

2023 Annual Report

Final

Matawatchan Closed Waste Disposal Site

ECA No. A412204

March 27, 2024

Jp2g Project # 22-6213C





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March 26, 2024



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EXECUTIVE SUMMARY

Jp2g Consultants Inc. (Jp2g) was retained by the Township of Greater Madawaska to conduct the 2023 ground and surface water monitoring at the Matawatchan Waste Disposal Site (WDS or landfill), located on Part of Lot 13, Concession 5, in the geographic Township of Matawatchan, in the amalgamated Township of Greater Madawaska, in the County of Renfrew. Access to the site is provided by County Road 71 (Matawatchan Road), approximately one kilometer north of the hamlet of Matawatchan.

The Matawatchan site was closed to all operations as of December 31, 2009, and prior to closure operated as an active waste disposal site, which was approved to accept municipal waste from the geographic Townships of Griffith and Matawatchan, in accordance with Environmental Compliance Approval A412204. The site consists of an approved waste disposal area of 2.3 hectares within a total property area of 4.9 hectares, inclusive of a 0.6-hectare road allowance. Additional lands acquired to the north and east of the site serve as a contaminant attenuation zone. In 2008, the Township of Greater Madawaska submitted an application to amend the ECA to approve final closure concepts at the Matawatchan site. The application to amend the ECA was approved with an amendment on February 26, 2010. Final closure activities were undertaken at the site in 2010 and 2011.

In 2023, the groundwater flow direction at the site was similar to historical interpretations, with the predominant direction of groundwater flow being towards the east.

Groundwater quality at leachate monitoring well 91-2C was interpreted to be impacted partially from landfill-related factors, while downgradient monitoring wells 91-4A, 95-2A, and 95-2B were interpreted to have minor to no impact resultant of landfill-related factors (including final closure activities). Monitoring well 95-3B was damaged at some point between spring and summer 2020. Attempts were made to repair the damage in summer 2021, but further repair is required to obtain a sample. Significant impacts related to the closed Matawatchan WDS were not interpreted at the downgradient property boundary following completion of the 2023 groundwater monitoring program.

In 2023, no Reasonable Use Concept (RUC) exceedances were documented in the results from downgradient monitoring wells 95-2A and 95-2B. Based on the above, the Matawatchan WDS was interpreted to meet the intent of MECP Guideline B-7 at the downgradient eastern CAZ boundary in 2023.

With the inclusion of the 2023 surface water quality results, historical results at downstream location SW-2 were interpreted to suggest that no significant impacts occurred downstream of the Matawatchan WDS. The Matawatchan Waste Disposal Site was interpreted to be in conformance with Provincial Water Quality Objectives in 2023.

Given that the Matawatchan WDS has been closed since 2009, and since recent groundwater sampling events at the site have been interpreted to represent significant attenuation downgradient of the closed waste mound and conformance with Guideline B-7 at the downgradient property boundary, it is recommended that the Ontario Ministry of the Environment, Conservation, and Parks consider reductions in the scope of the groundwater monitoring program. Recommendations for changes to the program are included in Section 5.0 of this report.



1 INTRODUCTION

This report was prepared by Jp2g Consultants Inc. (Jp2g) for the purposes of presenting and interpreting the results of the 2023 ground and surface water monitoring program completed at Matawatchan Waste Disposal Site (WDS) located in the Township of Greater Madawaska.

Prior to site closure, the Matawatchan WDS operated as an active waste disposal site and was approved to accept municipal waste from the geographic Townships of Griffith and Matawatchan. Jp2g Consultants Inc. completed the environmental compliance monitoring in 2023. Prior to this, sampling and reporting was completed by Greenview Environmental. For consistency in reporting, details previously provided by Greenview (2023) have been repeated in part or in whole in this report.

1.1 Site Information

A detailed description of the site information and location is as follows:

- The site is located on Part of Lot 13, Concession 5, in the geographic Township of Matawatchan, in the amalgamated Township of Greater Madawaska as shown on **Figure 1**.
- The site coordinates are NAD 1983 UTM Zone 18 – 333853E 5002303N.
- Access to the site is provided by County Road 71 (Matawatchan Road), approximately one (1) kilometre (km) north of the hamlet of Matawatchan.
- The site consists of a landfilling area of 2.3 hectares (ha) within a total property area of 4.9 ha, inclusive of a 0.6 ha road allowance (**Figure 2**). The lands to the north and east of the landfilling area within the total property area, serve as a contaminant attenuation zone (CAZ) for the site as proposed in the approved Closure Plan (Greenview Environmental Management Limited [Greenview], 2008a). The Township registered the CAZ lands on title on March 5, 2013 (**Appendix A**).
- The Matawatchan WDS operates under Environmental Compliance Approval (ECA) A412204, with the most recent amendment dated February 26, 2010 (**Appendix A**).

1.2 Site Ownership and Key Personnel

Site operations are directed by the Township. Contacts for the municipality and the Competent Environmental Practitioner (CEP) for both groundwater and surface water as defined by the Ministry (2010) are as follows:

Municipal Contact

Township of Greater Madawaska
Leonard Emon
Facilities Manager
Phone: 613.752.2249
Email: lemon@greatermadawaska.com

CEP Contact

Jp2g Consultants Inc.
Andrew Buzza, P.Ge
Sr. Hydrogeologist
Phone: 613.828-7800
Email: andrewb@jp2g.com

1.3 Site Development of the Waste Disposal Site

The following section provides a general description of the site, including operational details:

Environmental Compliance Approval:

The site operates under ECA No. A412204 dated April 2, 1980 as amended February 26, 2010 (**Appendix A**).

Site Status:

The site has been closed since December 31, 2009.

Site Capacity:

Unknown.

Projected Site Life:

The site is closed.

Area of current waste cell footprint and approved footprint:

The current ECA recognizes a 2.3 ha landfilling area within a total site area of 4.9 ha.

Dates when the site opened, operated and closed as applicable:

The site was opened in the 1960's and ceased receiving municipal solid waste and was closed to the public on December 31, 2009.

Information on final cover, slopes and engineering controls:

Details are found in The Closure Plan Matawatchan WDS (Greenview 2008).

Any Permits To Take Water associated with the site:

There are no permits to take water associated with the site.

Other authorizing and/or control instruments associated with the site:

There are no storm water management facilities associated with the site.

Description of any leachate collection systems; and any sewage works, including the C of A number of the works:

The Matawatchan WDS is designed for the natural attenuation of leachate. There are no collection systems or sewage works at the site.

Any site developments which occurred during the year of the monitoring report:

None

Any new developments in the vicinity of the site of relevance from a monitoring perspective:

None.

Historical Site Overview

Environmental Baseline Investigations which were undertaken:

Investigations of the Matawatchan WDS have been carried out since 2001. Reports have been submitted annually to the Ministry.



Design and Construction of the Site:

The design and closure requirements for the waste disposal site are outlined in Greenview (2008) listed as item 1 in Schedule A of the ECA.

Development of environmental monitoring systems:

Environmental monitoring is conducted annually in accordance with Condition 2(1)(2)(5)(6) and (7) of the ECA and recent TSS review comments.

Conceptual site model:

Infiltrating groundwater at the site will migrate vertically through more porous overburden material until intersected by the shallow groundwater table over bedrock. Groundwater flow is governed by local topography predominantly to be downhill to the north and east.

Initial placement of waste materials:

Within the 2.3 ha landfilling area.

Filling, closure and placement of final cover over waste cells:

Completed.

Problems associated with of final cover over waste:

There have been no documented issues with the final cover on the waste disposal site.

Date of site closure, actual or projected, including any closure plans:

December 31, 2009.

1.4 Ministry (MECP) Consultation

On September 29, 2014, the Township received the Ministry Technical Support Section (TSS) groundwater review comments to the 2011 and 2012 Annual Reports (Greenview, 2012 and 2013), dated January 10, 2014 (Greenview, 2015). A response to the Ministry TSS groundwater review of the 2011 and 2012 Annual Reports was included in the 2014 Annual Report (Greenview, 2015). As part of the Ministry TSS review, the Ministry approved the removal of the summer groundwater elevation measurement event for the site. This change was instituted for the 2015 groundwater monitoring program (Greenview, 2016).

