C' Municipal Class Environmental Assessment in accordance with the *Environmental Assessment Act*. This report documents the background research and potential modelling involved in the investigation and presents conclusions and recommendations pertaining to archaeological concerns.

The study area consists of a linear corridor covering 2.34 ha (5.78 ac) that extends from Berthelot Street in the northeast to the North Channel of Lake Huron in the southwest (Map 1). This parcel is generally bounded by residential and infrastructure buildings to the northwest and residential buildings and wooded areas to the southeast. In legal terms, the study area falls on part of Mining Location A in the Geographic Township of Cobden, District of Algoma, Ontario. The Crown obtained these lands as part of the Robinson-Huron Treaty (Treaty 61) in 1850.

In 2024, ARA conducted a Stage 1 archaeological assessment of the wider eastern bank of the Town of Blind River to review alternatives for the Class EA (ARA 2024). Completed under PIF #P1106-0038-2024, the assessment determined that the current study area was a mixture of areas of archaeological potential and no archaeological potential. Areas of no archaeological potential were recommended for photo-documentation. Areas of archaeological potential were recommended for Stage 2 assessment. The report also recommended the C*riteria for Evaluating Marine Archaeological Potential* checklist should be consulted for in-water impacts to the North Channel of Lake Huron, and a separate Marine Archaeological Assessment may be required.

Following the recommendations of the Stage 1 assessment, a Marine Archaeological Assessment under Licence #2024-37 was conducted in 2024 as it was determined that the North Channel of Lake Huron had the potential for marine archaeological resources, in part due to the historical association of Blind River as a center of lumber processing and shipping (ARA 2025 [forthcoming]). The impacts of the intake with a buffer of at least 20 m was assessed by shallow water assessment with aquascope, underwater drone survey as well as side scan sonar and magnetometer survey. The latter identified eight cultural features primarily related to the use of the waters for log boom cribs. Three of these features were potentially directly impacted by the project and were recommended for either avoidance or further detailed studies. The path of the intake was altered to avoid all identified features. The current study area of the present Stage 2 reflects the updated design of the intake.

The investigation encompassed the entire study area. Legal permission to enter and conduct all necessary fieldwork activities within the assessed lands was granted by the Town. As set out in

Section 1.0 of the 2011 *Standards and Guidelines for Consultant Archaeologists* (*S&G*s), the investigation was carried out to achieve the following objectives:

- Provide information about geography, history and current land conditions;
- Determine whether any previous archaeological fieldwork has been completed;
- Evaluate in detail the study area's archaeological potential; and
- Recommend appropriate strategies for a Stage 2 assessment, if necessary.

The Ministry of Citizenship and Multiculturalism (MCM) is asked to review the results and recommendations presented herein and enter the report into the Ontario Public Register of Archaeological Reports. A Record of Indigenous Engagement is included in the project report package in accordance with the requirements set out in Section 7.6.2 of the 2011 *S&Gs*.

1.2 Historical Context

While archaeological work has been conducted in northern Ontario for several decades, the scope of work remains limited. Scholarly understanding of human occupation of boreal forests has improved but remains a developing field guided by incomplete predictive modelling with unclear efficacy. Large areas of northern Ontario remain largely undeveloped and unexplored by archaeological study (Hamilton 2000). With occupation beginning in the Archaic period approximately 8,000 years ago, the greater vicinity of the study area comprises a complex set of land-use patterns and chronologies of Indigenous and Euro-Canadian occupation. Section 1.2.1 summarizes the region's settlement history, whereas Section 1.2.2 documents the study area's past and present land uses. Two previous archaeological reports containing relevant background information were identified during the research component of the study.

1.2.1 Settlement History

1.2.1.1 Pre-Contact

The Pre-Contact history of the region is lengthy and rich, and a variety of Indigenous groups inhabited the landscape. Archaeologists generally divide this vibrant history into three main periods: Palaeo, Archaic and Woodland. Each of these periods comprises a range of discrete sub-periods characterized by identifiable trends in material culture and settlement patterns, which are used to interpret past lifeways. The principal characteristics of these sub-periods are summarized in Table 1.

Table 1: Pre-Contact Settlement History
(Wright 1972a, 1972b; Ellis and Ferris 1990; Hinshelwood 2004; Munson and Jamieson 2013)

Sub-Period	Timeframe	Characteristics
Early Palaeo	9000–8400 BC	Small bands move into southern Ontario; Mobile hunters and gatherers; Utilization of seasonal resources and large territories; Gainey, Barnes and Crowfield traditions; Fluted points; Northern Ontario virtually unoccupied due to retreating glaciers and associated glacial lakes (e.g., Lake Algonquin)

Sub-Period	Timeframe	Characteristics
Late Palaeo	8400–7500 BC	Majority of northern Ontario remained uninhabited until Plano peoples; Plano tradition restricted mainly to areas northwest of Lake Superior (e.g., Lakehead Complex); Unfluted lanceolate points; Palynological research indicates the newly exposed interior lands of northwestern Ontario were, for a time, sub-artic tundra/taiga (e.g., mainly treeless) that would have supported herds of caribou; Sites from this period are typically found near relict shorelines (e.g., Lake Minong and Lake Agassiz) and inland river terraces
Early Archaic	7500–6000 BC	As the glaciers melted and retreated, people expanded into the emerging landscape of the Canadian Shield; During the Nakina Phase (ca. 7000 BC) and Driftwood Stadial (ca. 6100 BC), glaciers, glacial lakes and post-glacial environmental factors would have provided an unattractive setting for early hunters and gatherers in northern Ontario
Middle and Late Archaic	6000–700 BC	As the land rebounded and became fertile (e.g., modern boreal forest environment), new traditions emerged (e.g., Shield Archaic in the north and Laurentian Archaic in the south); Shield Archaic peoples best understood as caribou hunters and fisherman; Material culture is marked by the appearance of copper tools and the likely manufacture of the birch bark canoe; Copper tool manufacture is largely linked to the 'Old Copper Culture' of the western Lake Superior basin; Far-reaching trade relations also emerged during the Archaic period, which likely played a major role in the spread of later Woodland technologies and lifeways
Early and Middle Woodland	700–900 BC	Primarily distinguished from the earlier Shield Archaic by the widespread appearance of pottery; Some argue that pottery did not appear until ca. 200 BC; Laurel tradition dominant in northern Ontario; Pottery is often cone-shaped, with plain bodies and stamp impressions on the shoulder and rim; Moose and beaver were important sources of food and secondary goods; Seasonal campsites were utilized; Material culture consisted of a variety of stone and bone tools, including scrapers, arrowheads, knives, net-sinkers, awls, harpoons and beaver incisor knives; Some evidence of the consumption of wild rice and domesticated plant foods such as maize during the Middle Woodland, but the origin and extent of this development is unclear
Late Woodland	AD 900–1600	Area occupied by Algonquian-speaking peoples; Traditions in this region developed alongside those of the Iroquoian-speaking Huron-Petun of southern Ontario; Ceramic styles predominantly derived from the south, but also influences from Lake Superior; Adopted smoking pipes and ossuary burials from the Huron-Petun, but tool traditions and houses were dissimilar; Engaged in frequent dog burials; Practised corn horticulture in a partial way

1.2.1.2 Post-Contact

The arrival of European explorers and traders at the beginning of the 17th century triggered widespread shifts in Indigenous lifeways and set the stage for the ensuing Euro-Canadian settlement process. Documentation for this period is abundant, ranging from the first sketches of Upper Canada and the written accounts of early explorers to detailed township maps and lengthy histories. The Post-Contact period can be effectively discussed in terms of major historical events, and the principal characteristics associated with these events are summarized in Table 2.

Table 2: Post-Contact Settlement History
(Kirkwood and Murphy 1878; ODCL 1884; Hardy 1894; Coyne 1895; Anderson 1898; Dobie 1909; Howard 1917; Mika and Mika 1977; Mika and Mika 1983; Shragge and Bagnato 1984; Ellis and Ferris 1990; AO 2022; Town of Blind River 2022; Lavallé 2023)

Historical Event	Timeframe	Characteristics
Early Exploration	Early 17th century	Contact with European fur traders began in late 1500s or early 1600s; Brûlé explores southern Ontario in 1610; Champlain visits in 1613 and 1615/1616; Iroquoian-speakers (Huron, Petun and Neutral) and Algonquian-speakers (Anishinabeg) encountered; Anishinabeg were primarily seasonal hunters and had few fixed settlements, unlike the more sedentary Iroquoian-speakers of southern Ontario; Extensive trade relations in place with their Huron neighbours, where furs and meat were traded for corn and fish-nets
Increased Contact and Conflict	Mid- to late 17th century	Conflicts between various First Nations during the Beaver Wars result in numerous population shifts; European explorers continue to document the area, and many Indigenous groups trade directly with the French and English; 'The Great Peace of Montreal' treaty established between roughly 39 different First Nations and New France in 1701
Fur Trade Development	Early to mid-18th century	The French established and maintained trading posts along the Upper Great Lakes, offering enticements to attract fur traders from the First Nations; Peace between the French and English with the Treaty of Utrecht in 1713; The fur trade introduced new technologies and economic relationships into the forager lifestyle of the Anishinabeg, and European-manufactured goods replaced some traditional technologies; Ethnogenesis of the Métis; Hostilities between French and British lead to the Seven Years' War in 1754; French surrender in 1760
British Control	Mid- to late 18th century	*Royal Proclamation of 1763 recognizes the title of the First Nations to the land; Numerous treaties subsequently arranged by the Crown; First land cession under the new protocols is the Seneca surrender of the west side of the Niagara River in August 1764; The Niagara Purchase (Treaty 381) in 1781 included this area; Fur trade continued to develop, eventually dominated by the Hudson's Bay Company*
Loyalist Influx	Late 18th century	United Empire Loyalist influx into southern Ontario after the American Revolutionary War (1775–1783); British develop interior communication routes and acquire additional lands; *Constitutional Act* of 1791 creates Upper and Lower Canada; Many new counties and townships created in southern Ontario; Northern Ontario remained in the hands of the First Nations
District Formation	Mid-19th to early 20th century	Euro-Canadian interest in lands along the north shores of Lake Superior and Lake Huron increased in the 1840s, as mining companies began to send prospectors, surveyors and engineers into the area; Robinson-Superior Treaty (Treaty 60) and Robinson-Huron Treaty (Treaty 61) completed in 1850; Algoma District created in 1858, with Sault Ste. Marie as the district seat; Michipicoten Post administered posts at Pic, Long Lake and Red Rock before its closure ca. 1904; Wawa surveyed by J. Cozens in 1897; Algoma Central Railway chartered in 1899 to transport iron ore from the Helen Mine to Sault Ste. Marie; James Bay Treaty (Treaty 9) completed in 1905 and 1906
District Development	Early to mid-20th century	Employment opportunities included agriculture, logging, transporting goods, mining and continued railway construction; Algoma Central Railway opened to Michipicoten in 1911 and Hearst in 1914, crossing the Canadian Pacific Railway at Franz and the Canadian National Railway at Oba; The portion of the Trans-Canada Highway between Sault Ste. Marie and Wawa was completed in 1960; The closing of this 'Big Gap' facilitated further development in northern Ontario, connecting isolated communities and providing transportation options; International bridge crossing at Sault Ste. Marie opened in 1962

1.2.1.3 Town of Blind River

The general location of Blind River was believed to have been noted by Samuel De Champlain in 1632 as a yearly gathering place for drying berries for the surrounding Indigenous Nations (Mika and Mika 1977). Sustained Euro-Canadian activity in the area was not until 1789 when the

Northwest Company established a Fur Trading post at the mouth of the Mississaugi River to the west. Following its purchase by the Hudson Bay Company, business slowed and many fur traders settled in the surrounding area (Town of Blind River 2022). The river was named as it was difficult for early voyageurs to see from the lake, but the town proper did not adopt this name until the late 19th century. It was initially known by locals as *Le Petit Moulin* or *The Little Mill* (Mika and Mika 1977; Albert *et al* 1996).

By the mid-19th century, the discovery of copper in the Bruce mines spurred further settlement in the area. In order to supply the lumber demands of the mine, Joseph Salvail of Montreal established the first sawmill at the eastern outlet of the Blind River in 1853. He chose the location as it facilitated the construction of dams for power, and the resulting ponds allowed the storage of timber logs (Albert et al. 1996). It is said to have been at the location of the present-day Old Mill Motel (Town of Blind River 2022). Subsequent arrivals were predominantly of French origin, attracted by the growing lumber industry. The area soon attracted further lumber interests and quickly became a significant lumber center in the Great Lakes, with American tug-boats bringing the lumber to Saginaw and Thunder Bay (Rupp 1955; Kauffmann 1970; Albert et al. 1996). Others were encouraged to migrate by reports of abundant farmland (Kirkwood and Murphy 1878). The first post office was established in 1877, the Canadian Pacific Railway arrived in 1884, and the first school was built in 1897 (Rupp 1955; Mika and Mika 1977; Lavallé 2023).

In 1904, a canal was built to connect the Mississagi and Blind Rivers to facilitate the transportation of logs. Blind River had been incorporated as a town and a second sawmill had been built on the western arm of the town in 1906. By this time, the Mississagi and Blind Rivers were reported to contain 44 lumber camps with over 3,000 people employed at this time. Companies like the Blind River Boom and Slide Company, Blind River Transportation Company and the Blind River Driving Company were established around the turn of the century to manage the logistics of this industry (Kauffmann 1970). The quantity being shipped out of Blind River was such that a separate government wharf had to be built to allow goods other than lumber to be unloaded (Albert *et al* 1996). Other supporting industries included Diagles Powerhouse, two general stores, and the McFadden Lumber Company sawmill, built by Carpenter Hixon Company in 1929 (Mika and Mika 1977). The Great Mississauga Fire in 1948 destroyed many easily accessible timber stocks. A depression in the lumber industry followed which led to the eventual closure of the McFadden Lumber Company in 1969 (Town of Blind River, 2022). Despite these setbacks, it remains a thriving community supported by the lumber industry, the discovery of uranium in 1955 and the arrival of the Trans-Canada Highway in 1960 (Mika and Mika 1977; Shragge and Bagnato 1984).

1.2.2 Past and Present Land Use

1.2.2.1 Overview

During Pre-Contact and Early Contact times, the vicinity of the study area would have comprised a mixture of coniferous trees, mixed-wood forests and open areas. Indigenous communities likely managed the landscape to some degree, but in general, Anishinaabeg populations lived lightly on the land and practised sustainable lifeways. During the mid-19th century, Euro-Canadian settlers arrived in the area and began to clear the forests for agricultural, logging, mining, and settlement purposes. The study area was located within the historical limits of Blind River. The land use at

the time of assessment can be classified as a mixture of residential, infrastructural, wooded areas and water courses and water bodies.

1.2.2.2 Mapping and Imagery Analysis

In order to gain a general understanding of the study area's past land uses, five historical settlement maps, one geological map and one aerial image were examined during the research component of the study. Specifically, the following resources were consulted:

- The *Atlas of the Dominion District of Nipissing* (1874) (MU 2024);
- The *Plan of Mining Location being part of the Indian Reserve in the Township of Cobden, Algoma* (1882) (LAC 2024a);
- The *Family Atlas of the World* (1890) (UA 2024a);
- The *Unrivaled Atlas of the World* (1905) (UA 2024b);
- A fire insurance plan from 1915 (Courtesy of the Timber Museum);
- A geological map from 1964 (MNDMNF 2024);
- An aerial image from 2005 (GE 2024).

The limits of the study area are shown on georeferenced versions of the consulted historical resources in Map 2–Map 8.

Tackabury and Walling's *Atlas of the Dominion District of Nipissing* (1874) has limited information but identifies several key details including the outline of the Township of Cobden and the location of Blind River with a labelled "Salvaile's Mills" likely referencing the sawmill established by the Savail family on the east arm at the mouth of the Blind River (Map 2). No other details are recorded about the Town of Blind River. S. James' *Plan of Mining Location being part of the Indian Reserve in the Township of Cobden, Algoma* (1882) documents that the post office, a sawmill, a steamboat wharf and several other structures of Blind River in 1882 (Map 3). Rand McNally and Co.'s *The Family Atlas of the World* (1890) and *The Unrivaled Atlas of the World* (1905) both illustrated the previous establishment of the Canadian Pacific Railway directly through the community of Blind River (Map 4 and Map 5).

Charles E. Goad's *Blind River, Algoma District, Ontario, 77 miles east of Sault St. Marie on Canadian Pacific Railway, October 1915* (1915), the Fire Insurance Plan for the Town of Blind River, provided details regarding the historical composition of the now Town of Blind River. A digitized compilation of all panels of the Fire Insurance Plan is provided courtesy of the Blind River Timber Museum (Map 6). Pertinent details provided include the prior establishment of many of the roadways of the present-day town including Woodward Avenue, Lawton Avenue, Scott Avenue, Huron Avenue, Hamilton Avenue, Cobden Avenue, Victoria Avenue, Laborne Avenue, Causley Street, Murray Street, Leacock Street and Park Street and a dense collection of frame and stone structure closer to Blind River, including the White Pine Lumber Company at its mouth. It should be noted that the lack of structures on these streets should not be taken as evidence that the parcels were unoccupied, however, but rather that the corresponding panels for the Fire Insurance Plan were not compiled.

The 1964 geological map indicates a similar landscape as in 1915, but with the expansion of Blind River with additional structures to the east of the study area and closer to the shoreline (Map 7). The current full extent of Huron Avenue not yet been established and the roadways between it and present-day Queen Avenue to the east (i.e. Extension of present-day Murray Street, Cobden Avenue South) are absent. By 2005, Huron Avenue has assumed its full extent and the nearby water treatment plan has been established (Map 8).

1.3 Archaeological Context

The Stage 2 assessment was conducted on October 22, 2024 under PIF # P1106-0059-2024. ARA utilized a Samsung Galaxy A50 and a Samsung Galaxy S23 with built-in GPS/GNSS receivers during the investigation (UTM17/NAD83). The limits of the study area were confirmed using project-specific GIS data translated into GPS points for reference in the field, in combination with aerial imagery showing physical features in relation to the subject lands.

The archaeological context of any given study area must be informed by 1) the condition of the property as found (Section 1.3.1), 2) a summary of registered or known archaeological sites located within a minimum 1 km radius (Section 1.3.2) and 3) descriptions of previous archaeological fieldwork carried out within the limits of, or immediately adjacent to the property (Section 0).

1.3.1 Condition of the Property

The study area lies within the Great Lakes–St. Lawrence forest region, which is a transitional zone between the southern deciduous forest and the northern boreal forest. This region extends along the St. Lawrence River across central Ontario to Lake Huron and west of Lake Superior along the border with Minnesota, and its southern portion extends into the more populated areas of Ontario. It is dominated by hardwood forests, although coniferous trees such as white pine, red pine, hemlock and white cedar commonly mix with deciduous broad-leaved species like yellow birch, sugar and red maples, basswood and red oak (MNR 2025).

The study area is situated within the Thessalon Ecodistrict (5E-1) of the Georgian Bay Ecoregion (5E). Located on the north shores of the North Channel of Lake Huron, it extends from Elliot Lake in the east, the Ontario-United States border in the west and Wakomata Lake in the north. The Ecodistrict is comprised mainly of acidic Precambrian bedrock material with a rolling landscape and areas of morainal material. Cambrian sandstone and shale bedrock can be found along St. Mary's River. The undulating topography in the Ecodistrict was a result of remnant glaciolacustrine material deposited when the area was submerged by the glacial lakes Algonquin, Mattawa and the Nipissing Great Lakes. In larger river valleys like the Mississagi River, glacial meltwater has deposited glaciofluvial material (Wester et al. 2018).

Surficial materials and landforms within the Thessalon Ecodistrict are primarily bedrock (71%), while Humo-Ferric Podzols have developed in the better-drained and deeper glaciolacustrine, glaciofluvial and morainal deposits. Smaller amounts of Gleysols, Mesisols, and Humisols have formed in areas of poor drainage or where water accumulates along the shore. One-third of the forests in this area are dominated by deciduous Maple trees (Wester et al. 2018)

According to the Ontario Soil Survey, the study area consists of primarily Monteagle sandy loam with a small area of Medette sandy loam at the most northern extent. Both are noncalcareous, orthic humo-ferric podzols. Specifically, Monteagle is a very stony glacial till that drains well while Medette is a fine sand outwash with imperfect drainage (Gillespie et al. 1983).

The subject lands fall within the Blind River Watershed which is under the jurisdiction of the Blind River Area office of the Ministry of Natural Resources (MNR 2007). Specifically, the study area is traversed by Lake Huron in the south, 410 m east of Blind River and 5.56 km south of Lake Duborne. The study area north of Murray Street is underlain by the Precambrian bedrock of the Canadian Shield comprised of undifferentiated igneous and metamorphic rock, exposed at the surface or covered by a discontinuous, thin layer of drift. The south is undifferentiated till with a predominantly sand to silty sand matrix (MM 2014). At the time of assessment, the study area primarily consisted of Huron Avenue, flanked by residential homes in the north and Causley Street, a railway and open fields in the south.

1.3.2 Registered or Known Archaeological Sites

The Ontario Archaeological Sites Database (OASD) and the Ontario Public Register of Archaeological Reports were consulted to determine whether any registered or known archaeological resources occur within a 7 km radius of the study area. The available search facility returned 32 registered and three unregistered sites located within at least a 7 km radius (the facility returns sites in a rectangular area rather than a radius, potentially resulting in returns beyond the specified distance). Communication with Mississauga First Nation identified an additional unregistered site in the vicinity of the study area. The sites are summarized in Table 3.

Table 3: Registered and Unregistered Archaeological Sites within 7 km

Borden No.	Site Name / Identifier	Time Period	Affinity	Site Type	Distance from Study Area
CbHr-1	Poissette	Archaic	Indigenous	Camp/campsite	> 1 km
CbHr-2	Blind River	Pre-Contact	Indigenous	Camp/campsite	> 1 km
CbHr-4	Cataract River	Archaic, Pre-Contact	Indigenous	Camp/campsite, fishing	> 1 km
CbHs-1	Mouth	Other	Unspecified	Findspot	> 1 km
CbHs-2	Chiblow 1	Post-Contact	Indigenous	Findspot	> 1 km
CbHs-3	Mississagi (Chiblow 2)	Post-Contact, Woodland, Late	Ojibwa	Camp / campsite, house	> 1 km
CbHs-4	Bridge (Chiblow 3)	Late Woodland, Post-Contact	Indigenous	Findspot	> 1 km
CbHs-5	Renard	Late Woodland	Indigenous	Camp / campsite	> 1 km
CbHs-6	Swimming Bear	Late Woodland, Post-Contact	Indigenous	Large camp / campsite	> 1 km
CbHs-7	Falls	Late Woodland, Post-Contact	Indigenous, Euro-Canadian	Burial ground, Fur Trade Post	> 1 km
CbHs-8	Wood	Late Woodland	Indigenous	Camp / campsite	> 1 km
CbHs-9	Poor Little Tree Site	Late Woodland	Indigenous	Unspecified	> 1 km
CbHs-10	Kor Rock Structure	Unspecified	Unspecified	Rock structure, Puckasaw Pit	> 1 km
CbHs-11	Contemporary Bear	Pre-Contact, Post-contact	Indigenous	Camp / campsite	> 1 km
CbHs-12	Sayer's	Pre-Contact, Post-Contact	Indigenous	Unspecified	> 1 km

Borden No.	Site Name / Identifier	Time Period	Affinity	Site Type	Distance from Study Area
CbHs-13	Tippecanoe	Post-Contact	Indigenous	Unspecified	> 1 km
CbHs-14	Patrick Point Rock Structure	Unspecified	Indigenous	Rock structure	> 1 km
CbHs-15	Boom Camp	Late Woodland	Indigenous	Camp / campsite	> 1 km
CbHs-16	Whippoorwill Rock Structure	Unspecified	Indigenous	Rock structure	> 1 km
CbHs-17	East Terrace 1	Woodland, Late	Algonkian	Camp/campsite	> 1 km
CbHs-18	East Terrace 2	Woodland, Late	Algonkian	Camp/campsite	> 1 km
CbHs-23*	Mary Bonefant	Late Woodland	Indigenous	Unspecified	> 1 km
CbHs-24*	Rock Cut	Late Woodland	Indigenous	Unspecified	> 1 km
CbHs-25*	White Tail Deer	Late Woodland	Indigenous	Unspecified	> 1 km
CbHs-26*	Flying Hawk	Post-Contact	Euro-Canadian	Unspecified	> 1 km
CbHs-27*	Thomas Farm	Post-Contact	Euro-Canadian	Unspecified	> 1 km
CbHs-28*	Sweet Marie	Late Woodland	Indigenous	Unspecified	> 1 km
CbHs-29*	Moonlight Beach	Late Woodland	Indigenous	Unspecified	> 1 km
CbHs-30*	Cormorant	Late Woodland	Indigenous	Unspecified	> 1 km
CbHs-31*	Warren Neufeld	Late Woodland	Indigenous	Unspecified	> 1 km
CbHs-32*	Ruby Rouge	Post-Contact	Euro-Canadian	Unspecified	> 1 km
-	99HPGCC-1	Unspecified	Unspecified	Mound Structures	> 1 km
-	99HPGCC-2	Woodland	Indigenous	Unspecified	> 1 km
-	99HPGCC-3	Woodland, Post-Contact	Indigenous, Euro-Canadian	Unspecified	> 1 km
-	27 Centre Street	Post-Contact	Euro-Canadian	Homestead	300 m – 1 km

* Recorded in reporting with associated Borden but not registered with MCM

None of the previously identified sites are located within 300 m of the subject land, and they are not direct features of potential. The site identified as 27 Centre Street was subject to limited excavations by avocational archaeologist Lois Jones on the property briefly associated with Norman Bethune, an innovative Canadian thoracic surgeon from the early 20th century. Finds were limited, and the site was never registered with the OASD (A. Hawkins pers. Communication). Additionally, on the northern bank of the Blind River, across from the Town Hall, a member of the Mississauga First Nation recovered two Early Woodland projectile points: a Kramer style and a Kramer/Meadowood cross (J. Cousineau, pers. communication).

The absence of sites near the Town of Blind River reflects a lack of assessment in the area rather than an absence of archaeological potential. A review of archaeological sites within the wider area provides insights into the site types potentially within the study area and the surrounding landscape. Nineteen registered and ten unregistered archaeological sites are located along the Mississagi River delta between 3 to 7 km to the west of the current study area. All were identified prior to the current *S&Gs* or as part of research projects and do not adhere to the current standards of archaeological assessment.

Archaeological work in this area began with the archaeologist J. V. Wright in 1961 when he identified the Chiblow 1 (CbHs-2), Chiblow 2 (CbHs-3), Chiblow 3 (CbHs-4) and Mouth (CbHs-1) sites. Helen Devereux conducted excavations of the Chiblow 1 (CbHs-2) and Chiblow 2 (CbHs-3) sites in 1962 and 1963 while also identifying the Contemporary Bear (CbHs-11) site. All of these sites were notably identified on the east bank of the Mississagi River (Bertulli and Kilpatrick 1977; Archéologie Illimitée Inc. 1981).

Wright returned with W. C. Noble to conduct work on the Chiblow 3 (CbHs-4) site and identified the Falls (CbHs-7) site in 1964 and 1968. A more extensive survey was conducted by Morris Brizinski and Helen Devereux of Laurentian University in 1975 on behalf of the Ontario Ministry of Natural Resources. Their work focused on Fox Island, Weber Island and Island No. 5 within the delta. They identified the Renard (CbHs-5), the Wood (CbHs-8), Poor Little Tree (CbHs-9) and Kor Rock Structure (CbHs-10) sites on Fox Island as well as the Swimming Bear Site (CbHs-6) on Island No. 5 (Brizinksi 1975). Salvage excavations were completed for the Renard (CbHs-5) due to the erosion of the site into the river. A trench consisting of 27 1 m^2 units was excavated along the bank, yielding Indigenous ceramics, lithics, and copper artifacts with features including pits and several hearths/possible hearths (Bertulli and Kilpatrick 1977).

Laurentian University returned in 1977 under M. M. Bertulli, identifying an additional six sites including the Boom Camp (CbHs-15), Sayer's (CbHs-12), Tippecanoe (CbHs-13), Patrick Point Rock Structure (CbHs-14) and Whippoorwill Rock Structure (CbHs-16) sites. Further survey was completed at the Boom Camp Site simultaneously with excavations at the Renard (CbHs-5), Falls (CbHs-7), and Chiblow 3 (CbHs-3) sites (Bertulli 1981).

Further work in the area was completed by Archéologie Illimitée Inc. in 1980, prior to the development of a uranium hexafluoride refinery by Eldorado Nuclear Ltd. Alongside several sites related to the early logging activity and domestic occupation of the area, they identified the East Terrace 1 (CbHs-17) and East Terrace 2 (CbHs-18) sites (Archéologie Illimitée Inc. 1981). CbHr-2 was noted in the OASD as identified in advance of the impacts of Eldorado Nuclear. However, the Archéologie Illimitée Inc. report does not provide additional information on this site.

Brizinksi later returned to the area in 1995 to conduct a survey of lands previously impacted by the Huron Among the Pines Golf Course, motivated by a site discovery during the earlier field school. The goal of the survey was to determine the intensity of habitation by Indigenous and early Euro-Canadian peoples along an extinct beach ridge of the Mississagi River. The survey of surface debris resulted in the identification of an additional ten sites including seven Late Woodland Indigenous and three Euro-Canadian sites, all in varying degrees of disturbance aside from Mary Bonenfant (CbHs-23). Site types were not provided, but the presence of Indigenous ceramic, lithic tools, and fire-cracked rock suggest at least seasonal occupation campsites, with Late Woodland being a particularly optimal time for this now-extinct beach ridge. Borden numbers were provided for the sites, but they were never formally registered with the MCM and listed in the OASD. Further historical research on the Euro-Canadian sites and protection of the undisturbed portion of the Indigenous sites was recommended (Brizinski and Wood 1995).

Woodland Heritage Services Limited (WHS) later returned in 1999 prior to a proposed expansion of the now Huron Pines Golf & Country Club to the north from a 9-hole course to an 18-hole course (WHS 1999). The assessment determined that large sections of the golf course area had been heavily landscaped and or completely stripped of topsoil. They conducted a pedestrian survey with intervals of 3 m for areas previously cleared of topsoil. Areas where original soils were intact were subject to test pit survey with intervals of 10 m and reduced to 5 m when archaeological resources were identified. The goal of the assessment was to relocate the ten archaeological sites

identified in 1995 along with Chiblow 1 (CbHs-2) and Chiblow 2 (CbHs-3) sites to evaluate the potential for development impacts of the golf course expansion.

The Mary Bonenfant (CbHs-23), Rock Cut (CbHs-24), Thomas Farm/Four (CbHs-27), Ruby Rouge (CbHs-32), Moonlight Beach (CbHs-29), Chiblow 1 (CbHs-2) and Chiblow 2 (CbHs-3) sites remained outside of the development impacts and were subjected only to a limited pedestrian survey. Of these six sites, only Ruby Rouge (CbHs-32) yielded additional artifacts which included primarily scrap metal and broken glass. White Tail Deer (CbHs-25) was relocated by pedestrian and test pit survey, while Warren Neufeld (CbHs-31) was relocated by just a test pit survey. Additional artifacts recovered included Indigenous ceramics along with quartz and chert tools, but these were all recovered from disturbed contexts. Similarly, the test pit survey recovered several chert flakes in a heavily disturbed context potentially related to the Cormorant Site (CbHs-30). Flying Hawk (CbHs-26) appeared to have since been completely destroyed. The original location of the Sweet Marie site (CbHs-28) and Moonlight Beach (CbHs-29) sites was subject to a test pit survey, but no additional artifacts were recovered, and their locations could not be confirmed (WHS 1999).

The 1999 investigations identified an additional three sites. The 99HPGCC-1 site was associated with a series of mounds between the Ruby Rouge (CbHs-32) and Thomas Farm/Four (CbHs-27) sites. Test pits around the mounds did not yield any artifacts, so it remains unclear to which period and/or nearby site these mounds may have been associated. Test pits near the Sweet Marie site (CbHs-29) recovered fire-cracked rock and Indigenous ceramic within a buried cultural layer. These finds were identified as the 99HPGCC-2 site. The 99HPGCC-3 site was a larger multi-component Indigenous and Euro-Canadian site. The Euro-Canadian component comprised foundations of potentially three buildings with a large amount of domestic and architectural refuse in the area. It was determined to be historical with a potential fur-trade period component. Test pits in the area yielded flakes, Indigenous ceramic, fire-cracked rock, lithic cores and an assortment of lithic tools. Additional Indigenous artifacts were recovered from eroded sediments along the Mississaugi River but lacked clear contextual information to be associated with a site (WHS 1999).

The assessment determined many of the sites identified by Brizinksi were likely more consolidated archaeological resources separated by more recent activites. The Rock Cut (CbHs-24) and Cormorant (CbHs-30) sites were recommended to be consolidated with the White Tail Deer site (CbHs-25). Similarly, the Ruby Rouge (CbHs-32), 99HPGCC-2, and 99HPGCC-3 sites were proposed to be all part of the Warren Neufeld site (CbHs-31). Areas of the two consolidated sites potentially impacted by the expansion were recommended to be capped by a layer of sterile soil, and no development was to occur outside of the previously assessed areas. If development was to directly impact the Warren Neufeld site (CbHs-31), Stage 4 archaeological assessment was recommended (WHS 1999).

Sites within 7 km of the study area were not limited to the Mississagi Delta. Further north are two additional sites. CbHr-1 was situated northwest of Lake Duborne and noted as identified by Laurentian University but no further information could be obtained. The area is noted by the Mississauga First Nation as an area where projectile points continue to be identified by members of the community and their ancestors had long farmed and fished along these waters. Battle Point, a small peninsula along the lake, was recorded by the Mississauga First Nation as the site of a

battle between the Haudenosaunee and Mississauga Ojibway. Local elders note that Haudenosaunee had previously travelled to capture women, and on this occasion, the Ojibway ambushed and defeated them before pushing the remnants down the Penewabecong to the mouth of Blind River. The remnants attempted to hold out on an island at the mouth, and all but one individual was killed. They were spared in order to report the story of the conflict (White 2013). A similar battle was recorded by Bacqueville de La Potherie, the French Royal Commissioner to Canada in the 1690s, in 1653 when a Haudenosaunee force of 120 was defeated north of Manitoulin Island by a combined force of 'Nikikouek, Mississaga, and Saulteurs,' with one survivor left alive (Schmalz 1991: 19). Northwest of CbHr-1, CbHr-2 was identified by Thor Conway in 1991, but only limited information was obtained regarding of the site.

An additional test pit survey on the Chiblow 2 (CbHs-3) site was conducted as part of an Indigenous Archaeological Monitor training project in 2019, yielding artifacts from the 16th and 17th centuries through to the 20th century. Notably, the area remained in use as a boat launch and hunting area until the present (Hawkins 2020). Altogether, these sites demonstrate the potential for archaeological resources within the Blind River area. They also document tangible evidence of the landscape's past and continued importance to the Indigenous peoples of the area and their descendant communities, including the Mississauga First Nation. Additionally, several of the identified sites document the key importance of the Fur Trade and the lumber industry to the development of the area as it presently stands, including a potential Northwest/Hudson Bay Company trading post and several lumber campsites.

1.3.3 Previous Archaeological Work

Reports documenting assessments conducted within the subject lands and assessments that resulted in the discovery of sites within adjacent lands were also sought during the research component of the study. In order to ensure that all relevant past work was identified, an investigation was launched to identify reports involving assessments within 50 m of the study area. The investigation determined that there are two available reports documenting previous archaeological fieldwork within the specified distance (Map 9).

These two reports are specifically related to the current project. In 2024, ARA conducted a Stage 1 archaeological assessment of the wider eastern bank of the Town of Blind River to review alternatives for the proposed raw water intake and low lift pumping station (ARA 2024). Completed under PIF #P1106-0038-2024, the assessment determined that the study area was a mixture of areas of archaeological potential and no archaeological potential. Areas of no archaeological potential were recommended for photo-documentation as no property survey was conducted. Areas of archaeological potential were recommended for Stage 2 assessment. The report also recommended if any in-water work is planned within the North Channel of Lake Huron or Blind River, the Cr*iteria for Evaluating Marine Archaeological Potential* checklist should be consulted, and a separate Marine Archaeological Assessment may be required.

Following the recommendations of the Stage 1, a Marine Archaeological Assessment under Licence #2024-37 was conducted in 2024 as it was determined that the North Channel of Lake Huron had the potential for marine archaeological resources, in part due to the historical association of Blind River as a center of lumber processing and shipping (ARA 2025 [forthcoming]). The impacts of the intake with a buffer of at least 20 m was assessed. The area

near the shoreline was subject to a shallow water assessment with aquascope for the first 40 m and an underwater drone surveyed the first 100 m. Neither identified any cultural material. The remainder of the corridor was subject to sidescan sonar and magnetometer survey, which identified eight cultural features primarily related to the use of the mouth of Blind River for log boom cribs. Three of these features were potentially impacted by the project and were recommended for either avoidance or further detailed studies to document and evaluate their significance. The path of the intake was altered to avoid all identified features. The current study area of the present Stage 2 reflects the updated design.

2.0 STAGE 2 PROPERTY ASSESSMENT

2.1 Field Methods

The Stage 2 assessment involved visual inspection to evaluate archaeological potential and a combination of visual inspection and judgemental test pit survey to confirm disturbance. Environmental conditions were ideal during the investigation, permitting good visibility of land features and providing an increased chance of finding evidence of archaeological resources. A breakdown of the specific fieldwork activities, weather and lighting conditions appears in Table 4. ARA, therefore, confirms that fieldwork was carried out under weather and lighting conditions that met the requirements set out in Section 1.2 Standard 2 and Section 2.1 Standard 3 of the 2011 *S&Gs*.

Table 4: Fieldwork Activities and Environmental Conditions

Date	Activity	Field Director	Lighting	Cloud Cover	Precipitation	Temperature (°C)
22/10/2024	Combination survey; Visual Inspection	CR	Bright	Partial	None	3

The study area was subjected to a systematic visual inspection and photo-documentation in accordance with the requirements set out in Section 1.2 of the 2011 *S&Gs* and as recommended by the ARA Stage 1 archaeological assessment (2024). This component of the investigation was conducted concurrently with the property survey. The inspection confirmed that all surficial features of archaeological potential were present where they were previously identified and did not result in the identification of any additional features of archaeological potential not visible on mapping (e.g., relic water channels, patches of well-drained soils, etc.).

The visual inspection confirmed and identified several areas of disturbance, including the existing roadway and railway infrastructure, areas of buried utilities and areas of significant landscaping (Image 1–Image 14). These areas had clearly been impacted by past earth-moving/construction activities, resulting in the disturbance of the original soils to a significant depth and severe damage to the integrity of any archaeological resources. No other natural features (e.g., permanently wet lands, overgrown vegetation, heavier soils than expected, etc.) or significant built features (e.g., heritage structures, landscapes, plaques, monuments, cemeteries, etc.) that would affect assessment strategies were identified.

The test pit survey method was utilized to complete the assessment within the grassed, overgrown area in the southwest because ploughing was not possible or viable (Image 15–Image 18). The initial test pits revealed evidence of extensive disturbance throughout the areas of archaeological potential, and it was determined that survey at a maximum interval of 5 m was not warranted. A combination of visual inspection and judgemental test pit survey was utilized to confirm the extent of disturbance in accordance with Section 2.1.8 of the 2011 S&Gs. Using this method, ARA crew members hand excavated small regular test pits with a minimum diameter of 30 cm at no prescribed interval. Test pits were excavated according to professional judgement to verify that these areas had no archaeological potential (Image 19–Image 22). Disturbed soils were encountered across the assessed area.

As required by Section 2.1.2 Standard 4 of the 2011 *S&Gs*, test pits were excavated to within 1 m of all built structures or until test pits exhibited evidence of ground disturbance. Each test pit was excavated into at least the first 5 cm of subsoil, (or to a sufficient depth to confirm deep disturbance if subsoil was not preserved) or to bed rock, and the resultant pits were examined for stratigraphy, potential features and/or evidence of fill. The study area was determined to be deeply disturbed as soils encountered comprised a mixture of dark brown and brownish yellow fill with high concentrations of pebbles, cobbles, boulders and modern debris (Image 23–Image 28). Test pits in the north between the railway and Martin Street were approximately 30-40 cm in depth to bedrock. South of Martin Street, depths ranged from 70-80 cm to a light brownish yellow sandy subsoil. All soils were screened through mesh with an aperture of no greater than 6 mm and examined for archaeological resources. No locations of archaeological materials were encountered during the test pit survey. The test pits were backfilled upon completion.

The utilized field methods are presented in Map 10–Map 11. The study area is depicted as a layer in these maps. A breakdown of field methods appears in Table 5.

Table 5: Field Methods

Category	Study Area
Property assessed by pedestrian survey at an interval of 5 m	0.00% (0.00 ha)
Property assessed by test pit survey at an interval of 5 m	0.00% (0.00 ha)
Property assessed by test pit survey at an interval of 10 m	0.00% (0.00 ha)
Property assessed by visual inspection and judgemental test pit survey to confirm disturbance	25.19% (0.59 ha)
Property assessed with a modified survey interval due to a physical or cultural constraint	0.00% (0.00 ha)
Property not assessed due to physical constraint	0.00% (0.00 ha)
Property not assessed because of permanently wet areas	0.00% (0.00 ha)
Property not assessed because of exposed bedrock	0.00% (0.00 ha)
Property not assessed because of sloped areas	0.00% (0.00 ha)
Property not assessed because of disturbed areas	44.33% (1.04 ha)
Property previously assessed and of no further concern	0.00% (0.00 ha)
Property requiring Marine Archaeological Assessment (Licence #2024-37)	30.48% (0.71 ha)
Total	**100.00% (2.34 ha)**

2.2 Record of Finds

The investigation did not result in the discovery of any archaeological materials. The inventory of the documentary record, which includes a quantitative summary of the field notes, photographs and mapping materials associated with the project, appears in Table 6.

Table 6: Documentary Record

Field Documents	Total	Nature	Location
Photographs	43	Digital	50 Nebo Road, Unit 1, Hamilton
Notes	1	Digital	50 Nebo Road, Unit 1, Hamilton
Maps	2	Digital	50 Nebo Road, Unit 1, Hamilton

2.3 Analysis and Conclusions

No archaeological sites were identified within the assessed lands.

3.0 RECOMMENDATIONS

The Stage 2 assessment did not result in the identification of any archaeological materials. It is recommended that no further assessment be required within the study area. Lands beyond the study area were not fully assessed and require further assessment if development is contemplated in the future as per the potential modelling and recommendations in the Stage 1 assessment report (ARA 2024). In-water impacts are anticipated for this project for which the Marine Archaeological Report under Licence #2024-37 should be consulted (ARA 2025 [forthcoming]). Should impacts to the North Channel of Lake Ontario extend beyond the scope of this report be planned, the *Criteria for Evaluating Marine Archaeological Potential* checklist should be consulted.

4.0 ADVICE ON COMPLIANCE WITH LEGISLATION

Section 7.5.9 of the 2011 *S&Gs* requires that the following information be provided for the benefit of the proponent and approval authority in the land use planning and development process:

- This report is submitted to the Minister of Citizenship and Multiculturalism as a condition of licensing in accordance with Part VI of the *Ontario Heritage Act*, R.S.O. 1990, c 0.18. The report is reviewed to ensure that it complies with the standards and guidelines that are issued by the Minister, and that the archaeological fieldwork and report recommendations ensure the conservation, protection and preservation of the cultural heritage of Ontario. When all matters relating to archaeological sites within the project area of a development proposal have been addressed to the satisfaction of the MCM, a letter will be issued by the ministry stating that there are no further concerns with regard to alterations to archaeological sites by the proposed development.
- It is an offence under Sections 48 and 69 of the *Ontario Heritage Act* for any party other than a licensed archaeologist to make any alteration to a known archaeological site or to remove any artifact or other physical evidence of past human use or activity from the site, until such time as a licensed archaeologist has completed archaeological fieldwork on the site, submitted a report to the Minister stating that the site has no further cultural heritage value or interest, and the report has been filed in the Ontario Public Register of Archaeology Reports referred to in Section 65.1 of the *Ontario Heritage Act*.
- Should previously undocumented archaeological resources be discovered, they may be a new archaeological site and therefore subject to Section 48 (1) of the *Ontario Heritage Act*. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out archaeological fieldwork, in compliance with Section 48 (1) of the *Ontario Heritage Act*.
- The *Funeral, Burial and Cremation Services Act*, 2002, S.O. 2002, c.33 requires that any person discovering human remains must notify the police or coroner and the Registrar at the Ministry of Public and Business Service Delivery.

5.0 IMAGES

Image 1: Disturbed Lands
(October 22, 2024; Facing Northwest)

Image 2: Disturbed Lands
(October 22, 2024; Facing Northwest)

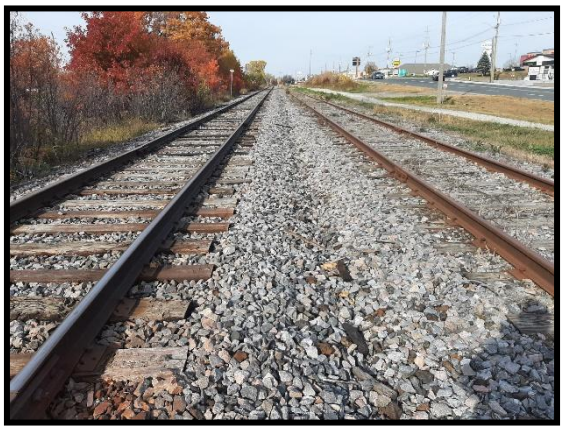


Image 3: Disturbed Lands
(October 22, 2024; Facing Northwest)

Image 4: Disturbed Lands
(October 22, 2024; Facing Northwest)

Image 5: Disturbed Lands
(October 22, 2024; Facing Northwest)

Image 6: Disturbed Lands
(October 22, 2024; Facing Southeast)

Image 7: Disturbed Lands
(October 22, 2024; Facing Southwest)

Image 8: Disturbed Lands
(October 22, 2024; Facing Northeast)

Image 9: Disturbed Lands
(October 22, 2024; Facing Northeast)

Image 10: Disturbed Lands
(October 22, 2024; Facing Southwest)

Image 11: Disturbed Lands
(October 22, 2024; Facing Northeast)

Image 12: Disturbed Lands
(October 22, 2024; Facing Northeast)

Image 13: Disturbed Lands
(October 22, 2024; Facing East)

Image 14: Disturbed Lands
(October 22, 2024; Facing East)

Image 15: Field Conditions
(October 22, 2024; Facing Northwest)

Image 16: Field Conditions
(October 22, 2024; Facing Southwest)

Image 17: Field Conditions
(October 22, 2024; Facing Northwest)

Image 18: Field Conditions
(October 22, 2024; Facing Northeast)

Image 19: Test Pit Survey
(October 22, 2024; Facing South)

Image 20: Test Pit Survey
(October 22, 2024; Facing Northeast)

Image 21: Test Pit Survey
(October 22, 2024; Facing Southwest)

Image 22: Test Pit Survey
(October 22, 2024; Facing West)

Image 23: Disturbed Test Pit
(October 22, 2024; Facing North)

Image 24: Disturbed Test Pit
(October 22, 2024; Facing North)

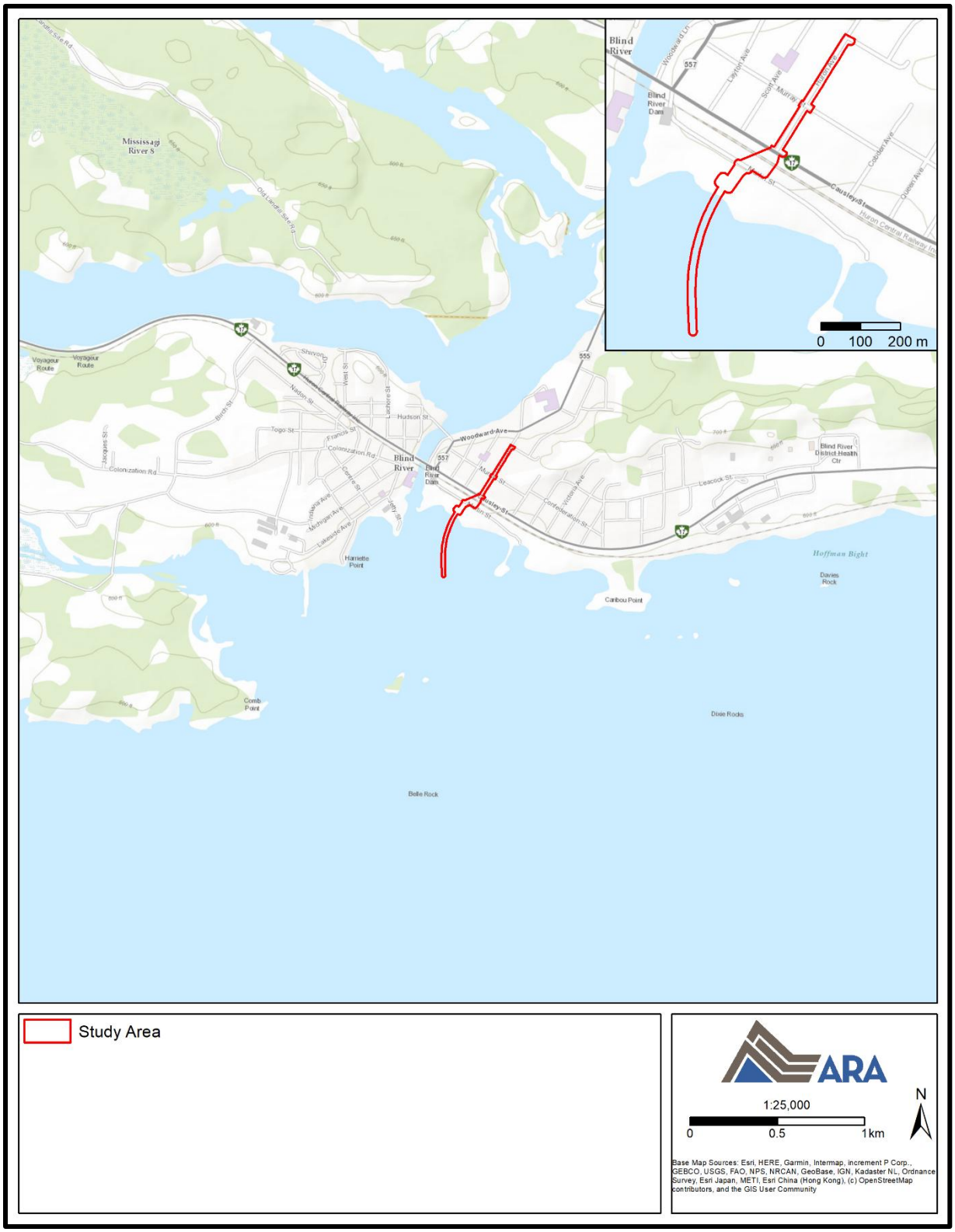
Image 25: Disturbed Test Pit
(October 22, 2024; Facing North)

Image 26: Disturbed Test Pit
(October 22, 2024; Facing North)

Image 27: Disturbed Test Pit
(October 22, 2024; Facing North)

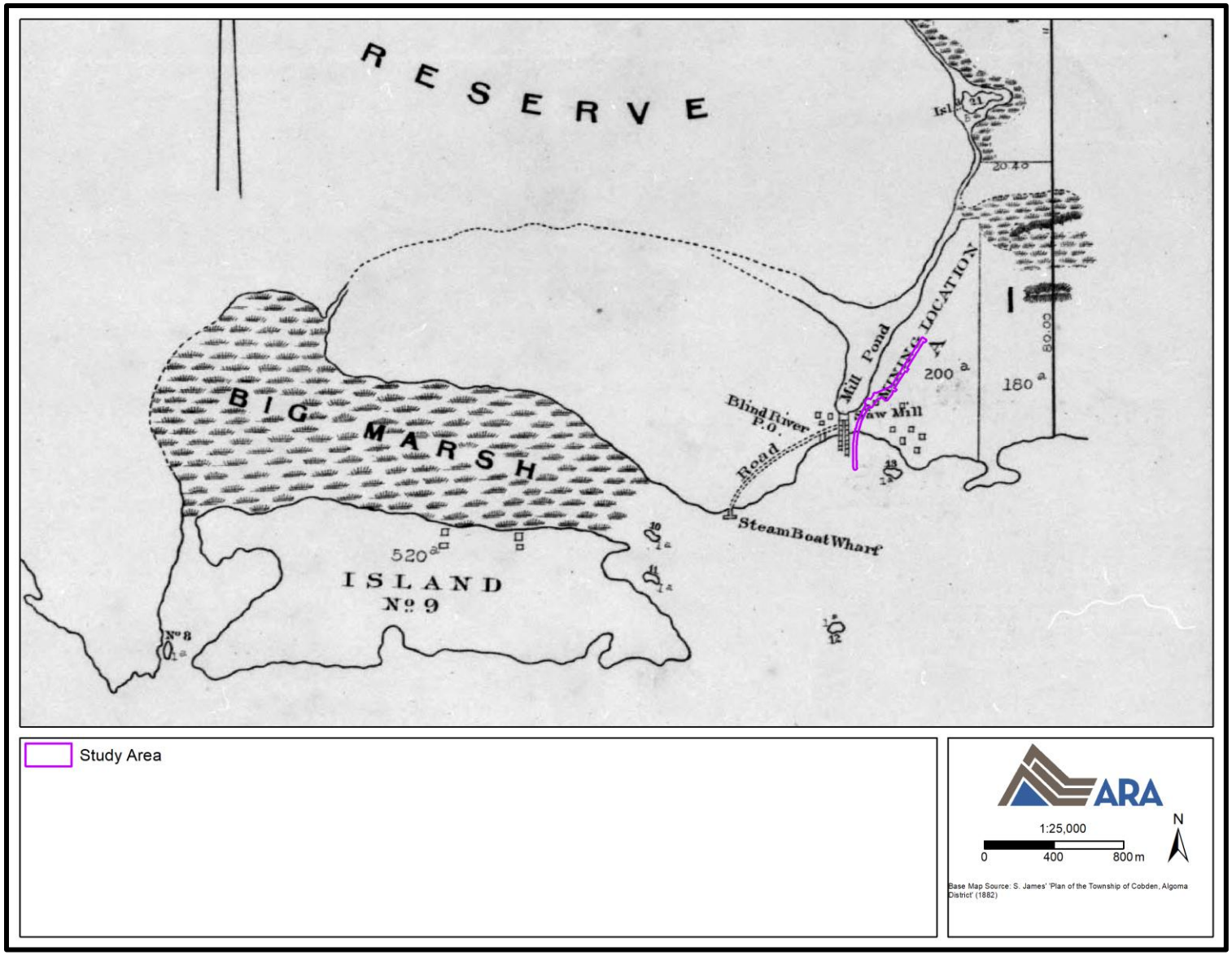
Image 28: Disturbed Test Pit
(October 22, 2024; Facing North)

6.0 MAPS

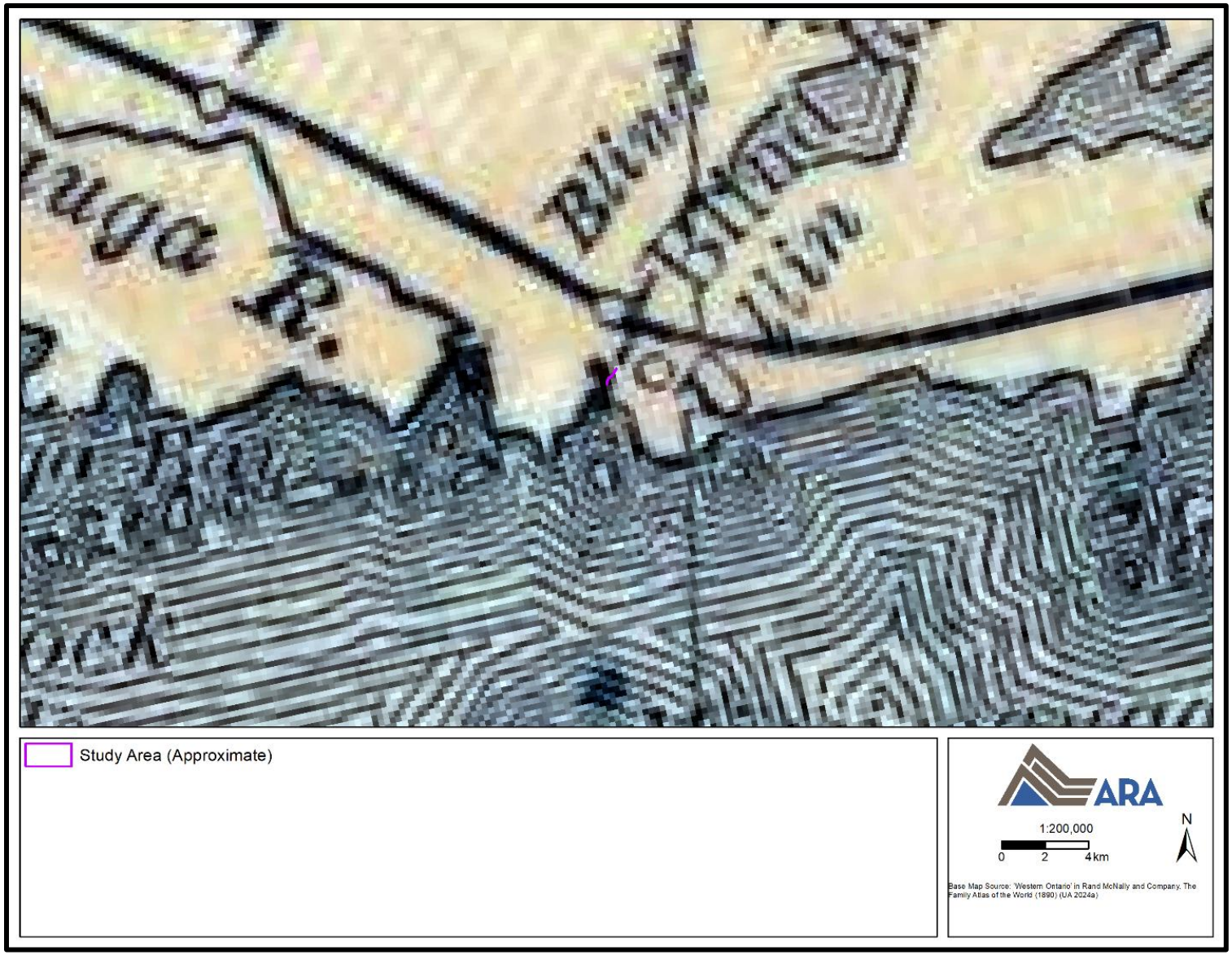


Map 1: Topographic of Study area
(Produced under licence using ArcGIS® software by Esri, © Esri)

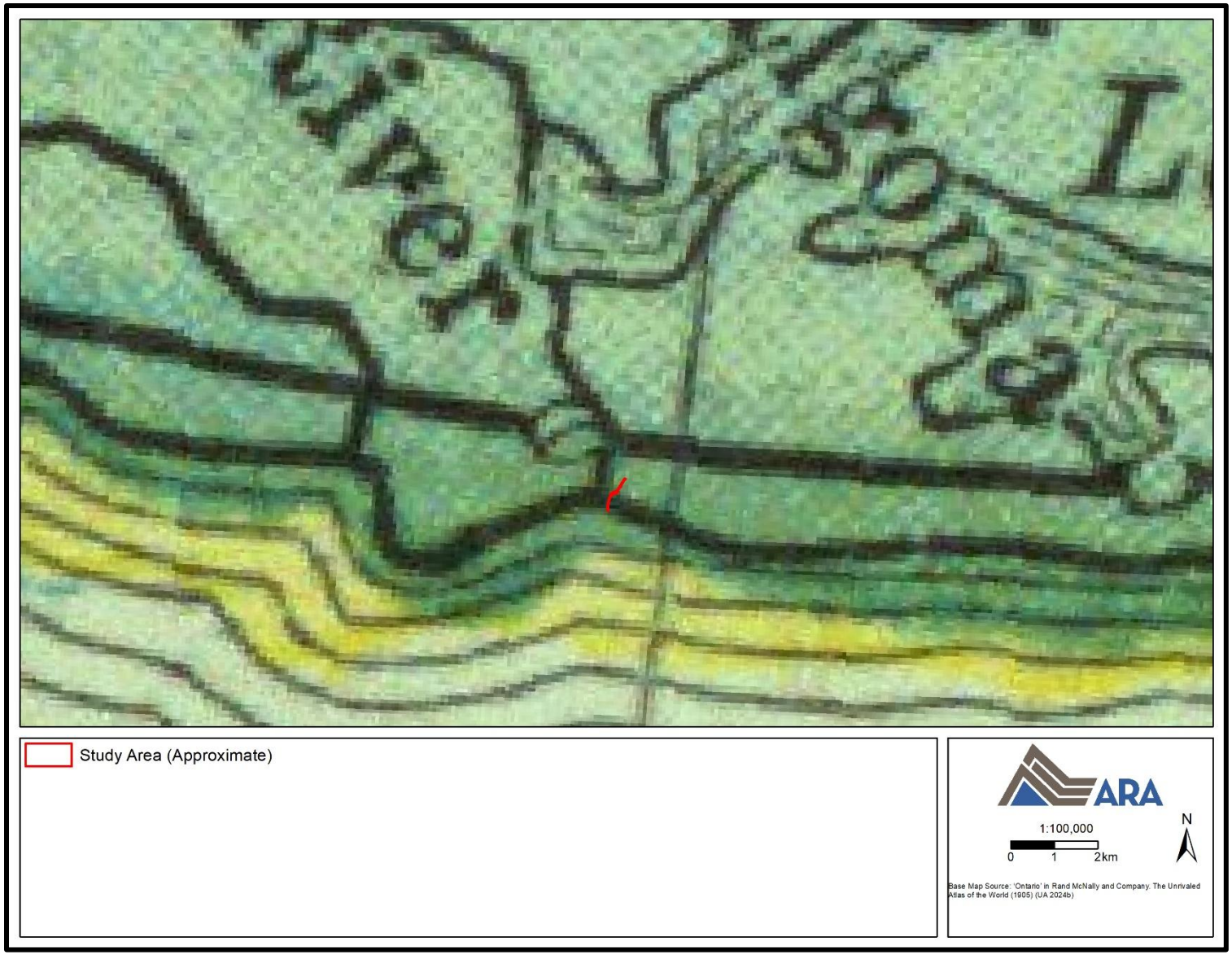
Map 2: *Atlas of the Dominion District of Nippissing* (1874)
(Produced under licence using ArcGIS® software by Esri, © Esri; OHCMP 2019)



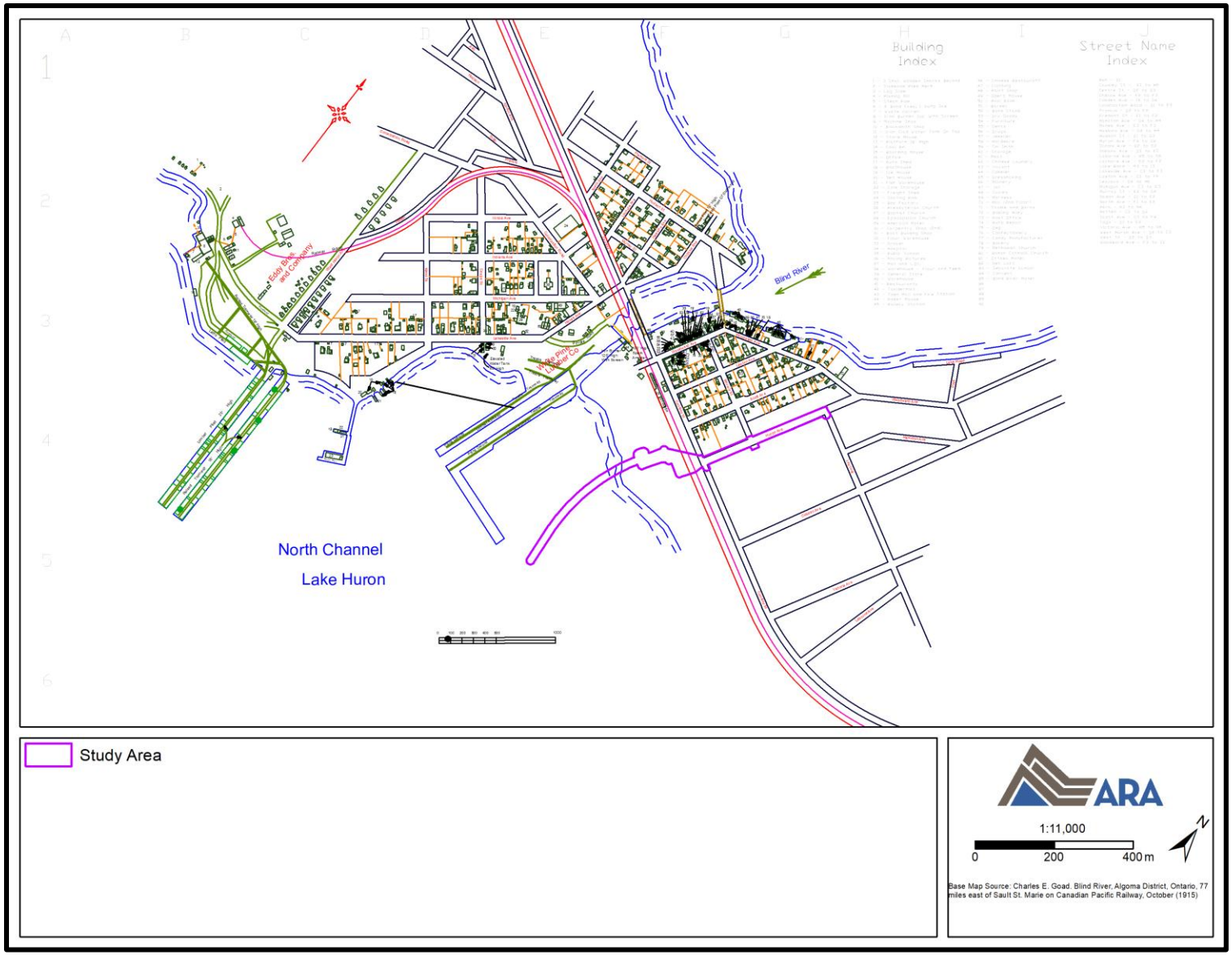
Map 3: ***Plan of Mining Location being part of the Indian Reserve in the Township of Cobden, Algoma*** **(1882)**
(Produced under licence using ArcGIS® software by Esri, © Esri; LAC 2024a)



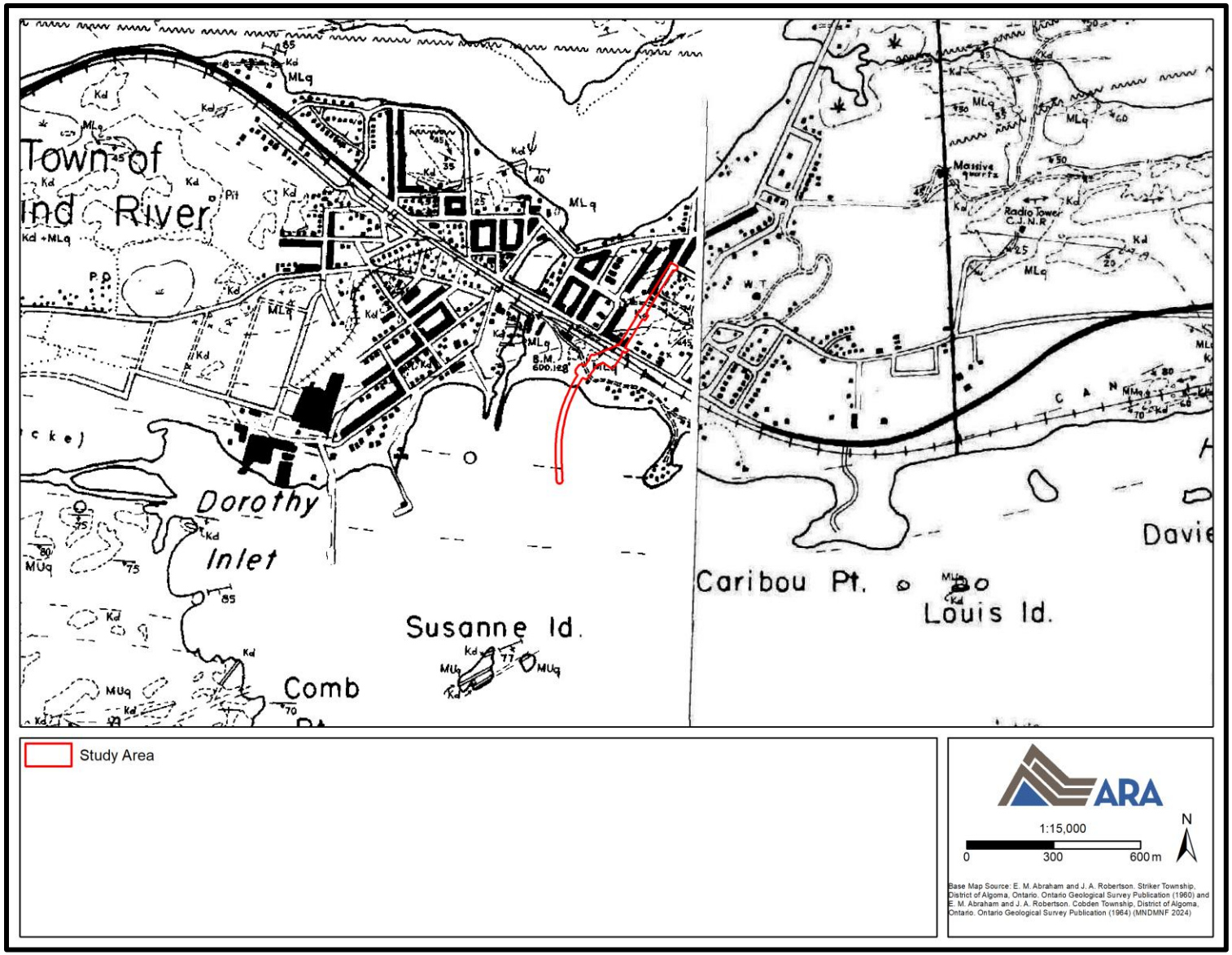
Map 4: *The Family Atlas of the World* (1890)
(Produced under licence using ArcGIS® software by Esri, © Esri; MU 2001)



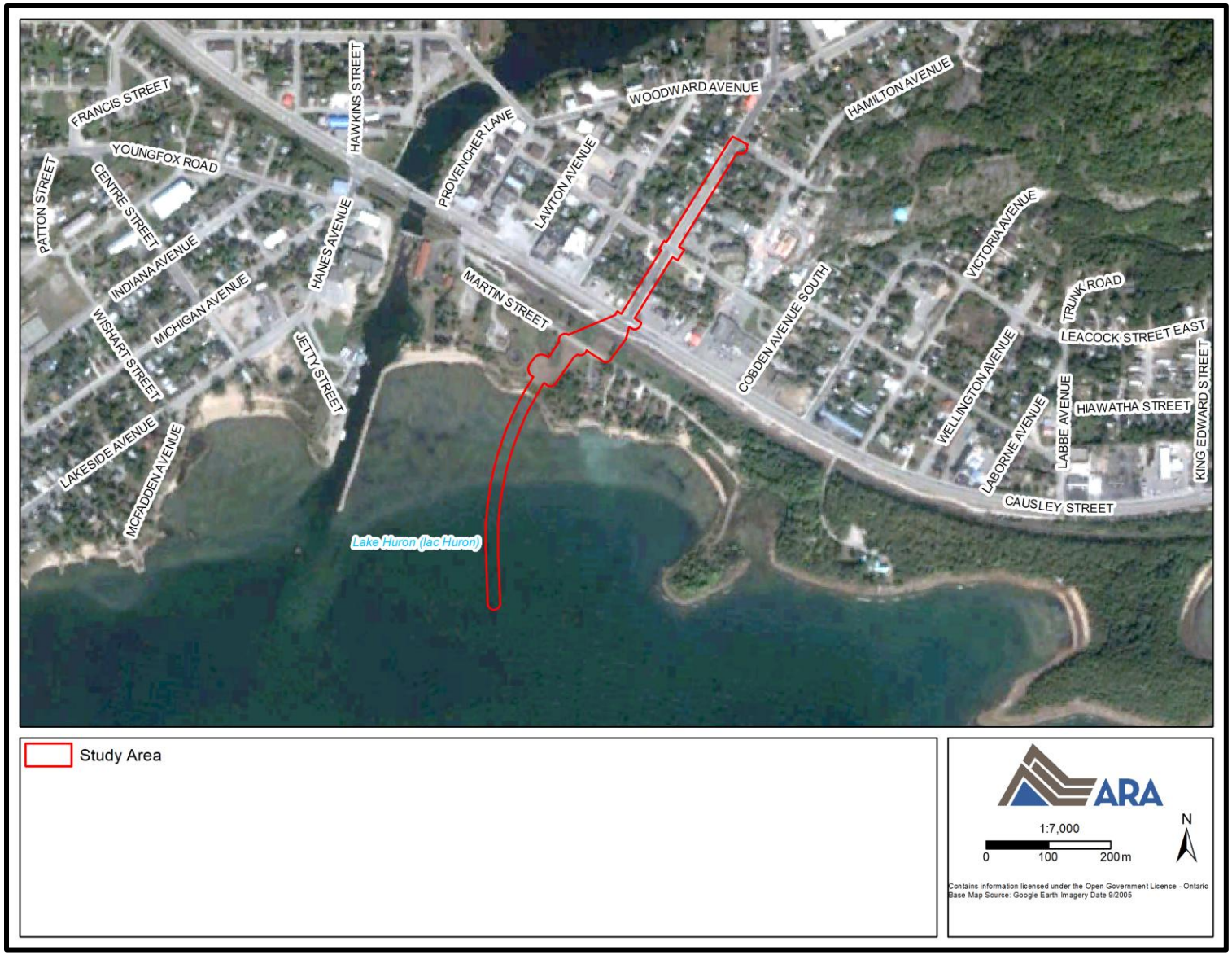
Map 5: The Unrivaled Atlas of the World (1905)
(Produced under licence using ArcGIS® software by Esri, © Esri; OCUL 2023)



Map 6: Fire Insurance Plan (1915)
(Produced under licence using ArcGIS® software by Esri, © Esri; Courtesy of the Timber Museum)

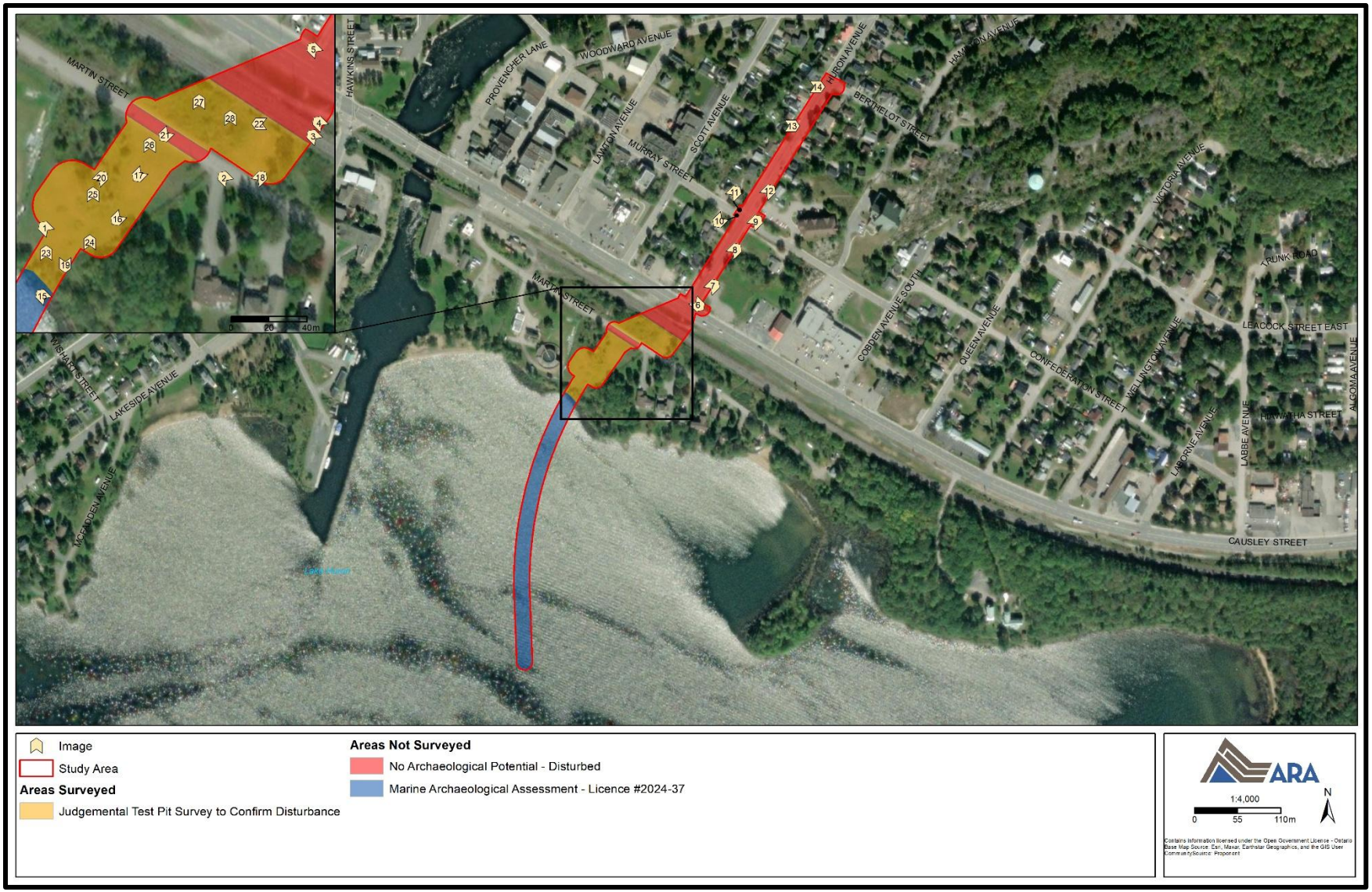


Map 7: Ontario Geological Survey (1960)
(Produced under licence using ArcGIS® software by Esri, © Esri; MNDMNF 2024)



Map 8: Google Earth 9/10/2005 (2005)
(Produced under licence using ArcGIS® software by Esri, © Esri; GE 2024)

Map 9: Previous Assessments
(Produced under licence using ArcGIS® software by Esri, © Esri)



Map 10: Field Methods (Aerial)
(Produced under licence using ArcGIS® software by Esri, © Esri)

Map 11: Field Methods (Development Plan)
(Produced under licence using ArcGIS® software by Esri, © Esri)

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O

Appendix O: Marine Archaeological Study

ARCHAEOLOGY | HERITAGE | OUTREACH | CONSERVATION

Marine Archaeological Assessment
Blind River Raw Water Intake and Low Lift Pumping Station
North Channel, Lake Huron/Georgian Bay
Town of Blind River
Mining Location A
Geographic Township of Cobden
District of Algoma, Ontario

Prepared for
Town of Blind River
c/o
CIMA+
500-5935 Airport Road
Mississauga, ON L4V 1W5

Licensed under
S. Janusas
License #2024-37
ARA File #2024-0143

21/07/2025

Original Report

The following has been adapted from the Assembly of First Nations and demonstrates the importance of water for Indigenous communities (https://www.afn.ca/honoring-water/):

Archaeological Research Associates Ltd. recognizes the importance of water for Indigenous communities in its many elements including but not limited to the shaping of the land, the rivers, lakes, ice and oceans. We recognize and acknowledge that the Indigenous peoples of North America have a special relationship with water, built on their subsistence ways of life that extends back thousands of years. Traditional activities depend on water for transportation, drinking, cleaning, purification, and provides habitat for the plants and animals gathered as medicines and foods.

EXECUTIVE SUMMARY

Under a contract awarded in September 2024, Archaeological Research Associates Ltd. (ARA) carried out a Marine Archaeological Assessment of lands with the potential to be impacted by the development of a new raw water intake and low lift pumping station in the Town of Blind River, District of Algoma, Ontario. The Town of Blind River is currently supported by the Blind River Water Treatment Plant which draws from five groundwater wells. A well-field capacity evaluation indicated long-term declining water yields and quality, underlining the need for a new source of drinking water for the town. The archaeological assessment was carried out in support of a Schedule 'C' Municipal Class Environmental Assessment in accordance with the *Environmental Assessment Act*. This report documents the background research and potential modelling involved in the investigation and presents conclusions and recommendations pertaining to archaeological concerns.

In 2024, ARA conducted a Stage 1 archaeological assessment of the wider eastern bank of the Town of Blind River to review alternatives for the Class EA (ARA 2024). Completed under Project Information Form (PIF) #P1106-0038-2024, the assessment determined that the current study area was a mixture of areas of archaeological potential and no archaeological potential. Areas of no archaeological potential were recommended for photo-documentation. Areas of archaeological potential were recommended for Stage 2 assessment. The report also recommended the *Criteria for Evaluating Marine Archaeological Potential* checklist should be consulted for in-water impacts to the North Channel of Lake Huron, and a separate Marine Archaeological Assessment may be required.

The Stage 2 assessment of the terrestrial portion of this project is being completed under PIF #P1106-0059-2024 and the report is forthcoming (ARA 2025 [forthcoming]). Completed in 2024, this assessment photo-documented areas visually determined to be disturbed. The test pit survey method was utilized to complete the assessment within the grassed, overgrown area. The initial test pits revealed evidence of extensive disturbance throughout the areas of archaeological potential that were assessed and a combination of visual inspection and judgemental test pit survey was utilized to confirm the extent of disturbance. The Stage 2 assessment did not result in the identification of any archaeological materials and no further was recommended within the study area.

The study area consists of a linear corridor covering 2.34 ha (5.78 ac), extending from Berthelot Street in the northeast to North Channel of Lake Huron in the southwest (Map 1). The Marine Archaeological Assessment consisted of marine background research and a field assessment of the impacts of the intake with a buffer of at least 20 m and included shallow water assessment with aquascope, underwater drone survey as well as side scan sonar survey and magnetometer survey, ground-truthing of possible cultural targets. Legal permission to enter and conduct all necessary fieldwork activities within the assessed lands was granted by the Town. Archaeological work was conducted under marine archaeological licence # 2024-37 issued to S. Janusas.

The field visit was conducted on October 15th, 2024. Conditions in-water provided good visibility and surface conditions were suitable to run both side scan and magnetometer survey. The underwater drone assessment was conducted within the corridor and a buffer from the shoreline

outwards to 100 m. The shallow water archaeological assessment was subject to an aquascope survey conducted in three to five-metre intervals advancing from the shoreline to 40 m into the lake, where the water depth never exceeded more than two feet.

ARA, on behalf of CIMA+ and the Town of Blind River, facilitated Indigenous engagement with First Nation and Indigenous Communities (FNICs) who may be interested in the project. FNICs were provided information on the project and invited to participate in fieldwork and share traditional knowledge of the area. They will also be provided a copy of the draft report to review. As the project was in their traditional territory, the Mississauga First Nation sent a representative to participate in the marine archaeological assessment.

There were eight targets located with the sidescan and magnetometer survey. Three of these are directly within the proposed intake corridor. Several targets were part of a series of cribs, detected in a navionics chart, that extended from west to east across the study area and beyond. They would have been part of a series of log boom cribs used during the timber/lumber period of Blind River, where logs were assembled in rafts before heading to market.

There were no nearshore artifacts located in the water or in the shallows up to 100 m from the shoreline. There were numerous cultural items located between the cobbles of the shore, but the mix included railway spikes, broken glass, plastic, pipe, aluminum, iron staples, etc. While there is a possibility that some of these materials, for example, the heavy iron staples, may have been part of the logging industry, these materials are not in situ, nor discrete from other accumulated materials on the shoreline itself, thereby lessening their significance. No materials were retained as they were not in situ and not associated with a particular site or the possibility of a site.

Should impacts to S4, S5 and S8 be unavoidable, the recommendation is that S5 and S8 be subject to a more thorough investigation using underwater cameras to capture information about their construction methods. Technical drawings of these structures would ensure that any vernacular traditions of construction are preserved. Target S4 should have a more thorough investigation using underwater cameras to ensure that there are no additional cultural features present within the accumulation. Following communications with the client, it was determined that the path of the intake could be altered so that S4, S5 and S8 could be avoided, protected with a 5 m archaeological buffer (Figure 22).

Therefore, based on the marine archaeological background research and the field survey, the following is recommended:

- No additional archaeological mitigation is recommended for updated course of the intake; and,
- Compliance legislation must be adhered to in the event of discovery of deeply buried cultural material or features.

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ABBREVIATIONS

ARA – Archaeological Research Associates Ltd.
MCM – Ministry of Citizenship and Multiculturalism
PIF – Project Information Form
S&Gs – Standards and Guidelines for Consultant Archaeologists

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1.0 PROJECT CONTEXT

1.1 Development Context

Under a contract awarded in September 2024, Archaeological Research Associates Ltd. (ARA) carried out a Marine Archaeological Assessment of lands with the potential to be impacted by the development of a new raw water intake and low lift pumping station in the Town of Blind River, District of Algoma, Ontario. The Town of Blind River is currently supported by the Blind River Water Treatment Plant, which draws from five groundwater wells. A well-field capacity evaluation indicated long-term declining water yields and quality, underlining the need for a new source of drinking water for the town. The archaeological assessment was carried out in support of a Schedule 'C' Municipal Class Environmental Assessment in accordance with the *Environmental Assessment Act*. This report documents the background research and potential modelling involved in the investigation and presents conclusions and recommendations pertaining to archaeological concerns.

In 2024, ARA conducted a Stage 1 archaeological assessment of the wider eastern bank of the Town of Blind River to review alternatives for the Class EA (ARA 2024). Completed under Project Information Form (PIF) #P1106-0038-2024, the assessment determined that the current study area was a mixture of areas of archaeological potential and no archaeological potential. Areas of no archaeological potential were recommended for photo-documentation. Areas of archaeological potential were recommended for Stage 2 assessment. The report also recommended the *Criteria for Evaluating Marine Archaeological Potential* checklist should be consulted for in-water impacts to the North Channel of Lake Huron, and a separate Marine Archaeological Assessment may be required.

The Stage 2 assessment of the terrestrial portion of this project is being completed under PIF #P1106-0059-2024 and the report is forthcoming (ARA 2025 [forthcoming]). Completed in 2024, this assessment photo-documented areas visually determined to be disturbed. The test pit survey method was utilized to complete the assessment within the grassed, overgrown area. The initial test pits revealed evidence of extensive disturbance throughout the areas of archaeological potential that were assessed and a combination of visual inspection and judgemental test pit survey was utilized to confirm the extent of disturbance. The Stage 2 assessment did not result in the identification of any archaeological materials and no further was recommended within the study area.

The study area consists of a linear corridor covering 2.34 ha (5.78 ac), extending from Berthelot Street in the northeast to North Channel of Lake Huron in the southwest (Map 1). The Marine Archaeological Assessment consisted of marine background research and a field assessment of the impacts of the intake with a buffer of at least 20 m and included shallow water assessment with aquascope, underwater drone survey as well as survey side scan sonar and magnetometer survey, ground-truthing of possible cultural targets. Legal permission to enter and conduct all necessary fieldwork activities within the assessed lands was granted by the Town. Archaeological work was conducted under marine archaeological licence # 2024-37 issued to S. Janusas.

A Record of Indigenous Engagement is included in the project report package in accordance with the requirements set out in Section 7.6.2 of the 2011 *S&Gs*.

1.2 Current Environment

The study area consists of the waters of the North Channel of Lake Huron. The shoreline bordering the study area consists of a combined sandy/rocky surface. Waters are relatively shallow in the study area ranging from 0 (at the shoreline) to approximately 3.5 metres in depth (Figure 1).

The Town of Blind River lies at the mouth of Blind River and extends north, east and west. A small commercial fishery operates from the harbour. Sailing vessels access Blind River across the Blind River Bank, which extends 2.5 miles (approximately 4 km) offshore. Dangers to vessels on the approach include Davies Rock, which lies east of Caribou Point (east of the study area); Louis Island; and Dixie Rocks and Shoal Rock (south of Caribou Point). Southwest of the mouth of Blind River is Comb Point, where there is an area of drying boulders 91 m southeast of the point. Harriette Point is north of Comb Point, and the site is dangerous to vessels. There is a rock on a shoal located approximately 0.12 km northwest of Susanne Island, which, when dry, shows 0.6 m above water. Belle Rock is approximately 0.6 km south of Susanne Island, with a depth of 0.9 m. It is marked with a buoy.

A breakwater with an elevation of 1.5 m extends 244 m south of Harriette Point. An area of boulders and more submerged piles extends approximately 0.1 km south of the breakwater. The end of this is currently marked with a bifurcation buoy and its east side is marked with a buoy.

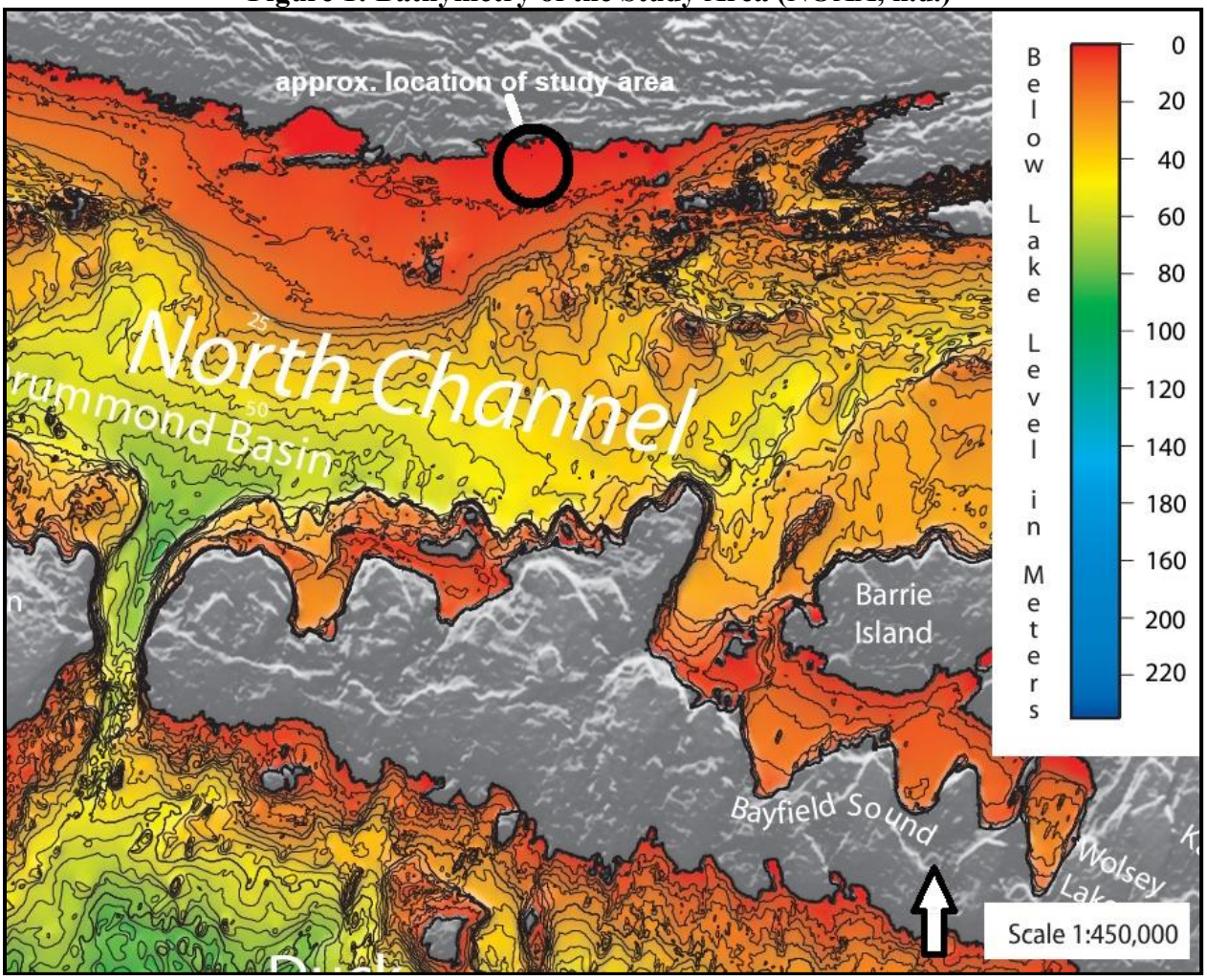
Another buoy marks the location of a shoal located approximately 0.2 km north-northeast of Comb Point light and has a depth of 0.9 m. A boulder shoal is located approximately 0.4 km east-northeast of the light with a depth of 1.5 m.

The Blind River Marine Park is located on the west side of the breakwater and protected by another breakwater 122 m to the west. An additional public wharf is located on the west side of the mouth of Blind River about 0.5 km northeast of Harriette Point. The wharf is 91 m long with a deck elevation of 1.2 m. This wharf is used by the local fishing fleet.

The harbour at the entrance of Blind River is 30 m wide between the public wharf and the east breakwater. The east breakwater is 240 m long and extends south-southwest from the east entrance point of the river. An area of submerged piles extends 76 m south of the breakwater. A row of submerged cribs extends eastward from the Blind River entrance towards Harriette Island. It is reported that a surge enters the harbour, particularly during southwest winds. The mouth of Blind River, the river itself and the west side of Blind River are clearly areas that have been modified repeatedly. Little is reported about the large sawmill on the east side of Blind River entrance. The boulder remains of a crib lie 152 m offshore at the west side of the river entrance at an elevation of 1.5 m.

Dorothy Inlet is the mouth of the west arm of Blind River. This location has numerous piles that obstruct the head of the inlet, and there are low bridges and a dam across the river. Susanne Island lies .4 miles (~.6 km) east of Comb Point.

Figure 1: Bathymetry of the Study Area (NOAA, n.d.)



A Navionics chart (Figure 2) illustrates a number of "obstructions" that roughly run from west to east and cross the study area. These are, in fact, cribs (confirmed through the archaeological assessment) and are part of a log boom crib works. Booms would have been constructed by creating a series of cribs. They would be constructed of local materials such as logs and stone and sunk in specific locations across an area to capture logs (Figure 3). There appear to be at least 16 cribs that form a somewhat straight line from the west end of the river pier, traversing the study area, and extending towards the east. Not all of these have been confirmed as cribs, as they lie outside the study area; however, it is likely that they represent part of boom crib work. This type of crib alignment allowed for planks to be laid down on top of the cribs (which at the time would have been above the water level), allowing young men (sometimes referred to as 'Boom Rats') to run across the planks from one crib to another, concentrating logs with ownership marks (stamps) at the end of them into groupings, so they could go to the sawmills and be properly accounted. They would be equipped with long-handled hooks to gather the logs and tie them into a raft.

Figure 2: Chart with Obstructions Running Across Study Area

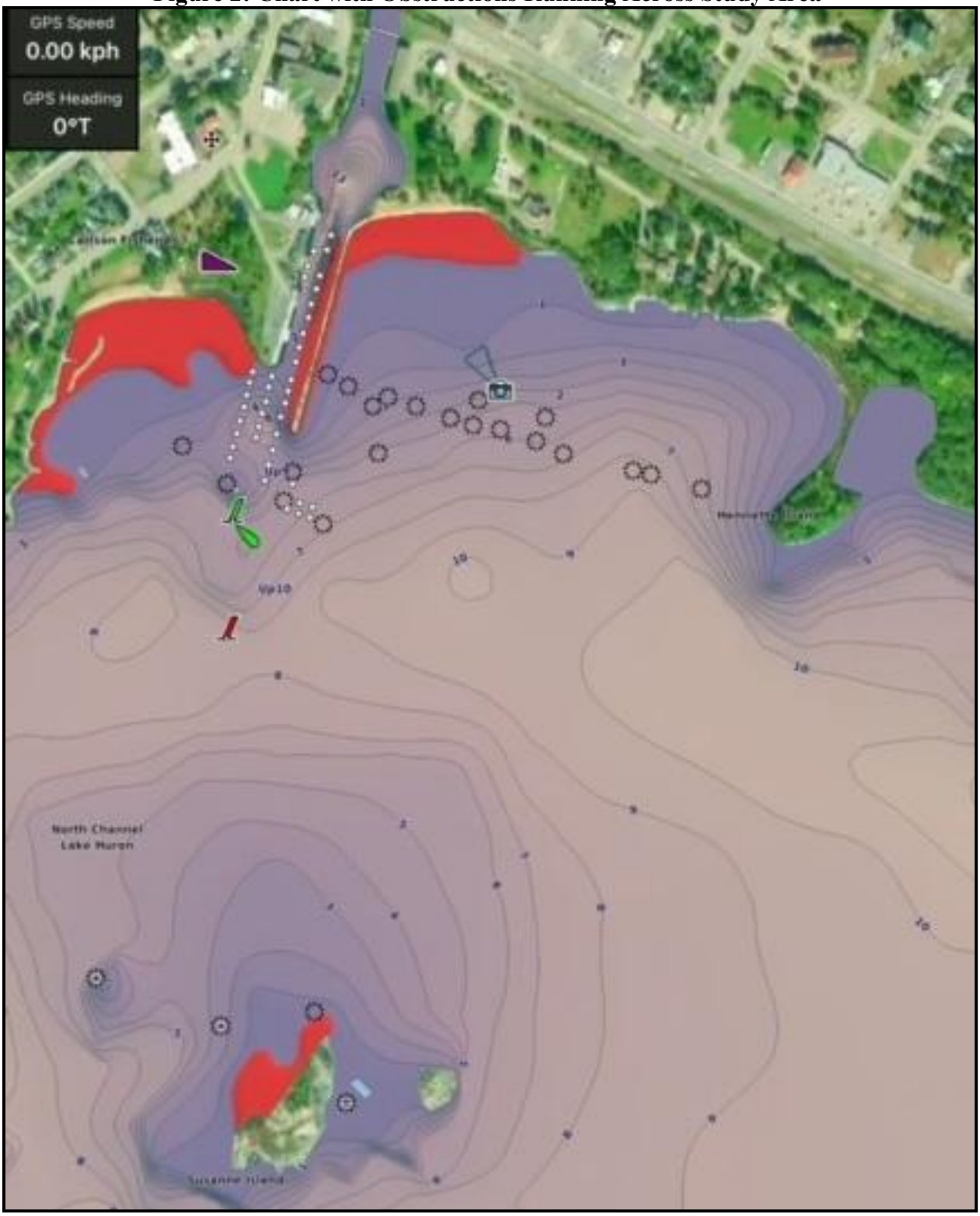


Figure 3: Example of a Log Boom Crib (Power Library, n.d.)

1.3 Indigenous Engagement

ARA, on behalf of CIMA+ and the Town of Blind River, facilitated Indigenous engagement with First Nation and Indigenous Communities (FNICs) who may be interested in the project. FNICs were provided information on the project and invited to participate in fieldwork and share traditional knowledge of the area. They will also be provided a copy of the draft report to review. As the project was in their traditional territory, the Mississauga First Nation sent a representative (Z. Piche) to participate in the marine archaeological assessment. While on-site, she was informed about the methodology for the shallow offshore assessment and was on board the survey vessel during the side scan and magnetometer survey.

2.0 BACKGROUND RESEARCH

The background research consists of presenting data from the Stage 1 land archaeological assessment conducted for the adjacent land area (ARA 2024). The Stage 1 assessment was conducted under PIF #P1106-0038-2024. The following are excerpts from the report.

2.1 Historical Context

While archaeological work has been conducted in northern Ontario for several decades, the scope of work remains limited. Scholarly understanding of human occupation of boreal forests has improved but remains a developing field guided by incomplete predictive modelling with unclear efficacy. Large areas of northern Ontario remain largely undeveloped and unexplored by archaeological study (Hamilton 2000). With occupation beginning in the Archaic period approximately 8,000 years ago, the greater vicinity of the study area comprises a complex set of land-use patterns and chronologies of Indigenous and Euro-Canadian occupation. Section 2.1.1 summarizes the region's settlement history, whereas Section 2.1.2 documents the study area's past and present land uses. No previous archaeological reports containing relevant background information were identified during the research component of the study.

2.1.1 Settlement History

2.1.1.1 Pre-Contact

The Pre-Contact history of the region is lengthy and rich, and a variety of Indigenous groups inhabited the landscape. Archaeologists generally divide this vibrant history into three main periods: Palaeo, Archaic and Woodland. Each of these periods comprises a range of discrete sub-periods characterized by identifiable trends in material culture and settlement patterns, which are used to interpret past lifeways. The principal characteristics of these sub-periods are summarized in Table 1.

Table 1: Pre-Contact Settlement History
(Wright 1972a, 1972b; Ellis and Ferris 1990; Hinshelwood 2004; Munson and Jamieson 2013)

Sub-Period	Timeframe	Characteristics
Early Palaeo	9000–8400 BC	Small bands move into southern Ontario; Mobile hunters and gatherers; Utilization of seasonal resources and large territories; Gainey, Barnes and Crowfield traditions; Fluted points; Northern Ontario virtually unoccupied due to retreating glaciers and associated glacial lakes (e.g., Lake Algonquin)
Late Palaeo	8400–7500 BC	Majority of northern Ontario remained uninhabited until Plano peoples; Plano tradition restricted mainly to areas northwest of Lake Superior (e.g., Lakehead Complex); Unfluted lanceolate points; Palynological research indicates the newly exposed interior lands of northwestern Ontario were, for a time, sub-artic tundra/taiga (e.g., mainly treeless) that would have supported herds of caribou; Sites from this period are typically found near relict shorelines (e.g., Lake Minong and Lake Agassiz) and inland river terraces
Early Archaic	7500–6000 BC	As the glaciers melted and retreated, people expanded into the emerging landscape of the Canadian Shield; During the Nakina Phase (ca. 7000 BC) and Driftwood Stadial (ca. 6100 BC), glaciers, glacial lakes and post-glacial environmental factors would have provided an unattractive setting for early hunters and gatherers in northern Ontario

Sub-Period	Timeframe	Characteristics
Middle and Late Archaic	6000–700 BC	As the land rebounded and became fertile (e.g., modern boreal forest environment), new traditions emerged (e.g., Shield Archaic in the north and Laurentian Archaic in the south); Shield Archaic peoples best understood as caribou hunters and fisherman; Material culture is marked by the appearance of copper tools and the likely manufacture of the birch bark canoe; Copper tool manufacture is largely linked to the 'Old Copper Culture' of the western Lake Superior basin; Far-reaching trade relations also emerged during the Archaic period, which likely played a major role in the spread of later Woodland technologies and lifeways
Early and Middle Woodland	700 BC–AD 900	Primarily distinguished from the earlier Shield Archaic by the widespread appearance of pottery; Some argue that pottery did not appear until ca. 200 BC; Laurel tradition dominant in northern Ontario; Pottery is often cone-shaped, with plain bodies and stamp impressions on the shoulder and rim; Moose and beaver were important sources of food and secondary goods; Seasonal campsites were utilized; Material culture consisted of a variety of stone and bone tools, including scrapers, arrowheads, knives, net-sinkers, awls, harpoons and beaver incisor knives; Some evidence of the consumption of wild rice and domesticated plant foods such as maize during the Middle Woodland, but the origin and extent of this development is unclear
Late Woodland	AD 900–1600	Area occupied by Algonquian-speaking peoples; Traditions in this region developed alongside those of the Iroquoian-speaking Huron-Petun of southern Ontario; Ceramic styles predominantly derived from the south, but also influences from Lake Superior; Adopted smoking pipes and ossuary burials from the Huron-Petun, but tool traditions and houses were dissimilar; Engaged in frequent dog burials; Practised corn horticulture in a partial way

2.1.1.2 Post-Contact

The arrival of European explorers and traders at the beginning of the 17th century triggered widespread shifts in Indigenous lifeways and set the stage for the ensuing Euro-Canadian settlement process. Documentation for this period is abundant, ranging from the first sketches of Upper Canada and the written accounts of early explorers to detailed township maps and lengthy histories. The Post-Contact period can be effectively discussed in terms of major historical events, and the principal characteristics associated with these events are summarized in Table 2.