In 2016, the Ministry TSS issued a surface water review of the 2015 Annual Report for the Matawatchan WDS, dated July 5, 2016 (Greenview, 2017). As part of the review, the Ministry TSS reviewer noted their agreement with Greenview's interpretation in the 2015 Annual Report (Greenview, 2016) that the surface water system in the vicinity of the site was in conformance with the Provincial Water Quality Objectives (PWQO) and the surface water system was not significantly impacted by the closed landfill (Greenview, 2017).

The Matawatchan WDS was inspected by the Ministry Ottawa District Office on July 11, 2016. Subsequent to the inspection, a Closed Waste Disposal Site Inspection Report (Inspection Report) was issued by the Ministry Ottawa District Office dated July 19, 2016, and was received by the Township electronically on July 26, 2016 (Greenview, 2017). No action items were noted as part of the Inspection Report.

On October 30, 2017, the Ministry TSS issued groundwater review comments to the 2016 Annual Report for the Matawatchan WDS (Greenview, 2018). The review noted that groundwater quality in 2016 was similar to previous years and was not interpreted to indicate significant adverse landfill-related impacts. A contingency plan was not deemed to be warranted at the time of the review.

No correspondence from the Ministry was provided in 2023.

1.5 Purpose and Scope

The purpose of this report is to provide an overview of the annual monitoring, environmental compliance, and operations at the Matawatchan WDS, in accordance with Condition 2 (3) and 2 (4) of the ECA (**Appendix A**), including the following:

- Groundwater quality assessment and Reasonable Use Concept (MECP Guideline B-7) compliance.
- Surface water quality assessment.
- Site operational overview.
- Preparation of an annual report that summarizes the results of the monitoring program and submitting the report to the Ministry.

1.6 Assumptions and Limitations

In preparing this annual monitoring report, Jp2g has relied on information provided by the Township of Greater Madawaska and details provided in the 2022 Annual Landfill Monitoring Report (Greenview, 2023).

2 SITE DESCRIPTION

The following sections present a summary of the physical characteristics for the Matawatchan WDS and is based in part on the descriptions provided in previous reports.

2.1 Topography and Drainage

The former landfilling area at the site is located on a bedrock ridge that slopes generally to the northeast of the site (**Figure 2**). Based on the northeastern trending slope, the direction of surface water drainage and groundwater flow in the vicinity of the former landfilling area is predominantly to the east (**Figures 3 and 4**). The nearest significant water body in the vicinity of the site is Centennial (Black Donald) Lake, which is located approximately 2 km to the east (Greenview, 2023).

2.2 Hydrogeological Conditions

Overburden geology at the site is characterized by subsurface layers of sand and silty sand from 1.8 metres (m) to 3.3 m (recorded at boreholes 91-4 and 91-5), with pockets of sand and gravel underlying the refuse at the site (Golder, 2007). Gneiss bedrock is found at the site, ranging in depth from 2.0 to 7.0 m below ground surface, with the sand and gravel to silty sand overburden overlying the bedrock unit. Overburden depths are greater at the eastern portion of the site, given the relief of the natural topography sloping towards the east, and the layers of sand and refuse located on the eastern slope of the site in this area (Golder Associates Ltd. [Golder], 2007). Bedrock outcrops are visible to the west of the waste mound at the site, in the vicinity of monitoring well 95-4, indicating that overburden thickness is generally shallow in this area. Immediately to the south of the site



is a steep bedrock ridge overlain by limited to no overburden material. Bedrock outcropping to surface is visible along most of the eastward-trending ridge; the private lands south of the bedrock ridge are at a significantly lower elevation than the Waste Disposal Site. No groundwater-to-surface water interactions have been observed along the extent of the eastward-trending bedrock ridge.

Hydraulic conductivity values for overburden materials at the site have been estimated to vary from 1×10^{-7} to 2×10^{-3} centimetres per second (cm/s) for silt, 2×10^{-5} to 2×10^{-2} cm/s for fine to medium sand, and 3×10^{-2} to 3 cm/s for gravel (Sonderegger and Wade, 2001). Based on site topography and annual groundwater monitoring at the site, groundwater at the site is interpreted to flow predominantly to the east (**Figures 3 and 4**).

Borehole logs for on-site well installations are not available.

2.3 Land Use

The land use designation for the Matawatsch WDS is Inactive Waste Disposal Site on Schedule "A" to the County's Official Plan. The WDS is zoned Inactive Waste Disposal Site on Schedule "E" to By-Law 22-2003. The site has been closed to all waste operations since December 31, 2009.

2.4 Operational Setting

The Matawatsch WDS consists of a landfilling area of 2.3 ha within a total property area of 4.9 ha, inclusive of a 0.6 ha road allowance (**Figure 2**). The Closure Plan (Greenview, 2008a) and the application to amend the site's ECA were approved by the Ministry with the Amendment to the ECA dated February 26, 2010 (**Appendix A**). On December 18, 2012, the Township submitted a Certificate of Requirement to the Ministry regarding registration of the CAZ lands on title, in accordance with Condition 1 (14) (a) of the ECA (**Appendix A**). On March 5, 2013, the Certificate of Requirement was registered on title to the site at the land registry office in accordance with Condition 1 (14) (b) of the ECA, and subsequently a duplicate registered copy was submitted to the Ministry (Greenview, 2013).

As part of the Township's long-term waste management plan, the site was closed to all operations on December 31, 2009. The application of 600 millimetres (mm) of barrier soil to satisfy final cover requirements of the waste mound was substantially completed in late 2010 (Greenview, 2011). The Township completed additional final cover application, grading, and seeding of the site in order to satisfy final cover requirements in spring 2011. Final cover application in spring 2011 included additional barrier soil (600 mm) placement in the northeastern portion of the former landfilling area and vegetative cover (150 mm) placement over the entire former landfilling area. Monitoring well 91-2C was extended concurrent with final cover application in the northeastern corner of the former landfilling area.

3 ENVIRONMENTAL MONITORING PROGRAM

3.1 Monitoring Locations

Table 1 (in the Tables section) summarizes the location of monitoring wells and surface water monitoring stations. All monitoring locations including groundwater wells and the surface water monitoring stations are provided in **Figure 2** and **Appendix B** contains photographs of the wells and surface water monitoring stations in Fall 2023.

3.1.1 Groundwater Monitoring Locations

Nine ground water wells were installed at and around the Matawatchan WDS between 1991 and 1995. Details are as follows:

- **Monitoring Well 91-2A, 2B, & 2C**
Located within the existing limit of waste at the site.
- **Monitoring Well 91-4A**
Located approximately 50 m east and downgradient of the limit of the waste.
- **Monitoring Well 95-1**
Located approximately 70 m west and upgradient of the limit of the waste.
- **Monitoring Well 95-2A & 2B**
Located approximately 85 m east of the limit of the waste.
- **Monitoring Well 95-3B**
Located approximately 40 m southeast of monitoring well 91-4A, and approximately 80 m east and downgradient of the limit of waste.
- **Monitoring Well 95-4**
Located approximately 45 m west and upgradient of the limit of the waste.

3.1.2 Surface Water Monitoring Locations

In the summer 2023, surface water samples were collected at three locations:

Monitoring Location SW-1

Located approximately 60 m downgradient of the limit of the waste along an intermittent stream in the gully east of the site.

Monitoring Location SW-2

Located southeast of the Matawatchan WDS on an intermittent creek, downstream of the small low-lying area.

Monitoring Location SW-3 (Background)

Surface water station SW-3 is located on the intermittent creek south of the site and upstream of a small low-lying area southeast of the site.

3.2 Monitoring Procedures and Methods

All sampling was completed in general accordance with Jp2g Consultants Inc. standard operating procedures. Sampling methods and quality assurance measures are summarized and provided in **Appendix C**.

3.3 Groundwater Monitoring Program 2023

Two (2) environmental monitoring events were completed by Jp2g in 2023 (July 05 and October 30), as part of the 2023 environmental monitoring program. All environmental monitoring was completed by Jp2g field staff. **Table 2** (in the Tables section) summarizes the sampling activities that were completed during the spring and fall 2023 monitoring program events.