Table 2: Post-Contact Settlement History
(Kirkwood and Murphy 1878; ODCL 1884; Hardy 1894; Coyne 1895; Anderson 1898; Dobie 1909; Howard 1917; Mika and Mika 1977; 1983; Shragge and Bagnato 1984; Ellis and Ferris 1990; AO 2022; TBR 2022; Lavallé 2023)

Historical Event	Timeframe	Characteristics
Early Exploration	Early 17th century	Contact with European fur traders began in late 1500s or early 1600s; Brûlé explores southern Ontario in 1610; Champlain visits in 1613 and 1615/1616; Iroquoian-speakers (Huron, Petun and Neutral) and Algonquian-speakers (Anishinabeg) encountered; Anishinabeg were primarily seasonal hunters and had few fixed settlements, unlike the more sedentary Iroquoian-speakers of southern Ontario; Extensive trade relations in place with their Huron neighbours, where furs and meat were traded for corn and fish-nets
Increased Contact and Conflict	Mid- to late 17th century	Conflicts between various First Nations during the Beaver Wars result in numerous population shifts; European explorers continue to document the area, and many Indigenous groups trade directly with the French and English; 'The Great Peace of Montreal' treaty established between roughly 39 different First Nations and New France in 1701

Historical Event	Timeframe	Characteristics
Fur Trade Development	Late 17th to mid-18th century	The French established and maintained trading posts along the Upper Great Lakes, offering enticements to attract fur traders from the First Nations; Peace between the French and English with the Treaty of Utrecht in 1713; The fur trade introduced new technologies and economic relationships into the forager lifestyle of the Anishinabeg, and European-manufactured goods replaced some traditional technologies; Ethnogenesis of the Métis; Hostilities between French and British lead to the Seven Years' War in 1754; French surrender in 1760
British Control	Mid-18th century	*Royal Proclamation* of 1763 recognizes the title of the First Nations to the land; Numerous treaties subsequently arranged by the Crown; First land cession under the new protocols is the Seneca surrender of the west side of the Niagara River in August 1764; The Niagara Purchase (Treaty 381) in 1781 included this area; Fur trade continued to develop, eventually dominated by the Hudson's Bay Company
Loyalist Influx	Late 18th century	United Empire Loyalist influx into southern Ontario after the American Revolutionary War (1775–1783); British develop interior communication routes and acquire additional lands; *Constitutional Act* of 1791 creates Upper and Lower Canada; Many new counties and townships created in southern Ontario; Northern Ontario remained in the hands of the First Nations
District Formation	Mid-19th to early 20th century	Euro-Canadian interest in lands along the north shores of Lake Superior and Lake Huron increased in the 1840s, as mining companies began to send prospectors, surveyors and engineers into the area; Robinson-Superior Treaty (Treaty 60) and Robinson-Huron Treaty (Treaty 61) completed in 1850; Algoma District created in 1858, with Sault Ste. Marie as the district seat; Michipicoten Post administered posts at Pic, Long Lake and Red Rock before its closure ca. 1904; Wawa surveyed by J. Cozens in 1897; Algoma Central Railway chartered in 1899 to transport iron ore from the Helen Mine to Sault Ste. Marie; James Bay Treaty (Treaty 9) completed in 1905 and 1906
District Development	Early to mid-20th century	Employment opportunities included agriculture, logging, transporting goods, mining and continued railway construction; Algoma Central Railway opened to Michipicoten in 1911 and Hearst in 1914, crossing the Canadian Pacific Railway at Franz and the Canadian National Railway at Oba; The portion of the Trans-Canada Highway between Sault Ste. Marie and Wawa was completed in 1960; The closing of this 'Big Gap' facilitated further development in northern Ontario, connecting isolated communities and providing transportation options; International bridge crossing at Sault Ste. Marie opened in 1962

2.1.1.3 Town of Blind River

The general location of Blind River was believed to have been noted by Samuel De Champlain in 1632 as a yearly gathering place for drying berries for the surrounding Indigenous Nations (Mika and Mika 1977). Sustained Euro-Canadian activity in the area was not until 1789 when the Northwest Company established a Fur Trading post at the mouth of the Mississaugi River to the west. Following its purchase by the Hudson Bay Company, business slowed and many fur traders settled in the surrounding area (Town of Blind River 2022). The river was named as it was difficult for early voyageurs to see from the lake, but the town proper did not adopt this name until the late 19th century. It was initially known by locals as *Le Petit Moulin* or *The Little Mill* (Mika and Mika 1977; Albert *et al* 1996).

By the mid-19th century, the discovery of copper in the Bruce mines spurred further settlement in the area. In order to supply the lumber demands of the mine, Joseph Salvail of Montreal established the first sawmill at the eastern outlet of the Blind River in 1853. He chose the location as it facilitated the construction of dams for power, and the resulting ponds allowed the storage of timber logs (Albert et al. 1996). It is said to have been at the location of the present-day Old Mill Motel (Town of Blind River 2022). Subsequent arrivals were predominantly of French origin,

attracted by the growing lumber industry. The area soon attracted further lumber interests and quickly became a significant lumber center in the Great Lakes, with American tug-boats bringing the lumber to Saginaw and Thunder Bay (Rupp 1955; Kauffmann 1970; Albert et al. 1996). Others were encouraged to migrate by reports of abundant farmland (Kirkwood and Murphy 1878). The first post office was established in 1877, the Canadian Pacific Railway arrived in 1884, and the first school was built in 1897 (Rupp 1955; Mika and Mika 1977; Lavallé 2023).

In 1904, a canal was built to connect the Mississagi and Blind Rivers to facilitate the transportation of logs. Blind River had been incorporated as a town and a second sawmill had been built on the western arm of the town in 1906. By this time, the Mississagi and Blind Rivers were reported to contain 44 lumber camps with over 3,000 people employed at this time. Companies like the Blind River Boom and Slide Company, Blind River Transportation Company and the Blind River Driving Company were established around the turn of the century to manage the logistics of this industry (Kauffmann 1970). The quantity being shipped out of Blind River was such that a separate government wharf had to be built to allow goods other than lumber to be unloaded (Albert *et al* 1996). Other supporting industries included Diagles Powerhouse, two general stores, and the McFadden Lumber Company sawmill, built by Carpenter Hixon Company in 1929 (Mika and Mika 1977). The Great Mississauga Fire in 1948 destroyed many easily accessible timber stocks. A depression in the lumber industry followed which led to the eventual closure of the McFadden Lumber Company in 1969 (Town of Blind River, 2022). Despite these setbacks, it remains a thriving community supported by the lumber industry, the discovery of uranium in 1955 and the arrival of the Trans-Canada Highway in 1960 (Mika and Mika 1977; Shragge and Bagnato 1984).

2.1.2 Past and Present Land Use

2.1.2.1 Overview

During Pre-Contact and Early Contact times, the vicinity of the study area would have comprised a mixture of coniferous trees, mixed-wood forests and open areas. Indigenous communities likely managed the landscape to some degree, but in general, Anishinaabeg populations lived lightly on the land and practised sustainable lifeways. During the mid-19th century, Euro-Canadian settlers arrived in the area and began to clear the forests for agricultural, logging, mining, and settlement purposes. The study area was located within the historical limits of Blind River. The land use at the time of assessment can be classified as a mixture of residential, commercial, infrastructural, wooded areas, water courses and water bodies.

2.1.2.2 Mapping and Imagery Analysis

In order to gain a general understanding of the study area's past land use, historical settlement maps, a geological map, bathymetry and aerial images were examined during the research component of the study. Red areas on the map indicate the associated land archaeological assessment and the current marine archaeological study area is indicated in blue on the accompanying maps.

The study area consists of shallow waters, less than 10 m in depth. Tackabury and Walling's *Atlas of the Dominion District of Nipissing* (1874) has limited information but identifies several key details, including the outline of the Township of Cobden and the location of Blind River with a

labelled "Salvaile's Mills" likely referencing the sawmill established by the Salvail family on the east arm at the mouth of the Blind River (Map 2). No other details related to the marine infrastructure appear on the map. In S. James' *Plan of Mining Location being part of the Indian Reserve in the Township of Cobden, Algoma* (1882), there is no indication of any marine infrastructure in the study area although there is clearly a breakwater located at the west end of the mouth of Blind River (Map 3). Rand McNally and Co.'s *The Family Atlas of the World* (1890) and *The Unrivaled Atlas of the World* (1905) both illustrated the previous establishment of the Canadian Pacific Railway (CPR) directly through the community of Blind River, but neither illustrates any marine related infrastructure (Map 4 and Map 5).

Charles E. Goad's *Blind River, Algoma District, Ontario, 77 miles east of Sault St. Marie on Canadian Pacific Railway, October 1915* (1915), the Fire Insurance Plan for the Town of Blind River, provided details regarding the historical composition of the now Town of Blind River, including the nearby White Pine Lumber Company and other marine infrastructure further west extending into the North Channel of Lake Huron (Map 6). The 1964 geological map does indicate marine infrastructure at the mouth of Blind River, but nothing in the study area itself (Map 7).

2.1.3 Marine Historical Research

A description of current conditions in Section 1.2 clearly indicates that the majority of man-made modifications to the environs are at the mouth of Blind River, west of Blind River and in the river itself. While these modifications appear to be principally located outside the study area, the Sailing Directions (Canadian Hydrographic Service 2021) indicate the numerous shallow shoals and rock outcroppings around the study area and environs. These obstructions and shallow waters would have made any journey into and out of the Blind River harbour perilous, suggesting that the study area may have potential for the location of marine archaeological resources in the form of shipwrecks, canoes, etc.

The North Channel, the northern arm of Lake Huron, is in south-central Ontario, and lies between the Ontario mainland (north) and the islands of Manitoulin, Cockburn and Drummond. It is 120 miles long (195 km) and 1 to 20 miles (1.6 to 32 km) wide. The channel is connected on the west with St. Mary's River (via St. Joseph Channel) and on the east with Georgian Bay. Many small islands lie within the channel.

The early chart by Boulton (Figure 4) shows the location of the Blind River Mill at the mouth of the river and the two breakwaters on either side of the river mouth. The study area lies just west of Harriette Island and extends outwards towards Susanne Island. During this time period, waters were still very low, averaging 2.7 m.

A review of marine survey charts and officially published "Sailing Directions" and "Pilots" indicates that historically there was no significant alteration of the near-shore lake bottom between the Blind River "east breakwater" and Henriette Island. The area may have provided limited, shallow anchorage for small vessels over a sand/gravel bottom in less than two fathoms (approximately 3.6 m).

The land between the CPR and the shore was occupied by the White Pine Lumber Company during at least the early part of the 20th century. Being adjacent to the railway, the site was likely used for

the ready shipment of lumber and other wood products. This storage would not have impacted the nearby lake bottom. No marine infrastructure is indicated in the area in 1958 (Figure 5).

For centuries, Lake Huron's North Channel and St. Mary's River have provided the essential passageway, first for Indigenous peoples and then for successive waves of Europeans.

Figure 4: 1887–1888 Chart of the Study Area
(Surveyed by Staff Commodore J.B. Boulton and assisted by Mssrs. W.J. Stewart and D.C. Campbell 1887-8, Government of the Dominion of Canada; Soundings in fathoms)

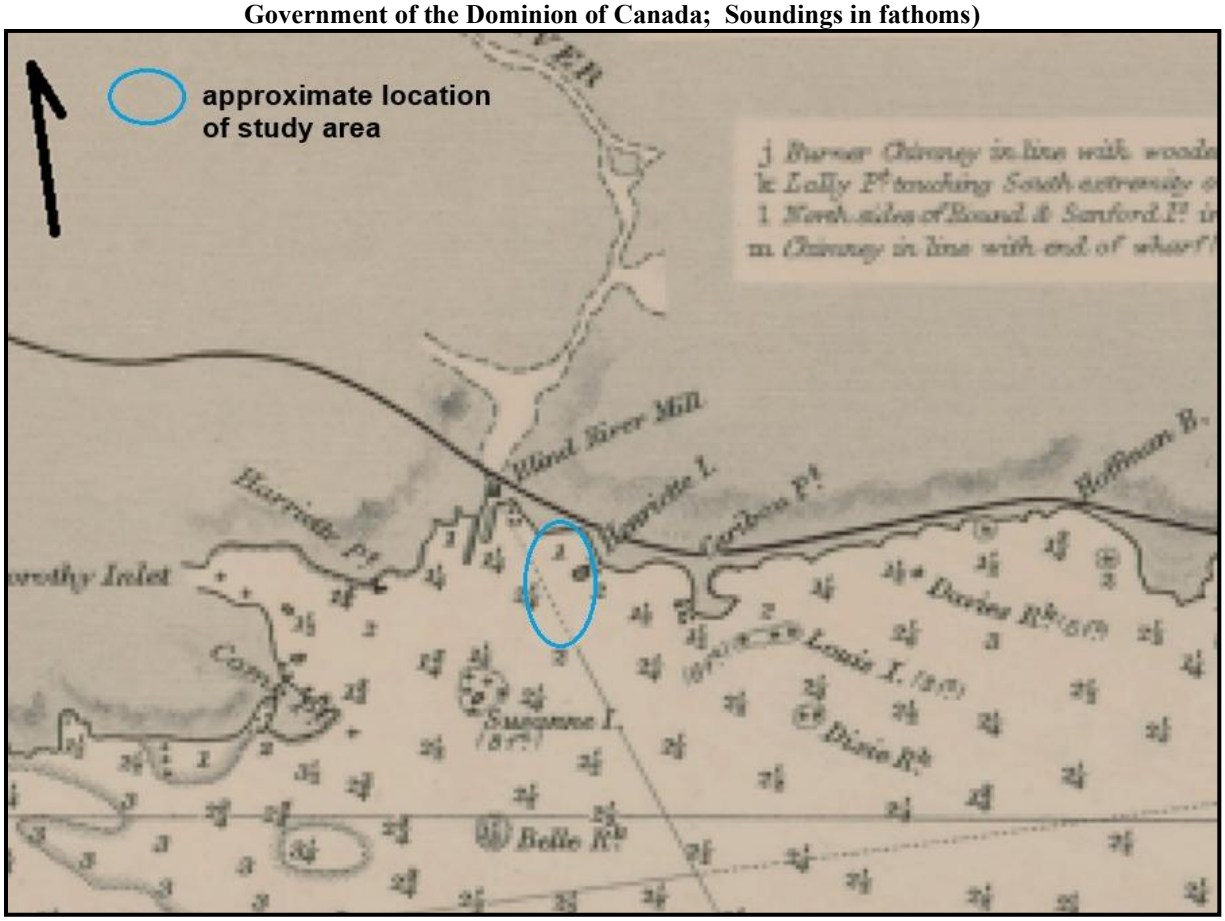
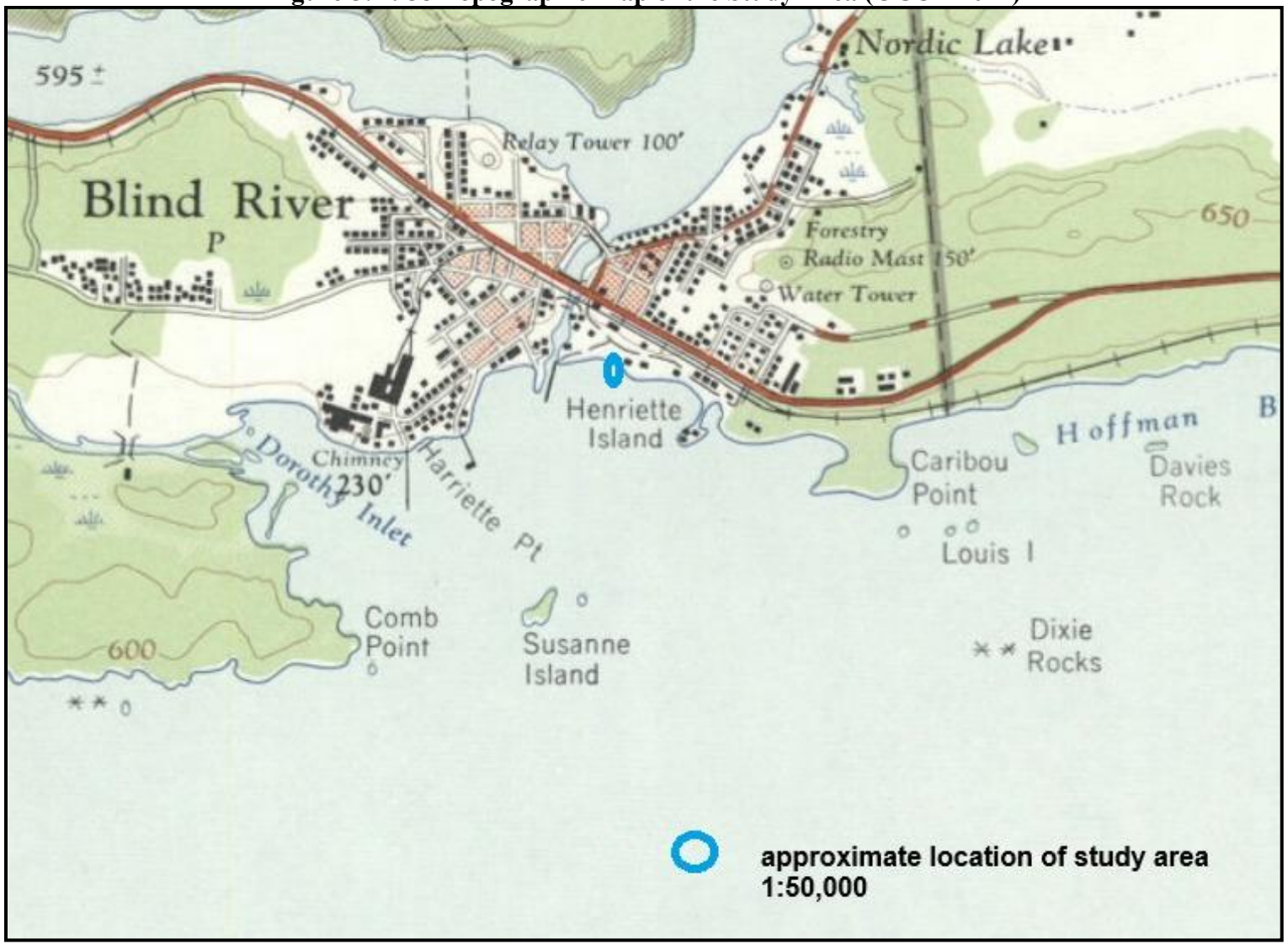


Figure 5: 1958 Topographic Map of the Study Area (OCUL 2024)



2.2 Registered or Known Archaeological Sites

The Ontario Archaeological Sites Database (OASD) and the Ontario Public Register of Archaeological Reports were consulted to determine whether any registered or known archaeological resources occur within a 1 km radius of the study area. MCM reported on September 24, 2024 (email) that there are no registered archaeological sites within 1 km of the marine archaeological study area.

A wider search of 7 km returned an additional 32 registered and three unregistered sites. Communication with Mississauga First Nation identified an additional unregistered site near the study area. The sites are summarized in Table 3.

Table 3: Registered and Unregistered Archaeological Sites within 7 km

Borden No.	Site Name / Identifier	Time Period	Affinity	Site Type	Distance from Study Area
CbHr-1	Poissette	Archaic	Indigenous	Camp/campsite	> 1 km
CbHr-2	Blind River	Pre-Contact	Indigenous	Camp/campsite	> 1 km
CbHr-4	Cataract River	Archaic, Pre-Contact	Indigenous	Camp/campsite, fishing	> 1 km
CbHs-1	Mouth	Other	Unspecified	Findspot	> 1 km
CbHs-2	Chiblow 1	Post-Contact	Indigenous	Findspot	> 1 km
CbHs-3	Mississagi (Chiblow 2)	Post-Contact, Woodland, Late	Ojibwa	Camp / campsite, house	> 1 km
CbHs-4	Bridge (Chiblow 3)	Late Woodland, Post-Contact	Indigenous	Findspot	> 1 km
CbHs-5	Renard	Late Woodland	Indigenous	Camp / campsite	> 1 km
CbHs-6	Swimming Bear	Late Woodland, Post-Contact	Indigenous	Large camp / campsite	> 1 km
CbHs-7	Falls	Late Woodland, Post-Contact	Indigenous, Euro-Canadian	Burial ground, Fur Trade Post	> 1 km
CbHs-8	Wood	Late Woodland	Indigenous	Camp / campsite	> 1 km
CbHs-9	Poor Little Tree Site	Late Woodland	Indigenous	Unspecified	> 1 km
CbHs-10	Kor Rock Structure	Unspecified	Unspecified	Rock structure, Puckasaw Pit	> 1 km
CbHs-11	Contemporary Bear	Pre-Contact, Post-contact	Indigenous	Camp / campsite	> 1 km
CbHs-12	Sayer's	Pre-Contact, Post-Contact	Indigenous	Unspecified	> 1 km
CbHs-13	Tippecanoe	Post-Contact	Indigenous	Unspecified	> 1 km
CbHs-14	Patrick Point Rock Structure	Unspecified	Indigenous	Rock structure	> 1 km
CbHs-15	Boom Camp	Late Woodland	Indigenous	Camp / campsite	> 1 km
CbHs-16	Whippoorwill Rock Structure	Unspecified	Indigenous	Rock structure	> 1 km
CbHs-17	East Terrace 1	Woodland, Late	Algonkian	Camp/campsite	> 1 km
CbHs-18	East Terrace 2	Woodland, Late	Algonkian	Camp/campsite	> 1 km
CbHs-23*	Mary Bonefant	Late Woodland	Indigenous	Unspecified	> 1 km
CbHs-24*	Rock Cut	Late Woodland	Indigenous	Unspecified	> 1 km
CbHs-25*	White Tail Deer	Late Woodland	Indigenous	Unspecified	> 1 km
CbHs-26*	Flying Hawk	Post-Contact	Euro-Canadian	Unspecified	> 1 km

Borden No.	Site Name / Identifier	Time Period	Affinity	Site Type	Distance from Study Area
CbHs-27*	Thomas Farm	Post-Contact	Euro-Canadian	Unspecified	> 1 km
CbHs-28*	Sweet Marie	Late Woodland	Indigenous	Unspecified	> 1 km
CbHs-29*	Moonlight Beach	Late Woodland	Indigenous	Unspecified	> 1 km
CbHs-30*	Cormorant	Late Woodland	Indigenous	Unspecified	> 1 km
CbHs-31*	Warren Neufeld	Late Woodland	Indigenous	Unspecified	> 1 km
CbHs-32*	Ruby Rouge	Post-Contact	Euro-Canadian	Unspecified	> 1 km
-	99HPGCC-1	Unspecified	Unspecified	Mound Structures	> 1 km
-	99HPGCC-2	Woodland	Indigenous	Unspecified	> 1 km
-	99HPGCC-3	Woodland, Post-Contact	Indigenous, Euro-Canadian	Unspecified	> 1 km
-	27 Centre Street	Post-Contact	Euro-Canadian	Homestead	300 m – 1 km

* Recorded in reporting with associated Borden but not registered with MCM

None of the previously identified sites are located within 300 m of the subject land, and they are not direct features of potential. The site identified as 27 Centre Street was subject to limited excavations by avocational archaeologist Lois Jones on the property briefly associated with Norman Bethune, an innovative Canadian thoracic surgeon from the early 20th century. Finds were limited, and the site was never registered with the OASD (A. Hawkins pers. Communication). Additionally, on the northern bank of the Blind River, across from the Town Hall, a member of the Mississauga First Nation recovered two Early Woodland projectile points: a Kramer style and a Kramer/Meadowood cross (J. Cousineau, pers. communication).

The absence of sites near Blind River reflects a lack of assessment in the area rather than an absence of archaeological potential. A review of archaeological sites within the wider area provides insights into the site types potentially within the study area and the surrounding landscape. Nineteen registered and ten unregistered archaeological sites are located within the Mississagi River delta between 3 to 7 km to the west of the current study area. All were identified prior to the current *S&Gs* or as part of research projects and do not adhere to the current standards of archaeological assessment.

Archaeological work in this area began with the archaeologist J. V. Wright in 1961 when he identified the Chiblow 1 (CbHs-2), Chiblow 2 (CbHs-3), Chiblow 3 (CbHs-4) and Mouth (CbHs-1) sites. Helen Devereux conducted excavations of the Chiblow 1 (CbHs-2) and Chiblow 2 (CbHs-3) sites in 1962 and 1963 while also identifying the Contemporary Bear (CbHs-11) site. All of these sites were notably identified on the east bank of the Mississagi River (Bertulli and Kilpatrick 1977; Archéologie Illimitée Inc. 1981).

Wright returned with W. C. Noble to conduct work on the Chiblow 3 (CbHs-4) site and identified the Falls (CbHs-7) site in 1964 and 1968. A more extensive survey was conducted by Morris Brizinski and Helen Devereux of Laurentian University in 1975 on behalf of the Ontario Ministry of Natural Resources. Their work focused on Fox Island, Weber Island and Island No. 5 within the delta. They identified the Renard (CbHs-5), the Wood (CbHs-8), Poor Little Tree (CbHs-9) and Kor Rock Structure (CbHs-10) sites on Fox Island as well as the Swimming Bear Site (CbHs-6) on Island No. 5 (Brizinksi 1975). Salvage excavations were completed for the Renard (CbHs-5) due to the erosion of the site into the river. A trench consisting of 27 1 m^2 units was excavated

along the bank, yielding Indigenous ceramics, lithics, and copper artifacts with features including pits and several hearths/possible hearths (Bertulli and Kilpatrick 1977).

Laurentian University returned in 1977 under M. M. Bertulli, identifying an additional six sites including the Boom Camp (CbHs-15), Sayer's (CbHs-12), Tippecanoe (CbHs-13), Patrick Point Rock Structure (CbHs-14) and Whippoorwill Rock Structure (CbHs-16) sites. Further survey was completed at the Boom Camp Site simultaneously with excavations at the Renard (CbHs-5), Falls (CbHs-7), and Chiblow 3 (CbHs-3) sites (Bertulli 1981).

Further work in the area was completed by Archéologie Illimitée Inc. in 1980, prior to the development of a uranium hexafluoride refinery by Eldorado Nuclear Ltd. Alongside several sites related to the early logging activity and domestic occupation of the area, they identified the East Terrace 1 (CbHs-17) and East Terrace 2 (CbHs-18) sites (Archéologie Illimitée Inc. 1981). CbHr-2 was noted in the OASD as identified in advance of the impacts of Eldorado Nuclear. However, the Archéologie Illimitée Inc. report does not provide additional information on this site.

Brizinksi later returned to the area in 1995 to conduct a survey of lands previously impacted by the Huron Among the Pines Golf Course, motivated by a site discovery during the earlier field school. The goal of the survey was to determine the intensity of habitation by Indigenous and early Euro-Canadian peoples along an extinct beach ridge of the Mississagi River. The survey of surface debris resulted in the identification of an additional ten sites including seven Late Woodland Indigenous and three Euro-Canadian sites, all in varying degrees of disturbance aside from Mary Bonenfant (CbHs-23). Site types were not provided, but the presence of Indigenous ceramic, lithic tools, and fire-cracked rock suggest at least seasonal occupation campsites, with Late Woodland being a particularly optimal time for this now-extinct beach ridge. Borden numbers were provided for the sites, but they were never formally registered with the MCM and listed in the OASD. Further historical research on the Euro-Canadian sites and protection of the undisturbed portion of the Indigenous sites was recommended (Brizinski and Wood 1995).

Woodland Heritage Services Limited (WHS) later returned in 1999 prior to a proposed expansion of the now Huron Pines Golf & Country Club to the north from a 9-hole course to an 18-hole course (WHS 1999). The assessment determined that large sections of the golf course area had been heavily landscaped and or completely stripped of top soils. They conducted a pedestrian survey with intervals of 3 m for areas previously cleared of top soils. Areas where original soils were intact were subject to test pit survey with intervals of 10 m and reduced to 5 m when archaeological resources were identified. The goal of the assessment was to relocate the ten archaeological sites identified in 1995 along with Chiblow 1 (CbHs-2) and Chiblow 2 (CbHs-3) sites to evaluate the potential for development impacts of the golf course expansion.

The Mary Bonenfant (CbHs-23), Rock Cut (CbHs-24), Thomas Farm/Four (CbHs-27), Ruby Rouge (CbHs-32), Moonlight Beach (CbHs-29), Chiblow 1 (CbHs-2) and Chiblow 2 (CbHs-3) sites remained outside of the development impacts and were subjected only to a limited pedestrian survey. Of these six sites, only Ruby Rouge (CbHs-32) yielded additional artifacts which included primarily scrap metal and broken glass. White Tail Deer (CbHs-25) was relocated by pedestrian and test pit survey, while Warren Neufeld (CbHs-31) was relocated by just a test pit survey. Additional artifacts recovered included Indigenous ceramics along with quartz and chert tools, but

these were all recovered from disturbed contexts. Similarly, the test pit survey recovered several chert flakes in a heavily disturbed context potentially related to the Cormorant Site (CbHs-30). Flying Hawk (CbHs-26) appeared to have since been completely destroyed. The original location of the Sweet Marie site (CbHs-28) and Moonlight Beach (CbHs-29) sites was subject to a test pit survey, but no additional artifacts were recovered, and their locations could not be confirmed (WHS 1999).

The 1999 investigations identified an additional three sites. The 99HPGCC-1 site was associated with a series of mounds between the Ruby Rouge (CbHs-32) and Thomas Farm/Four (CbHs-27) sites. Test pits around the mounds did not yield any artifacts, so it remains unclear to which period and/or nearby site these mounds may have been associated. Test pits near the Sweet Marie site (CbHs-29) recovered fire-cracked rock and Indigenous ceramic within a buried cultural layer. These finds were identified as the 99HPGCC-2 site. The 99HPGCC-3 site was a larger multi-component Indigenous and Euro-Canadian site. The Euro-Canadian component comprised foundations of potentially three buildings with a large amount of domestic and architectural refuse in the area. It was determined to be historical with a potential fur-trade period component. Test pits in the area yielded flakes, Indigenous ceramic, fire-cracked rock, lithic cores and an assortment of lithic tools. Additional Indigenous artifacts were recovered from eroded sediments along the Mississaugi River but lacked clear contextual information to be associated with a site (WHS 1999).

The assessment determined many of the sites identified by Brizinksi were likely more consolidated archaeological resources separated by more recent activites. The Rock Cut (CbHs-24) and Cormorant (CbHs-30) sites were recommended to be consolidated with the White Tail Deer site (CbHs-25). Similarly, the Ruby Rouge (CbHs-32), 99HPGCC-2, and 99HPGCC-3 sites were proposed to be all part of the Warren Neufeld site (CbHs-31). Areas of the two consolidated sites potentially impacted by the expansion were recommended to be capped by a layer of sterile soil, and no development was to occur outside of the previously assessed areas. If development was to directly impact the Warren Neufeld site (CbHs-31), Stage 4 archaeological assessment was recommended (WHS 1999).

Sites within 7 km of the study area were not limited to the Mississagi Delta. Further north are two additional sites. CbHr-1 was situated northwest of Lake Duborne and noted as identified by Laurentian University but no further information could be obtained. The area is noted by the Mississauga First Nation as an area where projectile points continue to be identified by members of the community and their ancestors had long farmed and fished along these waters. Battle Point, a small peninsula along the lake, was recorded by the Mississauga First Nation as the site of a battle between the Haudenosaunee and Mississauga Ojibway. Local elders note that Haudenosaunee had previously travelled to capture women, and on this occasion, the Ojibway ambushed and defeated them before pushing the remnants down the Penewabecong to the mouth of Blind River. The remnants attempted to hold out on an island at the mouth, and all but one individual was killed. They were spared in order to report the story of the conflict (White 2013). A similar battle was recorded by Bacqueville de La Potherie, the French Royal Commissioner to Canada in the 1690s, in 1653 when a Haudenosaunee force of 120 was defeated north of Manitoulin Island by a combined force of 'Nikikouek, Mississaga, and Saulteurs,' with one survivor left alive (Schmalz 1991: 19). Northwest of CbHr-1, CbHr-2 was identified by Thor Conway in 1991, but only limited information was obtained regarding of the site.

An additional test pit survey on the Chiblow 2 (CbHs-3) site was conducted as part of an Indigenous Archaeological Monitor training project in 2019, yielding artifacts from the 16th and 17th centuries through to the 20th century. Notably, the area remained in use as a boat launch and hunting area until the present (Hawkins 2020). Altogether, these sites demonstrate the potential for archaeological resources within the Blind River area. They also document tangible evidence of the landscape's past and continued importance to the Indigenous peoples of the area and their descendant communities, including the Mississauga First Nation. Additionally, several of the identified sites document the key importance of the Fur Trade and the lumber industry to the development of the area as it presently stands, including a potential Northwest/Hudson Bay Company trading post and several lumber campsites.

2.3 Previous Archaeological Work

Reports documenting assessments conducted within the subject lands and assessments that resulted in the discovery of sites within adjacent lands were also sought during the research component of the study. In order to ensure that all relevant past work was identified, an investigation was launched to identify reports involving assessments within 50 m of the study area. The investigation determined that there are two report documenting previous archaeological fieldwork within the specified distance. These two reports are specifically related to the current Class EA. There were no other land or underwater archaeological assessments conducted within 50 metres of the current study area.

In 2024, ARA conducted a Stage 1 archaeological assessment of the wider eastern bank of the Town of Blind River to review alternatives for the proposed raw water intake and low life pumping station (ARA 2024). Completed under PIF #P1106-0038-2024, the assessment determined that the study area was a mixture of areas of archaeological potential and no archaeological potential. Areas of no archaeological potential were recommended for at least photo-documentation. Areas of archaeological potential were recommended for Stage 2 assessment. The report also recommended if any in-water work is planned within the North Channel of Lake Huron or Blind River, the Criteria for Evaluating Marine Archaeological Potential checklist should be consulted, and a separate Marine Archaeological Assessment may be required.

The Stage 2 assessment of the terrestrial portion of this project is being completed under PIF #P1106-0059-2024 and the report is forthcoming (ARA 2025 [forthcoming]). Completed in 2024, this assessment photo-documented areas visually determined to be disturbed. The test pit survey method was utilized to complete the assessment within the grassed, overgrown area. The initial test pits revealed evidence of extensive disturbance throughout the areas of archaeological potential that were assessed and a combination of visual inspection and judgemental test pit survey was utilized to confirm the extent of disturbance. The Stage 2 assessment did not result in the identification of any archaeological materials and no further was recommended within the study area.

3.0 FIELD ASSESSMENT

A marine archeological assessment was warranted based on the historical use of Blind River as a harbour, association with former lumber mills in the area, and possible Indigenous use of the study area. An aquascope survey and underwater drone survey were conducted for the nearshore study area. Side scan sonar and magnetometer surveys were conducted of the offshore areas. The objective of the survey was to detect and establish the location of any underwater cultural features that may be impacted by the proposed intake.

3.1 Shoreline/Shallow Water Assessment

The marine archaeological assessment was conducted on October 15th, 2024. The waters provided good observation conditions with a maximum visibility of more than one metre to the bottom. The shoreline/shallow water assessment was conducted the width of the study area plus an additional five metres at either end (east and west). The in-water aquascope survey was conducted by traversing the areas in transects of between three and five metres from the shore/lake interface to a distance of about 40 m offshore. The water depth never exceeded two feet. No archaeological resources were located during the in-water shallow water survey. Image 1 – Image 8 illustrate the in-water aquascope assessment and some of the refuse on shore. The cobble beach extended into the water approximately 2 m and then the bottom was sand.

3.2 Side Scan Sonar, Magnetometer and Underwater Drone Survey

The survey equipment for the sidescan sonar survey, magnetometer survey and underwater drone survey consisted of the Survey Vessel Falcon (TC Registration C31414ON), with an Imagenex YellowFin multi-frequency side-scan sonar, an SDM-4000 magnetometer, and a FiFish V6 underwater drone with 4k video camera. Target coordinates were captured using a differential GPS with a positional accuracy of within 1 m. The survey data was collected and collated using Shark Marine's DiveLog software platform. The pipeline corridor and a 20-meter-wide buffer constituted the survey area (Figure 6 and Figure 7).

The geophysical conditions were good, with wind from the north west. The survey was conducted with a geophysical survey and visual drone survey of the pipe corridor as summarized in Figure 6. The geophysical survey coverage is depicted in Figure 7. The boat was unable to get closer to shore because of the shallow water (less than 1 m). Therefore, an underwater drone was used to visually assess the pipe corridor from shore extending south for 100 m, in addition to the aquascope assessment (i.e., 40 m from shore).

The side-scan sonar analysis identified eight targets with morphological characteristics that suggest they are cultural in nature. Three of the targets lie within the pipeline corridor. The location of these targets is shown in Figure 8 and the target coordinates and descriptions are provided in Table 4. The sonar mosaics are provided in Figure 9, Figure 10 and Figure 11.

Figure 6: Methodology (green – geophysical, orange – drone and aquascope/visual)

Figure 7: Geophysical Coverage Area

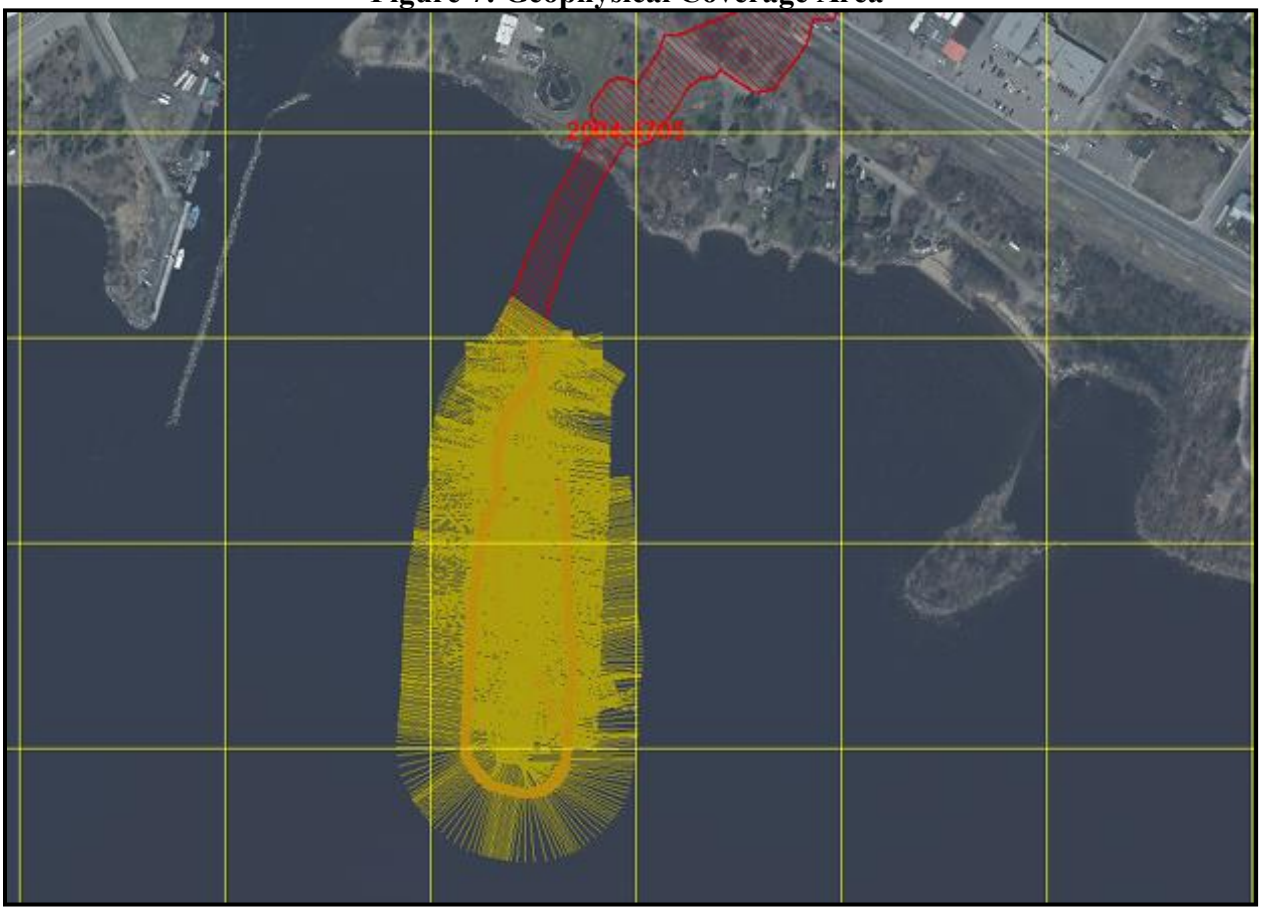


Figure 8: Target Locations in Relation to the Proposed Intake

Figure 9: Side Scan Mosaic Pass 1

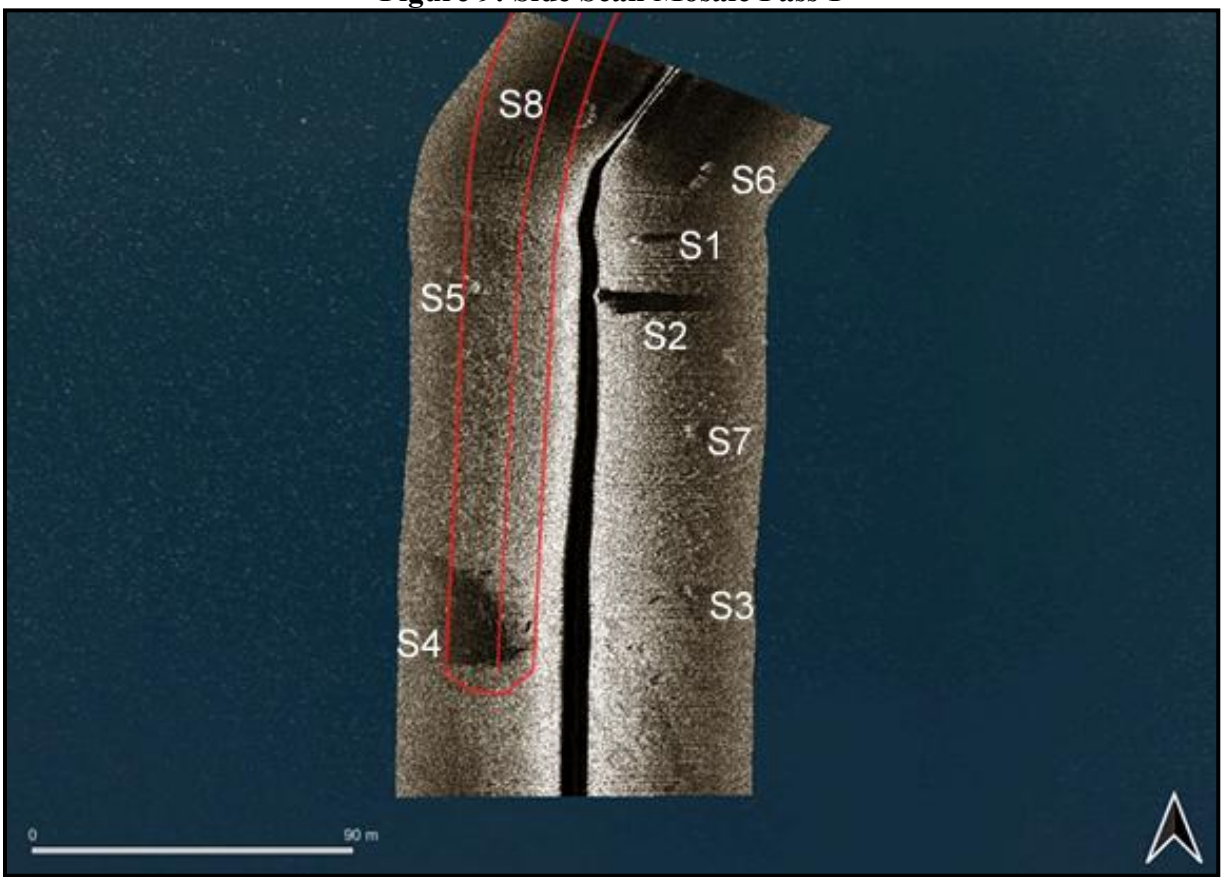


Figure 10: Side Scan Mosaic Pass 2

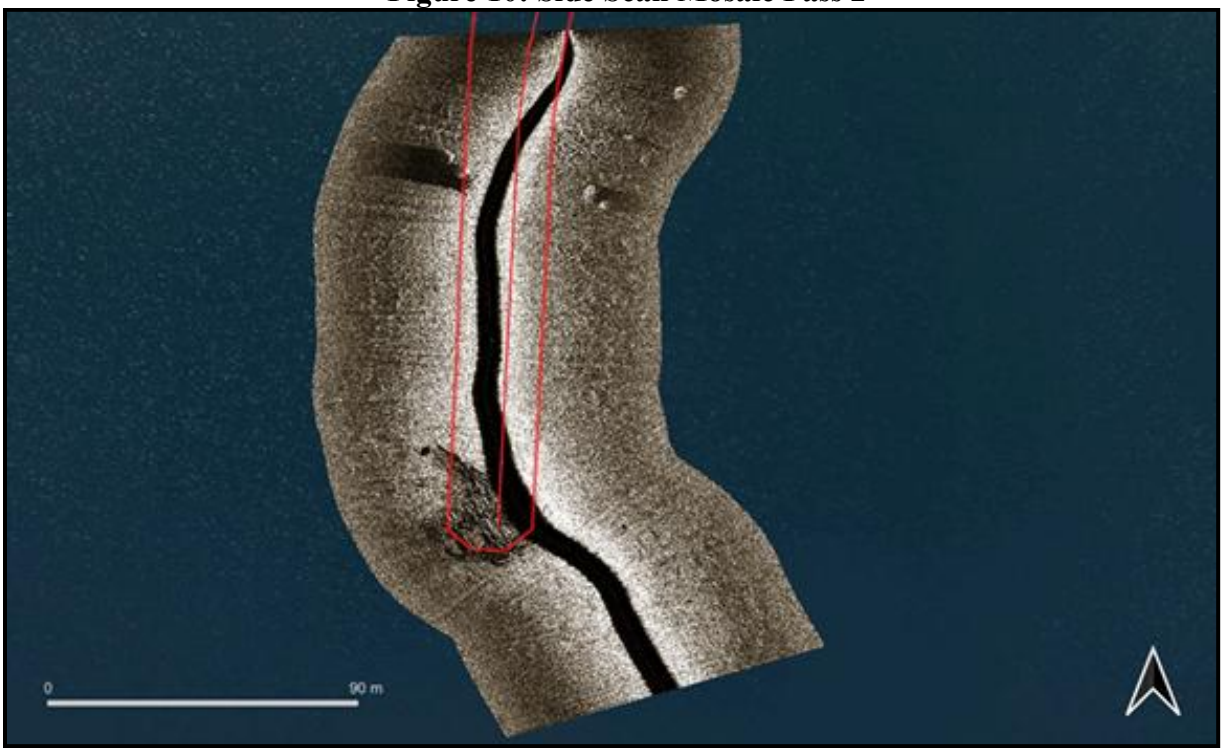


Figure 11: Side Scan Mosaic Pass 3

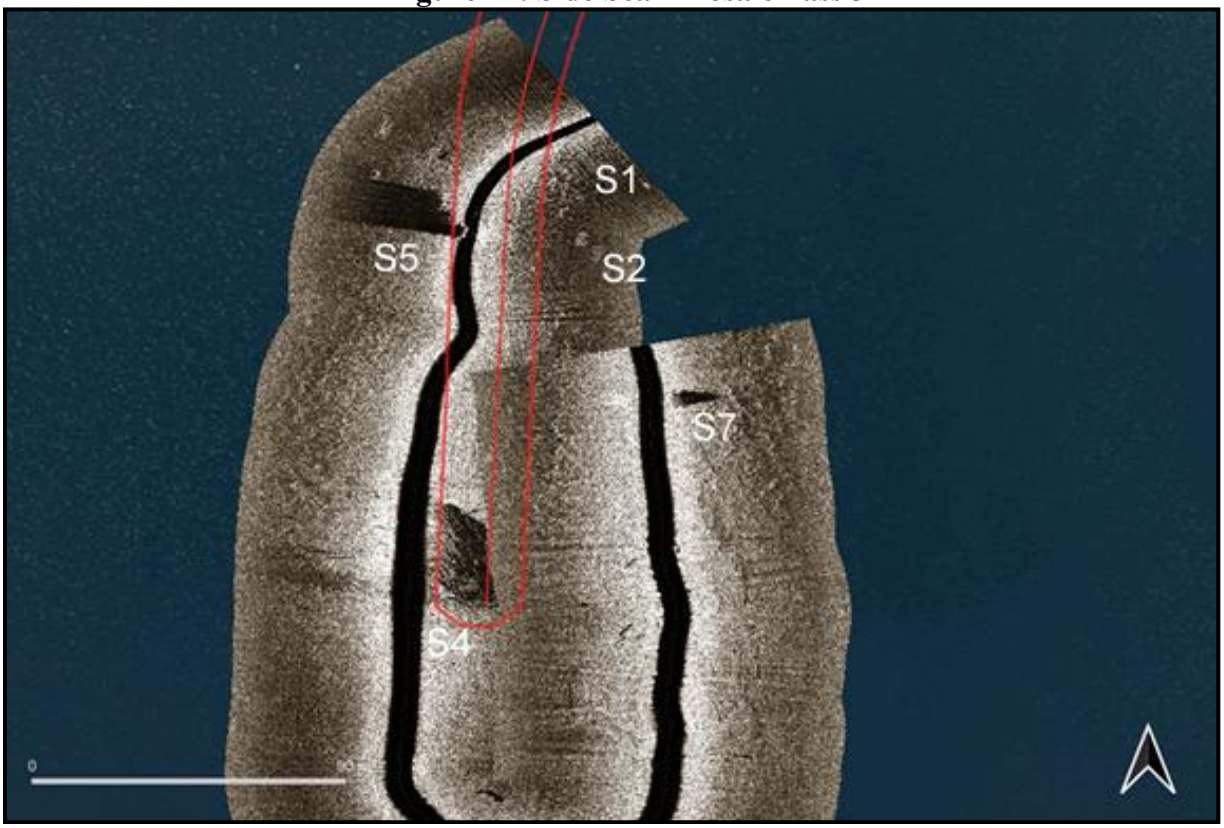


Table 4: Target Locations and Descriptor

Target	Description	Latitude	Longitude
S1	rock pile, possible remnant crib	46.18138	82.9537
S2	crib	46.18116	82.9539
S3	rock pile, remnant crib	46.18011	82.9535
S4*	log dump	46.17997	82.9543
S5*	large crib	46.18124.	82.9544
S6	crib	46.18166	82.9535
S7	crib	46.18085	82.9536
S8*	rock pile with logs, remnant crib	46.1818195	82.9541

Starred (*) targets lie within the proposed corridor. Decimal degrees and WGS84.

Two targets were detected with the magnetometer. The locations correspond to S5 (Figure 12) and S8 (Figure 13). There is undoubtedly metal located in the crib structure which would trigger a magnetometer spike. No other significant magnetic anomalies were detected.

Figure 12: Magnetometer Spike at S5

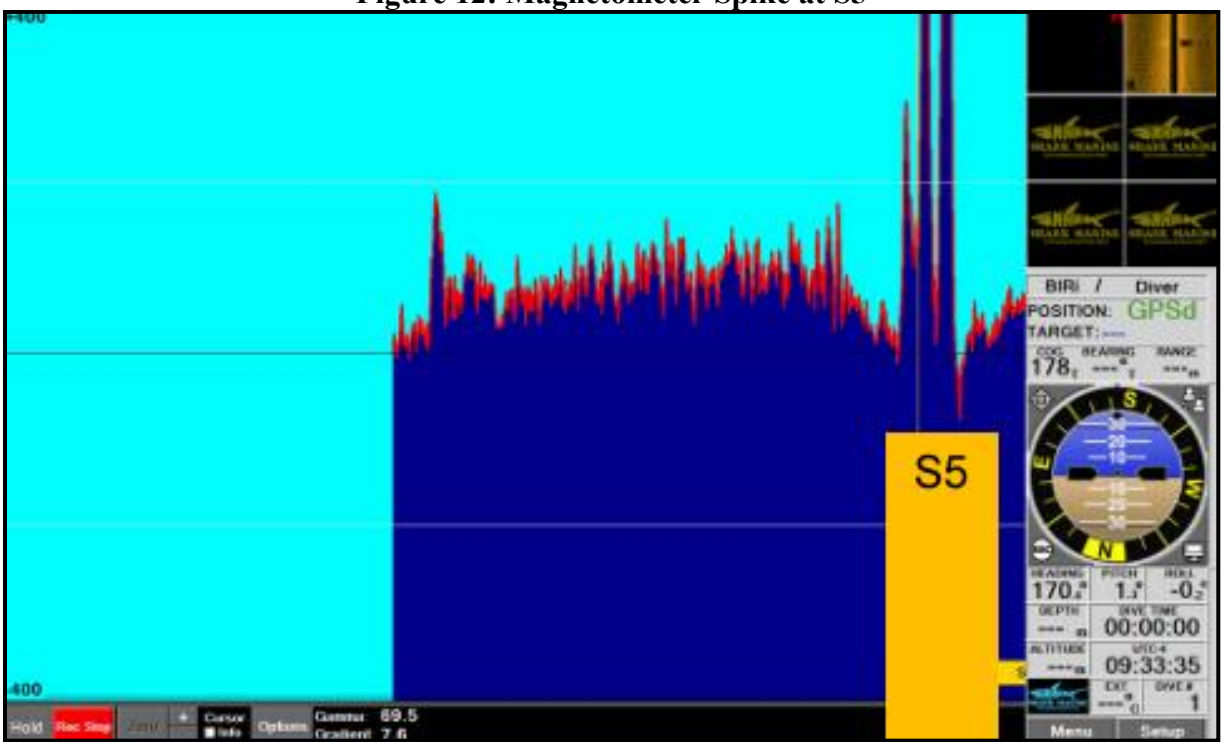
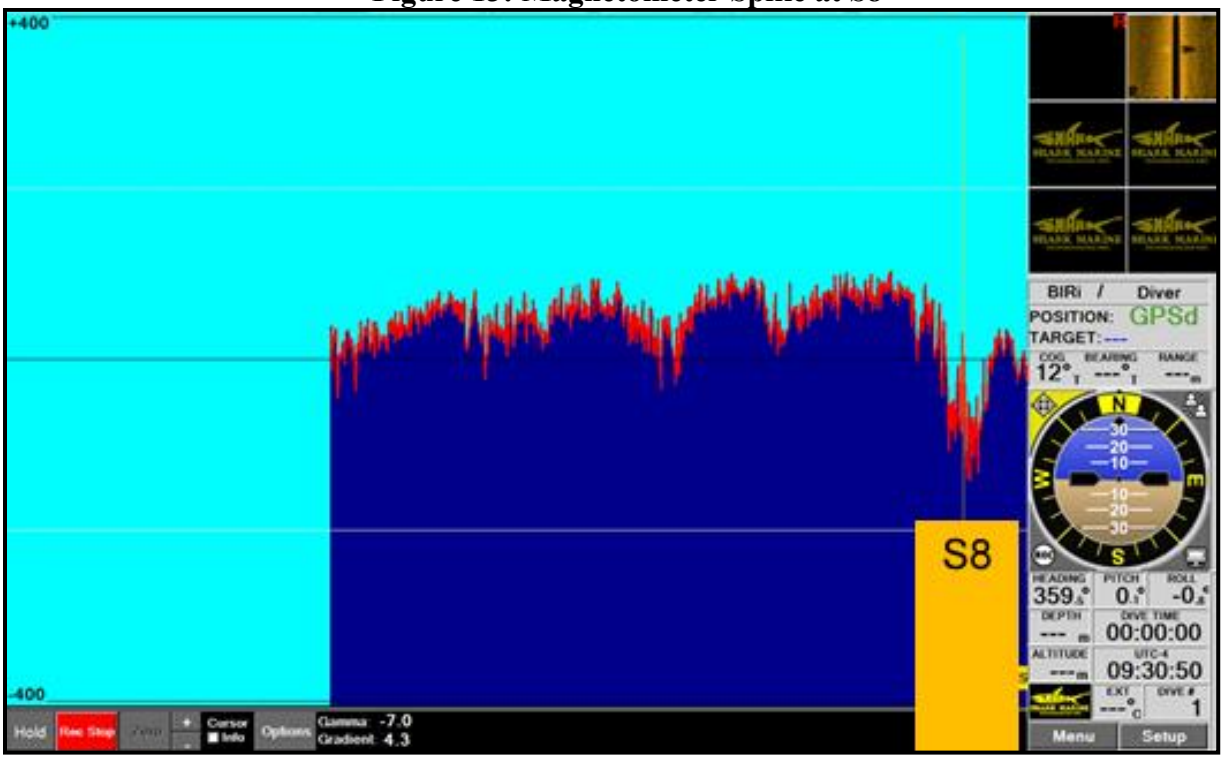


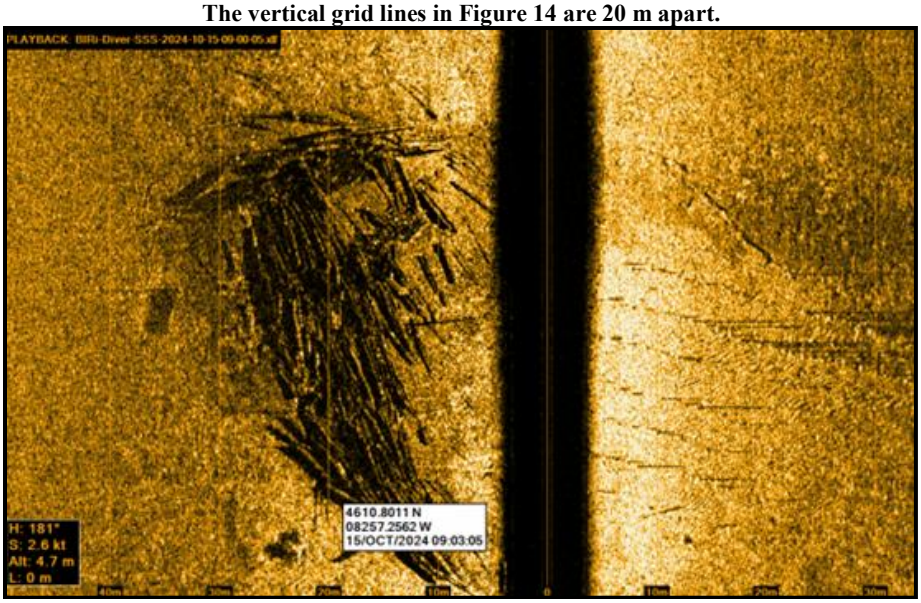
Figure 13: Magnetometer Spike at S8



3.2.1 Descriptions of Targets in Corridor

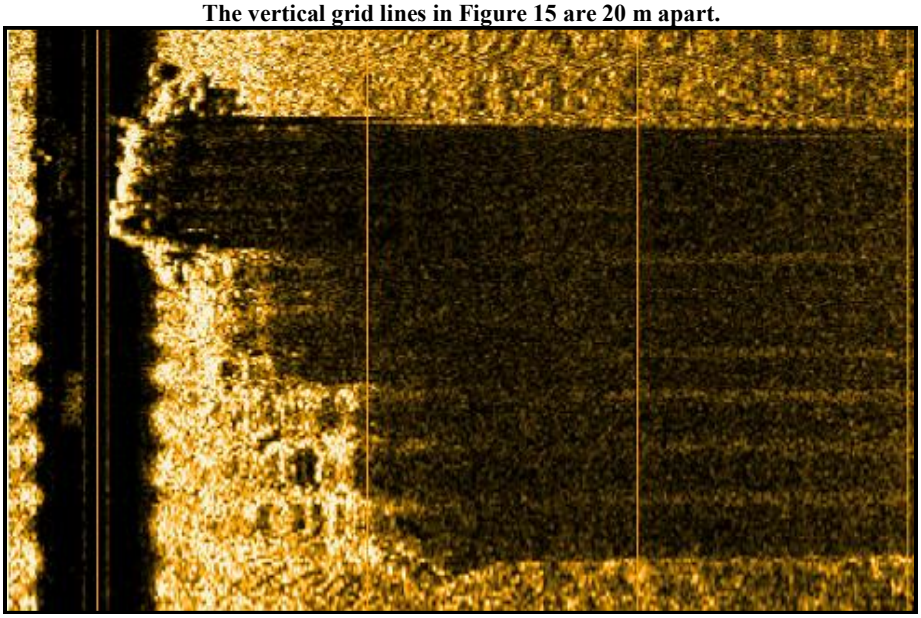
Target S4 is an accumulation of cut logs, approximately 40 m in length and 20 m wide (Figure 14; Image 9;). These do not appear to be the remnants of a structure but are likely the waterlogged and submerged remains of an abandoned log raft/boom.

Figure 14: Target S4 – Probable Remnants of a Log Raft/Boom
The vertical grid lines in Figure 14 are 20 m apart.



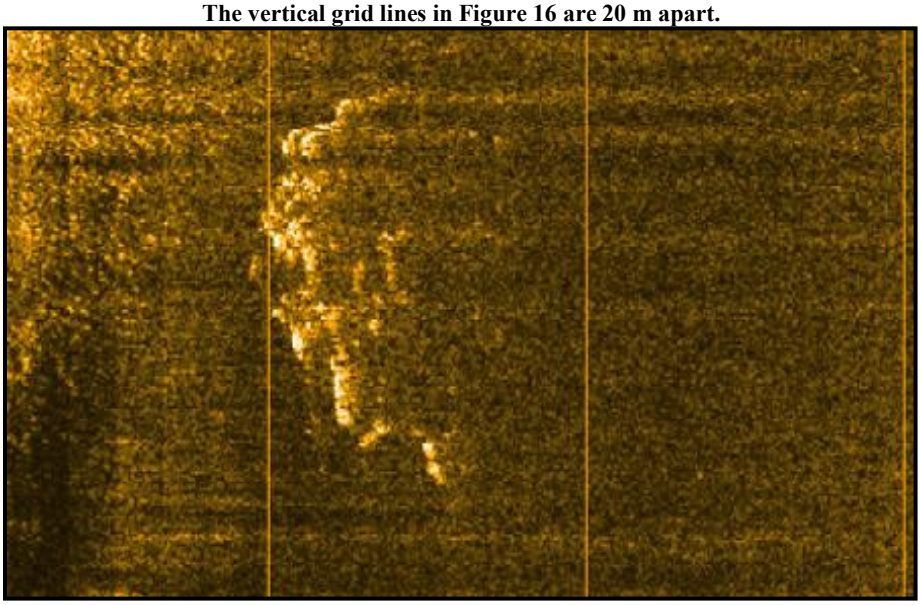
Target S5 is a large triple crib structure (Figure 15; Image 10). It is approximately 15 m in length, 6 m in width, and 2.5 m in height.

Figure 15: Target S5 – Triple Crib
The vertical grid lines in Figure 15 are 20 m apart.



Target S8 is a rock pile, approximately 10 m in diameter and 2.5 m in height (Figure 16; mImage 11). In addition to be a target in the sidescan sonar survey, it also presented as a magnetometer spike. There are logs associated with the rock feature and it is possible that this is a partially destroyed crib.

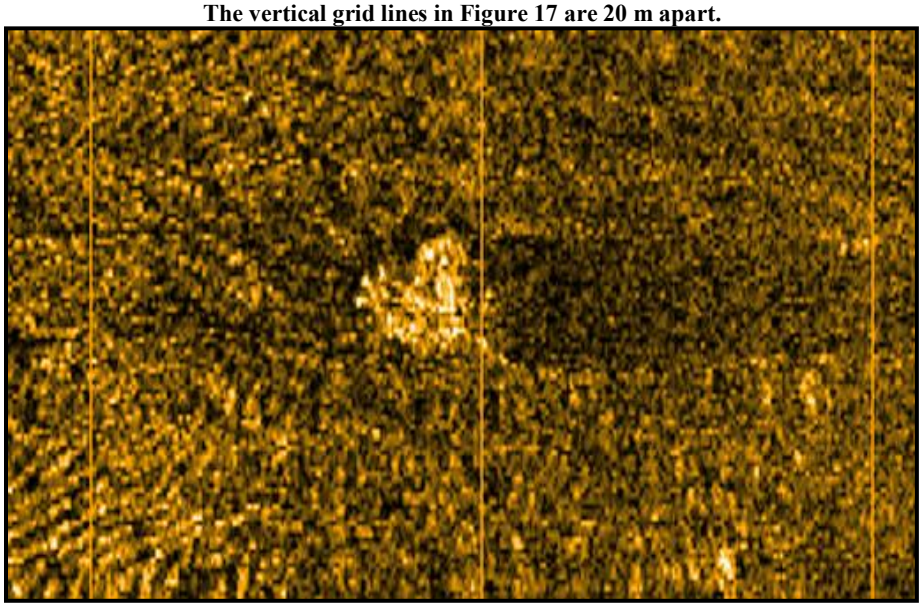
Figure 16: Target 8 – Rock Pile
The vertical grid lines in Figure 16 are 20 m apart.



3.2.2 Descriptions of Targets Outside the Corridor

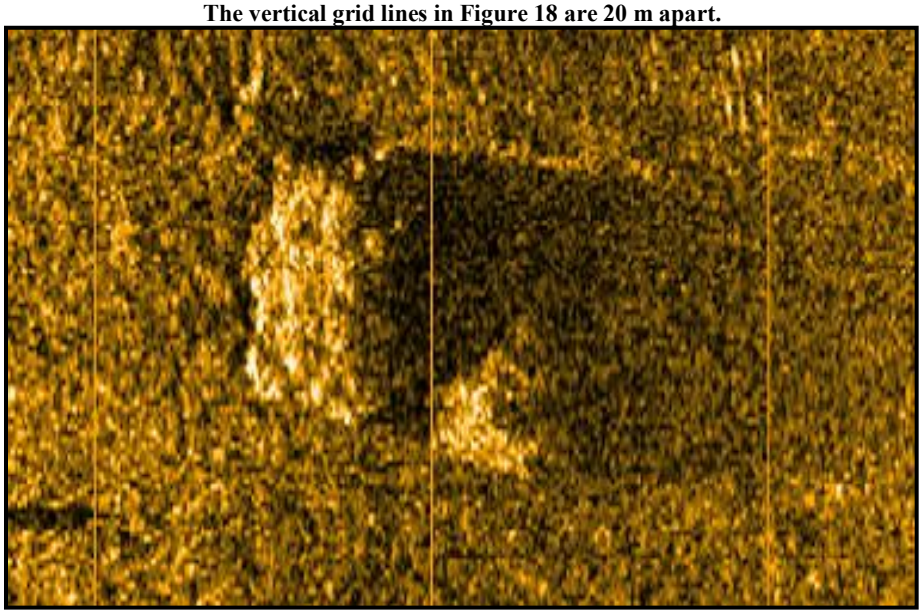
While located outside the study area, these targets are in proximity to the corridor and attention should be paid to avoid the targets. Target S1 is a rock pile, approximately 3 m in diameter and 1.5 m in height (Figure 17; Image 12). Given the diameter and height, it may have been a crib.

Figure 17: Target S1
The vertical grid lines in Figure 17 are 20 m apart.



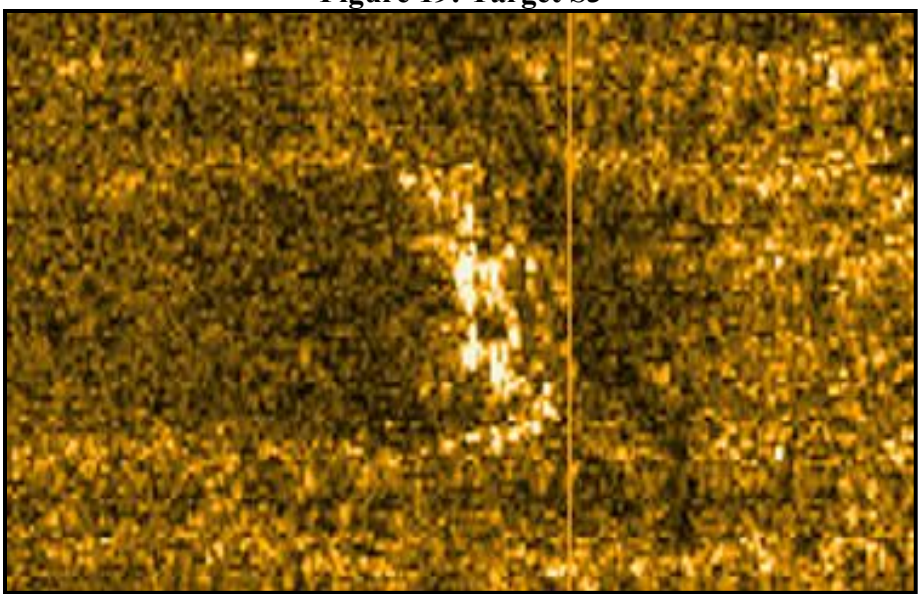
Target S2 is a (double) crib, approximately 4.5 by 4.5 m, length and width, and 2.8 meters in height (Figure 18; Image 13).

Figure 18: Target S2
The vertical grid lines in Figure 18 are 20 m apart.



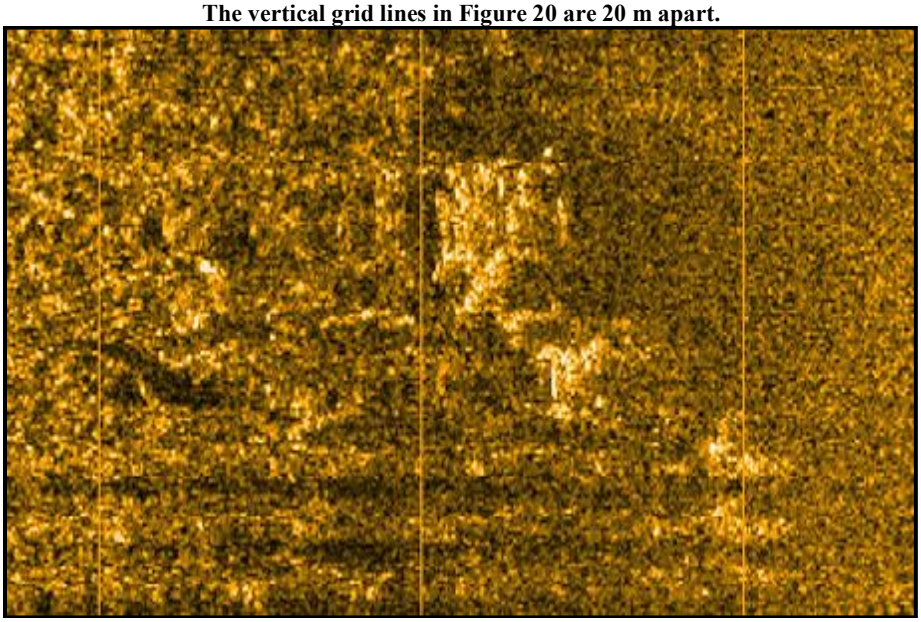
Target S3 is a small rock pile, approximately 3 m in diameter and 1.5 m in height (Figure 19). Given the diameter and height of the stone cluster and no evidence of scatter, this is likely a crib remnant.

Figure 19: Target S3



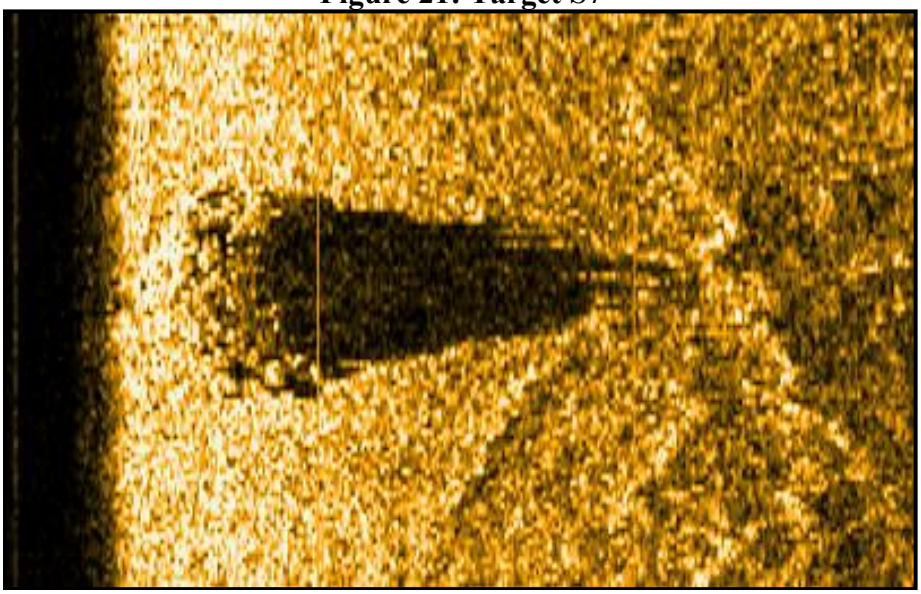
Target S6 is a double crib structure, approximately 8 m by 4 m in length and width, and 2.8 m in height (Figure 20).

Figure 20: Target S6
The vertical grid lines in Figure 20 are 20 m apart.



Target S7 is a crib, approximately 6.4 m in diameter and 2.2 m in height (Figure 21).

Figure 21: Target S7



3.2.3 Underwater Camera Survey of Near Shore Corridor

A FiFish underwater drone was employed to capture video of the near shore corridor, too shallow for sidescan or magnetometer survey. The visibility was approximately 3 meters. No cultural features were detected along the sandy bottom. Sample images are depicted below (Image 14 – Image 17).

4.0 ANALYSIS AND CONCLUSIONS

The shoreline of the North Channel of Lake Huron along the study area has been greatly modified over time, both by people – intentional – and by the environment – wind, waves, ice, changing water levels. A shallow water assessment with aquascope was conducted to detect the nearshore in-water possible resources. No materials were located by aquascope in the nearshore area up to a distance of approximately 40 m from the shoreline (maximum depth of two feet). The underwater drone surveyed 100 m from the shoreline south. No cultural materials were observed in the 100 m. The sidescan sonar and magnetometer survey detected eight cultural hits. Two of the magnetometer hits correlated with two of the sidescan hits (rock piles) and this assisted in identifiying those features as possible remnant cribs. There were only three targets found directly within the corridor: S4, S5 and S8. S4 are sunken logs in large quantity, with cut ends, likely part of a log boom or raft. S5 is a large crib composed of three individual cribs. S8 was identified by sidescan as a rock pile, but also was a magnetometer hit, suggesting metal. A visual of S8 showed several logs in the area as well. Collectively, it is possible that S8 is the remnant of a log crib.

Five other targets were located outside the study area corridor. These are cultural as well and probably formed part of a chain of log cribs that ran from west to east across, not only within the study area but extending from near the mouth of the Blind River east more than 300 m.

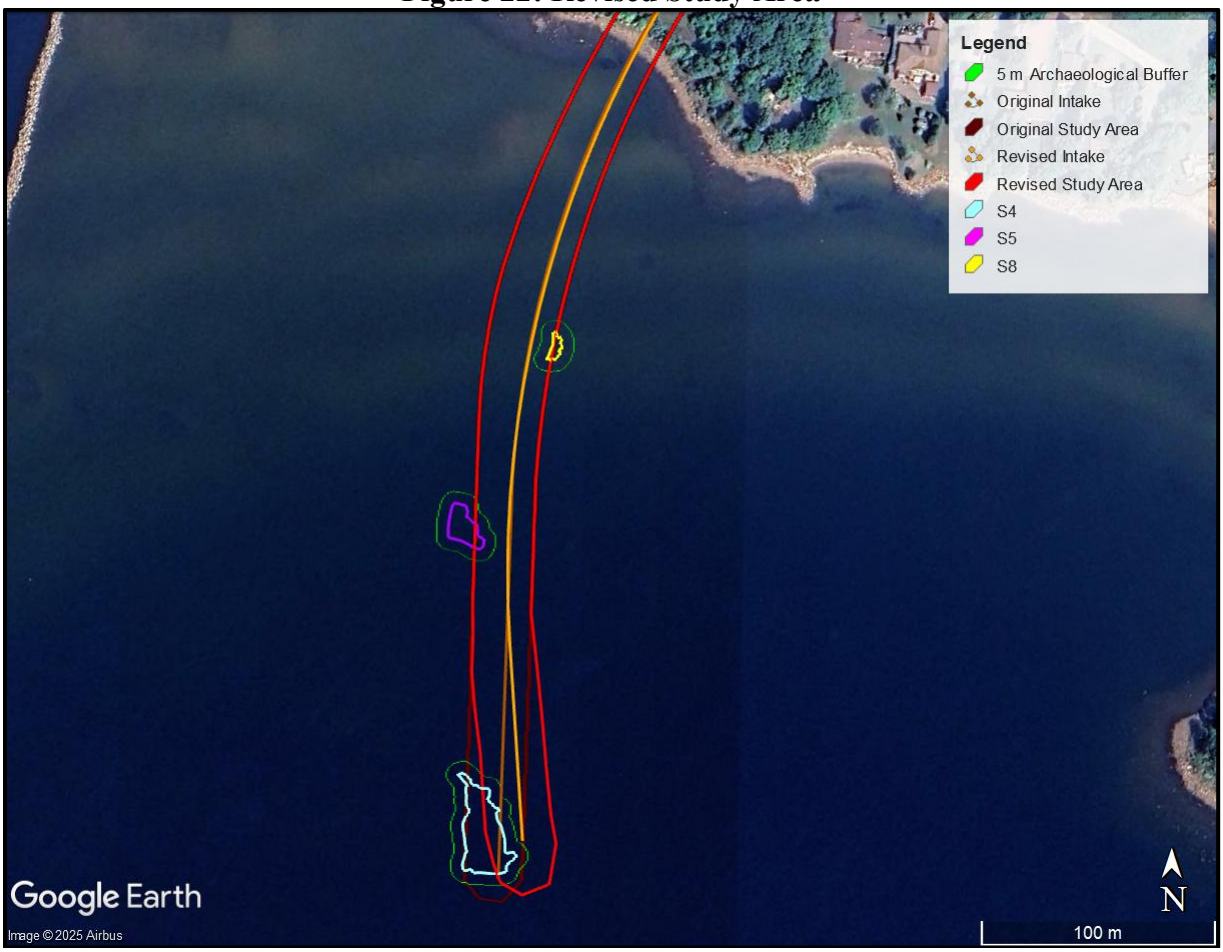
These cribs are part of the lumber industry era, when large rafts of logs were tied together, stored, etc. These cribs constitute a part of history for the community and are considered a significant archaeological resource.

Should impacts to S4, S5 and S8 be unavoidable, the recommendation is that S5 and S8 be subject to a more thorough investigation using underwater cameras to capture information about their construction methods. Technical drawings of these structures would ensure that any vernacular traditions of construction are preserved. Target S4 should have a more thorough investigation using underwater cameras to ensure that there are no additional cultural features present within the accumulation. Following communications with the client, it was determined that S4, S5 and S8 could be avoided along with a 5 m buffer around them by altering the course of the intake to the east (Figure 22).

The raw data consisting of magnetometer files (MAG), side-scan sonar (XTF) and track lines (TRK) are available for download here:
https://drive.google.com/drive/folders/13vxTaTXGbCO2FeIW9BRWHH7FUPAZv7

Processed and geo-referenced TIFF files of the sidescan data is available here:
https://drive.google.com/drive/folders/1Jf8Y4dr2Ztz_15-k_grMMAx6l69CdR7j

Figure 22: Revised Study Area



6.0 RECOMMENDATIONS

There were eight targets located using a sidescan and magnetometer survey. Three of these are directly within the proposed pipeline corridor. There were no nearshore artifacts located in the water or in the shallows up to 100 metres from the shoreline. There were numerous cultural items located between the cobbles of the shore, but the mix included railway spikes, broken glass, plastic, pipe, aluminum, iron staples, etc. While there is a possibility that some of these materials, for example, the heavy iron staples, may have been part of the logging industry, these materials are not in situ, nor discrete from other accumulated materials on the shoreline itself, thereby lessening their significance.

Should impacts to S4, S5 and S8 be unavoidable, the recommendation is that S5 and S8 are subject to a more thorough investigation using underwater cameras to capture information about their construction methods. Technical drawings of these structures would ensure that any vernacular traditions of construction are preserved. Target S4 should have a more thorough investigation using underwater cameras to ensure that there are no additional cultural features present within the accumulation. Following communications with the client, it was determined that the path of the intake could be altered so that S4, S5 and S8 could be avoided, protected with a 5 m buffer archaeological buffer (Figure 22).

Therefore, based on the marine archaeological background research and the field survey, the following is recommended:

- No additional archaeological mitigation is recommended for the updated course of the intake; and,
- Compliance legislation must be adhered to in the event of the discovery of deeply buried cultural material or features.

7.0 ADVICE ON COMPLIANCE WITH LEGISLATION

Section 7.5.9 of the 2011 *S&Gs* requires that the following information be provided for the benefit of the proponent and approval authority in the land use planning and development process:

- This report is submitted to the Minister of Citizenship and Multiculturalism as a condition of licensing in accordance with Part VI of the *Ontario Heritage Act*, R.S.O. 1990, c 0.18. The report is reviewed to ensure that it complies with the standards and guidelines that are issued by the Minister, and that the archaeological fieldwork and report recommendations ensure the conservation, protection and preservation of the cultural heritage of Ontario. When all matters relating to archaeological sites within the project area of a development proposal have been addressed to the satisfaction of the MCM, a letter will be issued by the ministry stating that there are no further concerns with regard to alterations to archaeological sites by the proposed development.
- It is an offence under Sections 48 and 69 of the *Ontario Heritage Act* for any party other than a licensed archaeologist to make any alteration to a known archaeological site or to remove any artifact or other physical evidence of past human use or activity from the site, until such time as a licensed archaeologist has completed archaeological fieldwork on the site, submitted a report to the Minister stating that the site has no further cultural heritage value or interest, and the report has been filed in the Ontario Public Register of Archaeology Reports referred to in Section 65.1 of the *Ontario Heritage Act*.
- Should previously undocumented archaeological resources be discovered, they may be a new archaeological site and therefore subject to Section 48 (1) of the *Ontario Heritage Act*. The proponent or person discovering the archaeological resources must cease alteration of the site immediately and engage a licensed consultant archaeologist to carry out archaeological fieldwork, in compliance with Section 48 (1) of the *Ontario Heritage Act*.
- Archaeological sites recommended for further archaeological fieldwork or protection remain subject to Section 48 (1) of the *Ontario Heritage Act* and may not be altered, or have artifacts removed from them, except by a person holding an archaeological licence.
- The *Funeral, Burial and Cremation Services Act*, 2002, S.O. 2002, c.33 requires that any person discovering human remains must notify the police or coroner and the Registrar at the Ministry of Public and Business Service Delivery.

8.0 IMAGES

Image 1: Study Area along Shoreline from Midway Point
(October 15, 2024; Facing Northwest)

Image 2: Study Area along Shoreline from Midway Point
(October 15, 2024; Facing Southeast)

Image 3: Sand Bottom – Devoid of Material
(October 15, 2024)

Image 4: Aquascope Assessment of Shallow Area
(October 15, 2024; Facing Southwest)

Image 5: Aquascope – shows clarity and shallowness of water
(October 15, 2024; Facing Southwest)

Image 6: Railway Spike amongst cobbles on shore
(October 15, 2024)

Image 7: Pipe (free floating) and Aluminum
(October 15, 2024)

Image 8: Plastic garbage on shore
(October 15, 2024)

Image 9: Target S4 – Log element on edge of larger accumulation
(October 15, 2024; FiFish V6)

Image 10: Target S5 - Large stone filled wooden crib
(October 15, 2024; FiFish V6)

Image 11: Target S8 - Rock pile
(October 15, 2024; FiFish V6)

Image 12: Target S1 - Rock pile (with cut log), possibly remnant crib
(October 15, 2024; FiFish V6)

Image 13: Target S2 – Stone filled crib with interlocking timber
(October 15, 2024; FiFish V6)

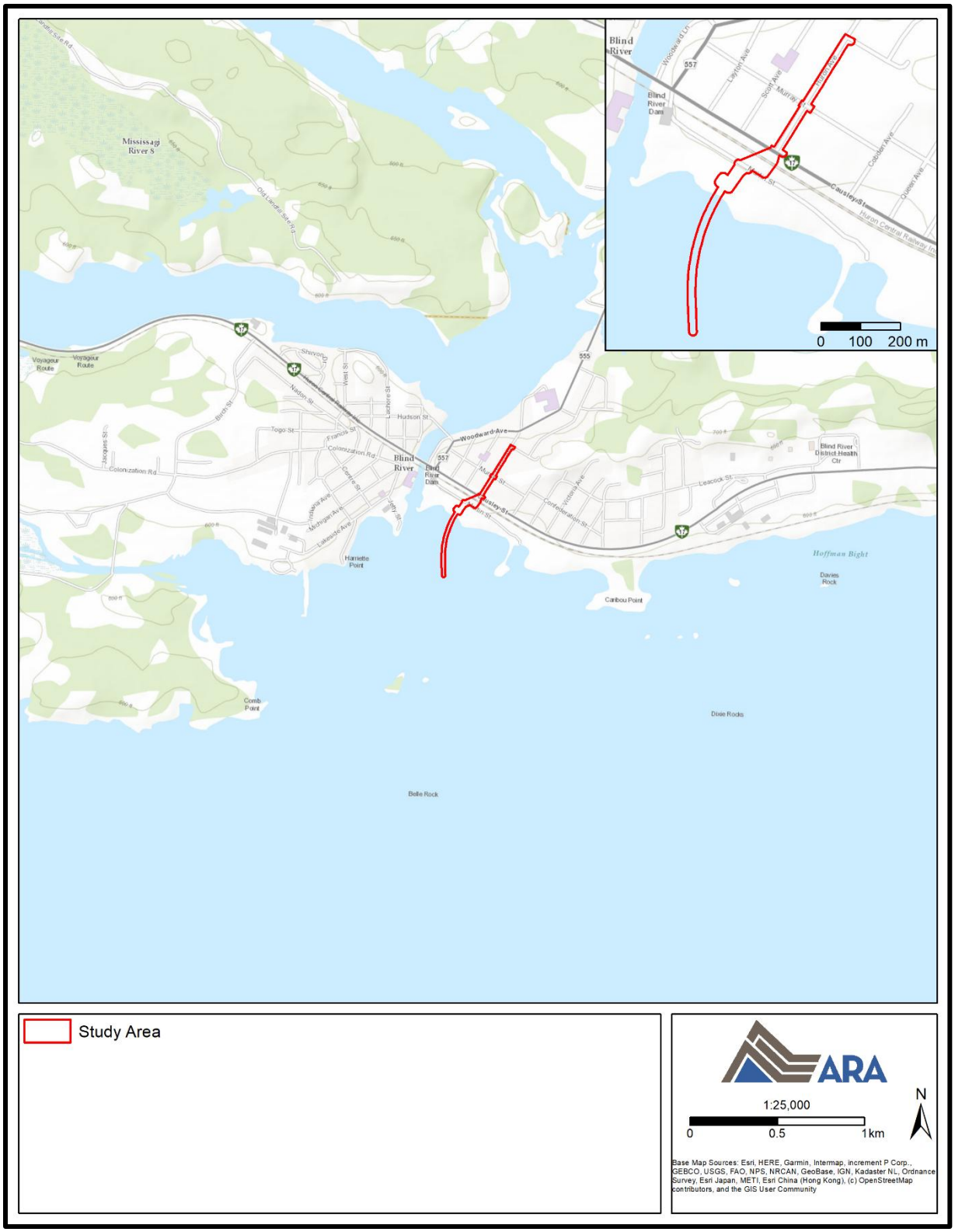
Image 14: Near shore Drone Survey
(October 15, 2024; FiFish V6)

Image 15: Near shore Drone Survey
(October 15, 2024; FiFish V6)

Image 16: Near shore Drone Survey
(October 15, 2024; FiFish V6)

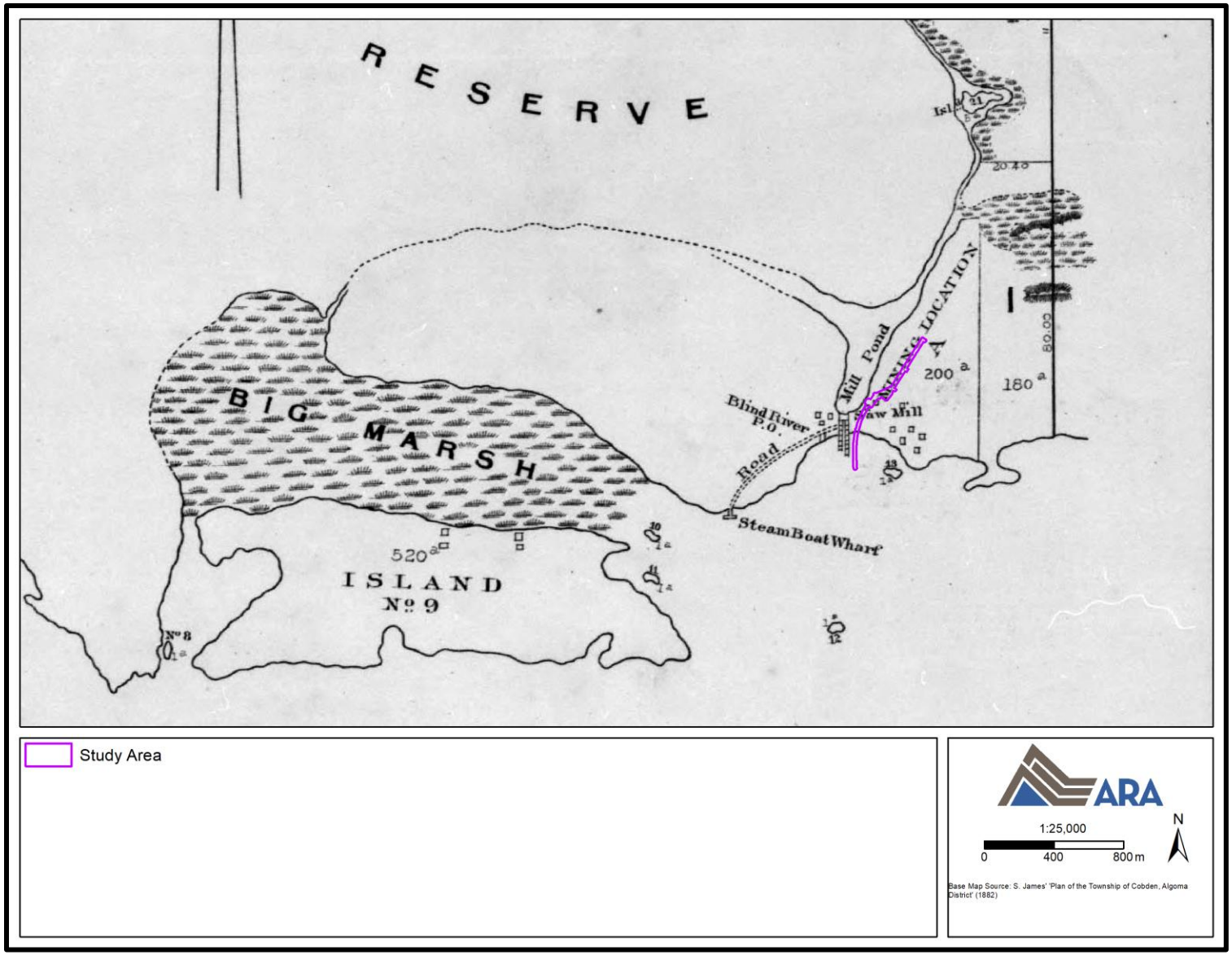
Image 17: Near shore Drone Survey
(October 15, 2024; FiFish V6)

9.0 MAPS

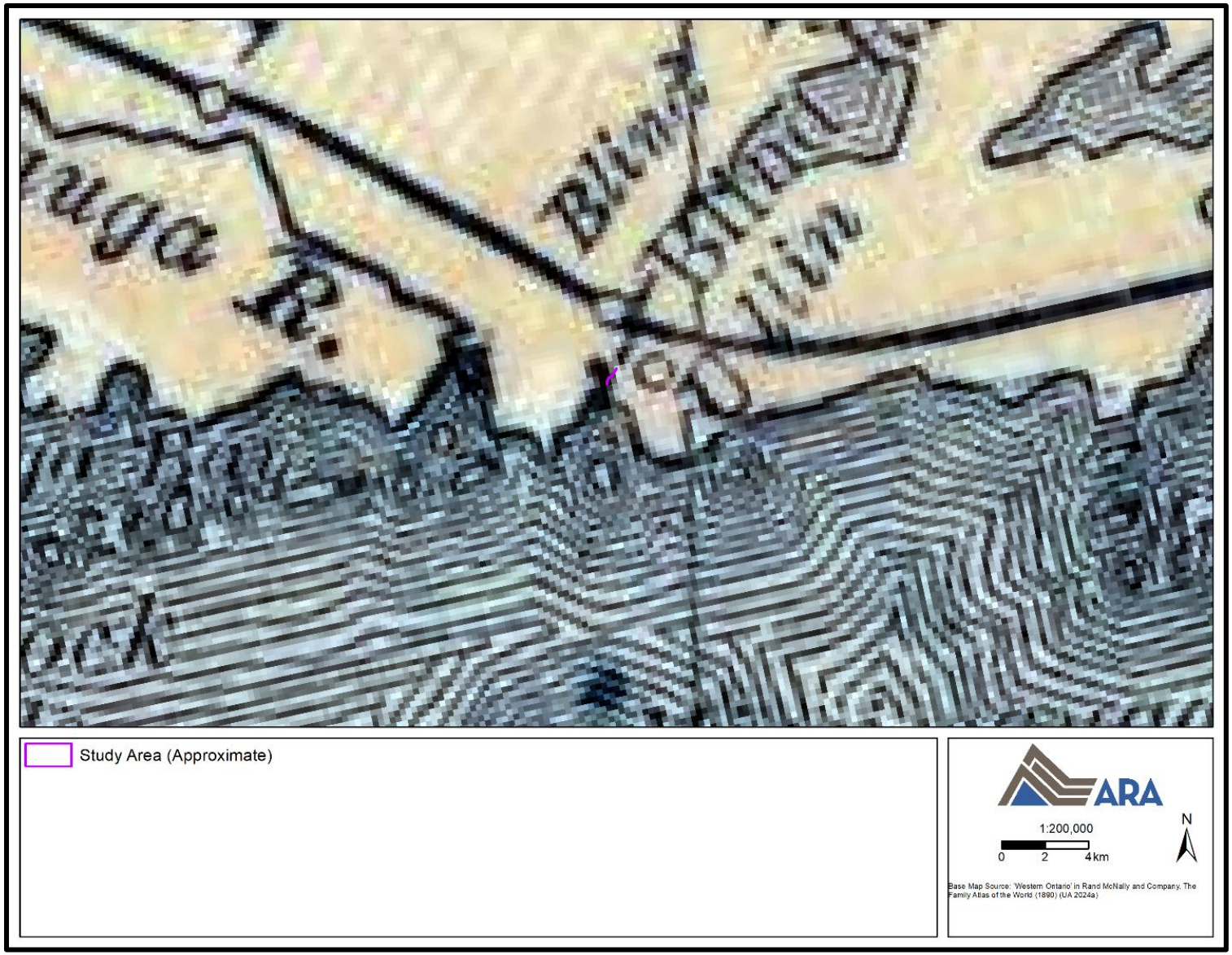


Map 1: Topographic of Study area
(Produced under licence using ArcGIS® software by Esri, © Esri)

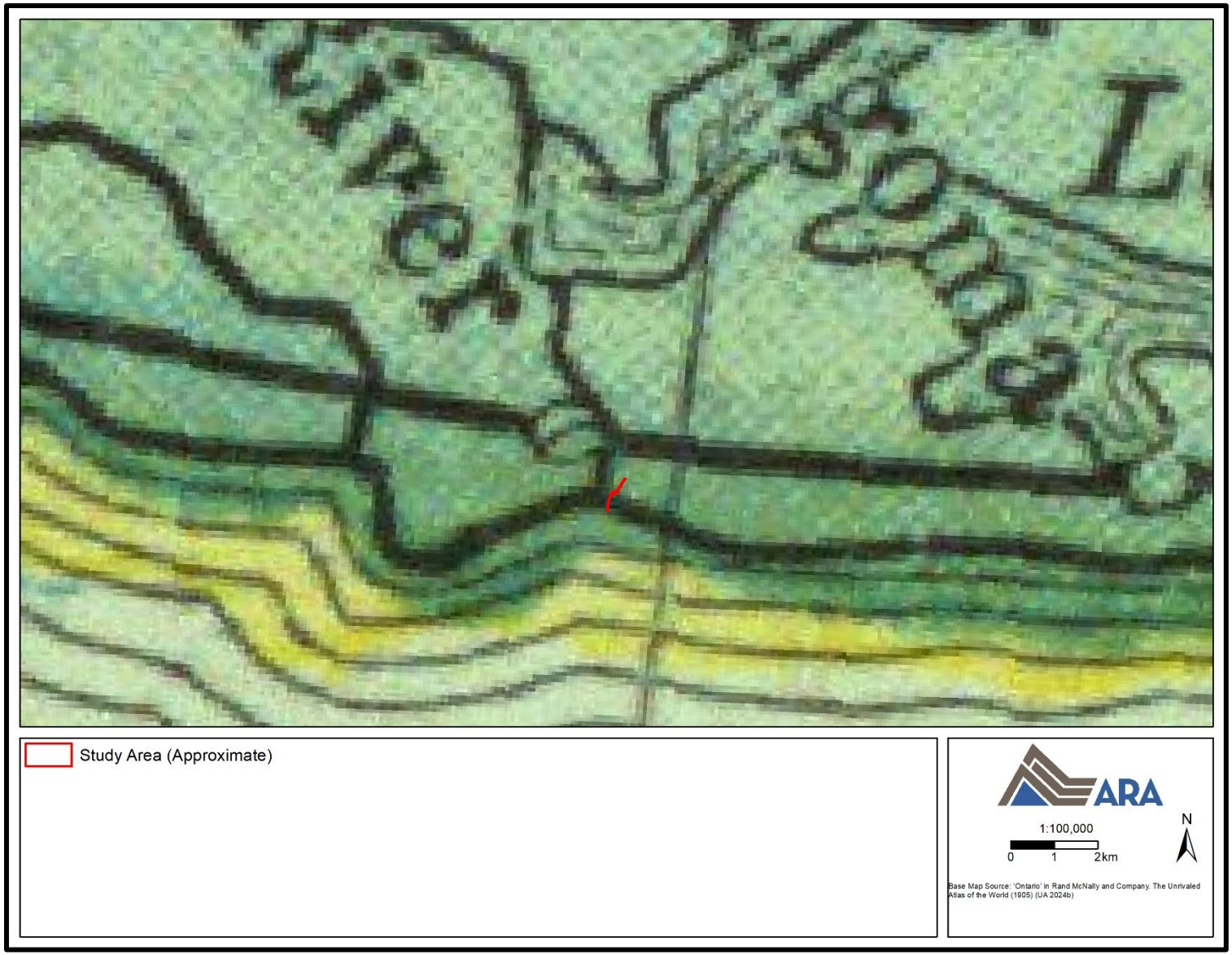
Map 2: *Atlas of the Dominion District of Nippissing* (1874)
(Produced under licence using ArcGIS® software by Esri, © Esri; OHCMP 2019)



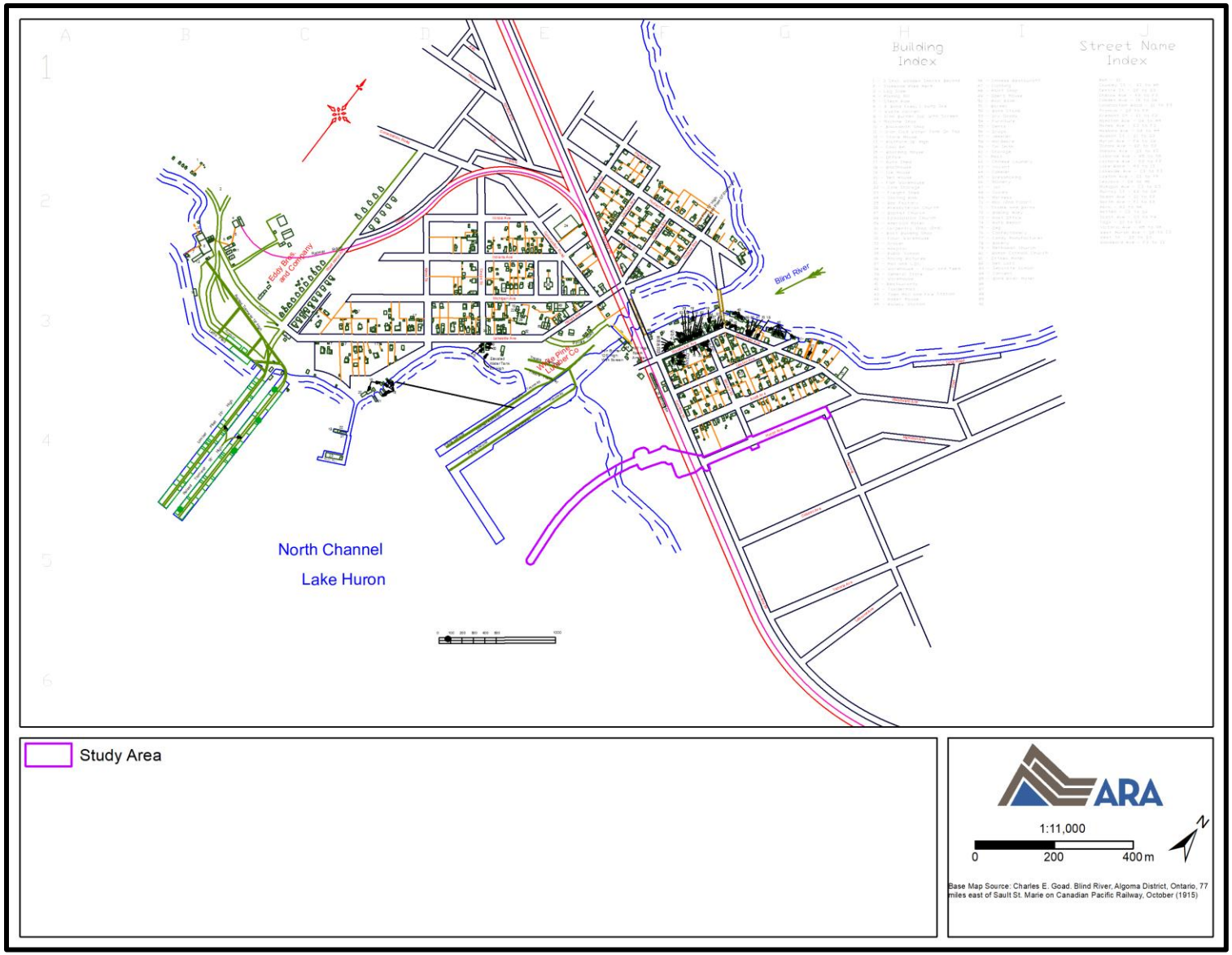
Map 3: ***Plan of Mining Location being part of the Indian Reserve in the Township of Cobden, Algoma*** **(1882)**
(Produced under licence using ArcGIS® software by Esri, © Esri; LAC 2024a)



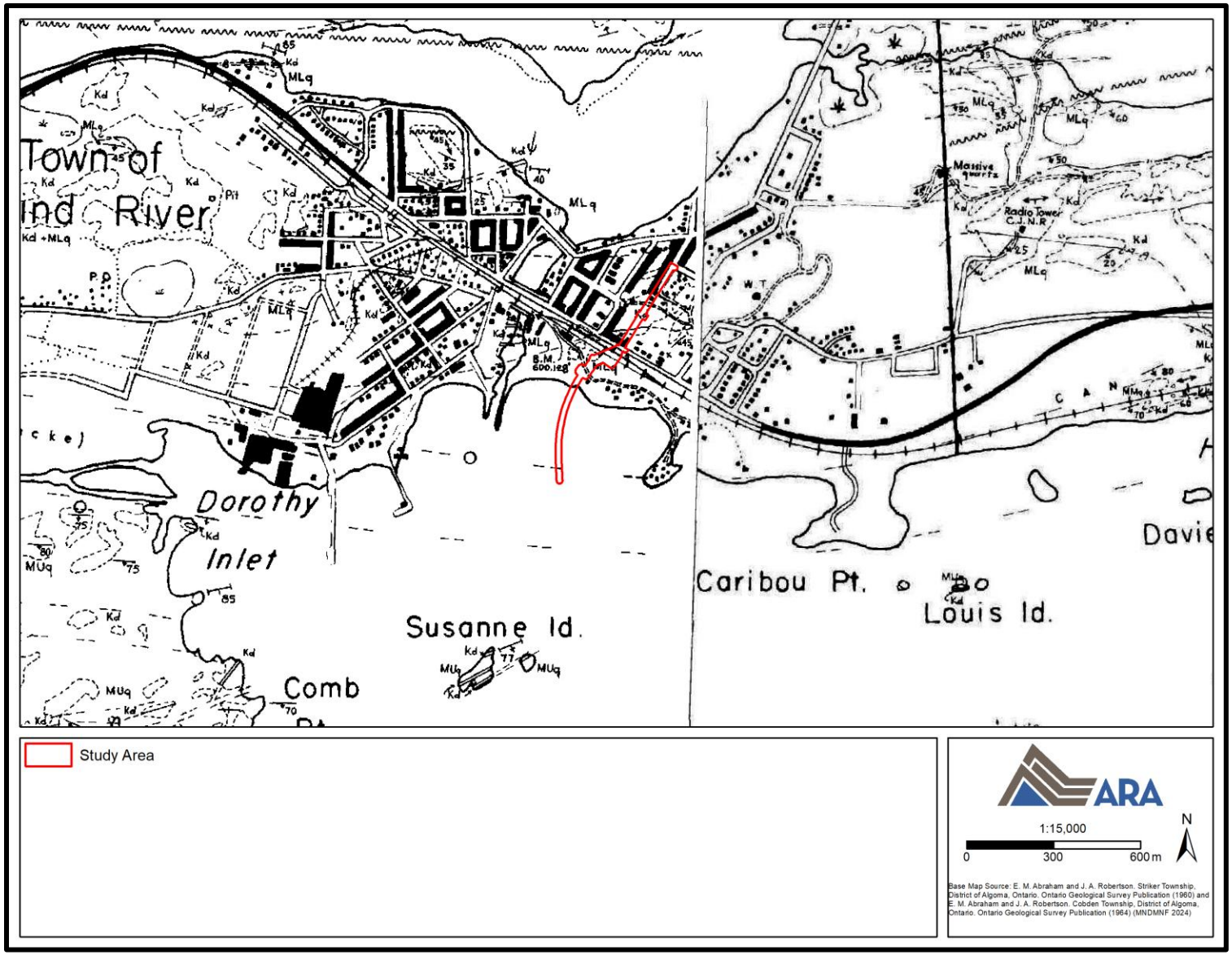
Map 4: *The Family Atlas of the World* (1890)
(Produced under licence using ArcGIS® software by Esri, © Esri; MU 2001)



Map 5: The Unrivaled Atlas of the World (1905)
(Produced under licence using ArcGIS® software by Esri, © Esri; OCUL 2023)



Map 6: Fire Insurance Plan (1915)
(Produced under licence using ArcGIS® software by Esri, © Esri; Courtesy of the Timber Museum)



Map 7: Ontario Geological Survey (1960)
(Produced under licence using ArcGIS® software by Esri, © Esri; MNDMNF 2024)

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P

Appendix P: Cultural Heritage Study

ARCHAEOLOGY | HERITAGE | OUTREACH | EDUCATION

Cultural Heritage Report:
Existing Conditions and Preliminary Impact Assessment
Blind River Raw Water Intake and Low Lift Pumping Station
Municipal Class Environmental Assessment
Town of Blind River
Geographic Township of Cobden
District of Algoma, Ontario

Prepared for the
Town of Blind River
c/o
CIMA+
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HR-536-2024
ARA File # 2024-0142

04/09/2025

EXECUTIVE SUMMARY

Under a contract awarded in September 2024 by CIMA+, on behalf of the Town of Blind River, Archaeological Research Associates Ltd. carried out a Cultural Heritage Report: Existing Conditions and Preliminary Impact Assessment (Cultural Heritage Report) as part of a Schedule 'C' Municipal Class Environmental Assessment for the development of a new raw water intake and low lift pumping station in the Town of Blind River, Algoma District, Ontario in accordance with the *Environmental Assessment Act*. This Cultural Heritage Report is part of the due diligence being undertaken for the study area.