As per Ministry TSS review comments on the Closure Plan (Greenview, 2010), shallow monitoring well 95-2A was added to the environmental monitoring program in 2010. Additionally, monitoring well 91-4A is compared to the Provincial Water Quality Objectives (PWQOs) given the potential for groundwater discharge to the surface in the vicinity of 91-4A, based on the historically observed flowing conditions during spring.

During the spring and fall 2023 sampling events, monitoring wells 95-2A and 95-3B were observed to be dry and samples could not be collected.

3.4 Surface Water Monitoring Program 2023

Two (2) surface water sampling events were completed coincidentally with the groundwater sampling in 2023. All environmental monitoring was completed by Jp2g field staff and **Table 2** summarizes the sampling activities that were completed during the spring and fall.

The surface water samples were collected by submerging a dedicated, non-preserved, sample container into the water body and decanting into preserved sample bottles so as not to displace preservative chemicals.

Surface water sampling location SW-1 was dry in 2023, and samples were not collected from SW-2 during both the spring and fall and from SW-3 in the fall.

3.5 Analytical Laboratory Accreditation

Ground and surface water samples were submitted for analysis to the Caduceon Environmental Laboratories (Caduceon), located in Ottawa, Ontario. Caduceon is accredited by the Canadian Association for Laboratory Accreditation (CALA), for specific environmental testing procedures listed in the scope of accreditation and is assessed biannually by CALA to the ISO/IEC 17025 standard. ISO/IEC 17025 is an international standard for both quality management and technical aspects of operating a testing laboratory. Caduceon is licensed by the Ministry to perform analysis on drinking water in Ontario in accordance with the Safe Drinking Water Act.

3.6 Landfill Gas Monitoring

Landfill gas monitoring is not part of the current environmental monitoring program for the site. The waste mound at the site is covered with porous soil materials, allowing natural gas flux to the atmosphere. Overburden geology at and adjacent to the site is characterized by shallow, sandy materials, overlying a dense bedrock unit. These overburden and bedrock characteristics, coupled with the extended distance to the nearest residence, provide a minimal risk of landfill gases impinging off-site receivers.

3.7 Operational Monitoring

The site was closed to all waste activities on December 31, 2009. On September 27, 2011, a survey was conducted to update the existing topographic data for the site following completion of final closure activities in 2011, which included the application of vegetative cover.

Waste record keeping and reporting were not conducted for the site in 2023, as the site was closed to operations and did not receive waste or recyclables for disposal, transfer, or market.



In 2023, all monitoring wells at the site were observed to be in good condition with the exception of monitoring well 95-3B, which was measured to have total depth of 1.52m. The original depth for this well is 5.96 m. Monitoring well 95-3B was repaired by Greenview in summer 2021 and was observed to be dry in 2022 and 2023. Further examination and/or repairs will be needed to acquire the required samples.

4 ENVIRONMENTAL MONITORING RESULTS 2023

4.1 Historical Data

Historical static water level and sampling results are presented in earlier reports completed by Greenview Environmental and are summarized in **Appendix D**.

4.2 Groundwater Flow Monitoring

Static water levels were measured in July and October 2023, and are summarized in **Appendix E**. Ground water flow patterns are provided in **Figures 3** and **4** for the July and October sampling events respectively.

Historically, groundwater at the site has been interpreted to flow towards the east to the general direction of the gully (Greenview 2023). In 2023, the interpreted groundwater flow at the site was interpreted to be consistent with historical results, as groundwater was interpreted to flow generally towards the east of the site boundary.

4.3 Groundwater Quality Assessment

4.3.1 Groundwater Assessment Criteria

Groundwater at landfill sites is generally assessed with regard to the criteria specified in the Ontario Drinking Water Quality Standards (ODWQS). The ODWQS is split into health and non-health related parameters. Non-health related parameters are in turn split into aesthetic objectives and operational guidelines.

Given that groundwater was interpreted to discharge to surface in the vicinity of 91-4A based on the historically observed flowing conditions of the well (Greenview, 2023), groundwater quality results from this location were also compared to the Provincial Water Quality Objectives (PWQOs).

Background groundwater quality at the Matawatchan WDS has historically been assessed at monitoring wells 95-1 and 95-4 that are located approximately 70 m and 45 m west and upgradient of the fill area respectively. In 2023, the median of the previous ten (10) sampling events from monitoring well 95-1 is used to determine background groundwater quality at the site.

4.3.2 Groundwater Quality 2023

The laboratory Certificates of Analysis are presented in **Appendix F**, and the results of the 2023 groundwater monitoring program are presented in **Appendix G**. Analytical data were compared to the Ontario Drinking Water Standards (ODWS) and Ministry Guideline B-7 and the (Reasonable Use Concept) RUC.



Monitoring Well 95-1 (Background)

In 2023, all parameters met the ODWS except iron and manganese during both sampling events. Concentrations of iron and manganese above the ODWS limits at monitoring well 95-1 was interpreted to be the result of naturally occurring conditions in the background at the site and/or related to off-site sources.

Monitoring Well 95-4

In spring 2023, all parameters met the ODWS. In fall 2023, the well was observed to have insufficient groundwater for sampling purposes, and groundwater samples could not be collected. Historically, monitoring well 95-4 had high concentrations of iron and manganese.

Monitoring Well 91-2C

Monitoring well 91-2C is located within the existing limit of waste at the site and has been used historically to characterize leachate quality. In 2023, all parameters met the ODWS except for manganese. Decreasing trends noted in groundwater quality results over the past five (5) years were interpreted to represent that landfill-related impacts at 91-2C are diminishing over time. Iron concentrations at 91-2C (leachate well) have generally been historically (and in 2023) lower than those documented in the background at monitoring wells 95-1 and 95-4.

Monitoring Well 91-4A

Groundwater monitoring well 91-4A is located east and approximately 50 m downgradient of the limit of the waste. In 2023, all parameters met the ODWS except TDS during both sampling events. Monitoring well 91-4A was not interpreted to be significantly impacted by landfill-related activities.

As noted in previous ministry correspondence (TSS surface water review comments Greenview, 2009), it was recommended that groundwater quality from this location (91-4A) be compared to the Provincial Water Quality Objectives (PWQOs) and the Canadian Water Quality Guidelines (CWQGs). In 2023, all parameters met the PWQO, and boron values did not exceed the limits of the CWQG.

Monitoring Well 95-3B

Monitoring well 95-3B is located approximately 40 m southeast of monitoring well 91-4A, and approximately 80 m east and downgradient of the limit of waste at the site. This well is likely compromised as indicated by Greenview (2023). In 2023, the well was observed to be dry, and samples could not be collected. An inspection of this well will be completed in 2024.

Monitoring Well 95-2A and 95-2B

Groundwater quality at the southeastern downgradient property boundary was assessed at nested monitoring well 95-2(A and B), which are located approximately 85 m east of the limit of the waste. The monitoring well 95-2A was observed to be dry and samples could not be collected during both sampling events in 2023. At monitoring well 95-2B, all parameters met the ODWS during both sampling events in 2023. Neither 95-2A nor 95-2B were historically interpreted to be significantly impacted from landfill-related factors. Impacts related to the closed waste mound were interpreted to be decreasing with time in the vicinity of 95-2A and 95-2B.



4.3.3 Reasonable Use Concept Assessment

The Reasonable Use Concept was developed by the Ministry to address the levels of off-site contaminants that are considered acceptable. The Reasonable Use Criteria allows for the definition of the level of contamination in the groundwater beyond which mitigative action should be undertaken. The acceptability of the landfill in terms of its impact on groundwater has been assessed in terms of the Reasonable Use Criteria (RUC). The RUC established the acceptability of change in groundwater quality (C_m) as follows:

Aesthetic Parameters

Degradation of less than 50% of the difference between the background quality and the established objective for the particular health related parameter.

Health Related Parameters

Degradation of less than 25% of the difference between the background quality and the established objective for the particular health related parameter. Acceptable concentrations are based on background levels and water quality guidelines (i.e. drinking water objectives).