The purpose of this assessment is to identify and evaluate built heritage resources (BHR) and cultural heritage landscapes (CHL) within and adjacent to the study area that may be impacted by the proposed undertaking. This assessment was conducted in accordance with the aims of the *Provincial Planning Statement* (2024), the *Ontario Heritage Act*, R.S.O. 1990, c. O.18, the *Environmental Assessment Act*, R.S.O. 1990, the Ontario Heritage Tool Kit series (MCM 2006a), and the *Town of Blind River Official Plan* (2015).

The Cultural Heritage Report approach included:

- Background research concerning the project and historical context of the study area;
- Consultation with Town of Blind River staff regarding heritage matters in the study area;
- Identification of any designated or recognized properties within and adjacent to the study area;
- On-site inspection and creation of an inventory of all properties with potential BHRs and CHLs within and adjacent to the study area;
- Evaluation of potential project impacts; and
- Provision of suggested strategies for the future conservation of identified BHRs and/or CHLs.

After conducting historical research, consultation, and field survey, two CHLs were identified within the study area.

This proposed project requires the replacement of the current raw water supply to the Blind River Water Treatment Plant to ensure a safe and reliable source of water and to meet the requirements for additional capacity and improved raw water quality. The project will require construction of a new raw watermain and a low lift pumping station. The Preliminary Preferred Water Supply Solution identified through the Environmental Assessment process was Alternative A3 (Intake Option 3A and LLPS Option LLPS3), which has been advanced to 90% design and would see the intake extend approximately 400m into Lake Huron, and a low lift pumping station constructed at the existing wastewater treatment plant located between Martin Street and Lake Huron. Two CHLs were identified within the study area, and the preferred alternative has the potential to result in direct and indirect impacts to CHL-1. Therefore, potential impacts and mitigation options related to the project have been outlined. Project impacts and mitigation measures may need refinement as detailed design is finalized.

As a result of this Cultural Heritage Report, the following mitigation strategies are recommended to address the identified potential adverse impacts:

- That during subsequent planning phases and completion of detailed design, CHLs be avoided where possible and any construction staging areas be located on lands away

from the portions of CHL-1 (North Channel, Lake Huron) not under construction. If necessary and where feasible, construction fencing should be erected along the periphery of the study area to ensure CHL-1 (North Channel, Lake Huron) is not further damaged by any construction machinery or vehicles; and
- Where construction is anticipated to result in tree and vegetation removal and damage to the shoreline/beach of CHL-1 (North Channel, Lake Huron), post-construction landscaping with native tree species should be employed during detailed design and any regrading should meet pre-construction conditions to restore the landscape as close as possible to an as-found condition.

The following considerations and recommendations should be undertaken as next steps:

- That the above mitigation measures be implemented and considered in subsequent planning phases and during completion of detail design;
- That public consultation may result in additional potential BHRs and/or CHLs being identified. These potential heritage resources should be reviewed by a qualified heritage consultant to 1) determine their cultural heritage value or interest, 2) evaluate potential project impacts, and 3) suggest strategies for future conservation of any candidate heritage resources; and
- That once finalized, CIMA+ should circulate this Cultural Heritage Report to staff/planners at the Town of Blind River and the Heritage Planning Unit of the Ministry of Citizenship and Multiculturalism.

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ABBREVIATIONS

ARA – Archaeological Research Associates Ltd.
BHR – Built Heritage Resource
CHL – Cultural Heritage Landscape
CHR – Cultural Heritage Resource
CHVI – Cultural Heritage Value or Interest
CPR – Canadian Pacific Railway
EA – Environmental Assessment
GUDI – Groundwater Under the Direct Influence of surface water
HCD – Heritage Conservation District
HCRY – Huron Central Railway
HSMBC – Historic Sites and Monuments Board of Canada
LLPS – Low Lift Pumping Station
MCEA – Municipal Class Environmental Assessment
MCM – Ministry of Citizenship and Multiculturalism
OHA – Ontario Heritage Act
OHT – Ontario Heritage Trust
O. Reg. – Ontario Regulation
PHP – Provincial Heritage Property
PPS – Provincial Planning Statement
WTP – Water Treatment Plant
WWTP – Wastewater Treatment Plant

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Biographies for key team members that demonstrate the qualifications and expertise necessary to perform cultural heritage work in Ontario are provided in Appendix B.

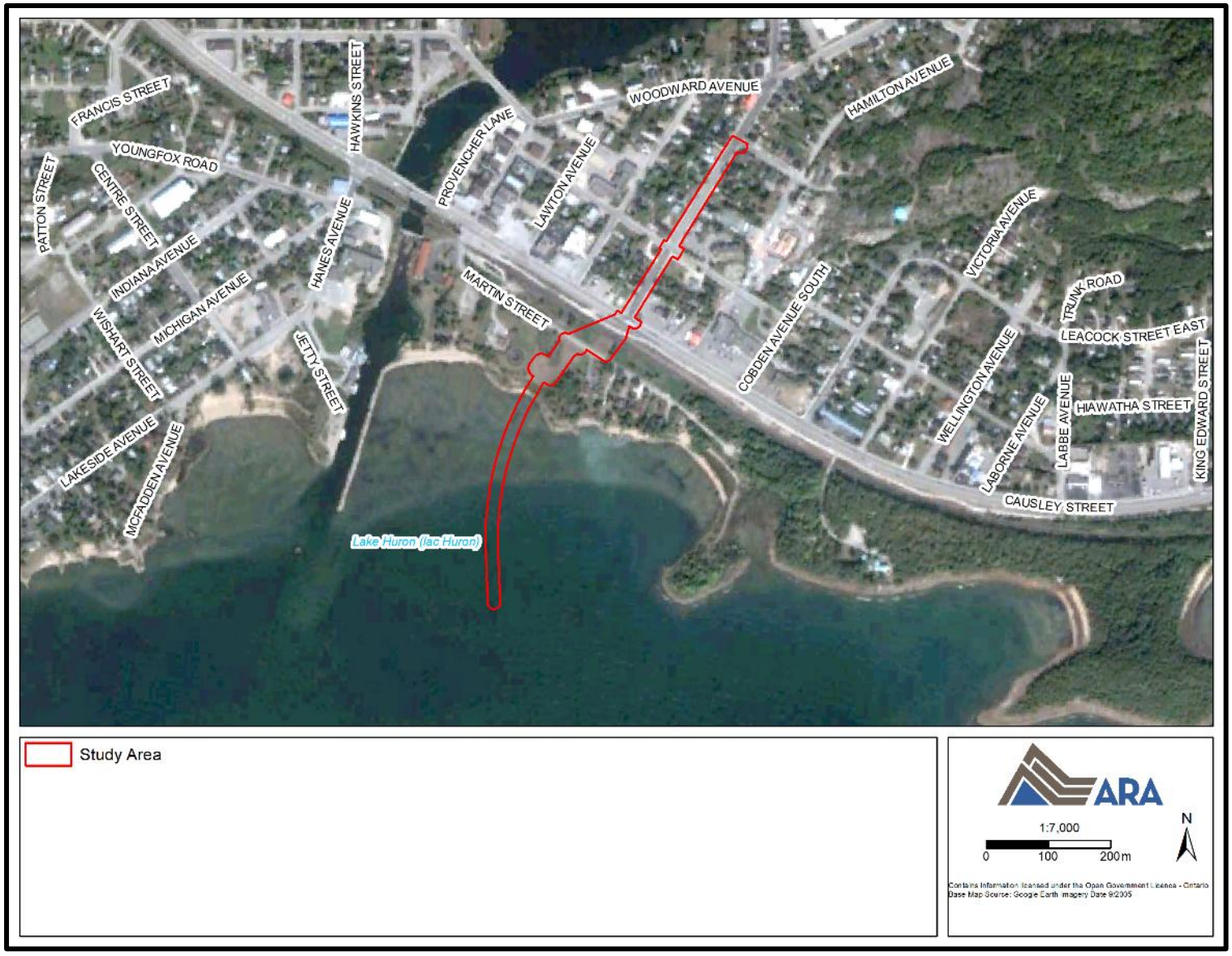
1.0 PROJECT CONTEXT

Under a contract awarded in September 2024, Archaeological Research Associates Ltd. (ARA) carried out a Cultural Heritage Report: Existing Conditions and Preliminary Impact Assessment (henceforth Cultural Heritage Report) as part of a Schedule 'C' Municipal Class Environmental Assessment (MCEA) for the development of a new raw water intake and low lift pumping station (LLPS) in the Town of Blind River, Algoma District, Ontario in accordance with the *Environmental Assessment Act*. Alternative design concepts for the identification of potential lake-based intake and LLPS sites for raw water supply replacement were developed. Based on technical screening and studies, a Preliminary Preferred Alternative was selected in Lake Huron east of the existing wastewater treatment plant (WWTP). The intake will extend approximately 400 metres into the lake, and a LLPS is to be constructed at the existing WWTP site (Town of Blind River 2023).

The study area extends down the Huron Avenue right-of-way from Berthelot Street in the north, across Causley Street (Trans-Canada Highway 17), the Huron Central Railway tracks, and Martin Street, to the east of the existing WWTP, and south into the North Channel of Lake Huron (see Map 1 and Map 2). The property parcels adjacent to this study area were assessed as part of this Cultural Heritage Report. In legal terms, the study area includes Lot 13, Concession 1 in the Geographic Township of Cobden, District of Algoma, Ontario.

The purpose of this assessment is to identify and evaluate any built heritage resources (BHR) and cultural heritage landscapes (CHL) within and adjacent to the study area that may be impacted by the proposed development plan. This assessment was conducted in accordance with the aims of the *Provincial Planning Statement* (2024), the *Ontario Heritage Act*, R.S.O. 1990, c. O.18, the *Environmental Assessment Act*, R.S.O. 1990, the Ontario Heritage Tool Kit series (MCM 2006a), and the *Town of Blind River Official Plan* (2015).

Map 1: Study Area in the Town of Blind River
(Produced by ARA under licence using ArcGIS® software by Esri, © Esri)



Map 2: Aerial Image of the Study Area in the Town of Blind River
(Produced by ARA under licence using ArcGIS® software by Esri, © Esri

2.0 LEGISLATION AND POLICY REVIEW

The framework for this Cultural Heritage Report is provided by federal guidelines, provincial environmental and planning legislation and policies, as well as local municipal Official Plans (OP) and guidelines.

2.1 Federal Guidelines

At the national level, *The Standards and Guidelines for Conservation of Historic Places in Canada* (Parks Canada 2010) provides guidance for the preservation, rehabilitation, and restoration of historic places, including BHRs and CHLs. Such guidance includes the planning and implementation of heritage conservation activities.

2.2 Provincial Policies and Guidelines

2.2.1 Environmental Assessment Act and Guidelines

An Environmental Assessment (EA) is a study that evaluates both the potential positive and/or negative effects of a project on the environment. Within the *Environmental Assessment Act,* the environment includes *"*any building, structure, machine or other device or thing made by humans*."* (Government of Ontario 1990). This study is conducted as part of recommendations within a streamlined EA process known as a Municipal Class EA (MCEA), which applies to routine projects grouped into classes that range from A (minor undertakings) to C (construction of new large facilities). The MCEA applies to municipal infrastructure undertakings including roads, water, and wastewater projects.

2.2.2 Planning Act

In Ontario, the *Planning Act* is legislation used by provincial and municipal governments in land use planning decisions. Section 2 of the Ontario *Planning Act* indicates that a council of a Municipality have regard for matters of provincial interest such as: "(d) the conservation of features of significant architectural, cultural, historical, archaeological or scientific interest" (Government of Ontario 1990). Section 3 of the *Planning Act* directs a municipal Council's decisions to be consistent with the Province's policy statements.

2.2.3 Provincial Planning Statement (2024)

The *Provincial Planning Statement* (PPS) (2024) contains a combined statement of the Province's land use planning policies. It provides the provincial government's policies on a range of land use planning issues.

The PPS 2024, which is enforced as of October 1, 2024, promotes the conservation of heritage resources through detailed polices in Section 4.6, such as 4.6.1 that states, "Protected heritage property, which may contain built heritage resources or cultural heritage landscapes, shall be conserved," and 4.6.3 that details "Planning authorities shall not permit development and site alteration on adjacent lands to protected heritage property unless the heritage attributes of the protected heritage property will be conserved" (MMAH 2024:28).

Further, 4.6.4 notes, "Planning authorities are encouraged to develop and implement: b) proactive strategies for conserving significant built heritage resources and cultural heritage landscapes" (MMAH 2024:28)

2.2.4 Ontario Heritage Act

The *Ontario Heritage Act* (OHA), R.S.O. 1990, c.018) is the guiding piece of provincial legislation for the conservation of significant cultural heritage resources in Ontario. The OHA gives provincial and municipalities governments the authority and power to conserve Ontario's heritage. The OHA has policies which address individual properties (Part IV), and heritage districts (Part IV), which require municipalities to create a register of such properties and allows the municipalities to list or de-list non-designated properties, which may have cultural heritage value or interest (CHVI) (Section 27).

To objectively identify cultural heritage resources, O. Reg. 9/06 (as amended by O. Reg. 569/22) made under the OHA sets out nine criteria for determining CHVI (MCM 2006b:20–27). The criteria set out in the regulation were developed to identify and evaluate properties for designation under the OHA. Best practices in evaluating properties that are not yet protected employ O. Reg. 9/06 to determine if they have CHVI. In the absence of specific CHL evaluation criteria, O. Reg 9/06 is also applied to consider the built and natural features of a property.

The O. Reg. 9/06 criteria are as follows:

1. The property has design value or physical value because it is a rare, unique, representative or early example of a style, type, expression, material or construction method,
2. The property has design value or physical value because it displays a high degree of craftsmanship or artistic merit, or
3. The property has design value or physical value because it demonstrates a high degree of technical or scientific achievement.
4. The property has historical value or associative value because it has direct associations with a theme, event, belief, person, activity, organization or institution that is significant to a community,
5. The property has historical value or associative value because it yields, or has the potential to yield, information that contributes to an understanding of a community or culture, or
6. The property has historical value or associative value because it demonstrates or reflects the work or ideas of an architect, artist, builder, designer or theorist who is significant to a community.
7. The property has contextual value because it is important in defining, maintaining, or supporting the character of an area,
8. The property has contextual value because it is physically, functionally, visually or historically linked to its surroundings, or
9. The property has contextual value because it is a landmark. O. Reg. 569/22, s. 1 (2).

A property must meet at least two of the criteria to be considered for designation. An OHA designation provides the strongest heritage protection available for conserving heritage resources.

2.3 Municipal Policies

2.3.1 Town of Blind Official Plan

The *Town of Blind River Official Plan* (2015:7) has three main principles with the first being "3.1 Manage Growth in a Responsible and Efficient Manner." Within this principle, Policy 3.1.4 indicates that "All new development and redevelopment should be designed to be consistent with the heritage, style and context of the existing community," and Policy 3.1.8 states that "…heritage resources of the community are conserved for future generations" (Town of Blind River 2015:7).

Section 4.8 "Cultural Heritage, Heritage Landscapes and Archaeological Resources" identifies policies related specifically to cultural heritage in the Town of Blind River. In Section 4.81, "General Policies" cultural heritage resources are "…divided into built heritage resources (i.e., buildings) and archaeological resources (i.e., cemeteries, burial sites and other sites acknowledged as significant at the local, provincial or national level)" (Town of Blind River 2015:18). This section also requires that all permitted new development have regard for heritage resources (Town of Blind River 2015). Additionally, and of relevance to this project as part of the "General Policies," "Council shall have regard for cultural heritage resources in the undertaking of municipal public works" (Town of Blind River 2015:18).

The Town of Blind River indicates it may utilize the OHA to "…protect and enhance the cultural heritage resources in the municipality through the designation of individual properties, and the establishment of heritage conservation districts" (2015:20-21). Also, under Section 4.8.1 "General Policies," the Town indicates that it would participate, where feasible, in conserving cultural heritage resources through several actions, including:

1. *Conserving built heritage resources, cultural heritage landscapes and archaeological resources that are under municipal ownership and/or stewardship.*
2. *Respecting the heritage resources recognized or designated by federal and provincial agencies.*
3. *Entering into a data-sharing agreement with the Ministry of Tourism and Culture whereby Council and the Ministry will share information related to cultural heritage resource protection.*
4. *Applying site plan control.*
5. *Incorporating heritage conservation through the preparation of a community improvement plan (per Section 28 of the Planning Act).*
6. *Partnering with organizations and senior levels of government in identifying, protecting and conserving heritage resources. Examples could include grants or loans for repairs or restoration of heritage properties.*
7. *Supporting the reduction of waste construction debris as a result of the demolition of buildings by promoting and encouraging the adaptive re-use of older and existing building stock.*
8. *Approving energy retrofits of heritage buildings without compromising the heritage integrity of the building.*
9. *Ensuring that public works projects and other municipal initiatives comply with the cultural heritage policies of this Plan as a condition of approval.*
10. *The identification and conservation of heritage trees.*
11. *The adaptive re-use of buildings.*

12. *Maintaining a consistent height and character profile for buildings notably infill and intensification projects.*
13. *Ensuring that cultural heritage resources both on shore and in the water are not adversely affected. When necessary, Council will require satisfactory measures to mitigate any negative impacts on significant cultural heritage resources.*
14. *Conserving cultural heritage resources when considering the establishment of new areas for mineral extraction or when considering the establishment of new operations or the expansion of existing operations. When necessary, Council will require satisfactory measures to mitigate any negative impacts on cultural heritage resources.*
15. *Retrofits for achieving energy efficiency will only be undertaken in a heritage building where it is demonstrated that retrofitting can be accomplished without compromising the heritage integrity of the building.*
16. *The preparation of a heritage master plan and an archaeological management plan. The Town will consult with the aboriginal community in the preparation of heritage plans* (Town of Blind River 2015:19-20).

The Town of Blind River may determine that a) is required as per Policy 4.8.4 (Town of Blind River 2015:21). The Town's Official Plan provides policy direction for a Cultural Heritage Impact Statement, which is to include the following matters:

1. *The nature of the proposed development;*
2. *The cultural heritage resource(s) to be affected by the development;*
3. *The impacts posed by the development on cultural heritage resource(s);*
4. *The measures, if any, which may be taken to mitigate any negative impacts of development on the cultural heritage resource (s);* (Town of Blind River 2015:22).

Additionally, "Council may impose conditions on any development approval which require the protection of cultural heritage resources, or to implement the appropriate mitigation measures to minimize the impacts of development on cultural heritage resources, as may be determined by a Cultural Heritage Impact Statement (CHIS)" (Town of Blind River 2015:22).

2.4 Policy Conclusions

Federal guidance, provincial legislation, and policies of the *Town of Blind River Official Plan* call for the conservation of cultural heritage resources, the maintenance and restoration of significant heritage resources, and provides policies and guidelines related to potential development impacts and the need for impact assessments for cultural heritage resources. This Cultural Heritage Report will draw upon these cultural heritage policies as they relate to the proposed project.

3.0 KEY CONCEPTS

The following concepts require clear definition in advance of the methodological overview and proper understanding is fundamental for any discussion pertaining to heritage resources:

- **Adjacent lands**, as defined in the PPS, means "for the purposes of policy 4.6.3, those lands contiguous to a *protected heritage property* or as otherwise defined in the municipal official plan" (MMAH 2024:38).
- **Built Heritage Resource** (BHR) can be defined in the PPS as "a building, structure, monument, installation or any manufactured or constructed part or remnant that contributes to a property's cultural heritage value or interest as identified by a community, including an Indigenous community. Built heritage resources are located on property that has been designated under Parts IV or V of the *Ontario Heritage Act*, or that may be included on local, provincial, federal, and/or international registers" (MMAH 2024:40).
- **Conserved** means "the identification, protection, management and use of *built heritage resources*, *cultural heritage landscapes* and *archaeological resources* in a manner that ensures their cultural heritage value or interest is retained. This may be achieved by the implementation of recommendations set out in a conservation plan, archaeological assessment, and/or heritage impact assessment that has been approved, accepted or adopted by the relevant planning authority and/or decision-maker. Mitigative measures and/or alternative development approaches should be included in these plans and assessments" (MMAH 2024:41).
- **Cultural Heritage Landscape** (CHL) is defined in the PPS as "a defined geographical area that may have been modified by human activity and is identified as having cultural heritage value or interest by a community, including an Indigenous community. The area may include features such as buildings, structures, spaces, views, archaeological sites or natural elements that are valued together for their interrelationship, meaning or association. Cultural heritage landscapes may be properties that have been determined to have cultural heritage value or interest under the *Ontario Heritage Act* or have been included on federal and/or international registers, and/or protected through official plan, zoning by-law, or other land use planning mechanisms" (MMAH 2020:41).
- **Cultural Heritage Value or Interest** (CHVI), also referred to as Heritage Value, is identified if a property meets one of the criteria outlined in O. Reg. 9/06, namely historic or associative value, design or physical value, and/or contextual value. Provincial significance is defined under the OHA's O. Reg. 10/06.
- **Heritage Attributes** are defined in the PPS as "the principal features or elements that contribute to a protected heritage property's cultural heritage value or interest, and may include the property's built, constructed, or manufactured elements, as well as natural landforms, vegetation, water features, and its visual setting (e.g., significant views or vistas to or from a protected heritage property" (MMAH 2024:44).
- **Protected Heritage Property** is defined as "property designated under Parts IV, V, or VI of the *Ontario Heritage Act*, property identified by the Province and prescribed public bodies as provincial heritage property under the Standards and Guidelines for the Conservation of Provincial Heritage Properties, property protected under federal legislation, and UNESCO World Heritage Sites" (MMAH 2024:50).
- **Significant** in reference to cultural heritage and archaeology is defined as "resources that have been determined to have cultural heritage value or interest. Processes and criteria for determining cultural heritage value or interest are established by the Province under the authority of the *Ontario Heritage Act*" (MMAH 2024:52).

4.0 HISTORICAL CONTEXT

Historic research for the project was completed using secondary sources. Additional background information was also obtained from aerial photographs, historical maps (i.e., illustrated atlases), archival sources (i.e., historical publications and records), and published secondary sources (online and print). The Town of Blind River and Algoma District have a long and continuing history of settlement including pre-contact and post-contact Indigenous campsites and villages due to its location on the north shore of Lake Huron. The study area has strong associations with Indigenous communities, and the heritage resources considered in this report can be associated with both Pre-Contact and Post-Contact cultural developments. Accordingly, this historical context section spans the Pre-Contact Indigenous occupation history through Euro-Canadian settlement history to present. The early history of the study area can be effectively discussed in terms of major historical events.

4.1 Settlement History

4.1.1 Pre-Contact

The Pre-Contact history of the region is lengthy and rich, and a variety of Indigenous peoples inhabited the landscape. This location was used and shared by many since time immemorial, each with their own traditions as to how they arrived, how they lived, and the major events that marked their time here. There is no singular way to tell this story. We have included a here a brief historical narrative of the Pre-Contact history as understood by heritage professionals.

The earliest documented evidence of occupation in Ontario dates to around 13,000 BC, after the retreat of the glaciers and the formation of the early lakes. At that time, small bands of Indigenous peoples moved into the region, leading mobile lives based on communal hunting of large game and the collection of plant-based food resources. During this period, which is referred to by archaeologists as the Palaeo period, Indigenous peoples ranged over very wide territories to live sustainability in a post-glacial environment.

Around 7500 BC, the climate warmed and forests appeared. The Indigenous peoples adapted their hunting practices and tools to better suit the new animal and plant food sources. This change in material cultural is referred to as the Archaic period. Populations increased in size and Indigenous peoples began to participate in long-distance trade.

The Woodland period is marked by the appearance of ceramic pottery, which is noted around 900 BC. The first evidence of maize (corn) horticulture in southern Ontario appears around AD 900 but was less present in northern Ontario. Overtime, the practice of maize horticulture improved, allowing for population increases, larger settlement sizes, and increased social complexity in villages. These developments are linked to the spread of Iroquoian-speaking populations in southern Ontario, including the ancestors of the historically documented Attawandaron, and Haudenosaunee nations. Algonquin-speaking populations, including the Anishinaabeg, represented a significant presence in northern Ontario and were less agriculturally oriented. As a result, archaeological evidence of their presence can be sometimes elusive. Nevertheless, this part of Ontario represents the ancestral territory of various Indigenous peoples, each with their own land use patterns and cultural traditions.

By the time of the arrival of the Europeans, villages were large and populous, with distinct cultures represented archaeologically. The end of the Woodland period is cited around AD 1600, with the

spread of the fur trade that resulted in substantial changes to Indigenous lifeways, including the rise in use of items of European manufacture. Increased contact with Europeans resulted in the introduction of diseases to the Indigenous communities and decreases in their population.

4.1.2 Post-Contact

The arrival of European explorers and traders at the beginning of the 17th century triggered widespread shifts in Indigenous lifeways and set the stage for the ensuing Euro-Canadian settlement process. Documentation for this period is abundant, ranging from the first sketches of Upper Canada and the written accounts of early explorers to detailed township maps and lengthy histories. The Post-Contact period can be effectively discussed in terms of major historical events, and the principal characteristics associated with these events are summarized in Table 1.

Table 1: Post-Contact Settlement History
(Kirkwood and Murphy 1878; ODCL 1884; Hardy 1894; Coyne 1895; Anderson 1898; Dobie 1909; Howard 1917; Mika and Mika 1977; Mika and Mika 1983; Shragge and Bagnato 1984; Ellis and Ferris 1990; AO 2022; Town of Blind River 2022; Lavallé 2023)

Historical Event	Timeframe	Characteristics
Early Exploration	Early 17th century	Contact with European fur traders began in late 1500s or early 1600s; Brûlé explores southern Ontario in 1610; Champlain visits in 1613 and 1615/1616; Iroquoian-speakers (Huron, Petun and Neutral) and Algonquian-speakers (Anishinabeg) encountered; Anishinabeg were primarily seasonal hunters and had few fixed settlements, unlike the more sedentary Iroquoian-speakers of southern Ontario; Extensive trade relations in place with their Huron neighbours, where furs and meat were traded for corn and fish-nets
Increased Contact and Conflict	Mid- to late 17th century	Conflicts between various First Nations during the Beaver Wars result in numerous population shifts; European explorers continue to document the area, and many Indigenous groups trade directly with the French and English; 'The Great Peace of Montreal' treaty established between roughly 39 different First Nations and New France in 1701
Fur Trade Development	Late 17th to mid-18th century	The French established and maintained trading posts along the Upper Great Lakes, offering enticements to attract fur traders from the First Nations; Peace between the French and English with the Treaty of Utrecht in 1713; The fur trade introduced new technologies and economic relationships into the forager lifestyle of the Anishinabeg, and European-manufactured goods replaced some traditional technologies; Ethnogenesis of the Métis; Hostilities between French and British lead to the Seven Years' War in 1754; French surrender in 1760
British Control	Mid-18th century	*Royal Proclamation* of 1763 recognizes the title of the First Nations to the land; Numerous treaties subsequently arranged by the Crown; First land cession under the new protocols is the Seneca surrender of the west side of the Niagara River in August 1764; Fur trade continued to develop, eventually dominated by the Hudson's Bay Company
Loyalist Influx	Late 18th century	United Empire Loyalist influx into southern Ontario after the American Revolutionary War (1775–1783); British develop interior communication routes and acquire additional lands; *Constitutional Act* of 1791 creates Upper and Lower Canada; Many new counties and townships created in southern Ontario; Northern Ontario remained in the hands of the First Nations
District Formation	Mid-19th to early 20th century	Euro-Canadian interest in lands along the north shores of Lake Superior and Lake Huron increased in the 1840s, as mining companies began to send prospectors, surveyors and engineers into the area; Robinson-Superior Treaty (Treaty 60) and Robinson-Huron Treaty (Treaty 61) completed in 1850; Algoma District created in 1858, with Sault Ste. Marie as the district seat;

Historical Event	Timeframe	Characteristics
		Michipicoten Post administered posts at Pic, Long Lake and Red Rock before its closure ca. 1904; Wawa surveyed by J. Cozens in 1897; Algoma Central Railway chartered in 1899 to transport iron ore from the Helen Mine to Sault Ste. Marie; James Bay Treaty (Treaty 9) completed in 1905 and 1906
District Development	Early to mid-20th century	Employment opportunities included agriculture, logging, transporting goods, mining and continued railway construction; Algoma Central Railway opened to Michipicoten in 1911 and Hearst in 1914, crossing the Canadian Pacific Railway at Franz and the Canadian National Railway at Oba; The portion of the Trans-Canada Highway between Sault Ste. Marie and Wawa was completed in 1960; The closing of this 'Big Gap' facilitated further development in northern Ontario, connecting isolated communities and providing transportation options; International bridge crossing at Sault Ste. Marie opened in 1962

Between 1815 and 1824, heavy immigration of settlers resulted in the doubling of the non-Indigenous population of Upper Canada from 75,000 to 150,000. This dramatic increase was a result of the outcome of the War of 1812 and the Crown's efforts to populate the province's interior (Surtees 1994). In the earlier Royal Proclamation of 1763, the British government recognized the title of the First Nations to the land they lived in and used. This meant that the land had to be purchased by the Crown from the First Nations before it could be used for European settlement. Subsequently, numerous treaties were arranged by the British and large swaths of territory were acquired. Today, it is understood that the Crown and Indigenous peoples had very different ideas about what the treaties represented. For the Crown, the treaties were usually viewed as complete land surrenders, paving the way for immigration and settlement. For First Nations and Indigenous communities, on the other hand, treaties were viewed as agreements to share the land as equal parties. However, with the subsequent influx of immigration and growing number of non-Indigenous settlers, their ability to sustain their traditional lifeways and adequately share the land was no longer a possibility.

The subject lands in question comprise part of the area subject to the 1850 Robinson Huron Treaty, an agreement between the British and the Anishinaabeg. Today, we recognize that the subject lands comprise part of the treaty and traditional territory of the Anishinaabeg (as represented by Atikameksheng Anishinawbek, Aundeck Omni Kaning, Garden River First Nation, M'Chigeeng First Nation, Mississauga First Nation, Sagamok Anishnawbek, Serpent River First Nation, Sheguindah First Nation, Sheshegwaning First Nation, Thessalon First Nation, Whitefish River First Nation, Wikwemikong First Nation, and Zhiibaahaasing First Nation) and the traditional territory of the Métis (as represented by the Métis Nation of Ontario).

4.1.3 Past and Present Land Use

4.1.3.1 Town of Blind River

The general location of Blind River was believed to have been noted by Samuel De Champlain in 1632 as a yearly gathering place for drying berries for the surrounding Indigenous Nations (Mika & Mika 1977). Sustained Euro-Canadian activity in the area was not until 1789 when the Northwest Company established a Fur Trading post at the mouth of the Mississaugi River to the west. Following its purchase by the Hudson Bay Company, business slowed and fur traders settled in the surrounding area (Town of Blind River 2022). The river was named as it was difficult for early voyageurs to see from the lake (Mika & Mika 1977).

By the mid-19th century, the discovery of copper in the Bruce mines spurred further settlement in the area. To supply the lumber demands of the mine, the Savoie family established the first sawmill at the mouth of the Blind River. It was located on the eastern arm of the river mouth and is said to be at the current location of the Old Mill Motel (Town of Blind River 2022). Subsequent arrivals were predominantly of French origin, attracted by the growing lumber industry. Others were encouraged to migrate by reports of abundant farmland (Kirkwood and Murphy 1878). By 1877, the first post office was established, followed by the arrival of the Canadian Pacific Railway (CPR) in 1885 and the first school in 1897 (Mika & Mika 1977; Lavallé 2023).

By 1906, Blind River had been incorporated as a town and a second sawmill had been built on the western arm of the town. Early supporting industries included Diagles Power House, two general stores, and the McFadden Lumber Company sawmill, built by Carpenter Hixon Company in 1929 (Mika & Mika 1977). The Great Mississauga Fire in 1948 destroyed easily accessible timber stocks. A depression in the lumber industry followed, which led to the eventual closure of the McFadden Lumber Company in 1969 (Town of Blind River 2022). Despite these setbacks, it remains a thriving community supported by the lumber industry, the discovery of uranium in 1955, and the arrival of the Trans-Canada Highway in 1960 (Mika & Mika 1977; Shragge & Bagnato 1984).

4.1.3.2 Canadian Pacific Railway

In the 1870s, British Columbia began negotiating with Canada with the goal of joining Confederation. However, as part of these negotiations, Canada was obligated to build a transcontinental railway to link British Columbia to the rest of the country (Hughes 2024). As a result of these negotiations, the Canadian Pacific Railway (CPR) was incorporated in February 1873, and the easternmost terminus of the railway was decided to be Lake Nipissing in Ontario, where it would connect with other rail lines in Toronto and Montreal. However, by the end of 1873, a scandal in the federal government scuttled the first iteration of the plans (Hughes 2024). However, the successive government carried on the plan by incorporating the Canadian Pacific Railway Company in 1874, with the intention to construct the transcontinental route in a piecemeal fashion, utilizing water routes whenever possible to lessen the dependence on railways. In 1878, the government changed again, the previous government's plans were cancelled, and the original transcontinental route was reinstated (Hughes 2024).

The original line between Sudbury to Sault Ste. Marie/Algoma Mills was initially intended to provide a connection to steamer routes along the Great Lakes to avoid construction around Lake Superior, although in 1884, it was decided that a northern route around the lake was unavoidable. This route would also provide access to American rail lines across the international border (Hughes 2024). The Blind River station was constructed in 1883, when the CPR opened (Hughes 2024). The opening of the railway through the town allowed the timber cut from the surrounding forests and processed at the saw and planing mills by the harbour to be shipped by rail in addition to steamer, which was a great boon to the economic fortunes of Blind River. In addition, there was mining activity of copper and uranium, which could also be shipped by rail. The railway facilitated a fledgling tourist industry, and a number of hotels were constructed in the town due to its scenic location on the north shore of Lake Huron (Hughes 2024).

The Blind River CPR station was a one-and-a-half storey frame building with a gable roof and a rectangular bay window. A passenger overhang extended out from each end of the station, and the station included a passenger waiting room, a ticket office, a baggage room, and a large freight shed that was added at an unknown date (Hughes 2024). The station was located between Martin

Street and the CPR tracks. The town of Blind River was located to the north of the rail corridor, which followed the shore of the lake. Rail passenger service was discontinued in 1977, and the station was removed in the mid-1980s (Hughes 2024). The route is currently leased from the CPR by the Huron Central Railway (HCRY), which was established in 1997 as a 278 km rail corridor between Sudbury and Sault Ste. Marie for use as a freight corridor. The HCRY is operated by the Canadian subsidiary of the Genesee & Wyoming Railroad (GWRR 2024).

4.1.3.3 Mapping and Imagery Analysis

To gain a general understanding of the study area, two historic settlement maps, one fire insurance plan, one topographic map, and one aerial photograph were examined during the research component of the study. Specifically, the following resources were consulted:

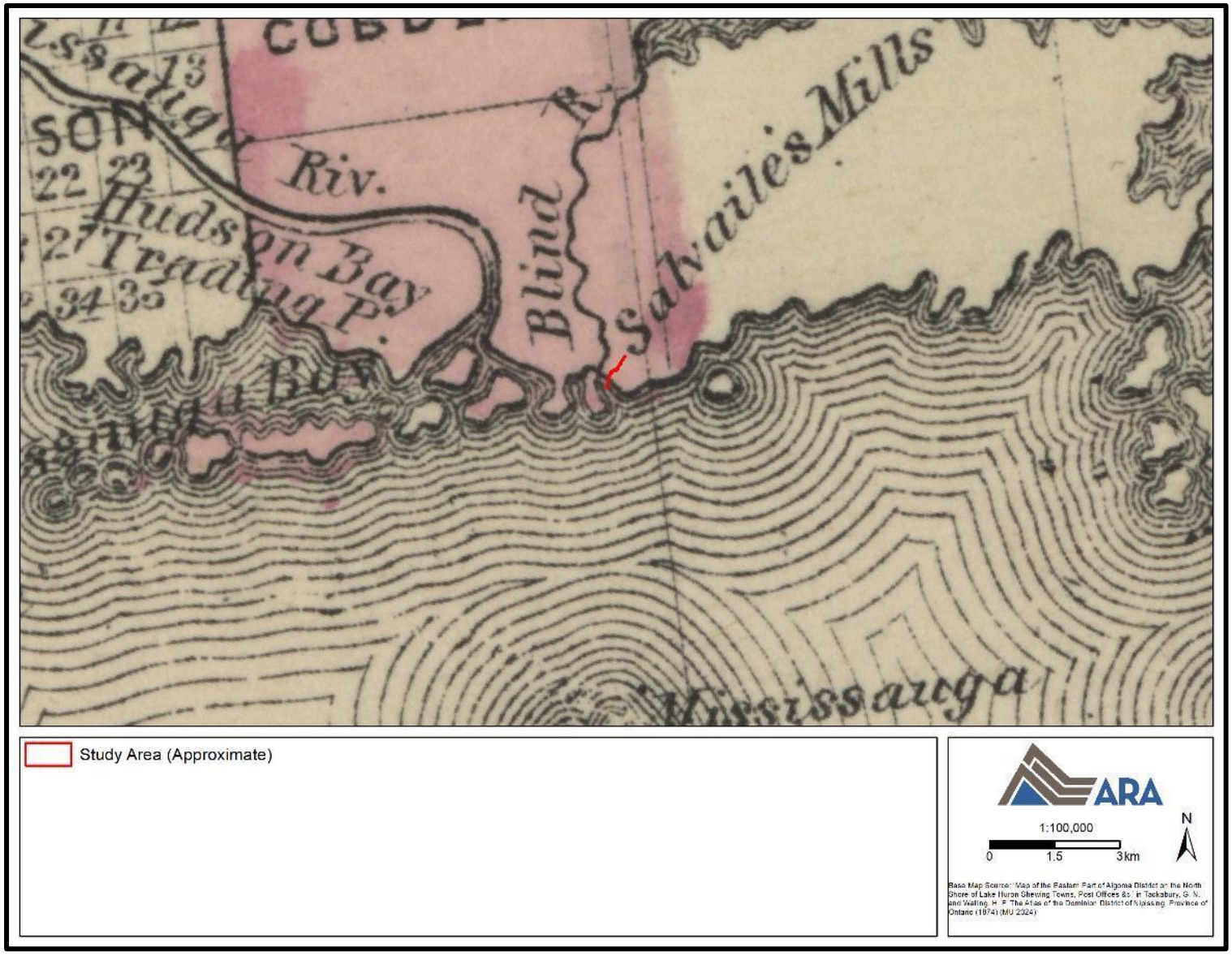
- The *Atlas of the Dominion District of Nipissing* (1874) (MU 2024);
- The *Family Atlas of the World* (1890) (UA 2024a);
- The *Unrivaled Atlas of the World* (1905) (UA 2024b);
- A fire insurance plan from 1915 (LAC 2024);
- A geological map from 1964 (MNDMNF 2024); and
- An aerial image from 2005 (GE 2024).

The limits of the study area are shown on georeferenced versions of the consulted historical resources in Map 3-Map 7. The *Atlas of the Dominion: District of Nipissing* (1874) indicates the study area was located on the north shore of a body of water (Lake Huron) to the east of a river (Blind River) and its mouth into the lake (see Map 3). It appears that the railroad was not yet laid, and the settlement of Blind River was not indicated on the map, although that does not mean that there were not people residing in the area at that time.

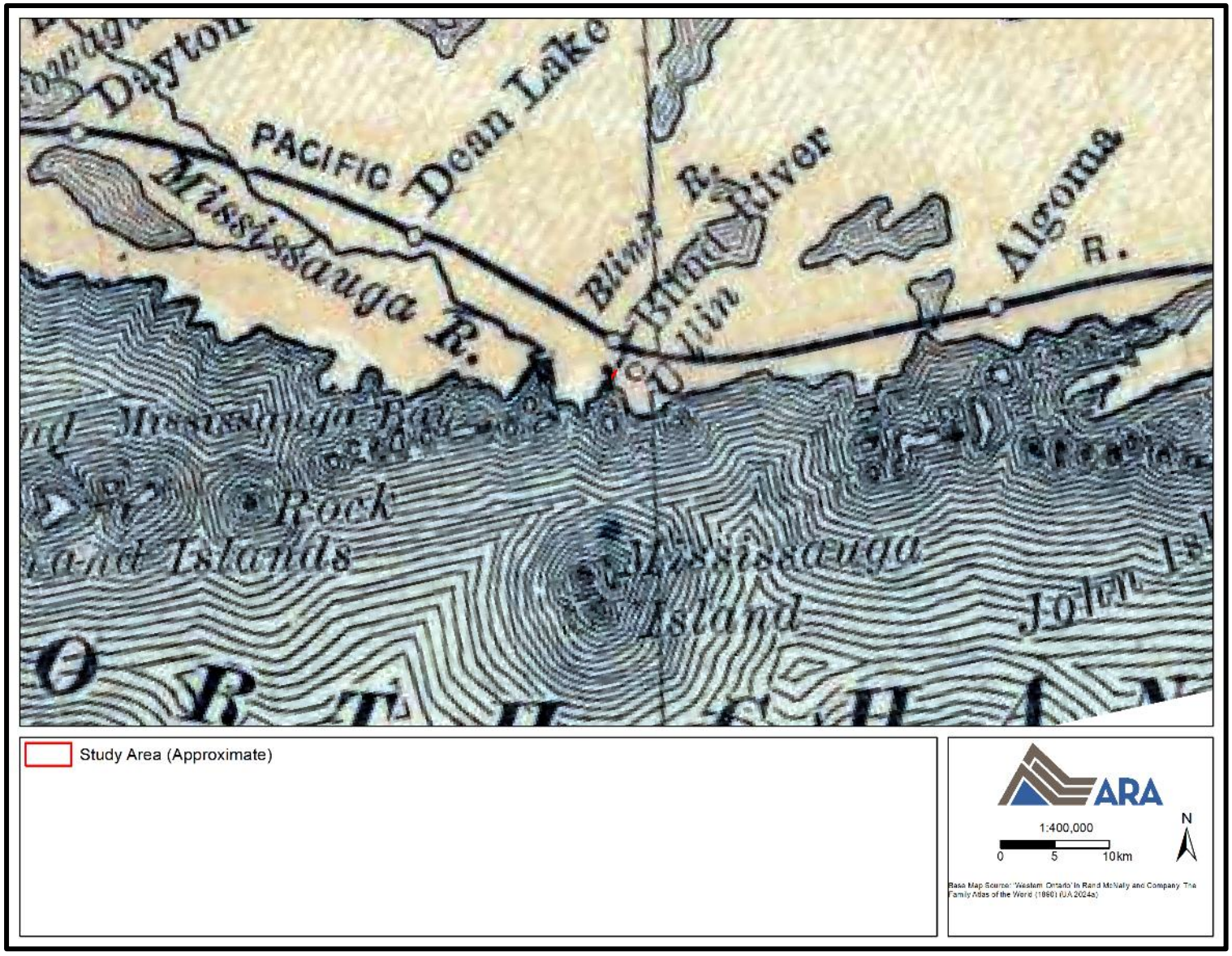
An atlas from 1890 indicates the study area was located on the north shore of Lake Huron, which was comprised of a series of small inlets and bays, including where the Blind River empties into the lake just west of the study area (see Map 4). The village of Blind River is marked with a small square along what is likely a rail corridor, which runs along the shoreline of the lake. Individual details of the village itself, such as buildings and streets, are not indicated. Another atlas from 1905 also shows the location of the study area on the north shore of Lake Huron, but like the 1890 map, individual details cannot be discerned (see Map 5).

A fire insurance plan from 1915 indicates the study area encompassed Huron Street from Leacock Street in the north to Causley Street in the south (see Map 6). The study area crossed the CPR rail corridor, which ran along the north shore of Lake Huron, and extended into the North Channel as far as the loading docks that belonged to the Pine River Lumber Company, whose business was predominately located at the river mouth of the Blind River where it opened into Lake Huron. There were no buildings or prominent landmarks located in or adjacent to the study area aside from Blind River's CPR station, which was located adjacent to the study area to the west, on the south side of the CPR line.

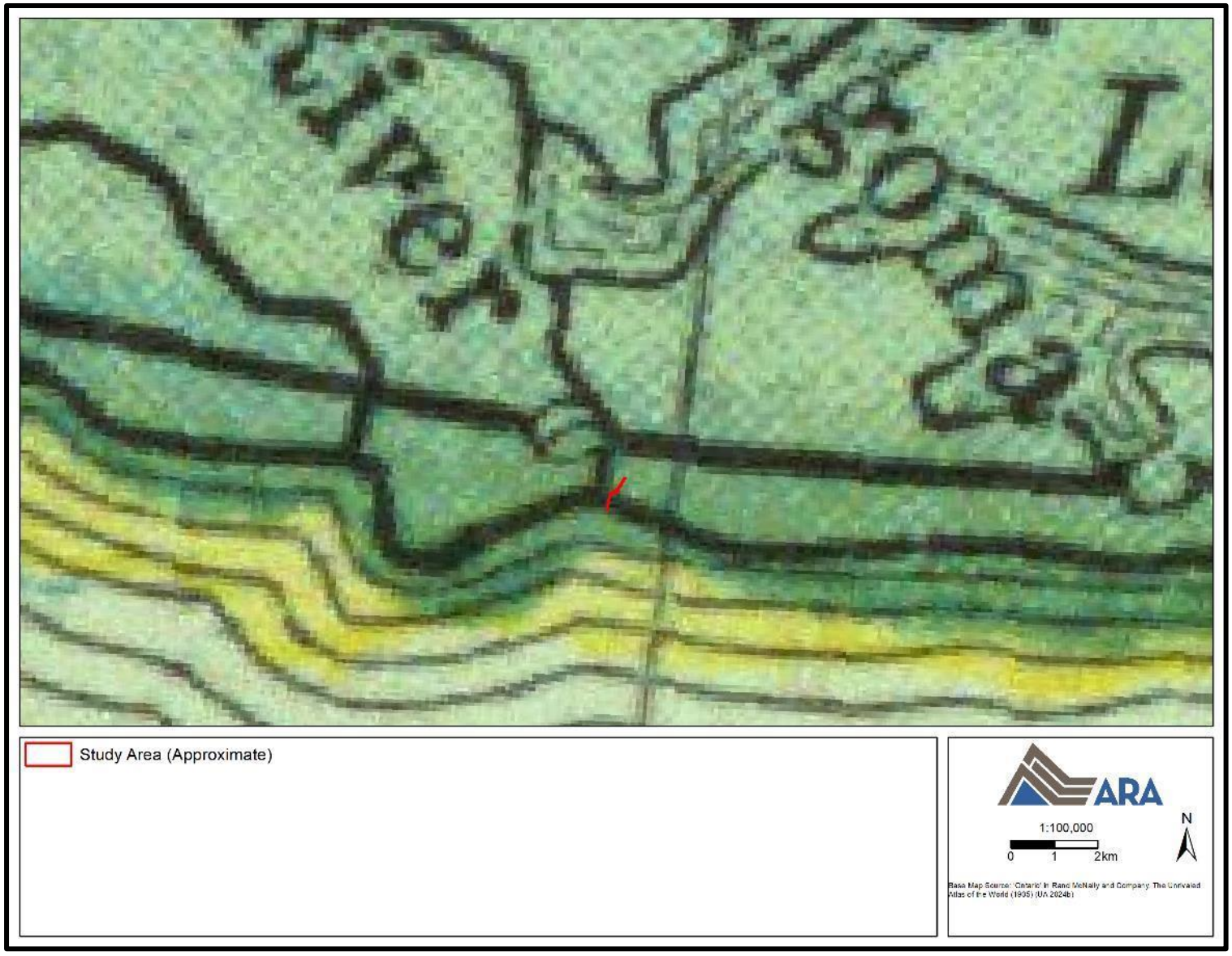
A geologic map from 1960 shows that the study area was located towards the east side of the Town of Blind River, which spanned either side of the CPR line (see Map 7). The study area encompassed a road corridor, crossed the CPR line to the south, and extended into the North Channel of Lake Huron. The north part of the study area appeared to be more intensively developed, as shaded blocks indicated the infilling of Blind River's town blocks, whereas the south end of the study area appears to be less settled and/or developed, especially along the shore of Lake Huron. The mouth of the Blind River was located to the west of the study area.



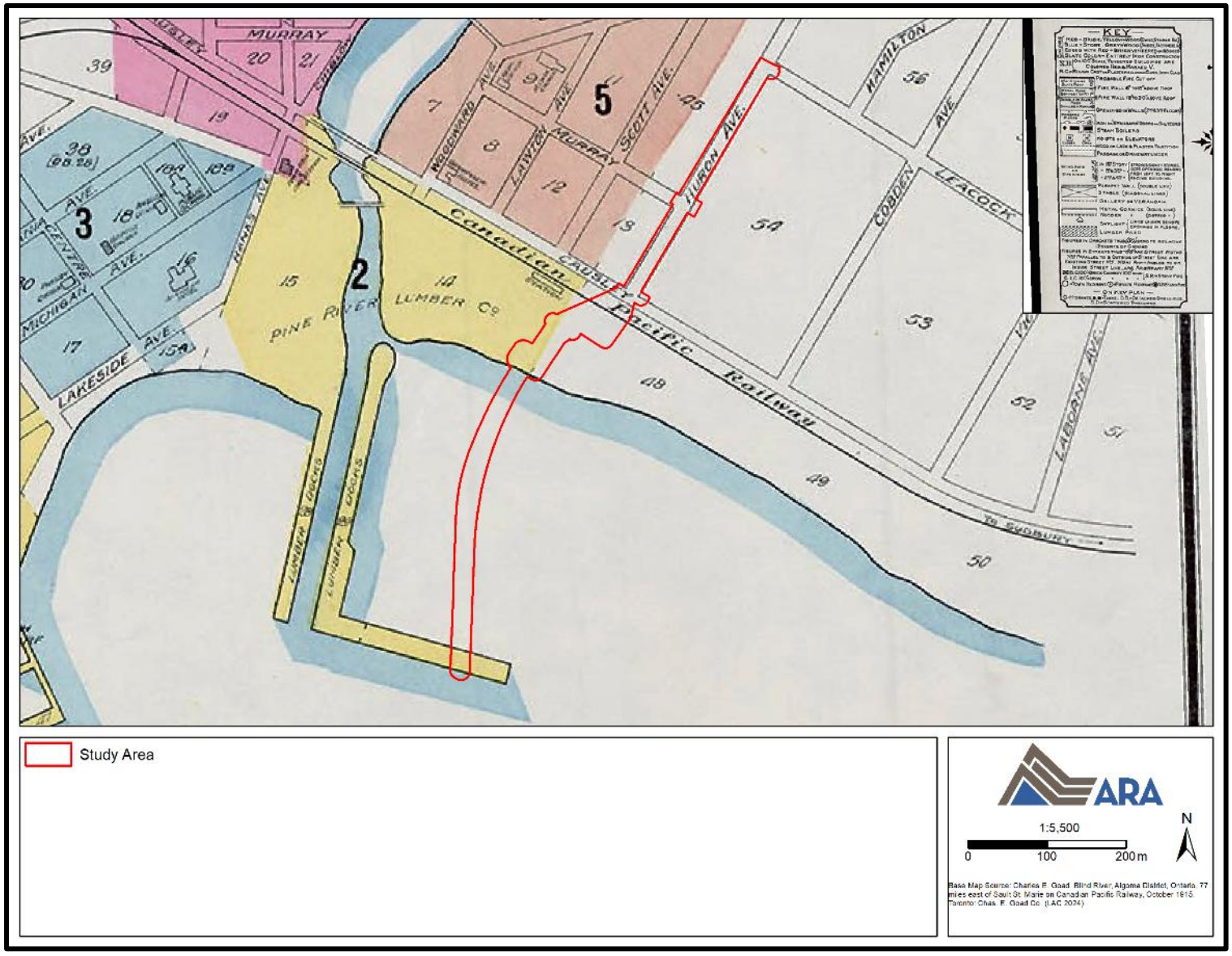
Map 3: Study Area in the *Atlas of the Dominion: District of Nippissing* (1874)
(Produced under licence using ArcGIS® software by Esri, © Esri; MU 2024)



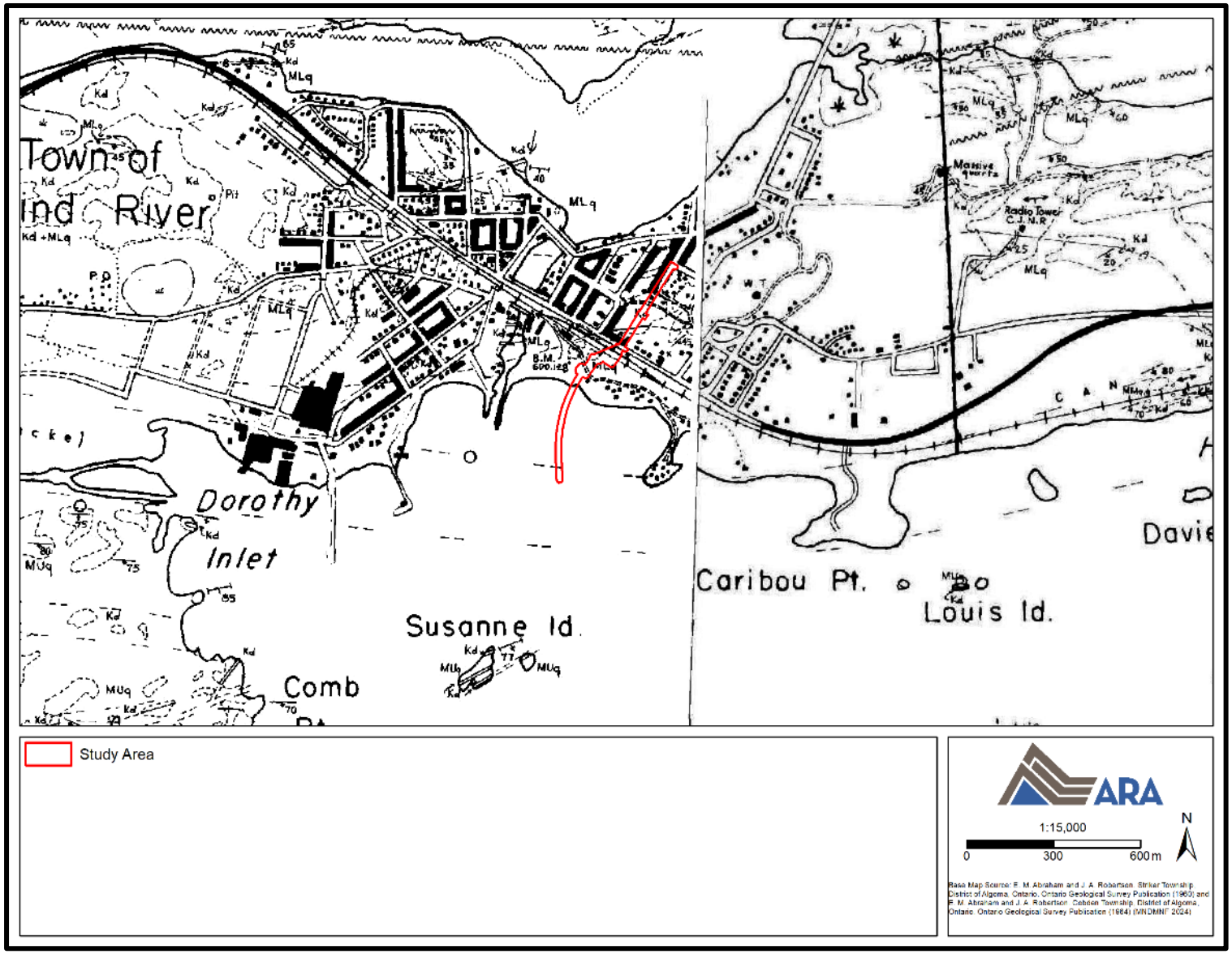
Map 4: Study Area in *The Family Atlas of the World* (1890)
(Produced under licence using ArcGIS® software by Esri, © Esri; UA 2024a)



Map 5: Study Area in *The Unrivaled Atlas of the World* (1905)
(Produced under licence using ArcGIS® software by Esri, © Esri; UA 2024b)



Map 6: Study Area on Fire Insurance Plan from 1915
(Produced under licence using ArcGIS® software by Esri, © Esri; LAC 2024)



Map 7: Study Area on an Ontario Geological Survey (1960)
(Produced under licence using ArcGIS® software by Esri, © Esri, MNDMNF 2024)

5.0 INFORMATION GATHERING

Built heritage resources (BHR), cultural heritage landscapes (CHL) and archaeological resources are broadly referred to as cultural heritage resources (CHR). A variety of types of recognition exist to commemorate and/or protect CHRs in Ontario.

The Minister of the Environment and Climate Change, on the advice of the Historic Sites and Monuments Board of Canada (HSMBC), makes recommendations to declare a site, event or person of national significance. The National Historic Sites program commemorates important sites that had a nationally significant effect on, or illustrates a nationally important aspect of, the history of Canada. A National Historic Event is a recognized event that evokes a moment, episode, movement or experience in the history of Canada. National Historic People are people who are recognized as those who through their words or actions, have made a unique and enduring contribution to the history of Canada. There exists Parks Canada's online *Directory of Federal Heritage Designations*, which captures these national commemorations. This directory also lists Heritage Railway Stations, Federal Heritage Buildings, and Heritage Lighthouses. It is important to note that these federal commemoration programs do not offer protection from alteration or destruction. The *Federal Canadian Heritage Database* was searched, and no plaques or properties were noted within or adjacent to the study area (Parks Canada 2024).

The Ontario Heritage Trust (OHT) operates the Provincial Plaque Program that has over 1,250 provincial plaques recognizing key people, places, and events that shaped the province. Additionally, properties owned by the province may be recognized as a "provincial heritage property" (MCM 2010). The OHT plaque database was searched and no properties within or adjacent to the study area are commemorated with an OHT plaque (OHT 2024).

The OHT's list of Heritage Conservation Districts was consulted. No designated districts were identified in or adjacent to the study area (OHT 2020). The list of properties designated by the Ministry of Citizenship and Multiculturalism (MCM) under Section 34.5 of the OHA was consulted. No properties in or adjacent to the study area are listed.

Many municipal heritage committees and historical societies provide plaques for local places of interest. "One role of municipal heritage groups (i.e., municipal heritage committees, historical societies) is to educate and inform the community on local heritage and several ways this could occur could include: producing descriptive guides and newsletters or by installing commemorative plaques" (MCM 2007:8). No plaques were located on properties within or adjacent to the study area.

The Town of Blind River's Municipal Heritage Register was not available online at the time of report preparation.

6.0 COMMUNITY ENGAGEMENT

At project commencement, ARA contacted the Town of Blind River's CAO, Kathryn Scott, to inquire about: any listed and/or designated properties, cemeteries, or other properties with CHVI attached by the community located within/adjacent to the study area; any corresponding by-law and listing information; properties with the intention to list or designate; any municipal heritage easements; and any available information related to the cultural heritage of the study area. A follow-up email was sent on November 20, 2024. ARA received a response from the Town's CAO the same day confirming there are no properties listed or designated on the Town's Municipal Heritage Register and there are no cemeteries within or adjacent to the study area.

A request was sent to the Ministry of Citizenship and Multiculturalism (MCM) on November 5, 2024 to confirm if any Provincial Heritage Properties (PHP) were located within the study area. A response was received the same day confirming that no properties have been designated by the Minister in the study area, nor is the MCM aware of any PHPs located within or adjacent to the study area.

7.0 IDENTIFICATION OF KNOWN AND POTENTIAL BUILT HERITAGE RESOURCES AND CULTURAL HERITAGE LANDSCAPES

The field survey component of a Cultural Heritage Report involves the collection of primary data through systematic photographic documentation of all potential BHRs and CHLs within the study area, as identified through historical research and consultation. Generally, potential BHRs and CHLs are identified by applying a 40-year rolling timeline. This timeline is considered an industry best practice (i.e., MTO 2007). A date of 40 years does not automatically attribute CHVI to a resource; rather, that it should be flagged as a potential resource and evaluated for CHVI. The purpose of this assessment is to identify and evaluate BHRs and CHLs within the study area and identify any protected resources adjacent to the study area that may be impacted by the proposed undertaking.

Additional heritage resources may also be identified during the survey itself. Photographs capturing all properties with potential BHRs and CHLs are taken, as are general views of the surrounding landscape. The field survey also assists in confirming the location of each potential BHR and CHL and helps to determine the relationship between resources. Given that such surveys are limited to areas of public access (i.e., roadways, intersections, non-private lands, etc.), there is always the possibility that obscured heritage resources may be missed or that heritage attributes may be refined upon closer inspection.

A field survey was conducted on October 16 and 17, 2024 to photograph and document properties within and adjacent to the study area, which extends along the Huron Avenue right-of-way from Berthelot Street in the north, across Causley Street (Trans-Canada Highway), the Huron Central Railway tracks, and Martin Street, to the east of the existing WWTP, and south into the North Channel of Lake Huron. The properties were viewed from the public realm only. Photographs documenting the study area and providing a record of the existing conditions are included in Image 1 to Image 18 in Appendix A. It should be noted that Huron Avenue from Woodward Avenue to Murray Street was under construction at the time of ARA's site visit.

As a result of consultation, examination of existing recognition, and research, two CHLs were identified in the study area that have met or have the potential to meet two or more O. Reg. 9/06 criteria. Their recognized or potential heritage status is summarized in Table 2. The locations of each CHL appear on Map 8.

Table 2: BHRs and CHLs with Known or Potential CHVI

BHR/ CHL #	Type of BHR/CHL	Location	Heritage Recognition	Description of Known or Potential CHVI	Image
CHL-1	Lake	North Channel, Lake Huron No Civic Address Within study area	None Identified in the field as a potential CHL	The North Channel, the northern arm of Lake Huron, is in south-central Ontario, and lies between the Ontario mainland (north) and the islands of Manitoulin, Cockburn and Drummond (ARA 2024). It is 120 miles long (195 km) and 1 to 20 miles (1.6 to 32 km) wide (ARA 2024). The channel is connected on the west with St. Mary's River (via St. Joseph Channel) and on the east with Georgian Bay. Many small islands lie within the channel. The waterbody is influential in defining this part of the province for Indigenous communities and settlers alike. The channel provided sustenance, raw material, and transportation routes to First Nations communities pre-and-post European contact and was utilized by settlers for similar reasons. Once dominated by fishing and logging industries, the Blind River harbour, near the mouth of the Blind River, was the location of the Blind River Mill (see Map 6), and the strip of land between the CPR line and the shore was occupied by the White Pine Lumber Company during at least the early part of the 20th century (ARA 2024). A Marine Archaeological Assessment completed by ARA in 2024 detailed marine resources tied to the lumber era, such as cribs, found in the North Chanel in proximity to the study area. These cribs constitute a part of the community's history and are considered a significant archaeological resource (ARA 2024).	
CHL-2	Railway	Canadian Pacific Railway (operating as Huron Central Railway) No Civic Address Within study area	None Identified in the field as a potential CHL	The Blind River train station was constructed in 1883 when the Canadian Pacific Railway (CPR) opened (Hughes 2024). The opening of the railway through the town allowed the timber cut from the surrounding forests and processed at the saw and planing mills by the harbour to be shipped by rail in addition to steamer, which was a great boon to the economic fortunes of Blind River. In addition, there was mining activity of copper and uranium, which could also be shipped by rail. The railway facilitated a fledgling tourist industry, and a number of hotels were constructed in the town due to its scenic location on the north shore of Lake Huron (Hughes 2024). The Town of Blind River was located to the north of the rail corridor, which followed the shore of the lake. Rail passenger service was discontinued in 1977, and the station was removed in the mid-1980s (Hughes 2024). The route is currently leased from the CPR by the Huron Central Railway (HCRY), which was established in 1997 as a 278 km rail corridor between Sudbury and Sault Ste. Marie for use as a freight corridor. The HCRY is operated by the Canadian subsidiary of the Genesee & Wyoming Railroad (GWRR 2024). The railway is depicted on the 1915 fire insurance plan of Blind River (see Map 6).	

Map 8: Assessment Results Map
(Produced by ARA under licence using ArcGIS® software by Esri, © Esri)

8.0 DESCRIPTION OF PROPOSED UNDERTAKING & PREFERRED ALTERNATIVE

This Cultural Heritage Report is being completed as part of the EA process to select the preferred alternative solution to replace the current raw water supply to the Blind River Water Treatment Plant (WTP), consisting of problematic Groundwater Under the Direct Influence of surface water (GUDI) wells. The EA's Problem/Opportunity Statement is as follows:

> *A preferred raw water supply solution is required to ensure a safe and reliable source of water to the Blind River WTP and to meet the requirements for additional capacity and improved raw water quality* (Town of Blind River 2023:6).

The Blind River WTP provides drinking water to the Town of Blind River, serving a population of 2,500 people (Town of Blind River 2023). The WTP source water consists of five GUDI wells. A well field capacity evaluation competed in 2006 indicated declining water yields and progressively worsening water quality, and the raw water supply cannot support water demands (Town of Blind River 2023).

A number of alternatives were screened based on their ability to meet the objectives of the EA's Problem/Opportunity Statement, to provide an adequate level of service for the buildout population, and to contribute to the overall long-term water quality objectives, operability and efficiency of the Drinking Water System (Town of Blind River 2023). Replacing the Raw Water Supply Source with of equal to/higher quality was selected as the Preliminary Preferred Alternative Solution, which would require construction of a new raw watermain and a LLPS (Town of Blind River 2023). Alternative design concepts for the identification of potential lake-based intake and LLPS sites for raw water supply replacement were developed, and options were assessed based on evaluation criteria. More specifically, four alternative intake locations and six alternative LLPS locations were considered for evaluation. Nine implementation alternatives were further developed as combinations of different locations of raw water intake and LLPS to provide replacement raw water supply of equal/to higher quality, reliability and continued supply of raw water to the Town of Blind River (Town of Blind River 2023).

The option with the overall best score (most benefits at a lower estimated construction cost) recommended as the Preliminary Preferred Water Supply Solution was Alternative A3 (Intake Option 3A and LLPS Option LLPS3), which would see the intake extending approximately 400m into Lake Huron, and a LLPS to be constructed at the existing WWTP site located between Martin Street and the lake (Town of Blind River 2023). A conceptual layout of the Preliminary Preferred Water Supply Solution is included in Figure 1. An evaluation summary of the preferred alternative determined the following:

- No property acquisition is required;
- Allows for operational crossover with the WWTP and will reduce the workforce impact;
- Less construction impacts to the natural environment;
- Lowest construction cost; and,
- Lowest disruption to public as no private properties are located nearby (Town of Blind River 2023:17).

A Water Sampling Study was completed to confirm the viability of raw water quality at the preferred intake location, and a Sensitivity Analysis was carried out to validate the selection of preferred alternative (Town of Blind River 2023).

Detailed design work for the project has advanced to 90% and construction approaches are being confirmed. At present, the works in the Huron Avenue municipal right-of-way are proposed to be open cut as are the works south of the HCRY tracks, with directional drilling employed under Causley Street (Trans-Canada Highway 17) and the HCRY tracks. Excavation or trenching is anticipated for the works extending into the North Channel of Lake Huron.

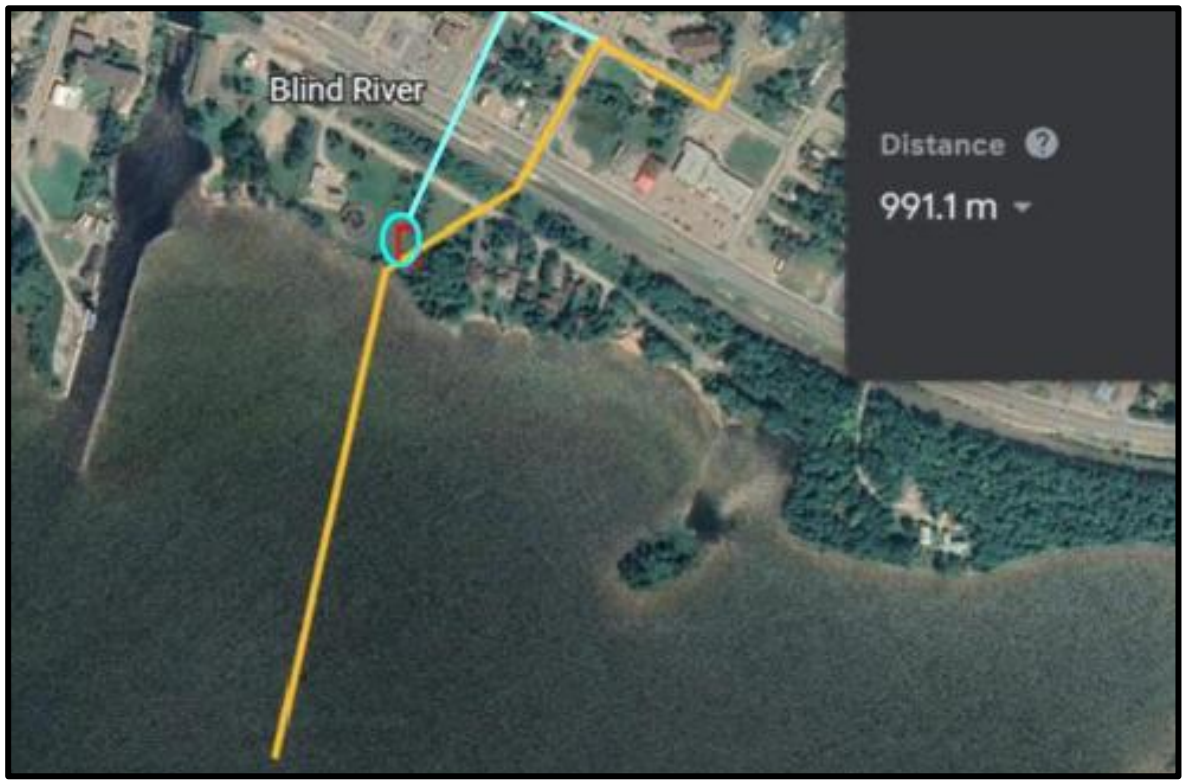


Figure 1: Preliminary Preferred Water Supply Solution Alternative A3 (Intake Option 3A and LLPS Option LLPS3)
(Town of Blind River 2023:13)

9.0 IDENTIFICATION OF POTENTIAL (PROJECT-SPECIFIC) IMPACT AND PROPOSED MITIGATION MEASURES

9.1 Analysis of Potential Impacts

The development of a new raw water intake and LLPS in the Town of Blind River has the potential to affect CHLs. MCM InfoSheet #5: *Heritage Impact Assessments and Conservation Plans* (MCM 2006c:3) provides a list of potential negative impacts (for evaluating against any proposed development impacts), which can be classified as either direct or indirect.

Direct impacts (those that physically affect the heritage resources themselves) include, but are not limited to: initial project staging, excavation/levelling operations, construction of access roads and renovations or repairs over the life of the project. These direct impacts may destroy some or all significant heritage attributes or may alter soils and drainage patterns and adversely impact unknown archaeological resources.

Indirect impacts include but are not limited to: alterations that are not compatible with the historic fabric and appearance of the area, the creation of shadows that alter the appearance of an identified heritage attribute, the isolation of a heritage attribute from its surrounding environment, the obstruction of significant views and vistas, change in land use such as rezoning allowing for a reduction in open spaces and other less-tangible impacts. There may be positive environmental and cultural effects as a result of an EA undertaking.

Project impacts and mitigation measures may need refinement before detail design is complete. As such, potential impacts and mitigation options related to the project will be discussed as they relate to the Preliminary Preferred Alternative Solution outlined in Section 8.0.

This proposed project requires construction of a new raw watermain and a LLPS to ensure a safe and reliable source of water to the Blind River WTP and to meet the requirements for additional capacity and improved raw water quality. No shadows will be cast near any of the identified CHLs as the proposed improvements will take place at or below grade level or will be low-density. None of the CHLs identified in Table 2 will be isolated from their surrounding environment, context, or significant relationship.

The proposed project is not anticipated to result in direct or indirect impacts to significant views or vistas within, from, or of built and natural features associated with the CHLs. Due to the nature of the CHLs identified, vibrations associated with the construction of the new raw watermain and a LLPS are not anticipated to negatively impact the landscapes.

Any impacts to potential and known archaeological sites are being addressed through the archaeological assessment process.

A summary of the potential impacts associated with the preferred alternative are provided in Table 3.

9.2 Mitigation Measures and Recommendations

The study area consists of the Huron Avenue right-of-way from Berthelot Street in the north, across Causley Street (Trans-Canada Highway 17), the Huron Central Railway tracks, and Martin Street, to the east of the existing WWTP, and south into the North Channel of Lake Huron, as

well as all adjacent properties. A field survey of the study area was conducted, and the potential CHLs identified were evaluated against the criteria of O. Reg. 9/06. In total, two CHLs were identified within the study area as having potential CHVI.

This assessment of the preferred alternative is being carried out to inform future planning and completion of the detail design phase (currently at 90%). Depending on the nature and extent of the proposed project, there is the potential that the identified CHLs may be indirectly or directly impacted by the proposed project.

The following mitigation strategies are recommended to address the identified potential adverse impacts:

- That during subsequent planning phases and completion of detail design, CHLs be avoided where possible and any construction staging areas be located on lands away from the portions of CHL-1 (North Channel, Lake Huron) not under construction. If necessary and where feasible, construction fencing should be erected along the periphery of the study area to ensure CHL-1 (North Channel, Lake Huron) is not further damaged by any construction machinery or vehicles; and
- Where construction is anticipated to result in tree and vegetation removal and damage to the shoreline/beach of CHL-1 (North Channel, Lake Huron), post-construction landscaping with native tree species should be employed during detail design and any regrading should meet pre-construction conditions to restore the landscape as close as possible to an as-found condition.

A summary of mitigation measures associated with the preferred design is provided in Table 3.

Table 3: Impacts and Preliminary Mitigation Measures

BHR/ CHL #	Name/Location	Heritage Recognition	Type and Description of Potential/Anticipated Impacts	Mitigation Measures: i. Mitigation Option ii. Mitigation Recommendation
CHL-1	North Channel, Lake Huron No Civic Address	None	**Potential Direct Impact:** A review of the project description outlined that the proposed works for the Blind River Raw Water Intake and LLPS EA Study will see the intake pipe extend approximately 400m into Lake Huron, representing a direct impact to the CHL during the design/construction process. The proposed works will include excavation or trenching into the North Channel of Lake Huron resulting in soil grading and the use of heavy machinery/ traffic. **Potential Indirect Impact:** There is the potential for indirect impacts to the CHL through the removal of vegetation framing the shoreline/beach as a result of construction equipment and regrading.	**Preferred Option:** Avoid any disruption to the North Channel of Lake Huron. **Alternative Option:** Storage and construction staging areas should be located within the study area, away from the portions of CHL-1 not under construction, where possible. If necessary and where feasible, construction fencing should be erected along the periphery of the study area to ensure the landscape is not further damaged by any construction machinery or vehicles. Where construction is anticipated to result in tree removal and damage to the shoreline/beach, post-construction landscaping with native tree species should be employed during detail design and any regrading should meet pre-construction conditions to restore the landscape as close as possible to an as-found condition. A Marine Archaeological Assessment completed by ARA in 2024 detailed marine resources tied to the lumber era, such as cribs, found in the North Chanel in proximity to the study area. The presence of the cribs resulted in a proactive change to the placement of the intake pipe to avoid any negative impacts.
CHL-2	Canadian Pacific Railway (operating as Huron Central Railway) No Civic Address	None	**No Direct or Indirect Impacts Anticipated** The railscape is not expected to be impacted by the undertaking as directional drilling will be employed, which will travel below the ground's surface.	No further recommendations required.

10.0 SUMMARY AND NEXT STEPS OR RECOMMENDATIONS

The study area extends along the Huron Avenue right-of-way from Berthelot Street in the north, across Causley Street (Trans-Canada Highway), the Huron Central Railway tracks, and Martin Street, to the east of the existing WWTP, and south into the North Channel of Lake Huron. The property parcels along and adjacent to this area were assessed as part of this Cultural Heritage Report.

A field survey of the study area was conducted, and all potential CHLs identified were evaluated against the criteria of O. Reg. 9/06. In total, two CHLs were identified within the study area as having potential CHVI.

This assessment of the Preliminary Preferred Alternative Solution is being carried out to inform future planning and the detail design phase. Depending on the nature and extent of the proposed project, there is potential that the identified CHLs may be directly or indirectly impacted by the proposed project.

The following mitigation strategies are recommended to address the identified potential adverse impacts:

- That during subsequent planning phases and completion of detail design, CHLs be avoided where possible and any construction staging areas be located on lands away from the portions of CHL-1 (North Channel, Lake Huron) not under construction. If necessary and where feasible, construction fencing should be erected along the periphery of the study area to ensure CHL-1 (North Channel, Lake Huron) is not further damaged by any construction machinery or vehicles; and
- Where construction is anticipated to result in tree and vegetation removal and damage to the shoreline/beach of CHL-1 (North Channel, Lake Huron), post-construction landscaping with native tree species should be employed during detail design and any regrading should meet pre-construction conditions to restore the landscape as close as possible to an as-found condition.

The following considerations and recommendations should be undertaken as next steps:

- That the above mitigation measures be implemented and considered in subsequent planning phases and during completion of detail design;
- That public consultation may result in additional potential BHRs and/or CHLs being identified. These potential heritage resources should be reviewed by a qualified heritage consultant to 1) determine their CHVI, 2) evaluate potential project impacts, and 3) suggest strategies for future conservation of any candidate heritage resources; and
- That once finalized, CIMA+ should circulate this Cultural Heritage Report to staff/planners at the Town of Blind River and the Heritage Planning Unit of the Ministry of Citizenship and Multiculturalism (MCM).

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Appendix A: Study Area Photographs

Image 1: Huron Avenue Looking South From Woodward Avenue (North End of Study Area)
(October 16, 2024; View Facing Southwest)

Image 2: Berthelot Street Looking East From Huron Avenue
(October 16, 2024; View Facing East)

Image 3: Huron Avenue Looking North From Murray Avenue
(October 16, 2024; View Facing Northeast)

Image 4: Huron Avenue Looking South From Murray Avenue
(October 16, 2024; View Facing Southwest)

Image 5: Huron Avenue Looking North From Causley Street
(October 16, 2024; View Facing Northwest)

Image 6: View Across Causley Street From Huron Avenue
(October 17, 2024; View Facing Southwest)

Image 7: Causley Street Looking East From Huron Avenue
(October 17, 2024; View Facing Southeast)

Image 8: Causley Street Looking West From Huron Avenue
(October 17, 2024; View Facing Northwest)

Image 9: View South to CPR Tracks From Causley Street
(October 17, 2024; View Facing Southwest)

Image 10: CPR Tracks Looking East From Study Area
(October 17, 2024; View Facing Southeast)

Image 11: CPR Tracks Looking West From Study Area
(October 17, 2024; View Facing Northwest)

Image 12: View to Martin Street From CPR Tracks
(October 17, 2024; View Facing Southwest)

Image 13: Martin Street Looking West From Study Area
(October 17, 2024; View Facing Northwest)

Image 14: View of Study Area From Martin Street
(October 17, 2024; View Facing Southwest)

Image 15: Panoramic View of Study Area From Lake Huron
(October 17, 2024; View Facing North)

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Appendix B: Team Member Biographies

Kayla Jonas Galvin, MA, RPP, MCIP, CAHP, Director – Heritage Operations
Kayla Jonas Galvin, Archaeological Research Associates Ltd.'s Director - Heritage Operations, has extensive experience evaluating cultural heritage resources and landscapes for private and public-sector clients to fulfil the requirements of provincial and municipal legislation such as the *Environmental Assessment Act*, the *Standards & Guidelines for the Conservation of Provincial Heritage Properties,* and municipal Official Plans. She served as Team Lead on the Ministry of Tourism, Culture and Sport Historic Places Initiative, which drafted over 850 Statements of Significance and for *Heritage Districts Work!*, a study of 64 heritage conservation districts in Ontario. Kayla was an editor *of Arch, Truss and Beam: The Grand River Watershed Heritage Bridge Inventory* and has worked on Municipal Heritage Registers in several municipalities. Kayla has drafted over 150 designation reports and by-laws for the City of Kingston, the City of Burlington, the Town of Newmarket, Municipality of Chatham-Kent, City of Brampton, and the Township of Whitchurch-Stouffville. Kayla is the Heritage Team Lead for ARA's roster assignments for Infrastructure Ontario and oversees evaluation of properties according to *Standards & Guidelines for the Conservation of Provincial Heritage Properties*. Kayla is a Registered Professional Planner (RPP), a Member of the Canadian Institute of Planners (MCIP), is a professional member of the Canadian Association of Heritage Professionals (CAHP) and sits on the board of the Ontario Association of Heritage Professionals.

Lindsay Benjamin, MAES, RPP, MCIP, CAHP, Heritage Project Manager
Lindsay Benjamin is a Project Manager with ARA's Heritage Team. She has 16 years of experience in cultural heritage conservation gained through work in private, academic and government organizations. She is practiced at providing professional planning recommendations and has extensive experience evaluating built heritage resources and cultural heritage landscapes for private and public-sector clients. Lindsay was the Primary Author and Project Manager of *Arch, Truss, and Beam: The Grand River Watershed Heritage Bridge Inventory*, served as a Team Lead on the Historic Places Initiative writing hundreds of statements of significance, and was Series Editor for Phase 2 of the *Heritage Districts Work!* project, a study of 32 heritage districts in Ontario. She has developed a cultural heritage landscape inventory, heritage conservation district studies, strategic conservation plans, worked on municipal heritage registers, and drafted hundreds of designation reports in several municipalities. She is practiced in the preparation of Cultural Heritage Reports: Existing Conditions and Preliminary Impact Assessments, Cultural Heritage Evaluation Reports, Heritage Impact Assessments, Heritage Conversation Plans and has a special interest in the conservation of heritage bridges through inventory and evaluation. She holds a Master of Applied Environmental Studies degree from the University of Waterloo School of Planning, is a Registered Professional Planner (RPP), a Member of the Canadian Institute of Planners (MCIP), and a Professional Member of the Canadian Association of Heritage Professionals (CAHP).

Penny Young, MA, CAHP, Heritage Team, Project Manager
Penny Young has over 21 years of experience working in government where she managed and coordinated the impacts to cultural heritage resources including built heritage, archaeological sites and cultural heritage landscapes for compliance with municipal, provincial and federal legislation and policy. Penny has held positions at the Ministry of Citizenship and Multiculturalism, Ministry of Transportation, City of Brampton, City of Burlington and City of Mississauga. In these roles she managed and coordinated the evaluations of, impacts to, and mitigation measures for cultural heritage resources including projects impacting heritage buildings, rehabilitation of bridges, archaeological sites and cultural heritage landscapes for compliance with municipal, provincial and federal legislation and policy. She also has considerable experience managing

technical reviews of planning documents and environmental assessment reports conducted for undertakings/planning activities e.g. Official Plans, Official Plan amendments, aggregate pits, mines, highway construction impacts, burial sites and Indigenous traditional use sites. Penny developed and commented on heritage and archaeological policies for numerous municipalities' Official Plans throughout Ontario to meet Provincial Policy Statements 2005 and 2014. She participated in heritage policy development for the City of Toronto's Official Plan, which won a 2013 Award of Excellence from the CAHP. Also, she revised, updated, and developed policy for the MTO 2008 Ontario Heritage Bridge Guidelines for Provincially Owned Bridges. She is a professional member of the Canadian Association of Heritage Planners (CAHP) and holds Professional License (archaeology) #P092 from the MCM. She also holds memberships in the Ontario Professional Planners Institute (OPPI) and the Ontario Archaeological Society (OAS).

L. Renee Hendricks, MA, Heritage Team, Cultural Heritage Technician
Renee is a Technical Writer/Background Researcher for the Heritage Team and assists in researching and evaluating the significance of cultural heritage resources using existing legislation. Most recently, she has worked on a number of projects for various municipalities across southern Ontario as well as Infrastructure Ontario. She also occasionally assists Business and Development in drafting proposals for prospective clients. Her work experience includes cultural heritage evaluation reports, heritage impact assessments, cultural heritage assessments, and conservation plans. Renee obtained a Master of Arts degree in archaeology from Trent University in 2018 and has a Bachelor of Arts with a major in archaeology and a minor in history from Texas State University. Prior to working for ARA's heritage department, Renee worked in the archaeological field as both a field technician and field director, in addition to extensive work as a lab technician analyzing predominately nineteenth century historic artifacts and drafting sections of archaeological reports.

Q

Appendix Q: Treatability Study

Blind River WTP
New Raw Water Intake and Low Lift Pumping Station

Technical Memorandum 5

Treatability Study for Lake-based Source

Wednesday, October 8, 2025

T001592B

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Technical Memorandum 5

Blind River WTP New Intake & LLPS

Treatability Study for Lake-based Source

Project no T001592B | File no 081

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1 Introduction

1.1 Background

The Blind River Water Treatment Plant (WTP) serves approximately 2,500 residents in the Town of Blind River, Ontario (the "Town"), and is operated by a contractor, The Public Utility Commission (PUC Inc). Commissioned in 2008, the WTP has a maximum rated capacity of 6,000 m^3/d, employing treatment including pH adjustment, chemically assisted coagulation and flocculation, dual-media filtration, GAC adsorption (optional), disinfection (sodium hypochlorite) and fluoridation. The WTP, illustrated in Figure 1-1, is presently supplied with raw water from a well field, located approximately 500m to the north, located on the east shoreline of the Blind River, on Riverside Drive. These wells are classified as supplying groundwater under the direct influence of surface water (GUDI), falling under regulations necessitating the same level of treatment as surface water. Treated water is pumped into an elevated tank and directly to the water distribution system, owned and operated by the Town.

The five active wells have a history of decline in both water quality and production, raising concern about their long-term viability as a reliable source of raw water. CIMA+ and TULLOCH are conducting a Class Environmental Assessment (EA) to verify the feasibility of and alternative raw water supply. The initial stages of the assessment led to an in-depth Evaluation of Alternatives (TM3) that resulted in the decision to construct a new intake pipe and low-lift pumping station in the preferred location, in the North Channel of Lake Huron.

As the current groundwater source is classified as GUDI, there is a good probability that the existing Blind River WTP meets the requirements to treat the new water source without any major modification. As part of the EA process, and to obtain approval to amend the MDWL and DWWP, this treatability assessment has been conducted to evaluate the quality of the new source (lake water), its ability to provide a secure, abundant and reliable supply for the present and future needs of the community and the level of effective treatment that the existing WTP can provide to the new source.

The regulations applicable under the Safe Drinking Water Act (SDWA), the Ontario Procedure for Disinfection of Drinking Water and the Ministry of the Environment, Conservation and Parks (MECP) Design Guidelines for DWS licensing and permits were used as objectives in this determination.

The standards provided in the Environmental Protection Act (EPA) Drinking Water Treatability Database (TDB), the Great Lakes Charter, and the Ten State Standards for

Water Works (ASDWA) were consulted to align this study with Drinking Water industry standards and best practices.

Figure 1-1: Blind River Water Treatment Plant

Licences and Permits

The Blind River Water Drinking Water System (DWS # 210000041) holds the following licenses and permits:

- MDWL 205-101
- DWWP 205-201 (included in **Appendix A**)
- PTTW 3410-BV7S44

1.2 Purpose

This study will serve to provide evidence of the proposed lake-source supply characterization and the treatment capacity of the existing WTP, from both a quantity and quality perspective, answering the following questions:

1) Will the lake provide a secure and abundant source of raw water to the DWS?
2) Are there adequate provisions for a reliable supply, at the existing WTP to meet the current rated capacity of 6,000 m^3/d?
3) Is the existing infrastructure able to provide adequate treatment and produce water that will consistently meet the SDWA Ontario Drinking Water Quality Standards, Objectives and Guidelines, using the new surface water as a source?

1.2.1 Quantity

In the years leading up to the construction of the WTP, a combination of increasingly strict provincial treatment objectives and deteriorating groundwater infrastructure (wells) prompted the Town to construct a conventional treatment facility. The decision was based in part on a 1996 Class EA, which made the recommendation to address the persistent challenges with meeting water quality objectives. The WTP process flow diagram is presented in Figure 1-2.

In 2009, the Town decommissioned five of its ten wells. Presently, the remaining wells are contending to meet production objectives, requiring frequent maintenance and refurbishment and yielding an undependable supply to serve the Town's needs.

The new intake and LLPS are designed to secure an adequate surface water supply to meet the projected needs of the Town into the future.

High organic solids content in the well supply contribute to the treatment and production challenges; the WTP is reportedly using approximately 30% of its production water to backwash the filters.

The Permit to Take Water (PTTW 3410-BV7S4M) allows for a maximum draw of 5,785 m^3 per day, from all wells, while the maximum yield that the wells can currently provide is approximately 1550 to 1800 m^3/day (18-20 l/s) as reported by operations.

The **rated capacity** of a water treatment plant is defined by the MECP in the Design Guidelines for Drinking Water Systems (MECP, 2008) as:

The volume of treated water that meets all applicable Ontario drinking water quality regulations including the aesthetic water quality objectives and that may be made available by the water treatment plant for delivery to the drinking water distribution system in any 24-hour period. Normally, it should be equal to the projected maximum day water demand of the drinking-water system, which is the maximum volume of water required in any 24-hour period during the design period.

The rated capacity of a WTP is essentially the net drinking water production rate (i.e. rate of overall drinking water production minus the sum of all in-plant losses and/or demand).

Backwash volume requirements are expected to be considerably reduced with the implementation of the new lake water source. The raw water infrastructure (new intake and LLPS) is being designed to supply a capacity equivalent to an additional 12% of treated water capacity to fulfill backwash and other in-plant water use requirements.

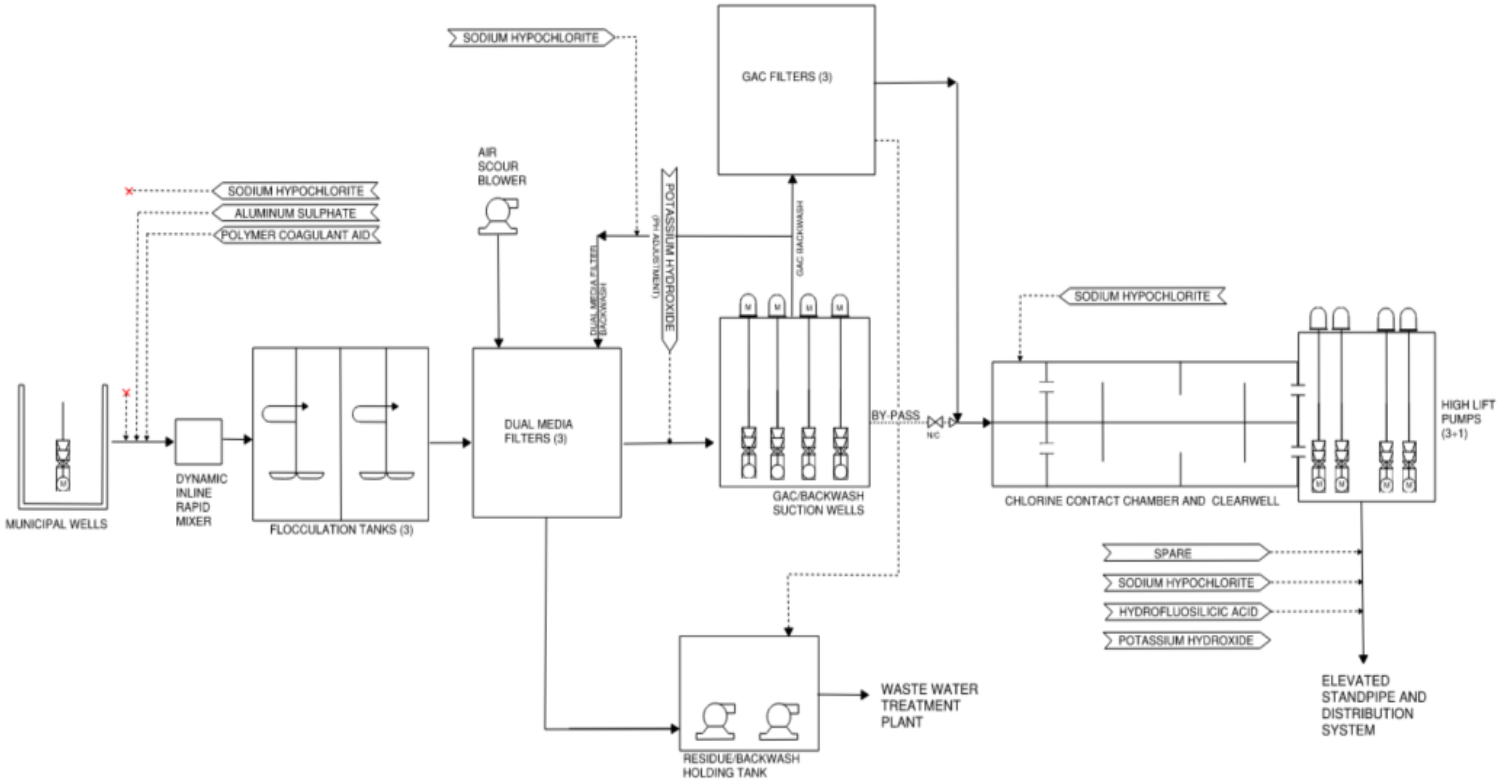

Figure 1-2: Blind River WTP Process Flow Diagram

1.2.2 Quality

Following the insightful guidance while corresponding with the MECP, an investigative sampling plan (the New Source Water Quality Sampling Plan, included as **Appendix B**) was produced for the area of interest in Lake Huron. Based on the bathymetry results (Tulloch, 2023) eight sampling locations were strategically selected, sampled and analyzed for a series of characterization parameters.

This sampling data was then compared with historical raw water quality data from the existing wells (a summary of which is provided in Section 2). The results of this comparison, along with an assessment of the capacity and suitability of the existing treatment process units, were used to highlight potential performance limiting factors for the existing WTP, when treating the new Lake Huron sourced water. A summary of the results is provided in Section 3.

2 Source Water Taking and Quality Review

2.1 Current Groundwater Source Overview and Challenges

The Water Treatment Plant (WTP) is currently supplied by four municipal groundwater wells via a 400mm transmission main. The wellhouses are equipped with pumps, process piping, and Programmable Logic Controllers (PLCs) that interface with the Supervisory Control and Data Acquisition (SCADA) system. Wellhouse #9, designated as the Control Building, is the largest and contains a diesel generator for backup power.

The existing Groundwater Under the Direct Influence (GUDI) Wells are aging and their condition is declining. The raw source water exhibits elevated levels of minerals and contaminants, including manganese, iron, color, organic carbon, turbidity, and hydrogen sulfide. These contaminants contribute to the formation of Disinfection Byproducts (DBPs), with system averages for Trihalomethanes (THMs) and Haloacetic Acids (HAAs) sometimes exceeding the Maximum Acceptable Concentrations (MACs). To effectively monitor DBP formation, sampling is conducted at a higher frequency than regulatory requirements.

2.2 Lake Water Sampling and Analysis

On May 12th, 2023, an investigative sampling plan (the New Source Water Quality Sampling Plan, included as **Appendix B**) was launched to perform an evaluation of the areas of the North Shore of Lake Huron proposed for the installation of the intake pipe to use as the Town's new source for drinking water. The study assesses the parameters required to identify and evaluate conditions which could threaten water quality and the water system, evaluating contamination from pathogens, chemicals, and radionuclides. The results of the study are used to determine the type of treatment required to meet water quality criteria under the Ontario Drinking Water Quality Standards (O. Reg. 169/03) and the Guidelines for Canadian Drinking Water Quality.

The Sampling Plan (as described in **Section 2.2.1** below) was reviewed and accepted by the MECP, with the suggestion that a full investigation of radionuclide concentrations be added, due to the proximity of a uranium refinery. Results showed radionuclide concentrations were not detectable.

2.2.1 Sampling and Analysis Plan

The sampling plan investigates an area of approximately 1 km^2 along the shoreline south of the WTP. The area is bounded on the west by Blind River, resident to an active

Marina and a WWTP outfall, and on the east by Caribou Peninsula. Based on the bathymetric survey completed by TULLOCH (TULLOCH, 2023) and historical information regarding the North Channel of Lake Huron, a total of 8 sites were sampled for selected parameters as outlined in the New Source Water Quality Sampling Plan (included as **Appendix B**). In the plan, which is still in progress, locations and parameters are provided for several rounds of sampling, spanning over a 1-year timeline, outlining specific analysis to be conducted monthly, quarterly, and seasonally as required to ensure sufficient data is collected to completely characterize the new source and illuminate possible threats. The sampling locations are illustrated in **Figure 2-1**.

Figure 2-1: Sampling Locations

TULLOCH completed sampling and analysis per the plan created by CIMA+. During the first sampling round, four (4) sample sites were selected (SW01-04). Grab samples of water (from each meter of depth) and sediment were obtained at each site and analyzed to determine the location possessing the best water quality. Minimal variability was noted between the results, suggesting that the water was of effectively uniform composition in the study area and that all the selected areas would provide a suitable source of raw water.