The chosen background values are utilized to calculate the RUC allowable concentrations for specific parameters, as per the following formulas:

Health Related:

$$C_{allow} = P_b + (C_m - P_b) \times 25\%$$

Non-Health Related:

$$C_{allow} = P_b + (C_m - P_b) \times 50\%$$

where:

C_{allow} = Maximum allowable concentration of parameter as per the RUC guidelines.

C_m = Maximum acceptable concentration (MAC) of parameter as per the ODWS/OG.

P_b = Chosen background value of parameter

In 2023, the median of the previous ten (10) sampling event results from background monitoring well 95-1 was used to determine background groundwater quality at the site.

Table 3 (at the Tables section) outlines the median calculation for background concentrations, and **Table 4** (at the Tables section) outlines the Reasonable Use Criteria.

4.3.4 Reasonable Use Conclusions - 2023

The reasonable use conclusions and the indicator parameters that exceed the RUC for the July and October 2023 sampling events are presented in **Table 5**. Based on the direction of groundwater flow, groundwater monitoring wells 95-2A and 95-2B were used for monitoring downgradient impacts at the property boundary southeast of the Matawatchan site, for assessing site compliance with the RUC and Guideline B-7.

Monitoring Well 95-2A

This well did not have sufficient groundwater to sample during the spring and fall 2023 sampling events.

Monitoring Well 95-2B

Results indicate that all parameters met the RUC criteria in 2023.

The RUC values for individual parameters should be generated each year based on analytical results obtained from the groundwater monitoring program. If RUC exceedances are noted, then action will be undertaken as appropriate and necessary in accordance with a defined groundwater contingency plan for the site. In cases where a groundwater contingency plan is not defined, a meeting with representatives of the MECP Ottawa District Office should be held to develop an appropriate contingency plan, as necessary and appropriate for the particular site.

Historically, downgradient well 95-2B had RUC non-conformances for concentrations of alkalinity, iron, and TDS. The RUC non-conformances historically noted from monitoring well 95-2B were attributed to the low groundwater conditions noted across the site and not to landfill-related factors.

4.4 Surface Water Quality Assessment

4.4.1 Surface Water Assessment Criteria

Surface water at landfill sites is generally assessed with regard to the criteria specified in the Provincial Water Quality Objectives (PWQOs). The PWQOs are a set of ambient surface water quality criteria. In addition to the PWQOs, surface water quality results are, where relevant, compared to select Canadian Water Quality Guidelines (CWQGs).

4.4.2 Surface Water Monitoring 2023

Photos of the monitoring stations are included in **Appendix B**, laboratory results are included in **Appendix F**, and the results of the surface water analysis for 2023 are included in **Appendix G**. **Figure 2** illustrate the locations of all surface water monitoring stations.

Surface water quality immediately to the east of the waste mound was assessed at SW-1, located approximately 60 m downgradient of the limit of waste along an intermittent stream in the gully east of the site. Surface water location SW-1 is located in the vicinity of the historically observed groundwater seep and well 91-4A. The intermittent stream on which SW-1 is located terminates underground near downgradient monitoring well 95-2B and is not directly connected to the surface water channel along which SW-3 (background) and SW-2 are located.

Surface Water Station SW-1

In 2023, the surface water station SW-1 was dry during both sampling events and samples could not be collected.

Surface Water Station SW-2

In 2023, samples could not be collected from station SW-2. Historical results at downstream location SW-2 suggested that no significant impacts occurred downstream of the Matawatchan WDS (**Appendix D**).

Surface Water Station SW-3 (Background)

In fall 2023, the surface water station SW-3 was dry, and samples could not be collected. In spring 2023, all parameter concentrations were below the PWQOs and other ambient surface water criteria.



Historically, background surface water quality was calculated using the 75th percentile of a minimum of the previous ten (10) sampling events resulting from background surface water monitoring location SW-3, however, the surface water stations SW-1 and SW-2 were not sampled in 2023.

4.5 Operations Summary

Access to the Matawatchan WDS is restricted by a lockable gate at the site entrance. The site is surrounded by forested lands, which provide adequate screening and restricted access for vehicular traffic, aside from the maintained site entranceway. The site access road extending from County Road 71 has sufficient width at the entrance and within the site to allow for unimpeded access when required. The site access road was observed to be in serviceable condition during the routine site inspections conducted by Jp2g during site visits in 2023.

A sign is posted at the entrance to the waste disposal site that indicates that the site was closed as of December 31, 2009, and provides addresses of other Township sites that are available to accept waste and recyclables.

4.5.1 Historical Details

On December 31, 2009, the Matawatchan WDS was closed to all waste operations in advance of final closure activities. Prior to closure, the site operated as a municipal solid waste landfill, accepting municipal waste and recyclables for disposal and market. The Matawatchan WDS was approved to accept waste from the geographic Townships of Griffith and Matawatchan.

An application to amend the ECA and supporting technical information including the Closure Plan (Greenview, 2008a), was submitted to the Ministry on September 19, 2008, in recognition of the operational concepts for the Township's waste management facilities. The Closure Plan was approved by the Ministry in the Amendment to the ECA for the site issued on February 26, 2010 (**Appendix A**).

The application of final cover (600 mm barrier cover plus 150 mm vegetative cover) was completed at the site in 2011 inclusive of seeding of the site in order to satisfy final cover requirements. Additional seeding of the former landfilling area at the site was completed in the spring 2012, specifically to the northeast and in the vicinity of monitoring well 91-2C. The extent of cover application is consistent with the limit of waste for final closure, as recognized in the ECA (**Appendix A**).

4.5.2 Waste Disposal / Transfer Summary

The Matawatchan WDS has been closed to all waste and recycling operations since December 31, 2009. Prior to closure, the Matawatchan WDS was approved to receive municipal waste and recyclables from the geographic Townships of Griffith and Matawatchan.

Developed as part of the Closure Plan, a proposed limit of waste for final closure was defined complete with associated final contours at closure (Greenview, 2008a). As such, final closure activities in 2010 and 2011 were undertaken in accordance with the Closure Plan (Greenview, 2008a) and Ministry guidelines. On September 27, 2011, a survey was conducted to update the existing site topographic data at the Matawatchan WDS following completion of final closure activities in 2011, which included the application of vegetative cover.

4.5.3 Site Inspections and Maintenance

Site inspections of the Matawatchan WDS were conducted by Jp2g on July 05, and October 30, 2023, coincidental with the environmental monitoring events. The Township also conducted periodic inspections to verify the compliance status of the site.

The site inspections included a cursory investigation of housekeeping/litter control aspects, monitoring well maintenance requirements in accordance with O. Reg. 903 (Wells), as amended, and a general site overview for Ministry regulatory compliance issues.

4.5.4 Monitoring and Screening Checklist

Appendix H contains a groundwater and surface water Monitoring and Screening Checklist. Based on the 2023 results no contingency measures are required to be implemented.

5 CONCLUSIONS AND RECOMMENDATIONS

Based on the results of the 2023 environmental monitoring program completed for the Matawatchan WDS, the following conclusions are provided:

- The groundwater flow direction at the site in 2023 was interpreted to be similar to historical interpretations with the direction of groundwater flow to the east of the CAZ boundary.
- In 2023, no Reasonable Use Concept (RUC) exceedances were documented in the results from downgradient monitoring wells 95-2A and 95-2B that were attributed to landfill-related factors. Based on the above, the Matawatchan WDS was interpreted to meet the intent of Ministry Guideline B-7 at the downgradient eastern CAZ boundary in 2023.
- With the inclusion of the 2022, surface water quality results (historical results) at downstream location SW-2 suggest that significant impacts have not been occurring downstream of the Matawatchan WDS which was interpreted to be in conformance with PWQO in 2023.
- The Matawatchan WDS has been closed since December 31, 2009, and no waste or recycling operations were conducted at the site in 2023.
- Given that the Matawatchan WDS has been closed since 2009, and since recent groundwater sampling events at the site have been interpreted to represent significant attenuation downgradient of the closed waste mound and conformance with Ministry Guideline B-7 at the downgradient property boundary, it is recommended that the Ministry consider reductions in the scope of the groundwater monitoring program. At this time, it is recommended that the groundwater monitoring program be modified to include the sampling and analysis of the following monitoring wells twice annually in spring and fall: 95-1 (background), 95-4, 91-2C (leachate), 95-2A (RUC), and 95-2B (RUC). No changes to the existing parameter suite for analysis are recommended as part of a revised groundwater monitoring program. Sampling for VOC at 91-2C annually in spring is recommended to be discontinued, given that no impacts related to VOCs have been historically apparent in results. All existing wells on-site are recommended to remain in place, such that groundwater elevations can be measured at each existing well for the establishment of groundwater contours and flow direction in future spring and fall sampling events; no monitoring wells are proposed to be decommissioned at this time. If approved by the Ministry, these proposed changes should be implemented the monitoring year following formal Ministry approval of the changes.