Based on the results of the Evaluation of Alternatives conducted in TM3 of this Class EA, and the results from the bathymetry depth study, water quality analysis, and financial assessment, one sampling location was selected for subsequent testing. This final location (SW05) was sampled, and testing was performed for all parameters listed in Tables 1 through 4 of the Technical Support Document for Ontario Drinking-water Quality Standards, Objectives and Guidelines, 2006. Additionally, the site and the

shoreline were sampled and visually monitored for algal blooms throughout the summer.

To evaluate possible risk factors (shallow water, river outflow, WWTP outfall) subsequent sampling rounds included the shoreline (SW06), the river mouth (SW07), and downstream of the WWTP outfall (SW08). Some of the sampling attempts were postponed due to inclement weather, resulting in a total of five (5) monthly sample rounds completed between May and October of 2023. Due to limiting ice conditions, sampling was postponed for November and December 2023. Additional rounds were performed in January and February from the shoreline of the river and when the lake could be safely accessed by boat, ten (10) more rounds of samples were taken between March and August 2024, focusing on the preferred intake placement site (SW01) and the River outfall (SW08) for a total of 18 sampling days.

2.2.2 Sampling and Analysis Results

The results from the investigative sampling program for the proposed lake source are shown in **Table 2-1**, along with the average water quality results for the existing GUDI wells. The well system data averages were derived from annual regulatory reports spanning the last five years (2018–2024), while the lake data comes from single grab samples taken approximately monthly between May 2023 and August 2024. The difference in data point volume and collection frequency introduces an expected range of incongruity between the sources.

Treated Water Quality Objectives are also included in **Table 2-1** for reference to indicate the level of treatment required for the raw source water. For example, the detection of E. coli in the raw water samples, where the objective is zero (undetectable), indicates the need for disinfection.

The data provided in **Table 2-1** indicates that the lake-based source is of significantly higher quality than the existing GUDI wells, with notably lower concentrations of parameters that currently complicate treatment including color, organic carbon, iron, manganese, sodium, nitrites, hardness, and aluminum.

Table 2-1: Raw Water Quality Comparison (Current Well Source vs. New Lake Source)

Parameter	Unit	Objective (for Treated Water)		Well Sample Values			Lake Sample Values		
		Type[1]	Value[2]	Min	Avg	Max	Min	Avg	Max
pH	-	OG[2]	6.5 – 8.5	6.6	7.19	7.8	6.94	7.96	8.39
Turbidity	NTU	AO[2]	≤ 5.0	0.10	0.24	0.68	0.22	0.69	1.50
E. coli	Cfu	MAC[2]	N/D[4]	0	0	1000	0	1.8	8.0
Total Coliforms	Cfu	MAC[2]	N/D[4]	0	1.8	16000	5	14	300
Colour	TCU	AO[2]	≤ 5	6.00	27.0	58.0	7.19	6.37	7.72
Alkalinity	mg/L	OG[2]	30 – 500	N/A[5]	127.0	N/A[5]	40.0	44.2	60.0
Hardness	mg/L	OG[2]	80 – 100	115.6	119.4	123.1	48.2	52.6	59.1
Ultraviolet Transmittance (UVT)	%	-	-	62.0	69.8	75.0	72.7	85.3	79.0
Dissolved Organic Carbon (DOC)	mg/L	AO[2]	≤ 5	3.8	4.5	5.6	2.7	4.7	6.8
Total Organic Carbon	mg/L	-	-	3.8	5.18	5.8	3.0	4.5	5.9
Nitrate	mg/L	MAC[2]	≤ 10	0.27	0.36	0.71	0.13	0.18	0.22
Nitrite	mg/L	MAC[2]	≤ 1.0	<0.05	0.05	0.06	N/D[4]	N/D[4]	N/D[4]
Iron	mg/L	AO[3]	≤ 0.1	0.13	0.62	1.10	0.01	0.07	0.08
Manganese	mg/L	AO[3]	≤ 0.02	0.11	0.14	0.34	N/D[4]	0.01	0.01
Aluminum	mg/L	OG[2 3]	≤ 0.1	0.02	0.06	0.110	0.01	0.03	0.04
Sodium	mg/L	AO[2 3]	≤ 20[6]	9.6	11.5	15.8	3.4	4.5	5.0
Arsenic	mg/L	MAC[2]	≤ 0.010[7]	<0.002	<0.002	<0.002	N/D[4]	N/D[4]	N/D[4]
Calcium	mg/L	-	-	32.8	37.4	39.1	12.9	13.6	14.1

Notes:

1. OG = Operational Guideline; AO = Aesthetic Objective; MAC = Maximum Acceptable Concentration
2. Per the Ontario Drinking Water Quality Standards (Government of Ontario, 2020), or the associated Technical Support Document (Government of Ontario, 2006)
3. Per the Guidelines for Canadian Drinking Water Quality (Health Canada, 2025)
4. N/D = Not Detectable
5. N/A = Data Not Available
6. Local Medical Officer of Health should be notified when sodium concentrations exceed 20 mg/L
7. Value should be maintained as low as reasonably possible

2.2.2.1 Characterization of Potential Lake Source Water

The results shown in **Table 2-1** indicate that the proposed lake source is reasonably pristine at a depth of 4 meters (SW05) at the time of testing, temperatures ranging from 12 to 22°C, pH between 7.7 and 8.3, and relatively low mineral content and alkalinity. The highest reported presence of Escherichia coliform (E. coli) was measured to be 4 cfu/100mL, Total coliform between 5 and 9 cfu/100mL with one result of 300 cfu/100mL in the October 2023 sample. Total organic carbon (TOC) ranging from 3.0-5.0 mg/L, with the majority being measured as dissolved (DOC) >95%. All other analysis for metals, phyto-consumables, microcystin, taste & odour compounds, hydrocarbons and radionuclides measured levels below the objectives or were not detectable.

Generally, the new source water can be characterized with having the following attributes:

- Visibly clear water to the bottom of the lakebed with low turbidity, low solids and low natural organic matter content.
- Relatively soft water with low mineral content and low alkalinity and high dissolved oxygen which is characteristically good for aquatic life but could catalyze corrosion. Considering the neutral to basic pH, low salinity and low electrical conductivity, corrosion is not of concern.
- Moderate colour – 6.3 - 7.7 TCU (AO <5 in treated water) and low values for presences of bacterial colonies (E.coli, Total coliforms) can both be treated easily with the systems in place.
- Sediment is 97% Sand (>75µm) with a coarse texture.

To determine the possible impact that the WWTP effluent might have on the intake, samples were taken from the Blind River mouth and directly downstream of the WWTP outfall. Results were obtained for bacteria, phyto-consumables, natural organics and suspended solids. Results showed comparable levels to the intake site and other parts of the lake. Notably, the electrical conductivity value was much lower in samples collected from the river, indicating less contamination.

2.2.3 Treatability Concerns for Lake Source Water

While the lake water quality is generally superior, a conservative approach dictates addressing the risk posed by its specific characteristics: low metals content, low alkalinity, and softness.

This water quality profile could encourage the leaching of metal deposits (such as lead, iron, and manganese) from the WTP filter media and the existing water distribution

system piping. These currently dormant compounds may react with the new water, dissolving into the drinking water. This potential will be addressed through:

- Development of a transition plan.
- Stringent water quality monitoring throughout the system.
- Implementation of corrosion control measures.

Further details on these and other treatability concerns are provided in the subsections below.

2.2.3.1 Low Turbidity & Low Alkalinity

Coagulation is the reaction between the alkalinity of the treated water and the coagulant which destabilizes the negatively charged particles in raw water by adding positively charged chemical compounds. The attraction of oppositely charged particles results in the formation of floc. In the lake water, alkalinity and turbidity concentrations are considerably low. Turbidity is noted consistently below 1.0 NTU and alkalinity averages 40 mg/L (as $CaCO_3$).

Although an indication of a pristine water source, this could pose operational challenges and require treatment of a different nature than is currently being applied to the well water. Since coagulants generally perform better in higher alkalinity and hardness, the lake water may present a challenge given the combination of low solids content and softness. This may require changing or supplementing coagulant products to optimize floc formation. Temperature and pH fluctuation, that is typical in surface water but not in groundwater, will influence the coagulation process as well.

2.2.3.2 Low Alkalinity, High Dissolved Oxygen & pH

As low alkalinity in water reduces its buffering capacity (ability to neutralize acids), and the presence of high dissolved oxygen (DO) in water can act to catalyze oxidization reactions, the chemical conditions in the distribution pipes will allow for corrosion to occur. Corrosion does not only cause degradation and tuberculation in steel pipes, it can also allow for harmful metals to leach from the pipes and dissolve into solution, posing a risk to the drinking water.

Lead, copper, and iron are of highest concern, for reasons of public health and aesthetics. To address this possibility, many municipal water systems employ corrosion control strategies to mitigate leachates. One of these strategies is the addition of an alkaline chemical to the water, increasing its pH. Water with high pH is more resistant to reaction with oxidants which can prevent the metals of concern from entering solution in the water. Additionally, the use of orthophosphate is becoming more common in water

treatment as a method for addressing this issue. It functions by building up a protective coating on the interior of steel pipes, preventing corrosion. It also slightly increases pH.

Fortunately, the process required for pH adjustment is already being employed at the WTP, using potassium hydroxide (KOH). While KOH may not have a major impact on alkalinity, the increase in pH could help to stabilize the water for coagulation and corrosion control. Alternative chemicals that provide pH and alkalinity adjustment can be investigated as well (e.g., calcium hydroxide, bicarbonates).

2.2.3.3 Disinfection By-Product Formation

When applying the practice of pre-chlorination to water with high organic content (DOC, TOC), the organics may react with chlorine to produce disinfection by-products (DBPs), including Trihalomethanes (THMs) and Haloacetic acids (HAAs). These chemicals are carcinogenic. Although not usually as prevalent in surface water, precursors to disinfection by-products (DBP's) include natural organic carbon (NOM, DOC, TOC), hydrocarbons (e.g., methane, propane). When these precursors are mixed with halogens (e.g., chlorine, bromine, fluorine) halogenated carbon compounds are produced, including the DBPs described above. The reaction and resulting concentrations are dependent on the availability of each precursor. Higher concentrations of organics and/or chlorine produce higher concentrations of DBPs.

DBPs are not a concern for the new lake source, considering water quality sampling results.

2.3 Recommendations for Transitioning from Groundwater to Surface Water

Bench-scale jar testing of the new source water and testing of coagulants is recommended to help determine which product(s) (or combination thereof) would work best. As the WTP operations laboratory possesses jar testing equipment, it is recommended that Operations develop a procedure and begin to jar test the lake water, at regular intervals (~weekly), capturing storm events and lake turnover for the time leading up to construction and commissioning.

Considerations to treatability, compliance and operational diligence should be included in the development of the commissioning plan.

3 Existing WTP Process Overview

3.1 Existing Plant Overview

The Blind River WTP commissioned in 2008, provides coagulation, flocculation, chemically-assisted direct filtration, chlorination, pH control and fluoridation.

Prior to the construction of the WTP, treatment consisted only of chlorination and fluoridation at the well field sites. According to the First Engineers' Report from 2000, the water supplied by the system did not meet the drinking water standards required at the time under the *Drinking Water Protection – Larger Water Works* regulation (O Reg 459/00, superseded in 2003) (Kresin Engineering Corporation, 2000). Results included elevated levels of iron, manganese, colour, odours, and taste. The report recommended the provision of a water treatment plant to address these inadequacies in the original system.

In general, the existing treatment plant is in good condition. It has been in service for just over 15 years and has experienced only minor wear and tear. As noted in the Facility Review conducted by CIMA+ in 2022, one important concern is the high volume of solids loading imposed on the filters, which results in frequent backwashing and elevated backwash volumes (CIMA+, 2022).

3.2 Existing Treatment Train Overview

The existing Blind River WTP provides treatment in three stages: flocculation, filtration, and disinfection. First, coagulant is added to the raw water, which then passes through an inline flash mixer, before flowing into the flocculation tanks where polymer is added. After coagulation and flocculation, the water is directly filtered (direct filtration), first through dual-media filters, then through granulated activated carbon (GAC) filters for taste and odour control. Sodium hypochlorite is added to the water as it enters the contact chamber, and disinfection contact time (CT) is provided first by the clearwells, and then the high lift pump wells. Potassium hydroxide is used to adjust pH and fluoride is added. The high lift pumps then move the treated water into the distribution system. A more detailed overview of treatment is available in **Appendix C**.

3.3 Site Visit Observations and Findings

On December 6, 2023, the proposed construction site area and the WTP were inspected by CIMA+. Photos were taken of the process equipment, SCADA screens and related manuals. Documentation was reviewed to compile a history of maintenance,

operation, and chemical use. The operator-in-charge (OIC) provided additional information as requested.

Overall, the WTP is well maintained with all system processes present, complete, and in good working condition as described in the documentation. Of note, the filters are each being backwashed every 24 hours, at minimum. The filter runs are short and backwash sessions are extended due to the heavy loading of floc that they are receiving. The equipment is spaced well for maintenance, offering sufficient room for a minor amount of new equipment, if required.

At the time of the site visit, two wells were out of service, for reconditioning, with the aim of increasing their yield. As a result, production had been limited to the remaining three wells for a few weeks. Operations reports that this is a regular occurrence, required to continue to meet demand. However, yield improvements from rehabilitation have been declining each time they occur.

3.4 Existing Process Units

Table 3-1 presents the individual process units compared to recommended design values from the MECP Design Guidelines (or other sources as noted). Process units, including key equipment are described and dimensioned in **Table 3-1**.

Table 3-1: Existing Water Treatment Process Units

Process Unit	Design Parameter	Guideline Value	Value at Rated Capacity (6 MLD)
Coagulant Rapid Mixer (VFD)	G value (s^{-1})	order of 1000 s^{-1}	4,491 (2,250 if 50%)
Flocculation Tanks (VFD)	Detention time (min)	15 min (direct filtration system objective)	25
	G value - Stage 1 (s^{-1})	10-70 s^{-1}	17.10
	G value - Stage 2 (s^{-1})		11.11
Filtration (multi-media)	Filtration rate (m/h)	11.7 m/h	6.8
		18 m/h (one filter in backwash mode)	10.2
	Unit Filter Run Volume (UFRV) (m^3/m^2)	>200 m^3/m^2 [1]	485
Filtration (GAC)	Empty Bed Contact Time (EBCT) (min)	5 to 20 min	19.6
Disinfection	CT (mg-min/L)	refer to Section 3.5	refer to Section 3.5

Process Unit	Design Parameter	Guideline Value	Value at Rated Capacity (6 MLD)
Backwash and Residue Management	Surface Overflow Rate (SOR, m/h)	<1 to 2.4 m/h	<1
	Backwash rate	37-50 m/h	40.0

Note:
1. UFRV is a suggested guideline, used to indicate whether the process is operating efficiently, and is not an MECP requirement (Charles, 2023).

3.5 Disinfection Process

The Blind River WTP provides disinfection via chlorination with sodium hypochlorite Since the wells which currently provide raw water to the plant have been identified as GUDI, the facility is currently subject to similar regulatory requirements as surface water treatment plants for the required removal and inactivation of pathogens, under the MECP's Procedure for Disinfection of Drinking Water in Ontario (MECP, 2016). These requirements are listed in **Table 3-2**.

Table 3-2: Required Pathogen Removal/Inactivation Credits for Surface/GUDI Water

Pathogen	Total Required Removal/ Inactivation	Minimum Removal/Inactivation to be Provided by Disinfection
Giardia Cysts	3-log	0.5-log
Cryptosporidium Oocysts	2-log	-
Viruses	4-log	2-log

Based on the existing conditions and calculated log removal and inactivation credits awarded to the WTP for chemically assisted direct filtration (2-log for Giardia and Cryptosporidium, 1-log for viruses) per the system's MDWL, the chlorine disinfection system must provide inactivation of at least 1-log for Giardia, and 3-log for viruses. The breakdown of required and provided log removal and inactivation credits are available in **Table 3-3**.

Table 3-3: Blind River WTP Removal/Inactivation Credits and Requirements

Stage	Giardia	Cryptosporidium	Viruses
Chemically Assisted Direct Filtration	2-log	2-log	1-log
Disinfection	1-log	0	3-log
Achieved / Required	3/3	2/2	4/4

The chlorine contact time (CT) required to achieve these disinfection credits is dependent on two parameters:

- Temperature
- pH

The WTP's O&M manual outlined assumed operating values for each of these, which were used to calculate the CT required during the design of the WTP. These operating values and the resulting required CT are provided in **Table 3-4**. In addition, expected minimum and maximum temperatures and pH levels in Lake Huron have been included in this table, as well as the resulting "worst-case" required CT.

Table 3-4: CT Required Design Basis

Parameter		Value
Temperature (°C)	Operational Value[1]	10
	Lake Huron Maximum[2]	25
	Lake Huron Minimum[2]	0.5
pH	Operational Value[1]	7.5
	Lake Huron Maximum[2]	8.5
	Lake Huron Minimum[2]	6.5
Required Inactivation Credits by Disinfection	Giardia	1-log
	Viruses	3-log
Free Chlorine Residual (mg/L)	Operational Value[1]	1.0
CT Required (mg-min/L)	At Operational Values[3]	45.0
	Worst-Case Scenario[3 4]	122.0

Notes:
1. Per the Blind River WTP Operations and Maintenance Manual (Kresin Engineering Corporation & Simcoe Engineering Group, 2008).
2. Based on historical levels in Lake Huron.
3. Based on the required credits for 1-log inactivation of Giardia, as the required CT is greater than that for 3-log viruses.
4. Based on the minimum temperature and maximum pH recorded in Lake Huron.

The CT provided is dependent on three parameters:

- Free chlorine residual
- Treated water flowrate
- Contact chamber volume

Each of these parameters, as well as the resulting CT provided, have been summarized in **Table 3-5**. Per the DWWP (included in **Appendix A**), the clearwells and high-lift suction wells are considered to be chlorine contact chambers.

The effective volumes and provided CT in **Table 3-5** assume a contact chamber water level of 3.0m. This is roughly equal to the standard operating level of the plant, per a sample report under the WTP's Drinking Water Quality Management (DWQMS) plan (included as **Appendix D**). However, there are other possible design values for this level:

- The design CT calculations assume a minimum clearwell level of 1.2m (Kresin Engineering Corporation & Simcoe Engineering Group, 2008)
- Plant operations has indicated the SCADA system has an operational setpoint for the clearwell LoLo level alarm at 2.0m, and the plant is not in operation if this alarm is exceeded.
- The WTP's as-built drawings indicate a maximum operating level is 5.5m.

The effective volumes and provided CTs under each of these conditions has been included with the calculation sheet in **Appendix E**.

Table 3-5: CT Provided Design Basis

Parameter	Value	
20-Year Design Flowrate (m^3/day)	3,000	
Ultimate Design Flowrate (m^3/day)	6,000	
Free Chlorine Residual (mg/L)	1.0	
Parameter	**Clearwells**	**Suction Wells**
Length (m)[1]	19.5	6.0
Width (m)[1]	13.0	4.5
Surface Area (m^2)	253.5	27.0
Number of Cells	2	2
Total Surface Area (m^2)	507.0	54.0
Baffling Factor	0.4[2]	0.1[3]
Effective Operating Volume (m^3) [4]	1521.0	162.0
Parameter	**20 Year Design Flow**	**Ultimate Design Flow**
CT Provided (mg-min/L)	300	150

Notes:
1. Dimensions taken from as-built drawings

2. Listed on the WTP's DWQMS operational plan (provided in **Appendix D**)
3. Factor for unbaffled condition, per the Procedure for Disinfection of Drinking Water in Ontario (MECP, 2016).
4. Assuming a clearwell level of 3.0m.

Per **Table 3-5**, even at the ultimate design flowrate, there is sufficient CT provided under normal operating conditions to meet the required worst-case required CT.

In addition to these normal operating conditions, the CT provided was calculated under a number of other potential operating conditions, varying clearwell levels, chlorine residual levels, and the flowrate of treated water. The resulting CT from these other conditions is included with the calculation sheet in **Appendix E**. Some key findings from this calculation sheet are:

- Assuming a free chlorine residual of 1.0mg/L, adequate CT is provided at the current minimum level setpoint of 2.0m for the 20-year design flowrate (3,000 m^3/day). However, at the ultimate design flowrate (6,000 m^3/day) the provided CT under these conditions falls below the worst-case required CT.
    - A small increase in the minimum level setpoint (from 2.0 to 2.5 m) or the free chlorine residual (from 1.0 to 1.25 mg/L) can address this deficiency following the ultimate build-out of the LLPS.
- The minimum CT volume which can be provided without taking the plant offline occurs when one clearwell and one suction well are taken out of service, leaving one of each in place ("single train operation"). Under single train operation, a small increase in the minimum level setpoint or the free chlorine residual are required to ensure the worst-case required CT continues to be met at the 20-year design flowrate. At the ultimate design flowrate, however, a fairly substantial increase in level or residual would be required.

4 Process Performance Limitations

No performance limiting factors are apparent based on the design and capacity of each process unit and the water treatment system as a whole.

The plant would benefit from additional equipment redundancy. For example, the in-line coagulant rapid mixer does not have a redundant partner and cannot be bypassed during production and there is one air scour blower for backwashing of the dual-media filters. The determined risk associated with the breakdown of this equipment is not high and can be managed with maintenance.

The remaining concerns related to the operation of this plant come from three sources. The first two are poor raw water quality and unreliable quantity, which this project will remedy with a new lake-based intake.

The third is that the WTP was built for a higher capacity than it is using. The process units are not expected to reach their intended capacity for years. This can introduce challenges for operations and maintenance, if the pumps and motors are operated at their minimum range over a long period of time, necessitating early maintenance, increased breakdowns, and reduced life span.

To reduce the high costs of upgrading facility works, many plants are designed for a future, higher capacity, looking into a 25-to-50-year lifespan. If operations continue to rotate equipment regularly, the extra capacity (at low flow) provides a good buffer to treatment, with the ability to facilitate longer detention times for flocculation and disinfection, longer filter runs and overall better treated water quality. During peak demand, and as the population increases, the plant is more than suitable, and the Town is not expected to incur capital costs for capacity upgrades into the foreseeable future.

5 Conclusions and Recommendations

Based on the investigation carried out in this study, the existing equipment at the Blind River WTP can serve to meet the treatability requirements of the new source water. To ensure compliance under all foreseeable conditions, minor limitations and recommendations are suggested as follows:

1. Develop a transition plan to maintain treated drinking water quality during construction, commissioning and integration of the new source water. Include steps to move from well water to the lake water, with the intention to mitigate risks to water quality compliance and determine operational limitations, barriers, optimization, and possible new requirements. Transition plans may include:
    - Conducting a series of jar tests on the lake water, investigating dosage of coagulants, polymers, pH and alkalinity adjustment.
    - Including treatability plans into the commissioning plan.
    - Increased operational diligence during transition with consideration to the water chemistry impact resulting from mixing of the two waters.
2. Set operational guidelines to ensure CT is continuously being met under all conditions, up to the WTP's maximum rated capacity. Set alarm setpoints higher than exceedance values for all parameters contributing to CT. Update the O&M manual to reflect setpoint changes and new operating practices.
3. Update the standard operating procedures and provide training to include new duties required to operate and maintain the new Intake and LLPS.
4. Develop a plan for decommissioning the wells. Unless used for monitoring, all wells should be properly abandoned or decommissioned in accordance with the requirements of Wells Regulation (R.R.O. 1990, Regulation 903) under the Ontario Water Resources Act.
5. Develop emergency response plans to implement in case of:
    - A spill entering the new defined IPZ;
    - Anchor or watercraft engagement on intake pipe;
    - Ice or mussel event blocking the intake;
    - Loss of water level, or flooding;
    - Backflow preventer (BFP) /check valve failure;
    - Communications failure, and/or power failure;
    - Loss of critical equipment;
    - Other foreseeable events that may constitute an emergency.

6 References

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A

Appendix A: Current Blind River Drinking Water Works Permit

Ontario

DRINKING WATER WORKS PERMIT

Permit Number: 205-201
Issue Number: 3

Pursuant to the *Safe Drinking Water Act*, 2002, S.O. 2002, c. 32, and the regulations made thereunder and subject to the limitations thereof, this drinking water works permit is issued under Part V of the *Safe Drinking Water Act*, 2002, S.O. 2002, c. 32 to:

The Corporation of the Town of Blind River

11 Hudson Street
P.O. Box 640
Blind River, ON
P0R 1B0

For the following municipal residential drinking water system:

Blind River Drinking Water System

This drinking water works permit includes the following:

Schedule	Description
Schedule A	Drinking Water System Description
Schedule B	General
Schedule C	All documents issued as Schedule C to this drinking water works permit which authorize alterations to the drinking water system
Schedule D	Process Flow Diagrams

DATED at TORONTO this 20th day of June, 2016

Signature

Aziz Ahmed, P.Eng.
Director
Part V, *Safe Drinking Water Act*, 2002

Schedule A: Drinking Water System Description

System Owner	**The Corporation of the Town of Blind River**
Permit Number	**205-201**
Drinking Water System Name	**Blind River Drinking Water System**
Schedule A Issue Date	**June 20, 2016**

1.0 System Description

1.1 The following is a summary description of the works comprising the above drinking water system:

Overview

The **Blind River Drinking Water System** consists of [5] groundwater wells and pump houses, [1] drinking water treatment plant, [2] storage reservoirs (clearwells), [1] elevated storage tanks and approximately 350 meters of trunk watermains and 35 kilometers of distribution watermains.

Groundwater Wells

Well No. 5

Description	Gravel packed well
Location	Located along the east shoreline of Blind River within the built-up section of the Town
UTM Coordinates	NAD27: Zone 17: Easting 349755: Northing 5116840
Dimensions	650 mm x 300 mm, depth 17.6 m
Equipment	Equipped with one (1) submersible pump capable of pumping a minimum of 6.3 L/s and a maximum of 13.24 L/s, discharging into a 400 mm common discharge header.
Notes	GUDI Well

Well No. 6

Description	Gravel packed well
Location	Located along the east shoreline of Blind River within the built-up section of the Town
UTM Coordinates	NAD27: Zone 17: Easting 349640: Northing 5116740
Dimensions	450 mm x 250 mm, depth 20.1 m
Equipment	Equipped with one (1) submersible pump capable of pumping a minimum of 6.3 L/s and a maximum of 13.24 L/s, discharging into a 400 mm common discharge header.
Notes	GUDI Well

Well No. 7

Description	Gravel packed well
Location	Located along the east shoreline of Blind River within the built-up section of the Town
UTM Coordinates	NAD27: Zone 17: Easting 349700: Northing 5116760
Dimensions	600 mm x 300 mm, depth approximately 20 m
Equipment	Equipped with one (1) submersible pump capable of pumping a minimum of 6.3 L/s and a maximum of 13.24 L/s, discharging into a 400 mm common discharge header.
Notes	GUDI Well

Well No. 8

Description	Naturally developed well
Location	Located along the east shoreline of Blind River within the built-up section of the Town
UTM Coordinates	NAD27: Zone 17: Easting 349875: Northing 5116980
Dimensions	200 mm diameter, casing to a depth of 21 m
Equipment	Equipped with one (1) submersible pump capable of pumping a minimum of 6.3 L/s and a maximum of 13.24 L/s, discharging into a 400 mm common discharge header.
Notes	GUDI Well

Well No. 9

Description	Drilled well
Location	Located along the east shoreline of Blind River within the built-up section of the Town near Riverside Drive
UTM Coordinates	NAD83: Zone: 17 Easting: 349607 Northing: 5116867
Dimensions	150 mm diameter, depth 15.24 m
Equipment	Equipped with one (1) submersible pump capable of pumping at 6.3 L/s discharging into a 100 mm pipe to the control building.
Notes	GUDI Well

Blind River Treatment Plant

Blind River Water Treatment Plant

Name	Blind River Water Treatment Plant
Street Address	47 Murray Street
UTM Coordinates	NAD 83: Zone 17: Easting 349593: Northing 5116383
System Type	Chemically assisted filtration and disinfection
Notes	Encloses treatment process units, water storage, pumping facilities, chemical feed and storage facilities, residue management system, loading and unloading facilities, electrical and SCADA control, mechanical equipment, a standby generator set, a laboratory and operations and visitor center. Three parallel treatment process trains, each rated at one third of the design maximum day flow of 6,000 m^3/day comprised of one in-line rapid mixer, three identical flocculation tanks, three dual media filters, three GAC contactors, de-sludging dual-media filtration and backwash facilities

Coagulation

In-Line Rapid Mixer

Description	One (1) in-line mechanical rapid mixer.
Dimensions	300 mm by 600 mm long
Notes	on the raw water header immediately after the coagulant injection location

Flocculation

Flocculation Tank

Description	Three (3) flocculation trains, operating in parallel, each train with two (2) flocculation cells in series.
Equipment	Each cell consisting of one (1) 17.36 m^3 concrete tank with one (1) variable speed drive mixer.
Notes	

Filtration

Dual Media Filters

Description	Gravity Flow Multi-Media Filter Beds
Equipment	Three (3) gravity flow multi-media filter beds with two layers, operating in parallel, each rated at one third of the design maximum day flow or 2000 m^3/day with a filtration rate of approximately 7 m/hr and a hydraulic capacity of 12 m/hr with automatic backwash by air scouring and equipped with filter-to-waste ripening cycle. Multi-media filter beds with a surface area of each filter unit of approximately 12.25 m^2 consisting of top 450 mm layer of anthracite and lower 500 mm layer of Filox-R media.
Notes	One (1) backwash blower capable of delivering approximately 530 SCFM.

GAC Contactors

Description	Three (3) granular activated carbon contactors operating in parallel.
Dimensions	Each contactor unit with a surface area of approximately 12.25 m^2 x 1.67 m depth
Capacity	Rated at (one third of the design maximum day flow) 2,000 m^3/day equipped with an automatic backwash with filtered water.
Equipment	Two (2) vertical turbine pumps (one duty one standby), each rated at 68 L/s pumping from the filtered water well.
Notes	

Instrumentation and Control

Continuous Monitoring/Control Equipment

Description	SCADA System
Equipment	One (1) flow meter on the raw water header, high lift pump discharge header, each dual-media filtered water discharge header, each GAC contactor discharge header, GAC transfer pump discharge header and backwash water pump discharge header.
	One (1) continuous free chlorine residual analyzer with an alarm and recorder on the high lift pump discharge header.
	One (1) continuous free chlorine residual analyzer with an alarm and recorder at the outlet of the water treatment plant after secondary chlorination.
	Ultra-sonic level transmitters on the flocculated water conduit, the dual-media filters, the dual-media filtered water wells, the GAC contactors, the clearwell cells and the residue holding tank.
	One (1) continuous turbidity meter with an alarm and recorder on the raw water header, each dual-media filter discharge pipe and the water treatment plant common discharge pipe.
	One (1) continuous fluoride residual analyzer with an alarm and recorder at the discharge from the water treatment plant.
Notes	

Backwash System

Description	Backwash system for backwashing the dual-media filters and GAC contactors
Equipment	Three (3) vertical turbine pumps (two duty one standby) each rated at 68 L/s at 13 m TDH.
	13.5 kW motor pumping from the filtered water well.
Notes	

Waste Residual Management

Residue Management System

Description	Temporary holding of process wastewater, directed to municipal WWTP
Equipment	One (1) residue holding tank approximately 4.6 m wide x 15.05 m long x 4.0 m SWD.
	Two (2) dry well end suction type pumps (one duty one standby), each rated at 6 L/s at 6.5 m TDH, pumping from the residue holding tank directly into the existing sanitary sewer over a 24 hour period at a uniform rate.
Notes	

High Lift Works

High Lift Pumps

Description	Four (4) vertical turbine pumps (three duty, one standby)
Capacity	Each rated at 34 L/s at 35 m TDH capable of operating simultaneously.
Notes	

On-Site Storage

Dual-Media Filtered Water Well (non-chlorinated)

Description	One (1) two-celled well
Dimensions	Each cell is 6.0 m wide x 8.0 m long x 5.5 m SWD or 127 m^3 (total 254 m^3).
Notes	

Clearwell Cells (chlorine contact)

Description	Two (2) four-compartment clearwell cells
Dimensions	Each with a useable volume of 243.7 m^2 x 5.5 m SWD or 1340.4 m^3 (total 2680.7 m^3).
Notes	

Pump Wells (chlorine contact)

Description	Two (2) high lift suction well.
Dimensions	Each with a useable volume of 4.5 m wide x 6.0 m long x 5.5 m SWD or 148.5 m^3 (total 297 m^3).
Notes	

Emergency Power

Standby Power

Description	
Equipment	One (1) 300 kW prime power standby power diesel generator, water-cooled, sized to accommodate the design maximum day flow located in a separate room of the Water Treatment Plant.
	One (1) 195 kW prime power standby power diesel generator, water-cooled, sized to operate all four existing well pumps and the control facilities in order to ensure continuous raw water supply to the Water Treatment Plant located in a separate room of the Control Building.
	UPS for the water treatment plant SCADA control system.
Notes	

Chemical Addition

Hydrofluosilicic Acid

Description	Fluoridation system
Feed Point	injecting into the high lift discharge header with a carrier water supply.
Equipment	One (1) 1,136 L hydrofluosilicic acid storage tank.
	Two (2) stepper motor driven positive-displacement diaphragm metering pumps, paced to finished water flow,
Notes	

Coagulant (PACL)

Description	Coagulant and coagulant aid system
Equipment	Two (2) 2000 L PACl (coagulant) storage tanks and two (2) 200 L polymer (coagulant aid) supply drums.
	Two (2) positive displacement diaphragm metering pumps for coagulant (one duty, one standby) and one (1) polymer metering pump for coagulant aid, paced to raw water flow, injecting into the raw water header upstream of the inline rapid mixer.
Notes	Notes: Coagulant may change as a result of jar-testing and new product trials to optimize process.

Sodium Hypochlorite

Description	Primary disinfection, pre and post chlorination as well as filter backwash
Equipment	Primary Disinfection - Two (2) common 4,000 L sodium hypochlorite storage tanks Two (2) stepper motor driven positive-displacement diaphragm metering pumps (one duty, one standby), paced to filtered water flow, injecting into the chlorine contact chamber with a carrier water supply, prior to discharge to the pumpwell.
	Post Chlorination - Two (2) stepper motor driven positive-displacement diaphragm metering pumps (one duty, one standby), paced to finished water flow, injecting into the high lift discharge header with a carrier water supply
	Pre-chlorination (provisional) - Two (2) common 4,000 L sodium hypochlorite storage tanks One (1) stepper motor driven positive-displacement diaphragm metering pump, paced to raw water flow, injecting into the raw water header with a carrier water supply, prior to the rapid mix chamber.
	Dual-media filter Backwash NaOCl (provisional) - Two (2) common 4,000 L sodium hypochlorite storage tanks. One (1) stepper motor driven positive-displacement diaphragm metering pump, paced to backwash water flow, injecting into the dual-media filter backwash header with a carrier water supply.
Notes	

Potassium Hydroxide

Description	pH adjustment system
Feed Point	filter effluent header prior to the GAC contactors.
Equipment	One (1) 1,000 L potassium hydroxide storage tank.
	Two (2) stepper motor driven positive-displacement diaphragm metering pumps, paced to filtered water flow,.
Notes	

Elevated Storage Tank

Name	The Town of Blind River Elevated Tank
Street Address	53 Queen Ave., Blind River,
UTM Coordinates	NAD83, Zone 17N, 5116530N, 349820E
System Type	Stand pipe, storage & system pressure
Notes	

Watermains

1.2 Watermains within the distribution system comprise:

1.2.1 Watermains that have been set out in each document or file identified in column 1 of Table 1.

Table 1: Watermains

Column 1 Document or File Name	Column 2 Date
Town of Blind River – Water Distribution System	May 30, 2016

1.2.2 Watermains that have been added, modified, replaced or extended further to the provisions of Schedule C of this drinking water works permit on or after the date identified in column 2 of Table 1 for each document or file identified in column 1.

1.2.3 Watermains that have been added, modified, replaced or extended further to an authorization by the Director on or after the date identified in column 2 of Table 1 for each document or file identified in column 1.

Schedule B: General

System Owner	**The Corporation of the Town of Blind River**
Permit Number	**205-201**
Drinking Water System Name	**Blind River Drinking Water System**
Schedule B Issue Date	**June 20, 2016**

1.0 Applicability

1.1 In addition to any other requirements, the drinking water system identified above shall be altered and operated in accordance with the conditions of this drinking water works permit and the licence.

1.2 The definitions and conditions of the licence shall also apply to this drinking water works permit.

2.0 Alterations to the Drinking Water System

2.1 Any document issued by the Director as a Schedule C to this drinking water works permit shall provide authority to alter the drinking water system in accordance, where applicable, with the conditions of this drinking water works permit and the licence.

2.2 All Schedule C documents issued by the Director for the drinking water system shall form part of this drinking water works permit.

2.3 All parts of the drinking water system in contact with drinking water which are:

2.3.1 Added, modified, replaced, extended; or

2.3.2 Taken out of service for inspection, repair or other activities that may lead to contamination,

shall be disinfected before being put into service in accordance with a procedure approved by the Director or in accordance with the applicable provisions of the following documents:

a) The ministry's Watermain Disinfection Procedure, effective December 20, 2016;
b) AWWA C652 – Standard for Disinfection of Water-Storage Facilities;
c) AWWA C653 – Standard for Disinfection of Water Treatment Plants; and
d) AWWA C654 – Standard for Disinfection of Wells.

2.4 The owner shall notify the Director within thirty (30) days of the placing into service or the completion of any addition, modification, replacement or extension of the drinking water system which had been authorized through:

2.4.1 Schedule B to this drinking water works permit which would require an alteration of the description of a drinking water system component described in Schedule A of this drinking water works permit;

2.4.2 Any Schedule C to this drinking water works permit respecting works other than watermains; or

2.4.3 Any approval issued prior to the issue date of the first drinking water works permit respecting works other than watermains which were not in service at the time of the issuance of the first drinking water works permit.

2.5 For greater certainty, the notification requirements set out in condition 2.4 do not apply to any addition, modification, replacement or extension in respect of the drinking water system which:

2.5.1 Is exempt from subsection 31(1) of the SDWA by subsection 9.(2) of O. Reg. 170/03;

2.5.2 Constitutes maintenance or repair of the drinking water system; or

2.5.3 Is a watermain authorized by condition 3.1 of Schedule B of this drinking water works permit.

2.6 The owner shall notify the legal owner of any part of the drinking water system that is prescribed as a municipal drinking water system by section 2 of O. Reg. 172/03 of the requirements of the licence and this drinking water works permit as applicable to the prescribed system.

2.7 For greater certainty, any alteration to the drinking water system made in accordance with this drinking water works permit may only be carried out after other legal obligations have been complied with including those arising from the *Environmental Assessment Act*, *Niagara Escarpment Planning and Development Act*, *Oak Ridges Moraine Conservation Act, 2001* and *Greenbelt Act, 2005*.

3.0 Watermain Additions, Modifications, Replacements and Extensions

3.1 The drinking water system may be altered by adding, modifying, replacing or extending a watermain within the distribution system subject to the following conditions:

3.1.1 The design of the watermain addition, modification, replacement or extension:

a) Has been prepared by a Professional Engineer;

b) Has been designed only to transmit water and has not been designed to treat water;

c) Satisfies the design criteria set out in the Ministry of the Environment and Climate Change publication “Watermain Design Criteria for Future Alterations Authorized under a Drinking Water Works Permit – June 2012”, as amended from time to time; and

d) Is consistent with or otherwise addresses the design objectives contained within the Ministry of the Environment and Climate Change publication “Design Guidelines for Drinking Water Systems, 2008”, as amended from time to time.

3.1.2 The maximum demand for water exerted by consumers who are serviced by the addition, modification, replacement or extension of the watermain will not result in an exceedance of the rated capacity of a treatment subsystem or the maximum flow rate for a treatment subsystem component as specified in the licence, or the creation of adverse conditions within the drinking water system.

3.1.3 The watermain addition, modification, replacement or extension will not adversely affect the distribution system's ability to maintain a minimum pressure of 140 kPa at ground level at all points in the distribution system under maximum day demand plus fire flow conditions.

3.1.4 Secondary disinfection will be provided to water within the added, modified, replaced or extended watermain to meet the requirements of O. Reg. 170/03.

3.1.5 The watermain addition, modification, replacement or extension is wholly located within the municipal boundary over which the owner has jurisdiction.

3.1.6 The owner of the drinking water system consents in writing to the watermain addition, modification, replacement or extension.

3.1.7 A Professional Engineer has verified in writing that the watermain addition, modification, replacement or extension meets the requirements of condition 3.1.1.

3.1.8 The owner of the drinking water system has verified in writing that the watermain addition, modification, replacement or extension meets the requirements of conditions 3.1.2 to 3.1.6.

3.2 The authorization for the addition, modification, replacement or extension of a watermain provided for in condition 3.1 does not include the addition, modification, replacement or extension of a watermain that:

3.2.1 Passes under or through a body of surface water, unless trenchless construction methods are used;

3.2.2 Has a nominal diameter greater than 750 mm;

3.2.3 Results in the fragmentation of the drinking water system; or

3.2.4 Connects to another drinking water system, unless:

a) Prior to construction, the owner of the drinking water system seeking the connection obtains written consent from the owner or owner's delegate of the drinking water system being connected to; and

b) The owner of the drinking water system seeking the connection retains a copy of the written consent from the owner or owner's delegate of the drinking water system being connected to as part of the record that is recorded and retained under condition 3.3.

3.3 The verifications required in conditions 3.1.7 and 3.1.8 shall be:

3.3.1 Recorded on "Form 1 – Record of Watermains Authorized as a Future Alteration", as published by the Ministry of the Environment and Climate Change, prior to the watermain addition, modification, replacement or extension being placed into service; and

3.3.2 Retained for a period of ten (10) years by the owner.

3.4 For greater certainty, the verification requirements set out in condition 3.3 do not apply to any addition, modification, replacement or extension in respect of the drinking water system which:

3.4.1 Is exempt from subsection 31(1) of the SDWA by subsection 9.(2) of O. Reg. 170/03; or

3.4.2 Constitutes maintenance or repair of the drinking water system.

3.5 The document or file referenced in Column 1 of Table 1 of Schedule A of this drinking water works permit that sets out watermains shall be retained by the owner and shall be updated to include watermain additions, modifications, replacements and extensions within 12 months of the addition, modification, replacement or extension.

3.6 The updates required by condition 3.5 shall include watermain location relative to named streets or easements and watermain diameter.

4.0 Minor Modifications to the Drinking Water System

4.1 The drinking water system may be altered by adding, modifying or replacing the following components in the drinking water system:

4.1.1 Raw water pumps and treatment process pumps in the treatment system;

4.1.2 Coagulant feed systems in the treatment system, including the location and number of dosing points;

4.1.3 Valves;

4.1.4 Instrumentation and controls, including SCADA systems, and software associated with these devices;

4.1.5 Filter media, backwashing equipment and under-drains in the treatment system; or,

4.1.6 Spill containment works.

4.2 The drinking water system may be altered by adding, modifying, replacing or removing the following components in the drinking water system:

4.2.1 Treated water pumps and associated equipment;

4.2.2 Re-circulation devices within distribution system storage facilities;

4.2.3 In-line mixing equipment;

4.2.4 Chemical metering pumps and chemical handling pumps;

4.2.5 Chemical storage tanks (excluding fuel storage tanks) and associated equipment; or,

4.2.6 Measuring and monitoring devices that are not required by regulation, by a condition in the Drinking Water Works Permit, or by a condition otherwise imposed by the Ministry of the Environment and Climate Change.

4.3 The drinking water system may be altered by replacing the following:

4.3.1 Raw water piping, treatment process piping or treated water piping within the treatment subsystem;

4.3.2 Fuel storage tanks and spill containment works, and associated equipment; or

4.3.3 Coagulants and pH adjustment chemicals, where the replacement chemicals perform the same function;

a) Prior to making any alteration to the drinking water system under condition 4.3.3, the owner shall undertake a review of the impacts that the alteration might have on corrosion control or other treatment processes; and

b) The owner shall notify the Director in writing within thirty (30) days of any alteration made under condition 4.3.3 and shall provide the Director with a copy of the review.

4.4 Any alteration of the drinking water system made under conditions 4.1, 4.2 or 4.3 shall not result in:

4.4.1 An exceedance of a treatment subsystem rated capacity or a treatment subsystem component maximum flow rate as specified in the licence;

4.4.2 The bypassing of any unit process within a treatment subsystem;

4.4.3 A deterioration in the quality of drinking water provided to consumers;

4.4.4 A reduction in the reliability or redundancy of any component of the drinking water system;

4.4.5 A negative impact on the ability to undertake compliance and other monitoring necessary for the operation of the drinking water system; or

4.4.6 An adverse effect on the environment.

4.5 The owner shall verify in writing that any addition, modification, replacement or removal of drinking water system components in accordance with conditions 4.1, 4.2 or 4.3 has met the requirements of the conditions listed in condition 4.4.

4.6 The verifications and documentation required in condition 4.5 shall be:

4.6.1 Recorded on "Form 2 – Record of Minor Modifications or Replacements to the Drinking Water System", as published by the Ministry of the Environment and Climate Change, prior to the modified or replaced components being placed into service; and

4.6.2 Retained for a period of ten (10) years by the owner.

4.7 For greater certainty, the verification requirements set out in conditions 4.5 and 4.6 do not apply to any addition, modification, replacement or removal in respect of the drinking water system which:

4.7.1 Is exempt from subsection 31(1) of the SDWA by subsection 9.(2) of O. Reg. 170/03; or

4.7.2 Constitutes maintenance or repair of the drinking water system.

4.8 The owner shall update any drawings maintained for the drinking water system to reflect the modification or replacement of the works, where applicable.

5.0 Equipment with Emissions to the Air

5.1 The drinking water system may be altered by adding, modifying or replacing any of the following drinking water system components that may discharge or alter the rate or manner of a discharge of a compound of concern to the atmosphere:

5.1.1 Any equipment, apparatus, mechanism or thing that is used for the transfer of outdoor air into a building or structure that is not a cooling tower;

5.1.2 Any equipment, apparatus, mechanism or thing that is used for the transfer of indoor air out of a space used for the production, processing, repair, maintenance or storage of goods or materials, including chemical storage;

5.1.3 Laboratory fume hoods used for drinking water testing, quality control and quality assurance purposes;

5.1.4 Low temperature handling of compounds with a vapor pressure of less than 1 kilopascal;

5.1.5 Maintenance welding stations;

5.1.6 Minor painting operations used for maintenance purposes;

5.1.7 Parts washers for maintenance shops;

5.1.8 Emergency chlorine and ammonia gas scrubbers and absorbers;

5.1.9 Venting for activated carbon units for drinking water taste and odour control;

5.1.10 Venting for a stripping unit for methane removal from a groundwater supply;

5.1.11 Venting for an ozone treatment unit;

5.1.12 Natural gas or propane fired boilers, water heaters, space heaters and make-up air units with a total facility-wide heat input rating of less than 20 million kilojoules per hour, and with an individual fuel energy input of less than or equal to 10.5 gigajoules per hour; or

5.1.13 Emergency generators that fire No. 2 fuel oil (diesel fuel) with a sulphur content of 0.5 per cent or less measured by weight, natural gas, propane, gasoline or biofuel, and that are used for emergency duty only with periodic testing.

5.2 The owner shall not add, modify or replace a drinking water system component set out in condition 5.1 for an activity that is not directly related to the treatment and/or distribution of drinking water.

5.3 The emergency generators identified in condition 5.1.13 shall not be used for non-emergency purposes including the generation of electricity for sale or for peak shaving purposes.

5.4 The owner shall prepare an emission summary table for nitrogen oxide emissions only, for each addition, modification or replacement of emergency generators identified in condition 5.1.13.

Performance Limits

5.5 The owner shall ensure that a drinking water system component identified in conditions 5.1.1 to 5.1.13 is operated at all times to comply with the following limits:

5.5.1 For equipment other than emergency generators, the maximum concentration of any compound of concern at a point of impingement shall not exceed the corresponding point of impingement limit;

5.5.2 For emergency generators, the maximum concentration of nitrogen oxides at sensitive populations shall not exceed the applicable point of impingement limit, and at non-sensitive populations shall not exceed the Ministry of the Environment and Climate Change half-hourly screening level of 1880 ug/m^3 as amended; and

5.5.3 The noise emissions comply at all times with the limits set out in publication NPC-300, as applicable.

5.6 The owner shall verify in writing that any addition, modification or replacement of works in accordance with condition 5.1 has met the requirements of the conditions listed in condition 5.5.

5.7 The owner shall document how compliance with the performance limits outlined in condition 5.5.3 is being achieved, through noise abatement equipment and/or operational procedures.

5.8 The verifications and documentation required in conditions 5.6 and 5.7 shall be:

5.8.1 Recorded on “Form 3 – Record of Addition, Modification or Replacement of Equipment Discharging a Contaminant of Concern to the Atmosphere”, as published by the Ministry of the Environment and Climate Change, prior to the additional, modified or replacement equipment being placed into service; and

5.8.2 Retained for a period of ten (10) years by the owner.

5.9 For greater certainty, the verification and documentation requirements set out in conditions 5.6 and 5.8 do not apply to any addition, modification or replacement in respect of the drinking water system which:

5.9.1 Is exempt from subsection 31(1) of the SDWA by subsection 9.(2) of O. Reg. 170/03; or

5.9.2 Constitutes maintenance or repair of the drinking water system.

5.10 The owner shall update any drawings maintained for the works to reflect the addition, modification or replacement of the works, where applicable.

6.0 Previously Approved Works

6.1 The owner may add, modify, replace or extend, and operate part of a municipal drinking water system if:

6.1.1 An approval was issued after January 1, 2004 under section 36 of the SDWA in respect of the addition, modification, replacement or extension and operation of that part of the municipal drinking water system;

6.1.2 The approval expired by virtue of subsection 36(4) of the SDWA; and

6.1.3 The addition, modification, replacement or extension commenced within five years of the date that activity was approved by the expired approval.

7.0 System-Specific Conditions

7.1 Not Applicable

8.0 Source Protection

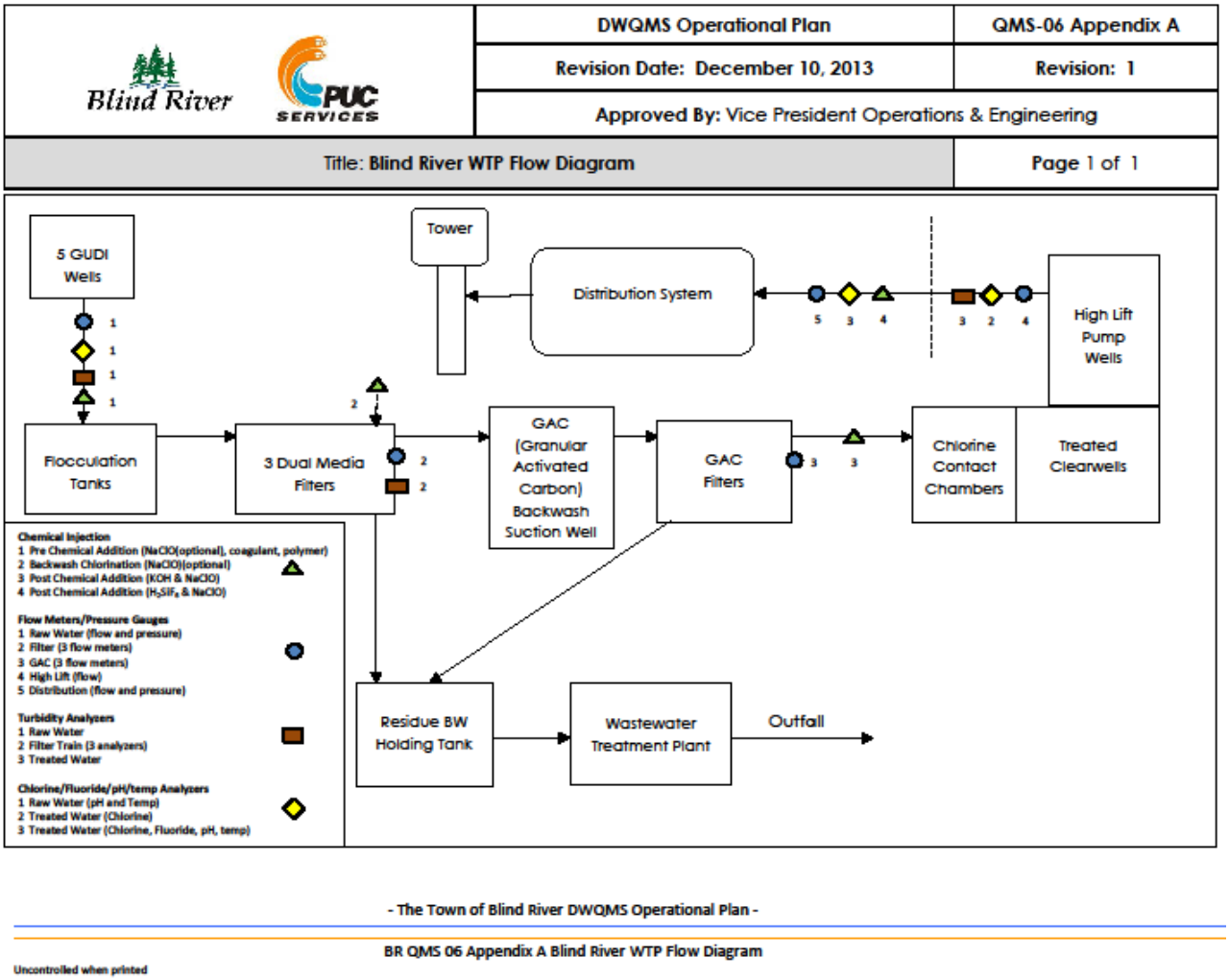
8.1 Not Applicable

Schedule D: Process Flow Diagrams

System Owner	**The Corporation of the Town of Blind River**
Permit Number	**205-201**
Drinking Water System Name	**Blind River Drinking Water System**
Schedule D Issue Date	**June 20, 2016**

1.0 Process Flow Diagrams

Blind River Water Treatment Plant



[Source: Blind River Drinking Water System DWQMS Operation Plan Number 205-401, April 10, 2012]

B

Appendix B: New Source Water Quality Sampling Plan

New Source Water Quality Study
Sampling Plan

Date: May 12, 2023

Project: T001592B

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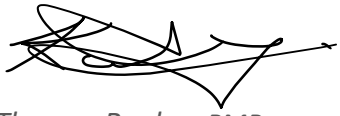

Verified by: *Thomas Rapley, PMP*

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May 12, 2023

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Background

The Town of Blind River is performing this evaluation to determine the viability of a new raw water source to replace the current well sources. The new Surface Water source is proposed to be taken from the North shore area of Lake Huron, in the Blind River Township region, west bay between the landmarks of the Blind River outfall (to the west) and the Cariboo Point Peninsula (to the East). The area will be grid sampled for raw water quality parameters of concern, to determine the preferred location of the new raw water intake. It has been noted that monitoring for seasonal variations of some parameters may be required. The sampling noted in this document is for evaluation purposes only and does not fall under legislated sampling regulations with respect to reporting. Further investigation may be required depending on the initial results.

Drinking Water Guidelines

The Guidelines for Canadian Drinking Water Quality set out the basic parameters that every water system (public, semi-public and private) should strive to achieve in order to provide the cleanest, safest and most reliable drinking water supply possible.

Guidelines are developed for microorganisms or chemical substances which meet the following criteria:

- exposure to the microorganism or substance could lead to adverse health effects; and
- it is frequently detected in, or could be expected to be found in, a large number of Canadian drinking water supplies; or
- the level at which it is detected, or could be expected to be detected, is of health significance.

The most important drinking water guidelines deal with microbiological quality, to ensure that there is minimal risk of exposure to disease-causing organisms in drinking water. Turbidity is also considered a surrogate microbiological parameter because it is closely linked to the microbiological safety of drinking water.

Aesthetic and operational guideline must also be considered. These guidelines address characteristics of the water which may affect its taste, odour and colour.

All guideline values and supporting documentation are posted on Health Canada's water quality website (www.hc-sc.gc.ca/waterquality).

The assessment of the drinking water supply forms the basis of all activities related to providing the cleanest, safest, most reliable drinking water to the public. Assessments identify the characteristics of the water source, potential hazards, how these hazards create risks and how these risks can best be managed. The drinking water supply includes everything from the collection of the raw water to the point where the water reaches the consumer.

Performance and design criteria

Authorities making decisions about treatment processes should select those that consistently provide potable and aesthetically-acceptable water to users. The microbiological safety of drinking water is a primary goal for public health. Minimum treatment of all supplies derived from surface water sources and groundwater impacted by surface waters should include disinfection, coagulation, sedimentation and filtration, or equivalent technologies.

It is also essential to develop comprehensive and scientifically defensible performance standards for those technologies that are economically affordable, effective, reliable and achievable. Treatment performance criteria are either narrative measures or numerical limits for a number of specific parameters which are required to meet a particular public health or environmental quality objective.

Minimum criteria for design, construction (including materials) and operation should ensure public health protection and environmental quality objectives are met. Alternative approaches should only be used if it can be demonstrated these are better or equivalent ways of achieving the same objectives.

The provisional objective of this task is to identify, evaluate and assess existing conditions that could constitute a threat to the new WTP intake both from a chemical and pathogen perspective. While having a Source Protection Plan (SPP) is a best practice there are no requirements under the Clean Water Act for municipalities that lie outside a defined Source Protection Area (SPA). It is assumed that the new intake structure, pipe, and LLPS locations are not in direct conflict with any major infrastructure and feasible for construction. The need and scope of a Source Water Protection Plan will be confirmed with the Town, MECP and the engineering teams working on this project.

Selecting source waters

The first step in implementing a drinking water program is to identify water to be used as the source of drinking water. At this stage, an assessment should be made of the potential risks associated with the source. Risks could include wildlife in a watershed, recreational activities such as boating in a reservoir, wastewater treatment plants nearby, agricultural or industrial activities, etc. The system should be designed to minimize the impact of the risks over time. The characteristics of the source water - including physical (such as aquifer characteristics for groundwater sources), microbiological and chemical parameters, and the types of natural and anthropogenic contaminants present - determine the type of treatment required in order to deliver the cleanest, safest, most reliable drinking water to the public. Wherever possible, the system chosen should also be capable of being adapted to deal with unforeseen contaminants. For this location study the potential risks include:

- Proximity to the wastewater outfall
- Proximity to recreational water way and shoreline activity
- Proximity to Uranium refinery outfall
- Shallow depth of proposed intake

Intakes and raw water reservoirs

Some of the key characteristics in the design and the construction of intakes and raw water reservoirs are the location, size and capacity, seasonal variations, retention times, design period, etc. In assessing these components, all potential hazards and their causes should be identified, and the level of risk associated with each of the hazards estimated, so priorities for risk management action can be established.

Treatment system

Treatment systems should be designed based on the site-specific raw water quality. Seasonal variations should be taken into account. Characteristics include treatment processes, treatment components, equipment design, chemicals used, treatment efficiency, monitoring procedures, etc. The treatment selected should address all potential hazards and the level of risk associated with those hazards.

(taken “Guidance For Safe Drinking Water In Canada: From Intake To Tap” www.hc-sc.gc.ca/waterquality)

Regulatory Considerations

This guide has been developed in accordance with Ontario's Safe Drinking Water Act, 2002, Ontario Water Resources Act and associated regulations. The Ontario Practices for the Collection and Handling of Drinking Water Samples (V2, 2009) should be followed for drinking water quality sampling programs. (Ontario, 2009)

A **representative sample** is one that reflects the same characteristics as and can be considered an accurate subset of the material being measured. Representative samples taken in a similar manner at the same time and location have an equal probability of yielding the same result. The location, time and method of sample collection must adequately define and isolate the material of interest or concern. The location and manner in which a sample is collected and handled in the field is the first step to ensuring representative and reliable analytical data.

Two types of samples are generally considered: composite samples and grab samples.

Composite samples are most appropriate in situations where the sampler is seeking to obtain information on the average value of a system in which a high degree of variability in the characteristics of the system or process being sampled is expected over time. An example of such a system is an industrial waste stream.

Grab samples consist of either a discrete sample or a series of samples collected over a period of time, generally not exceeding a total time period of 15 minutes. Grab samples represent the characteristics of the water sampled at a particular point in time. Sampling at the same point at a given frequency will allow the identification of trends through time and can provide a measure of variability over the long term.

For this study, as inline plumbing for sampling is not established, **grab samples** will be taken, over a set period of time, to evaluate the new raw water source, in the area of the proposed intake structure.

Environmental sampling strategies and designs generally fall into two groups: directive or probabilistic.

Directive sampling strategies are based on instructions that are laid out in regulations, permits, approvals and other documents. This approach is used when there is an understanding of the system and its anticipated characteristics. In this situation, legislation or control documents are used to specify sampling locations and frequency of sampling. Sampling as required by the Drinking Water Systems Regulation (O Reg 170/03) is an example of directive sampling.

Probabilistic sampling is used in environmental investigations designed to determine the source and/or extent of possible contamination of an area. This approach relies on field experience, historical documentation and knowledge of the behaviour of the contaminant under specific environmental conditions.

For the purposes of the investigation of the new (raw) source water intake location, we will be adopting a **probabilistic** approach.

Raw Water

Raw water refers to the source water for the water supply system. Its characterization is necessary to decide on treatment requirements. Changes to the temperature, pH, alkalinity, colour, turbidity and biological quality of the source water will affect the efficiency of, and may necessitate alterations to, the treatment process. Raw water monitoring for microbiological contamination is required under O Reg 170/03 for certain types of systems. The current version of the regulation should be consulted to determine the requirements for a specific system. Raw water characterization with respect to all parameters listed in the ODWQS and O Reg 170/03 may be required in the preparation of an Engineering Evaluation Report (New or Altered System). All raw water samples should be collected prior to any treatment process. (Ontario, 2009). This study proposes that the grab samples be taken at or near the locations indicated in Figure 2.

Figure 1: Area of Interest

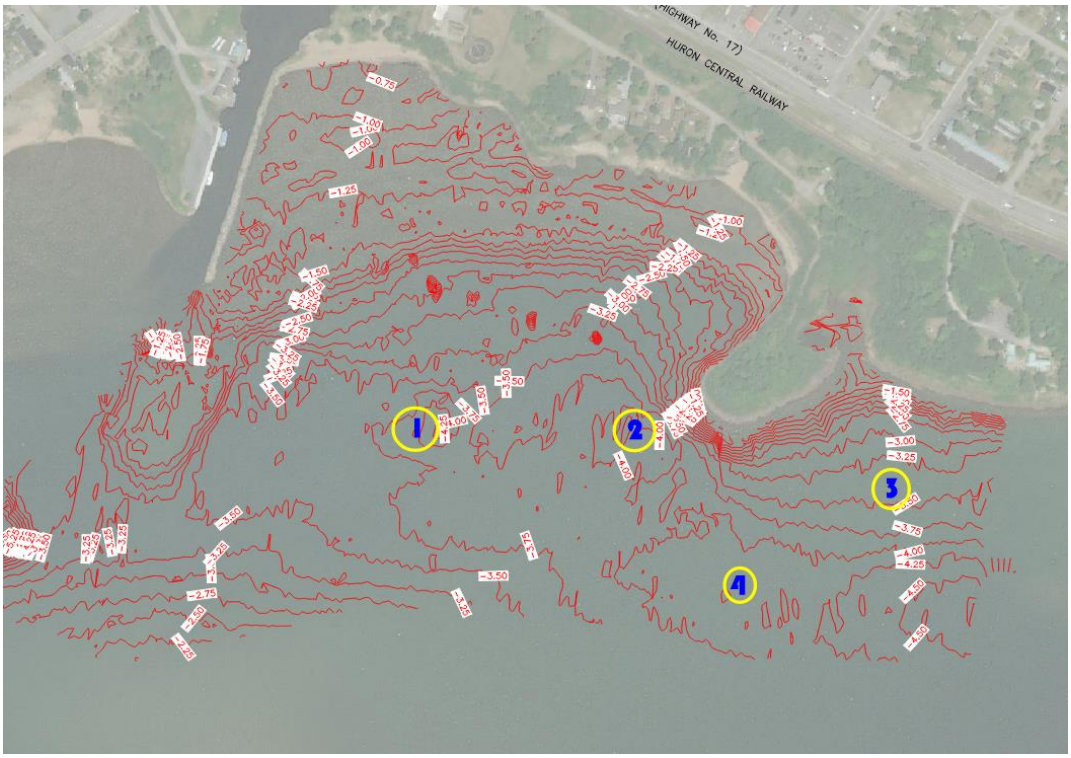

Figure 2: Proposed Sampling locations

Sampling

In a multiple barrier system for providing safe drinking water, the selection and protection of a reliable, high quality drinking water source is the first barrier. When considering the suitability of a raw water supply, a raw water characterization that includes an analysis of all physical, chemical and microbiological parameters included in Tables 1, 2 and 4 should be conducted. Testing for gross alpha and gross beta should be undertaken to determine whether the testing for the radionuclides listed in Table 3 is required. In addition, this characterization will enable the design of any further treatment that may be required, including impacts that any parameter may have on the treatment processes. The tables can be referred to in the O. Reg. 169/03 Technical Support Document for Ontario DWQ Standards, Objectives and Guidelines, 2009.

TABLE 1 – MICROBIOLOGICAL STANDARDS	
PARAMETER	**MAC**
Escherichia coli (E. coli)	not detectable
Total Coliforms	not detectable

TABLE 2 – CHEMICAL STANDARDS		
PARAMETER	**MAC (mg/L)**	**IMAC (mg/L)**
Alachlor		0.005
Aldicarb	0.009	
Aldrin + Dieldrin	0.0007	
Antimony		0.006
Arsenic		0.025
Atrazine + N-dealkylated metabolites		0.005
Azinphos-methyl	0.02	
Barium	1	
Bendiocarb	0.04	
Benzene	0.005	
Benzo(a)pyrene	0.00001	
Boron		5
Bromate		0.01
Bromoxynil		0.005
Cadmium	0.005	
Carbaryl	0.09	
Carbofuran	0.09	
Carbon Tetrachloride	0.005	
Chloramines	3	
Chlordane (Total)	0.007	
Chlorpyrifos	0.09	
Chromium	0.05	
Cyanazine		0.01
Cyanide(free)	0.2	
Diazinon	0.02	
Dicamba	0.12	
1,2-Dichlorobenzene	0.2	

TABLE 2 – CHEMICAL STANDARDS		
PARAMETER	**MAC (mg/L)**	**IMAC (mg/L)**
1,4-Dichlorobenzene	0.005	
Dichlorodiphenyltrichloroethane (DDT) + metabolites	0.03	
1,2-Dichloroethane		0.005
1,1-Dichloroethylene(vinylidene chloride)	0.014	
Dichloromethane	0.05	
2,4-Dichlorophenol	0.9	
2,4-Dichlorophenoxy acetic acid(2,4-D)		0.1
Diclofop-methyl	0.009	
Dimethoate		0.02
Dinoseb	0.01	
Dioxin and Furan		0.000000015 [a]
Diquat	0.07	
Diuron	0.15	
Fluoride	1.5 [b]	
Glyphosate		0.28
Heptachlor + Heptachlor Epoxide	0.003	
Lead	0.01[c]	
Lindane (Total)	0.004	
Malathion	0.19	
Mercury	0.001	
Methoxychlor	0.9	
Metolachlor		0.05
Metribuzin	0.08	
Microcystin-LR	0.0015	
Monochlorobenzene	0.08	
Nitrate (as nitrogen)	10.0 [d]	
Nitrite (as nitrogen)	1.0 [d]	
Nitrate + Nitrite (as nitrogen)	10.0 [d]	
Nitrilotriacetic Acid (NTA)	0.4	
N-Nitrosodimethylamine (NDMA)		0.000009
Paraquat		0.01
Parathion	0.05	
Pentachlorophenol	0.06	

TABLE 2 – CHEMICAL STANDARDS		
PARAMETER	**MAC (mg/L)**	**IMAC (mg/L)**
Phorate		0.002
Picloram		0.19
Polychlorinated Biphenyls (PCB)		0.003
Prometryne		0.001
Selenium	0.01	
Simazine		0.01
Temephos		0.28
Terbufos		0.001
Tetrachloroethylene (perchloroethylene)	0.03	
2,3,4,6-Tetrachlorophenol	0.1	
Triallate	0.23	
Trichloroethylene	0.005	
2,4,6-Trichlorophenol	0.005	
2,4,5-Trichlorophenoxy acetic acid (2,4,5-T)	0.28	
Trifluralin		0.045
Trihalomethanes	0.100 [e]	
Uranium	0.02	
Vinyl Chloride	0.002	

Short forms:
mg/L - milligrams per litre

Footnotes:

a) Total toxic equivalents when compared with 2,3,7,8-TCDD (tetrachlorodibenzo-p-dioxin).

b) Where fluoride is added to drinking water, it is recommended that the concentration be adjusted to 0.5 -0.8 mg/L the optimum level for control of tooth decay. Where supplies contain naturally occurring fluoride at levels higher than 1.5 mg/L but less than 2.4 mg/L the Ministry of Health and Long Term Care recommends an approach through local boards of health to raise public and professional awareness to control excessive exposure to fluoride from other sources.

c) This standard applies to water at the point of consumption. Since lead is a component in some plumbing systems, first flush water may contain higher concentrations of lead than water that has been flushed for five minutes.

d) Where both nitrate and nitrite are present, the total of the two should not exceed 10 mg/L (as nitrogen).

e) This standard is expressed as a running annual average of quarterly samples measured at point reflecting the maximum residence time in the distribution system.

TABLE 3 – RADIONUCLIDE STANDARDS					
NATURAL RADIONUCLIDES					
PARAMETER	**MAC (Bq/L)**	**PARAMETER**	**MAC (Bq/L)**	**PARAMETER**	**MAC (Bq/L)**
Beryllium-7	4000	Radium-226	0.6	Thorium-234	20
Bismuth -210	70	Radium-228	0.5	Uranium-234	4
Lead-210	0.1	Thorium-228	2	Uranium-235	4
Polonium-210	0.2	Thorium-230	0.4	Uranium-238	4
Radium-224	2	Thorium-232	0.1		
ARTIFICIAL RADIONUCLIDES					
PARAMETER	**MAC (Bq/L)**	**PARAMETER**	**MAC (Bq/L)**	**PARAMETER**	**MAC (Bq/L)**
Americium-241	0.2	Iodine-125	10	Selenium-75	70
Antimony-122	50	Iodine-129	1	Silver-108m	70
Antimony-124	40	Iodine-131	6	Silver-110m	50
Antimony-125	100	Iron-55	300	Silver-111	70
Barium-140	40	Iron-59	40	Sodium-22	50
Bromine-82	300	Manganese-54	200	Strontium-85	300
Calcium-45	200	Mercury-197	400	Strontium-89	40
Calcium-47	60	Mercury-203	80	Strontium-90	5
Carbon-14	200	Molybdenum-99	70	Sulphur-35	500
Cerium-141	100	Neptunium-239	100	Technetium-99	200
Cerium-144	20	Niobium-95	200	Technetium-99m	7000
Cesium-131	2000	Phosphorus-32	50	Tellurium-129m	40
Cesium-134	7	Plutonium-238	0.3	Tellurium-131m	40
Cesium-136	50	Plutonium-239	0.2	Tellurium-132	40
Cesium-137	10	Plutonium-240	0.2	Thallium-201	2000
Chromium-51	3000	Plutonium-241	10	Tritium	7000
Cobalt-57	40	Rhodium-105	300	Ytterbium-169	100
Cobalt-58	20	Rubidium-81	3000	Yttrium-90	30
Cobalt-60	2	Rubidium-86	50	Yttrium-91	30
Gallium-67	500	Ruthenium-103	100	Zinc-65	40
Gold-198	90	Ruthenium-106	10	Zirconium-95	100
Indium-111	400				

TABLE 4 – OBJECTIVES AND GUIDELINES		
PARAMETER	**AO** (mg/L - unless otherwise specified)	**OG** (mg/L - unless otherwise specified)
1,2-Dichlorobenzene	0.003[a]	
1,4-Dichlorobenzene	0.001[a]	
2,4-Dichlorophenol	0.0003[a]	
2,3,4,6-Tetrachlorophenol	0.001[a]	
2,4,6-Trichlorophenol	0.002[a]	
2,4,5-Trichlorophenoxy acetic acid (2,4,5-T)	0.02[a]	
Alkalinity (as $CaCO_3$)		30-500
Aluminum		0.1
Chloride	250	
Colour	5 TCU	
Copper	1	
Dissolved Organic Carbon	5	
Ethylbenzene	0.0024	
Hardness (as $CaCO_3$)		80-100
Heterotrophic Plate Count (HPC)- General bacteria population expressed as colony counts on a heterotrophic plate count		f
Iron	0.3	
Manganese	0.05	
Methane	3L/ m^3	
Monochlorobenzene	0.03[a]	
Odour	Inoffensive	

TABLE 4 – OBJECTIVES AND GUIDELINES		
PARAMETER	**AO** (mg/L - unless otherwise specified)	**OG** (mg/L - unless otherwise specified)
Organic Nitrogen		0.15
pH		6.5-8.5 (no units)
Pentachlorophenol	0.03[a]	
Sodium	b	
Sulphate	500[c]	
Sulphide	0.05	
Taste	Inoffensive	
Temperature	15^{0}C	
Toluene	0.024	
Total Dissolved Solids	500	
Turbidity	5 NTU[d]	e
Xylenes	0.3	
Zinc	5	

Parameters and Cost Analysis

Parameter	**Price**
ODWA Guideline Table 1,2 & 4	4060.40
Radionuclides Table 3	460.00
pH	10.00$
Dissolved Organic Carbon (DOC)	19.00$
Total Dissolved Solids (TDS)	16.30$
Total Organic Carbon (TOC)	21.50$
E.coli and Total Coliforms	33.70$
Heterotrophic Plate Count (HPC)	12.00$
Anions - Nitrate, Nitrite, Orthophosphorus	45.00$
Total Phosphorous	16.50$

Total Metals - Calcium, Magnesium, Sodium, Uranium	39.00$
Digestion for Total Metals	5.00$
Hardness (Calculation)	5.50$
Electrical Conductivity	8.00$
Microcystin	138.00$
Geosmin & MIB	170.40$

Representative Samples and Representative Data

Process Parameters

It is assumed that some or all of these parameters can be monitored "in-house" using bench top analysis. If so, samples can be taken for these more often, and analyzed inline with the operation regular "rounds" to provide as much data as possible. This information will assist in not only location choice but process optimization choices and treatment option selection.

- Temperature
- pH
- Turbidity
- Colour
- Electrical Conductivity

May need to send samples to a lab if equipment is not available in-house;

- Fluoride (natural background)
- Iron & Manganese
- Alkalinity
- Aluminum
- Hardness

Critical Parameters

In addition to the aforementioned parameters, the following are the essentials for analysis to provide critical information of the source water quality. Ideally, these should be sampled at least once (1) per month for variability and 2 -3 times in a row at to start with to help to determine the preferred intake site.

- E.coli and Total Coliforms
- Heterotrophic Plate Count (HPC)
- Dissolved Organic Carbon (DOC)
- Total Dissolved Solids (TDS)

- Total Organic Carbon (TOC)

Metals and Minerals of Concern

Recommend to sample these once per quarter to review for seasonal changes.

- Anions - Nitrate, Nitrite, Orthophosphorus
- Total Phosphorous
- Total Metals - Calcium, Magnesium, Sodium, Uranium

Seasonal Concerns

These parameters should be analysed once the water temperature is above 20C and during weather that includes significant exposure to heat, sun with less windy or lake current movement (more stagnant). A good indication of timing is when there is an announced Beach restriction or after 2 consecutive hot weather days (heat-wave) or when there is a visible bloom. Between June and October, at the selected intake site.

- Microcystin (blue-green algae- cyanotoxin) (Monthly or when bloom is visible)
- Geosmin & MIB (taste & odour compounds) (monthly or when noted poor water quality)

Scheduled and Regulated Concerns

Required to sample **once** at the selected intake site:

- Table 1,2 & 4
- Table 3 – Radionuclides

Sedimentation Sampling

Sedimentation analysis should be taken to characterize the lakebed material in order to plan for invasive (blasting) or digging in-water construction. Determination of the “soft depth” of sediment will aid in the design planning and cost projections for construction. One grab sample taken from each location should be sufficient. Additionally, this sediment can be analyzed for parameters of concern if deemed beneficial or necessary to the selection of the intake location. This should be discussed and decided on by the Town.

Analysis

ROUND 1: Grab samples will be taken at the 4 outlined locations in Figure 2, and sent for analysis as outlined in Table 5, below. These are to be taken at the 4 locations as outlined in Figure 2 until the preferred location is selected.

Subsequent rounds of analysis are outlined in Tables 6-10. These may be amended during the program depending on results.

Table 5: Summary of analysis **ROUND 1**

PARAMETER	FREQUENCY	LOCATION
• Temperature • pH • Turbidity • Electrical Conductivity • Colour (remove from analysis) • E.coli and Total Coliforms • Heterotrophic Plate Count (HPC) • Dissolved Organic Carbon (DOC) • Total Dissolved Solids (TDS) • Total Organic Carbon (TOC) • Hardness • Fluoride (natural background) • Iron & Manganese • Alkalinity • Aluminum • Anions - Nitrate, Nitrite, Orthophosphorus • Total Phosphorous • Total Metals - Calcium, Magnesium, Sodium, Uranium • Digestion for Total Metals • Sediment Characterization	Once – First round	4 locations from Figure 2

Table 6: Summary of analysis **ROUND 2-3**

PARAMETER	FREQUENCY	LOCATION
• Temperature • pH • Turbidity • Electrical Conductivity • Colour (if possible but not required) • E.coli and Total Coliforms • Heterotrophic Plate Count (HPC) • Dissolved Organic Carbon (DOC) • Total Organic Carbon (TOC) • Hardness	Weekly to bi-weekly (as feasible) 1-2 more times as determined by results	4 locations from Figure 2

Table 7: Summary of analysis **MONTHLY MONITORING**

PARAMETER	FREQUENCY	LOCATION
• Temperature • pH • Turbidity • Electrical Conductivity	Once per month	1 selected location

• Colour (if possible but not required) • E.coli and Total Coliforms • Heterotrophic Plate Count (HPC) • Dissolved Organic Carbon (DOC) • Total Organic Carbon (TOC)		

Table 8: Summary of analysis **QUARTERLY MONITORING**

PARAMETER	FREQUENCY	LOCATION
• Anions - Nitrate, Nitrite, Orthophosphorus • Total Phosphorous	Once every 3 months	1 selected location

Table 9: Summary of analysis **SEASONAL MONITORING**

PARAMETER	FREQUENCY	LOCATION
• Microcystin • Geosmin & MIB	Monthly Warm weather only (July-Oct) or when visible*	1 selected location

*Shoreline should be observed daily for visible algal blooms

Table 10: Summary of analysis **REGULATORY MONITORING**

PARAMETER	FREQUENCY	LOCATION
• Table 1,2 &4 • Table 3	Once/5yrs	1 selected location

Table 11: Sampling Recording Sheet (example)

Parameters	ODWQ Standards, Objectives and Guidelines[1]	Units	Preferred Intake Site			Sample Locations[2]			
			Min	Max	Average	1	2	3	4
Field Temperature	15 (AO)	°C							
Field Turbidity	≤ 5 (AO)	NTU							
pH	6.5 - 8.5 (OG)	-							
Colour	AO: ≤ 15	TCU							
Dissolved Organic Carbon (DOC)	5 (AO)	mg/L							
Total Organic Carbon (TOC)									
Total Dissolved Solids (TDS)	≤ 500 (AO)	mg/L							

Parameters	ODWQ Standards, Objectives and Guidelines[1]	Units	Preferred Intake Site			Sample Locations[2]			
			Min	Max	Average	1	2	3	4
Escherichia coli	ND (MAC)	CFU/100mL							
Total Coliforms	ND (MAC)	CFU/100mL							
Heterotrophic Plate Count (HPC)									
Microcystin	0.0015 (MAC)	mg/L							
Geosmin & MIB									
Oxidation Reduction Potential	-	mV							
Total Phosphorus	0.01	mg/L							
Conductivity	-	µS/cm							
Fluoride	1.5	mg/L							
Iron	AO: ≤ 0.3	mg/l							
Manganese	0.12 (MAC) 0.02 AO	mg/L							
Hardness	None								
Alkalinity									
Aluminum	DW (MAC) 2.9	mg/L							
Nitrate,	45 as nitrate; 10 as nitrate-nitrogen								
Nitrite	3 as nitrite; 1 as nitrite-nitrogen								
Total Phosphorous									
Total Metals - Calcium, Magnesium, Sodium, Uranium									
Schedule 23 - Inorganics									
Schedule 24 - Organics									
Glyphosphate (schd.24)	0.28 (MAC)	mg/L							
Radium 226	5	pCi/L[3]							
Uranium	0.020	mg/L							
Algal Bloom Visual Inspection									

Summary

The plan outlined in this document is a very thorough and cautious approach to the objective of this study. The main objectives of this sampling plan are to determine the suitability of the source water, select the area of highest quality and to plan for future treatment requirements. It should be noted that after the first or second round of sample results are received and evaluated, the remainder can be adjusted and specialized to provide a more focused dataset. Minimally, the critical parameters to be thoroughly evaluated are as follows. These parameters will yield results that will be critical to the treatability of the source water and illuminate major

areas of concern. These should be sampled as often as possible (see table) at the selected locations.

- Temperature
- pH
- Turbidity
- E. coli
- Total coliforms
- HPC
- DOC
- TOC
- Microcystins (seasonal)

Most scientific studies on cyanobacterial toxins focus on microcystins, which are generally regarded as the most important of the freshwater cyanotoxins. Responsible authorities and water supply managers should develop an appropriate monitoring and response strategy for their systems. A seasonal maximum acceptable concentration of 0.0015 mg/L (1.5 µg/L) is proposed for total microcystins in drinking water. This guideline is considered to be protective of the general population, including young children. Although the guideline is based on the toxicity of microcystin-LR (MC-LR), it is important to measure total microcystins, which includes all of the measurable microcystin variants, not just MC-LR, that are free in the water as well as bound within cyanobacterial cells.

Along with sampling, we recommend beginning regular visual monitoring for algal blooms, between June and October, near the intake location and along banks and shorelines. Early visual signs of a bloom may include water that appears unusually cloudy or the presence of what appears to be fine grass clippings or small clumps that may be well spaced. Colours can range from grey or tan to olive to blue-green to bright blue to red. As the bloom develops, the water may take on a “pea soup” or “spilled paint” appearance. A bloom may form a scum at the water surface (often overnight, if conditions are calm), which may then be pushed to the shoreline by the water current or wind. When planning visual monitoring, it is important to consider that cyanobacteria may be mixed back into the water column during the day. For more information, please consult the “Cyanobacterial Toxins in Drinking Water Document for Public Consultations” (Canada.ca)

Additionally of noted importance to the source water characterization are the following which should be sampled at least once at the selected location:

- Fluoride (natural background)
- Fe &Mn (aesthetic)
- Total Phosphorous (concern - wastewater outfall proximity)
- Total Metals - Calcium, Magnesium, Sodium, Uranium
- Anions - Nitrate, Nitrite, Orthophosphorus
- Radium 226 (concern - proximity to the refinery)

Conclusion

In conclusion, all the suggested parameters in Table 1-4 (O. Reg. 169/03) should be sampled for and analyzed at least once, at the selected intake location.

This plan was reviewed by the MECP, Senior Water Engineer. Recommendations are to carry out Table 1,2 & 4 analysis and to proceed with Table 3 (radionuclides) testing, regardless of the gross alpha & beta results due to the presence of the Blind River Uranium Refinery and outfall. As schedule 23 &24 parameters are already included in the Table 1, 2 and 4 parameters under the Technical Support Document for the Ontario Drinking Water Standards, Objectives and Guidelines. [Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines – Walkerton Clean Water Centre (wcwc.ca)] Therefore, there is no need to include this sampling in the plan as it would be duplicate sampling. These parameters will be tested every 60 months (5 years) as required by the reg. going forward.

To determine the best location to select as the intake location, the first round of samples should be taken and analyzed for the parameters in Table 5. We will then review the results and make a more directed recommendation/plan to continue with analysis of the regulated parameters and then determine if there are any parameters of concern. This will reduce any unnecessary costs and provide a comprehensive data set.

To determine the physical characteristics of the lakebed, a sediment grab sample should be taken at each location as well.

We also recommend that any sampling and analysis that can be completed on a regular basis, and without additional costs, be implemented into a monitoring plan, at regular intervals. This is suggested for any parameters that can be analyzed in-house, provided that regular grab sampling can occur. (ie. pH, temp, turbidity, fluoride, alkalinity, aluminum, hardness, conductivity, colour, iron, manganese), as well as Bacteria (E.coli, TC & HPC) and organic matter (DOC & TOC) as shown in Table 7.

It is important to stress that the sampling protocols for each individual (or set of) parameter(s) have not been provided in this document. Each test will require that the samples are collected and handled in a specified manner that is specific and critical to the analysis of that parameter. It is imperative that sample bottles, preservative, storage conditions and chain of custody forms are organized to meet the laboratory standards and to provide sound record keeping of submissions and results.

The samples must be taken to best represent the intake water, which will be near the bottom of the lakebed, approximately 0.5 to 1m above. The sample collection method should include provisions for determining this depth, without stirring up sediment from the bottom of the lakebed. Once this depth is established at each location then a hand pump (bilge) equipped with a length of hose would provide the best representative sample. Alternatively, a dipping bucket vessel can be lowered to that depth to retrieve the sample which will represent the column of water from the intake depth to the surface.

C

Appendix C: Detailed Treatment Train Overview

1 Equipment List

The table below contains a detailed list of the equipment currently in use at the Blind River WTP. Details taken from Blind River's DWWP and the WTP's O&M Manual.

Process Unit	Equipment and Description
Coagulation & Flocculation	One (1) in-line mechanical rapid mixer, 300mm dia. by 600mm long.
	One (1) stepper motor driver positive displacement metering pump, feeding MagnaFloc LT20 (polymer) into raw water header
	Two (2) stepper motor driver positive displacement metering pumps (duty/standby), feeding aluminum sulfate (coagulant) into raw water header
	One (1) 200L polymer (polyelectrolyte coagulant aid) storage tank
	One (1) 2000L aluminum sulfate storage tank
	Three (3) flocculation trains, each consisting of two (2) 17.36m^3 concrete cells with one (1) variable speed drive mixer each.
Filtration	Three (3) gravity flow dual-media filters, area of 12.25m2. Top layer is 450mm anthracite, bottom layer is 500mm of Filox-R media.
	Three (3) gravity flow granular activated carbon (GAC) filters with media depth 1670mm.
Backwash	Three (3) vertical turbine pumps (two duty, one standby), each rated at 68 L/s at 13m TDH.
	One (1) air scour blower with a capacity of 530 SCFM.
Disinfection (Chlorination)	Six (6) stepper motor driver positive displacement metering pumps, supplying four injection points with sodium hypochlorite. Two (2) pumps (duty/standby) supply to chlorine contact chamber for primary disinfection, two (2) supply to the high-lift pump discharge header, and one (1) each supply to the raw water header and backwash water header.
	Two (2) 4000L common storage tanks.
Primary Disinfection	Two-celled, below grade, baffled clearwells (Low Level Reservoir)
	Vertical turbine transfer pumps (rotating duty), each pump rated at 120 L/s at a TDH of 7.0 m
	Two-celled transfer well
Backwash/ Residue Management	One (1) backwash/residue holding tank, total volume of 276m3.
	Two (2) dry well end suction type pumps (duty/standby), each rated at 6 L/s at 6.5m TDH for removal of wastewater to municipal sanitary sewer system
	One (1) 300mm supernatant/overflow discharge line to overland swale

Process Unit	Equipment and Description
High Lift Pumps	Four (4) vertical turbine pumps (3 duty, 1 standby), each pump rated at 34 L/s at 35m TDH,
Fluoridation	Two (2) stepper motor driver positive displacement metering pumps (duty/standby), feeding hydrofluorosilicic acid into high-lift discharge header
	One (1) 1136L hydrofluorosilicic acid storage tank
pH Control	Two (2) stepper motor driver positive displacement metering pumps (duty/standby), feeding potassium hydroxide into high-lift discharge header or prior to GAC filters
	One (1) 270L potassium hydroxide storage tank

2 Detailed Treatment Train Overview

The existing process begins at the wellfield, located offsite of the WTP, near the bank of Blind River. Five (5) of eight (8) of the wells are in service, all of which are classified as GUDI. The operator interface is in a control building on the wellfield site, but there is no intrinsic control of the pumps alone. Under normal conditions, the entire raw water taking process is entirely automated by the SCADA system and is controlled by the level in the flocculated water conduit at the treatment plant. As the water level in the conduit rises, a control valve on the water header closes, and as the water level falls, the valve opens. If the valve is open to its fully opened position (~70%), the next duty pump turns on, and if the valve is closed to its fully closed position (~30%), the most recently started pump is stopped.

Pretreatment consists of addition of aluminum sulfate (coagulant) and MagnaFloc LT20 (polymer), mixing, and flocculation. Coagulant is added via two (2) positive displacement metering pumps, in duty-standby configuration, while polymer is added via one (1) such pump. Hypochlorite is only added on rare occasions when disinfection of the filtration system is required. Coagulant is currently added at between 25 – 30 mg/L. The rate of addition for coagulant, polymer, and hypochlorite, is automated by the SCADA system, controlled by the flowrate through the raw water header. The concentration set point is set by the operator in the SCADA system. Mixing is provided by a rapid mixer, after which the water enters the flocculation system. The flocculation system is made up of three (3) tanks – arranged in parallel – with two (2) cells – arranged in series – each. Each cell contains has a volume of 17 m3 and contains a VFD-controlled mixer, controllable from the plant SCADA system.

There are two filtration processes in the treatment train. The first is a multi-media system made up of three (3) dual-media filters of area 12 m2. The media are 450mm of anthracite followed by 500mm of Filox-R. While all filters are in use under normal operation, the plant can operate with only two in service. The filters are automatically controlled and adjusted, and backwashing occurs when the head loss through it exceeds a pre-set value. The second is a GAC adsorption process, made up of three (3) GAC filters of area 12 m2. with a media depth of 1.67m. This system can be bypassed when required, and its backwash cycle is also automatically started. Setpoints can be adjusted in the SCADA system.

In between the filtration processes, potassium hydroxide can be added if pH control is required. This is performed by two (2) positive displacement metering pumps, in duty-standby configuration. Potassium hydroxide can also be added to the high-lift discharge header.

Backwashing is provided by three (3) pumps (in a two (2) duty one (1) standby configuration). Chlorine can also be optionally added to the backwash discharge line. All backwash and residual is stored in a holding tank, with underflow pumped to the sanitary sewer, and overflow being discharged overland to a swale.

Disinfection is provided via chlorination with sodium hypochlorite. Sodium hypochlorite is added to the clearwell automatically based the set target residual (1.0 mg/L). Following the clearwell, treated water passes through a contact chamber. Hypochlorite can also be injected at three other points in the treatment train, including the backwash feed, the raw water feed, and the high-lift header (for trim). Hypochlorite is added via two (2) positive displacement metering pumps, in duty-standby configuration.

Treated water discharge is provided by four (4) high-lift pumps, in a three (3) duty one (1) standby configuration. As with all other plant processes, the high-lift pumps operate automatically, controlled by the water level in the elevated tank. Since the tank “floats” on the water distribution system, the level in the tank is a direct indicator of the current system pressure, and as such, the high-lift pumping system operates with the goal of maintaining the level in the tank, generally between 9.8m and 12.0m. As the water level falls, more pumps are turned on, and as the level rises, pumps are turned off. The high-lift discharge header is also point at which fluoridation occurs, via an automated feed of hydrofluorosilicic acid at the high-lift discharge header. This feed is provided by two (2) positive displacement metering pumps, in duty-standby configuration.

D

Appendix D: DWQMS Operational Plan and Conditions

Blind River / PUC SERVICES	DWQMS Operational Plan	Form 05-04
	Date: July 12, 2012	Revision: 1
	Approved By: Vice President Operations & Engineering	
	Title: Blind River Daily Report	

Date 1 / 9 / 2023

		Min	Ave	Max	
Raw Water					
AIT-0201	pH	8.02	8.19	8.36	
AIT-0202	Turbidity	0.05	0.16	0.66	NTU
PIT-0201	Raw Water Pressure	88.88	338.36	545.78	kPA
TIT-0201	Raw Water Temperature	34.60	35.30	35.70	°C
Dual Media Filter #1					
PDIT-0411	Head Loss	0.00	0.66	1.65	mH2O
AIT-0411	Turbidity	0.02	0.02	0.06	NTU
FTP-0411	Efficiency	100.00			%
	Compliance Runtime	23.44			Hours
	Total Runtime	23.44			Hours
Dual Media Filter #2					
PDIT-0421	Head Loss	0.00	0.73	2.00	mH2O
AIT-0421	Turbidity	0.03	0.04	0.09	NTU
FTP-0421	Efficiency	100.00			%
	Compliance Runtime	23.44			Hours
	Total Runtime	23.44			Hours
Dual Media Filter #3					
PDIT-0431	Head Loss	0.00	0.48	2.56	mH2O
AIT-0431	Turbidity	0.06	0.09	0.21	NTU
FTP-0431	Efficiency	100.00			%
	Compliance Runtime	23.44			Hours
	Total Runtime	23.44			Hours
GAC Filter #1					
PDIT-0711	Head Loss	0.00	0.09	0.29	mH2O
GAC Filter #2					
PDIT-0721	Head Loss	0.00	0.00	0.00	mH2O
GAC Filter #3					
PDIT-0731	Head Loss	0.00	0.12	0.44	mH2O
Treated Water					
AIT-0801	Turbidity	0.07	0.07	0.09	NTU
AIT-0802	Clearwell CL2 Residual	1.03	1.23	1.38	mg/l
AIT-0803	pH	7.61	7.74	8.02	
AIT-0804	Post CL2 Residual	0.83	1.15	1.68	mg/l
AIT-0805	Fluoride Residual	0.08	0.67	0.72	mg/l
PIT-0801	System Pressure	0.00	253.04	537.60	kPA
TIT-0801	Treated Water Temperature	0.00	13.11	32.07	°C
Clearwell Cell #1 Level					
LIT-0811	Level	2.39	3.00	3.60	Meters
Clearwell Cell #2 Level					
LIT-0821	Level	2.39	3.01	3.61	Meters
Minimum CT Achieved					
	$CT_{provided}$	160.84			

To determine the $CT_{(provided)}$ in clearwell only

$CT_{(provided)} = V/Q \times Cl \times BF$

CT	actual CT provided in system clearwell	160.84	
V	minimum volume of clearwell	1296.11	m
Q	maximum flow rate	55.59	L/s
Cl	minimum clearwell free chlorine residual	1.03	mg/L
BF	baffling factor	0.4	

To determine the $CT_{(required)}$ Value

$CT_{(required)} = 0.2828 pH^{2.69} \times Cl^{0.15} \times 0.933^{(T-5)} \times L$

CT	required CT to provide log inactivation	39.87	
L	required log inactivation	1	
pH	avg. pH of treated water	7.74	
Cl	minimum clearwell free chlorine residual	1.03	mg/L
T	avg. treated water temperature as C	13.11	

Chemical Tanks Levels

		Min	Avg	Max	
PACL Tank #1 Level					
LIT-1001	Percentage	58.89	2.00	2.00	%
PACL Tank #2 Level					
LIT-1002	Percentage	0.00	0.00	0.00	%
NaOH Tank #1 Level					
LIT-1301	Percentage	53.60	54.03	54.43	%
NaOH Tank #2 Level					
LIT-1302	Percentage	0.00	0.00	0.00	%
Hydrofluosilicic Acid Tank Level					
LIT-1401	Percentage	74.30	74.50	74.55	%
Potassium Hydroxide Tank Level					
LIT-1201	Percentage	83.84	84.86	85.87	%
Polyelectrolyte Drum Weight					
WIT-1101	lbs.	0.00	0.00	0.00	lbs.

Date 31 / 8 / 2023

		Min	Ave	Max	
Raw Water					
AIT-0201	pH	8.24	8.31	8.36	NTU
AIT-0202	Turbidity	0.08	0.25	0.72	kPA
PIT-0201	Raw Water Pressure	105.58	395.54	543.56	°C
TIT-0201	Raw Water Temperature	33.69	34.44	35.10	
Dual Media Filter #1					
PDIT-0411	Head Loss	0.16	0.66	1.34	mH2O
AIT-0411	Turbidity	0.02	0.02	0.03	NTU
FTP-0411	Efficiency	100.00			%
	Compliance Runtime	24.00			Hours
	Total Runtime	24.00			Hours
Dual Media Filter #2					
PDIT-0421	Head Loss	0.00	0.80	2.20	mH2O
AIT-0421	Turbidity	0.04	0.05	0.10	NTU
FTP-0421	Efficiency	100.00			%
	Compliance Runtime	23.44			Hours
	Total Runtime	23.44			Hours
Dual Media Filter #3					
PDIT-0431	Head Loss	0.00	0.48	2.38	mH2O
AIT-0431	Turbidity	0.06	0.12	0.29	NTU
FTP-0431	Efficiency	100.00			%
	Compliance Runtime	23.44			Hours
	Total Runtime	23.44			Hours
GAC Filter #1					
PDIT-0711	Head Loss	0.00	0.11	0.28	mH2O
GAC Filter #2					
PDIT-0721	Head Loss	0.00	0.00	0.00	mH2O
GAC Filter #3					
PDIT-0731	Head Loss	0.00	0.09	0.42	mH2O
Treated Water					
AIT-0801	Turbidity	0.07	0.07	0.09	NTU
AIT-0802	Clearwell CL2 Residual	1.03	1.22	1.34	mg/l
AIT-0803	pH	7.61	7.76	8.01	
AIT-0804	Post CL2 Residual	0.76	1.11	1.49	mg/l
AIT-0805	Fluoride Residual	0.09	0.67	0.71	mg/l
PIT-0801	System Pressure	167.67	247.54	315.91	kPA
TIT-0801	Treated Water Temperature	11.47	13.40	16.11	°C
Clearwell Cell #1 Level					
LIT-0811	Level	2.39	3.16	3.85	Meters
Clearwell Cell #2 Level					
LIT-0821	Level	2.39	3.17	3.87	Meters
Minimum CT Achieved					
	$CT_{provided}$	284.94			

To determine the $CT_{(provided)}$ in clearwell only

$CT_{(provided)} = V/Q \times Cl \times BF$

CT	actual CT provided in system clearwell	284.94	
V	minimum volume of clearwell	1295.33	m
Q	maximum flow rate	31.20	L/s
Cl	minimum clearwell free chlorine residual	1.03	mg/L
BF	baffling factor	0.4	

To determine the $CT_{(required)}$ Value

$CT_{(required)} = 0.2828 pH^{2.69} \times Cl^{0.15} \times 0.933^{(T-5)} \times L$

CT	required CT to provide log inactivation	39.30	
L	required log inactivation	1	
pH	avg. pH of treated water	7.76	
Cl	minimum clearwell free chlorine residual	1.03	mg/L
T	avg. treated water temperature as C	13.40	

Chemical Tanks Levels

		Min	Avg	Max	
PACL Tank #1 Level					
LIT-1001	Percentage	60.78	61.67	62.53	%
PACL Tank #2 Level					
LIT-1002	Percentage	0.00	0.00	0.00	%
NaOH Tank #1 Level					
LIT-1301	Percentage	54.40	54.81	55.16	%
NaOH Tank #2 Level					
LIT-1302	Percentage	0.00	0.00	0.00	%
Hydrofluosilicic Acid Tank Level					
LIT-1401	Percentage	74.52	74.60	74.72	%
Potassium Hydroxide Tank Level					
LIT-1201	Percentage	85.82	86.67	87.54	%
Polyelectrolyte Drum Weight					
WIT-1101	lbs.	0.00	0.00	0.00	lbs.

E

Appendix E: CT Calculations Sheet

Blind River WTP - Intake and Low Lift Pumping Station

Project Number:	T001592B	Date created:	Mar. 4, 2024
Task:	CT Calculations Sheet Tech Memo 5 - Appendix D	Created by:	Elliot De Angelis
		Reviewed by:	C. Alepin
Client:	Town of Blind River	Reviewed on:	Mar. 13, 2023
		Rev No.:	4

Design Basis

Dimension	Clearwells	High-Lift Suction Wells	
Length (m):	19.50	6.00	
Width (m):	13.00	4.50	Dimensions were taken from the WTP's as-built drawings. The baffling factor for the clearwells is listed on the WTP's DWQMS operational plan, available in Appendix E. The baffling factor for the high-lift suction well was assumed to be equal to the unbaffled condition listed in the Procedure for Disinfection of Drinking Water in Ontario (MECP, 2016).
Surface Area (one cell) (m^2):	253.50	27.00	
Surface Area (two cells) (m^2):	507.00	54.00	
Baffling Factor:	0.40	0.10	
Chlorine Residual:	1.00	mg/L	
Rated Flowrate:	6000	m^3/day	
	4.17	m^3/min	
Target CT:	122	mg-min/L	coldest temp. and highest pH: temp. 0.5 C, pH 8.5

Two Train Operation

Chamber	Effective Volume (m^3) at the following levels (m)			
	1.2	2	3	5.5
Clearwell (Two in operation)	608.4	1014.0	1521.0	2788.5
Suction well (Two in operation)	64.8	108.0	162.0	297.0

CT Provided (mg-min/L) at varying flowrates, 1.0 mg/L chlorine residual

Operating Depth (m)	Flow (m3/day)					
	6000	5000	4000	3000	2300	1700
5.5	275	330	412	550	717	970
3.0	150	180	225	300	391	529
2.0	100	120	150	200	261	353
1.2	60	72	90	120	156	212

CT Provided (mg-min/L) with varying residual, at rated flowrate of 6000m^3/day

CT Provided (mg-min/L)		Free Chlorine Residual (mg/L)				
WL Depth (m)	WL Depth (%)	0.5	0.75	1	1.25	1.5
5.5	100.0%	137	206	275	344	412
4.5	81.8%	112	169	225	281	337
3.5	63.6%	87	131	175	219	262
3.0	54.5%	75	112	150	187	225
2.5	45.5%	62	94	125	156	187
2.0	36.4%	50	75	100	125	150
1.5	27.3%	37	56	75	94	112
1.2	21.8%	30	45	60	75	90

One Train Operation

CT Provided (mg-min/L) at varying flowrates, 1.0 mg/L chlorine residual

Operating Depth (m)	Flow (m3/day)					
	6000	5000	4000	3000	2300	1700
5.5	137	165	206	275	358	485
3.0	75	90	112	150	196	265
2.0	50	60	75	100	130	176
1.2	30	36	45	60	78	106

CT Provided (mg-min/L) with varying residual, at rated flowrate of 6000m^3/day

CT Provided (mg-min/L)		Free Chlorine Residual (mg/L)				
WL Depth (m)	WL Depth (%)	0.5	0.75	1	1.25	1.5
5.5	100.0%	69	103	137	172	206
4.5	81.8%	56	84	112	141	169
3.5	63.6%	44	66	87	109	131
3.0	54.5%	37	56	75	94	112
2.5	45.5%	31	47	62	78	94
2.0	36.4%	25	37	50	62	75
1.5	27.3%	19	28	37	47	56
1.2	21.8%	15	22	30	37	45

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