5.1 Groundwater Monitoring

The Groundwater monitoring program in 2024 will be similar to previous year (2023) until the above-mentioned recommendations are approved by the Ministry. Groundwater monitoring should continue to occur twice in 2024 (May/June and October/November) and consist of the following (see **Table 6**):

- Water levels at all locations should be collected.
- Any wells that are found to be damaged should be repaired or replaced.
- Groundwater samples should be collected from all locations in May/June and October /November and include appropriate duplicate samples; and
- Samples should be analyzed for the parameters listed in **Table 6**.

5.2 Surface Water Monitoring

No changes to surface water monitoring are recommended for 2024. Surface water monitoring should continue to occur two times per year (May/June and October/November) and consist of the following (see **Table 6**).

- Collect surface water from SW-1, SW-2, and SW-3.
- Collect samples in May/June and October/November.
- Samples should be analyzed for the parameters listed in **Table 6**.
- Un-ionized ammonia should be calculated using field results.



6 REFERENCES

- CCREM (Canadian Council of Resource and Environment Ministers). 1987. Canadian Water Quality Guidelines. Prepared by the Task Force on Water Quality Guidelines.
- Jp2g Consultants Inc., 2001. Matawatchan Landfill Site, Interim Site Development and Operations Plan. August 2001.
- Golder Associates Ltd., 2006. 2005 Annual Report, Matawatchan Waste Disposal Site. March 2006.
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- Greenview Environmental Management Limited, 2008a. Closure Plan, Matawatchan Waste Disposal Site (A412204). September 19, 2008.
- Greenview Environmental Management Limited, 2008b. 2007 Annual Report, Matawatchan Waste Disposal Site (A412204). March 26, 2008.
- Greenview Environmental Management Limited, (2009-2023). (2008-2022) Annual Reports, Matawatchan Waste Disposal Site (A412204).
- Ontario Ministry of the Environment, 1994a. MECP Procedure 8-7-1: Determination of Contaminant Limits and Attenuation Zones. 1994.
- Ontario Ministry of the Environment, 1994b. Water Management: Policies, Guidelines, Provincial Water Quality Objectives of the Ministry of Environment and Energy. July, 1994.
- Ontario Ministry of the Environment, 1994c. MECP Guideline B-9: Resolution of Groundwater Interference Problems. 1994.
- Ontario Ministry of the Environment, 2006. Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines. June 2006.
- Ontario Ministry of the Environment, 2010. Monitoring and Reporting for Waste Disposal Sites, Groundwater, and Surface Water - Technical Guidance Document. November 2010.
- Sonderegger and Wade. 2001. Manual of Applied Field Hydrogeology. McGraw-Hill, New York. 2001



LIMITATIONS AND USE OF THE REPORT

This report was prepared for the exclusive use of the Township of Greater Madawaska. Any use which a third party makes of this report, or and reliance on, or decisions to be made based on it, are the responsibilities of such third parties. Jp2g Consultants Inc. accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

This landfill impact report involves a limited sampling of locations to assess the probability of contamination on site. The test data, chemical analyses, and conclusions given herein are the results of analyzing the groundwater encountered during the sampling programs. Based upon the total number of test holes performed, these are considered to be fairly representative of the groundwater conditions within each area tested. It should be noted, however, that any assessment regarding the presence of contamination on the property is based on interpretation of conditions determined at specific locations and depths. Chemical results are limited to those parameters tested.



Tables

Table 1
Groundwater Monitoring Well and Surface Water Sampling Locations
Matawatchan Waste Disposal Site

Groundwater			
Monitor	Zone	Northing	Easting
91-2C	18T	5002265	334182
91-4A	18T	5002314	334255
95-1	18T	5002289	334030
95-2A	18T	5002228	334214
95-2B	18T	5002227	334216
95-3B	18T	5002287	334316
95-4	18T	5002254	334114

Surface Water			
Monitor	Zone	Northing	Easting
SW-1	18T	5002260	334215
SW-2	18T	5002147	334360
SW-3	18T	5002055	334180

Notes:

Global Positioning System (GPS) point locations acquired by Greenview using a Garmin eTrex Venture HC.

Table 2: Monitoring Program 2023

Station ID	Monitorign Location	Spring 2023	Fall 2023	Notes
<u>Groundwater</u>				
91-2A	Within the existing limit of the waste at the site	NS	NS	Water level Only
91-2B	Within the existing limit of the waste at the site	NS	NS	Water level Only
91-2C	Within the existing limit of the waste at the site	√	√	
91-4A	Approximately 50 m east of the limit of the waste	√ + DUP	√	
95-1	Approximately 70 m west of the limit of waste.	√	√ + DUP	
95-2A	Approximately 85 m east of the limit of waste	Dry	Dry	
95-2B	Approximately 85 m east of the limit of waste	√	√	
95-3B	Approximately 80 m east of the limit of waste.	Dry	Dry	
95-4	Approximately 45 m west of the limit of waste	√	NS	
<u>Surface Water</u>				
SW-1	Approximately 60 m of the limit of the waste	Dry	Dry	
SW-2	Southeast of the Site	NS	NS	
SW-3	South of the Site	√ + DUP	NS	

Notes:

1. √ = sampled for the required parameters, field parameters and water level
2. DUP = Duplicate Sample taken
2. NS: Not sampled

Table 3: Median Background Concentrations (Using 95-1 Results)

Parameters (mg/L)	May 19	Oct 19	Apr 20	Oct 20	May 21	Nov 21	May 22	Nov 22	Jun 23	Oct 23	Median
Alkalinity	57	67	49	68	84	83	67	85	70	75	69
Chloride	0.7	1.2	0.9	0.8	0.7	0.6	0.9	<0.5	1.5	0.7	0.80
Nitrate	0.18	<0.05	0.07	<0.05	0.1	<0.05	<0.05	<0.05	--	--	0.10
Sulphate	38	35	33	36	40	38	44	55	39	45	39
TDS	106	110	93	113	124	115	120	131	125	145	118
Boron	<0.005	0.005	<0.005	0.007	0.005	0.01	<0.005	<0.005	0.005	--	0.005
Iron	0.86	0.923	0.959	1.1	0.553	1.72	2.14	0.509	0.529	1.27	0.941
Manganese	0.078	0.063	0.121	0.147	0.085	0.136	0.198	0.101	0.099	0.138	0.11
Sodium	1.4	1.5	1.5	1.4	1.2	1.7	1.4	1.3	1.2	1.5	1.40

Table 4: Reasonable Use Determination 2023 (Using 95-1 results)

Parameter (mg/L)	Pb	Cm	F	Callow
Alkalinity	69	500	0.5	285
Chloride	0.8	250	0.5	125
Nitrate	0.1	10	0.25	2.6
Sulphate	39	500	0.5	270
TDS	118	500	0.5	309
Boron	0.005	5	0.25	1.25
Iron	0.941	0.3	0.5	0.62
Manganese	0.11	0.05	0.5	0.08
Sodium	1.4	200	0.5	101

Table 5: Reasonable Use Conclusions 2023

Parameters	ODWS	C _{allow}	95-2A		95-2B	
			Jun-23	Nov-23	Jun-23	Nov-23
Health Related						
Nitrate	10	2.60	NS	NS	--	--
Boron	5	1.25			0.14	--
Aesthetic Parameters						
Alkalinity	500	285			149	227
Chloride	250	125			2.1	1.5
Sulphate	500	270			22	29
TDS	500	309			185	280
Iron	0.3	0.62			0.01	0.01
Manganese	0.05	0.08			<0.001	0.01
Sodium	200	101			9.6	16

NS : Not Sampled

Exceeds Resonable Use Criteria

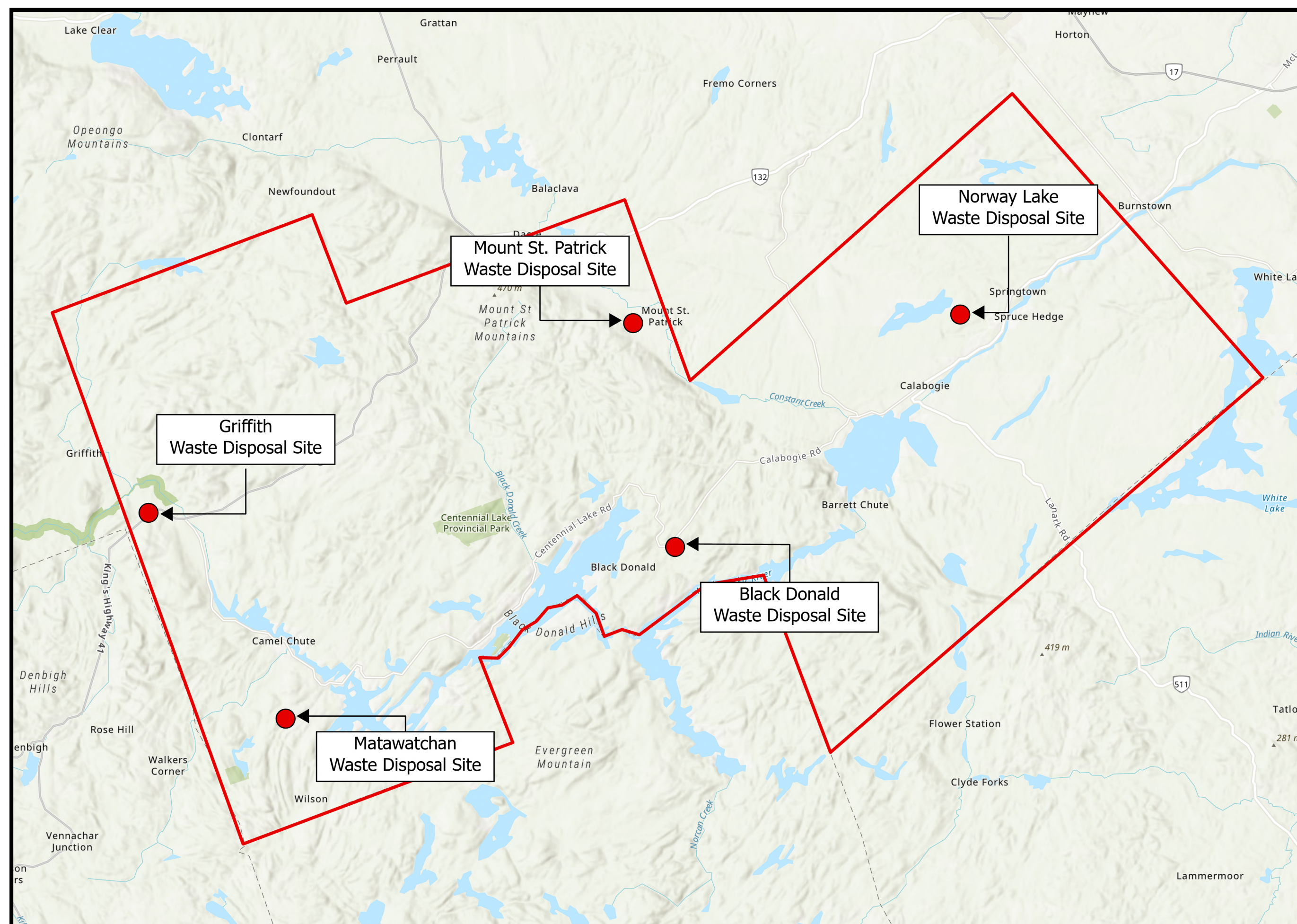
Table 6 : Proposed Monitoring Program 2024

Station ID	Task	Spring 2024	Fall 2024	Analytical Parameters
Groundwater				
91-2A	Measure water levels	√	√	<ul style="list-style-type: none"> - Major and minor ions (Ca, Na, Cl, SO4, B, K, Mg) - Trace metals (Fe, Mn, Cu, Sr) - Nitrogen species (NO3, NO2, NH3, TKN) - General parameters (alkalinity, COD, phenols, total dissolved solids) - Field measurements of pH, conductivity, Dissolved Oxygen, and water temperature - EPA 624 Volatile Organic Compounds VOC sample to be collected from 91-2C during spring sampling event
91-2B	Measure water levels	√	√	
91-2C	Measure water levels / Sample groundwater	√	√	
91-4A	Measure water levels / Sample groundwater	√	√	
95-1	Measure water levels / Sample groundwater	√	√	
95-2A	Measure water levels / Sample groundwater	√	√	
95-2B	Measure water levels / Sample groundwater	√	√	
95-3B	Measure water levels / Sample groundwater	√	√	
95-4	Measure water levels / Sample groundwater	√	√	
Surface Water				
SW-1	Sample Surface water	√	√	<ul style="list-style-type: none"> - Major and minor ions (Ca, Na, Cl, SO4, B, K, Mg, P) - Trace metals (Fe, Mn, Cu, Cd, Sr, Zn) with detection limits to PWQO - Nitrogen species (NO3, NO2, NH3, TKN) - General parameters (alkalinity, COD, phenols, total dissolved solids, biochemical oxygen demand) - Field measurements of dissolved oxygen, pH, conductivity, water temperature, and Un-ionized ammonia (calculation)
SW-2	Sample Surface water	√	√	
SW-3	Sample Surface water	√	√	

Notes:

One Duplicate Sample to be collected during each sampling event.

Figures



Township of Greater Madawaska

Waste Disposal Sites

LEGEND

- Waste Disposal Site
- Township Boundary

1:250 000



Regional Location Plan

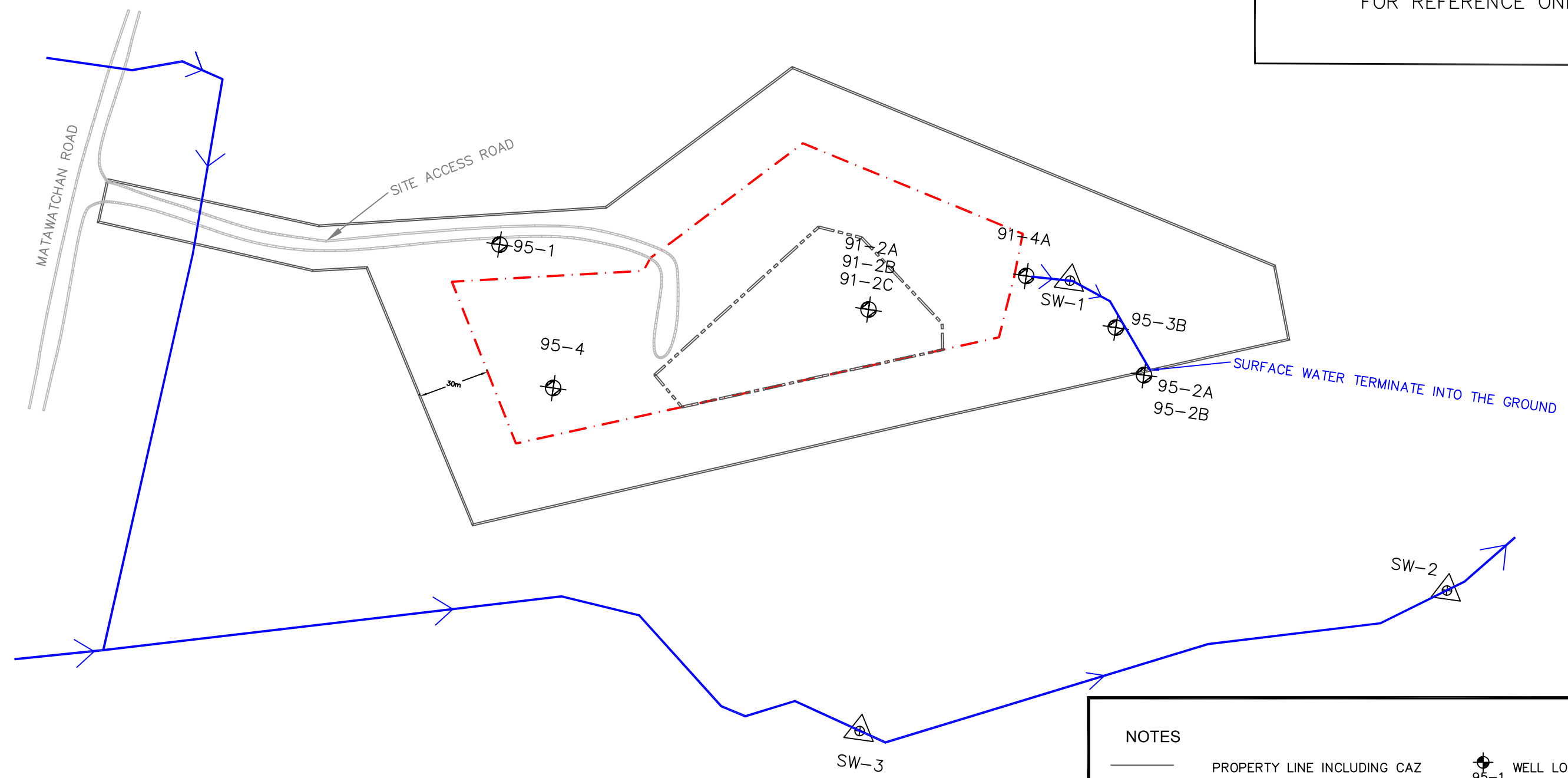
Project No. 22-6213C Greater Madawaska

Date: 3/12/2024	Drawn By: HV
	Checked By: KM

Notes:
 Map Layers Obtained from LIO
 Waste Disposal Site Locations Sourced from Greenview Environmental Management (2023)



NOTES:
SOURCE GREENVIEW 2022 AMR
FOR REFERENCE ONLY



NOTES

- PROPERTY LINE INCLUDING CAZ
- - - - - CLOSED LANDFILLING AREA
- ROADWAY
- - - - - AREA OF WASTE AT CLOSURE
- SEASONAL STREAM

WELL LOCATION
 95-1

SURFACE WATER LOCATION
 SW-3

1:2,000

0 m 20 40 60 80 100 m

TRUE NORTH

No.	DATE	BY	REVISIONS

Jp2g Consultants Inc.
ENGINEERS • PLANNERS • PROJECT MANAGERS

1150 MORRISON DRIVE, SUITE 410, OTTAWA, ON K2H 8S9
PHONE: 613-828-7800 FAX: 613-828-2600

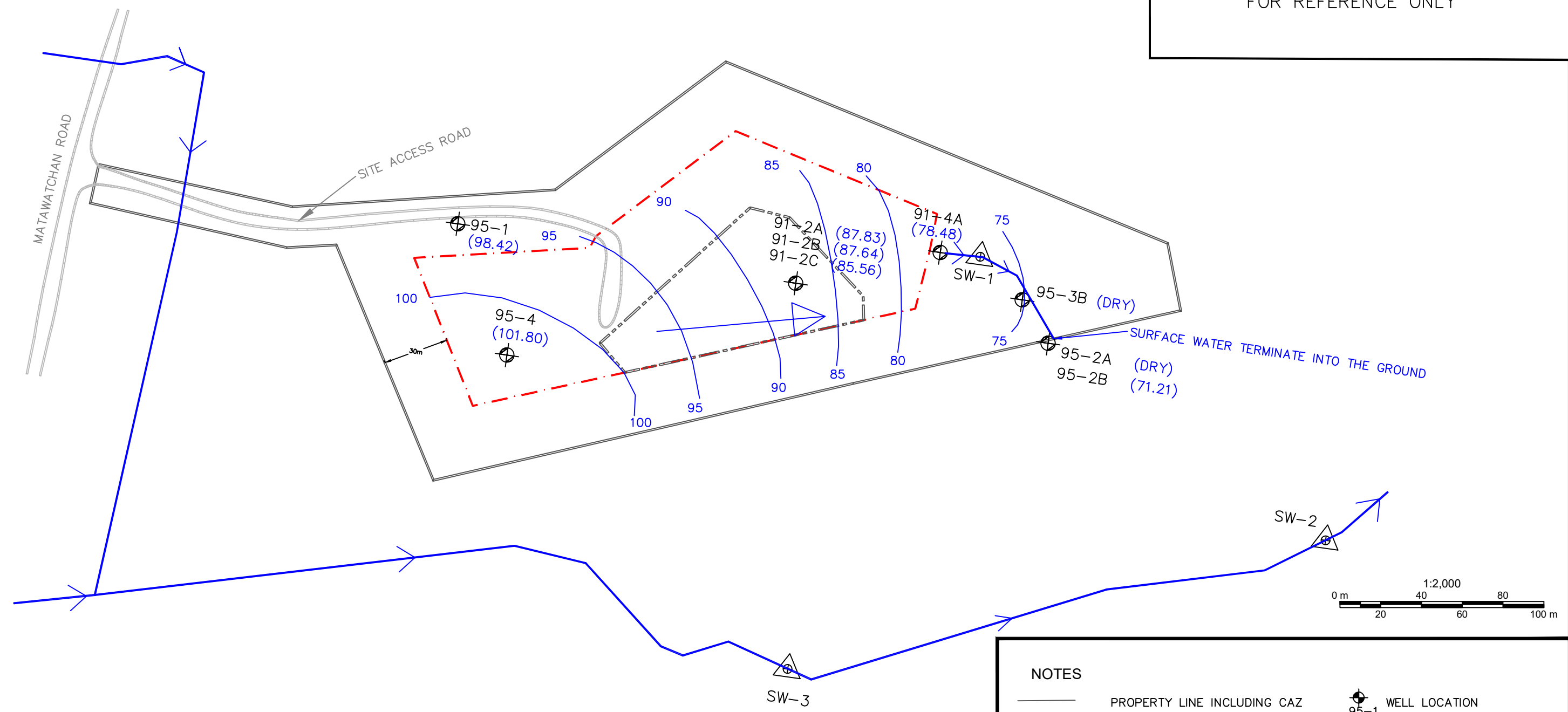
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CHECKED	KM
APPROVED	KM
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TOWNSHIP OF GREATER MADAWASKA
MATAWATCHAN WASTE DISPOSAL SITE

MONITORING LOCATIONS AND SITE PLAN

DATE	22-JAN-2024
PROJECT	22-6213C
PLOTTED	22-JAN-2024
REF	FIG 2

NOTES:
SOURCE GREENVIEW 2022 AMR
FOR REFERENCE ONLY



NOTES

- PROPERTY LINE INCLUDING CAZ
- GROUNDWATER CONTOURS
- (90.00) GROUNDWATER ELEVATIONS
- - - - - CLOSED LANDFILLING AREA
- ROADWAY
- - - - - AREA OF WASTE AT CLOSURE
- SEASONAL STREAM
- ⊕ WELL LOCATION
- ⊕ SW-3 SURFACE WATER LOCATION

TRUE NORTH

No.	DATE	BY	REVISIONS

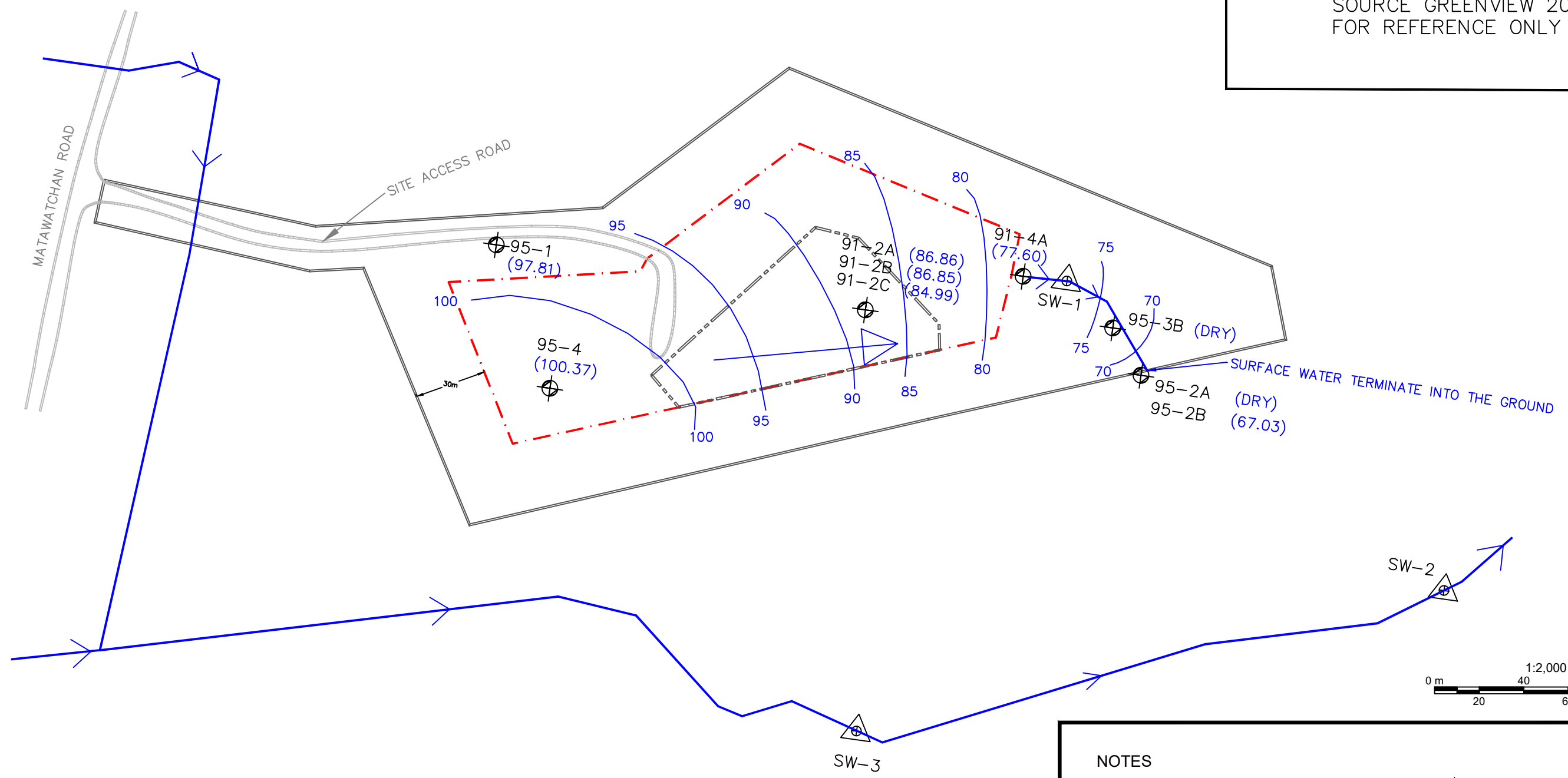
Jp2g Consultants Inc.
ENGINEERS · PLANNERS · PROJECT MANAGERS
1150 MORRISON DRIVE, SUITE 410, OTTAWA, ON K2H 8S9
PHONE: 613-828-7800 FAX: 613-828-2600

DESIGNED	QS
DRAWN	QS
CHECKED	KM
APPROVED	KM
SCALE	1:2000

TOWNSHIP OF GREATER MADAWASKA
MATAWATCHAN WASTE DISPOSAL SITE
Spring Groundwater Flow – JULY 2023

DATE	22-JAN-2024
PROJECT	22-6213C
PLOTTED	22-JAN-2024
REF	FIG 3

NOTES:
SOURCE GREENVIEW 2022 AMR
FOR REFERENCE ONLY



NOTES

- PROPERTY LINE INCLUDING CAZ
- GROUNDWATER CONTOURS
- (90.00) GROUNDWATER ELEVATIONS
- - - CLOSED LANDFILLING AREA
- ROADWAY
- - - AREA OF WASTE AT CLOSURE
- SEASONAL STREAM
- ⊕ WELL LOCATION
- ⊕ SURFACE WATER LOCATION

TRUE NORTH

No.	DATE	BY	REVISIONS

Jp2g Consultants Inc.
ENGINEERS · PLANNERS · PROJECT MANAGERS

1150 MORRISON DRIVE, SUITE 410, OTTAWA, ON K2H 8S9
PHONE: 613-828-7800 FAX: 613-828-2600

DESIGNED	QS
DRAWN	QS
CHECKED	KM
APPROVED	KM
SCALE	1:2000

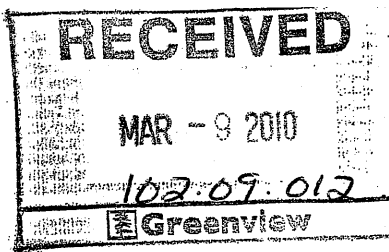
TOWNSHIP OF GREATER MADAWASKA
MATAWATCHAN WASTE DISPOSAL SITE

Groundwater Flow – October 2023

DATE	22-JAN-2024
PROJECT	22-6213C
PLOTTED	22-JAN-2024
REF	FIG 4



Appendix A
Environmental Compliance Approval
and Certificate of Requirement



Ministry of the Environment
Ministère de l'Environnement

AMENDMENT TO PROVISIONAL CERTIFICATE OF
APPROVAL
WASTE DISPOSAL SITE
NUMBER A412204
Notice No. 1
Issue Date: February 26, 2010

The Corporation of the Township of Greater Madawaska
1101 Francis St
Post Office Box, No. 180
Greater Madawaska, Ontario
K0J 1H0

Site Location: Matawatchan Waste Disposal Site
3508 Matawatchan Rd
Greater Madawaska Township, County of Renfrew

You are hereby notified that I have amended Provisional Certificate of Approval No. A412204 issued on April 2, 1980 for the use, operation and maintenance of a 2.3 hectare landfill site within a total site area of 4.9 hectare , as follows:

For the purpose of this Certificate of Approval and the terms and conditions specified below, the following definitions apply:

"Certificate " means this entire provisional Certificate of Approval document, issued in accordance with section 39 of the EPA, and includes any schedules to it, the application and the supporting documentation listed in Schedule "A";

"Director" means any Ministry employee appointed in writing by the Minister pursuant to section 5 of the EPA as a Director for the purposes of Part V of the EPA;

"District Manager" means the District Manager of the local district office of the Ministry in which the Site is geographically located;

"EPA " means Environmental Protection Act , R.S.O. 1990, c. E. 19, as amended;

"Ministry" means the Ontario Ministry of the Environment;

"Owner" means any person that is responsible for the establishment or operation of the Site being

approved by this *Certificate*, and includes The Corporation of the Township of Greater Madawaska successors and assigns;

"*Regional Director* " means the Regional Director of the local Regional Office of the *Ministry* in which the *Site* is located; and

"*Site* " means the entire waste disposal site, including the buffer lands, and contaminant attenuation zone at Matawatchan Waste Disposal Site, 3508 Matawatchan Rd, Greater Madawaska Township, County of Renfrew.

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

TERMS AND CONDITIONS

1. GENERAL

Compliance

- (1) The *Owner* and *Operator* shall ensure compliance with all the conditions of this *Certificate* and shall ensure that any person authorized to carry out work on or operate any aspect of the *Site* is notified of this *Certificate* and the conditions herein and shall take all reasonable measures to ensure any such person complies with the same.
- (2) Any person authorized to carry out work on or operate any aspect of the *Site* shall comply with the conditions of this *Certificate* .

In Accordance

- (3) Except as otherwise provided by this *Certificate*, the *Site* shall be designed, developed, built, operated and maintained in accordance with the documentation listed in the attached Schedule "A".

Interpretation

- (4) Where there is a conflict between a provision of any document listed in Schedule "A" in this *Certificate*, and the conditions of this *Certificate*, the conditions in this *Certificate* shall take precedence.
- (5) Where there is a conflict between the application and a provision in any document listed in Schedule "A", the application shall take precedence, unless it is clear that the purpose of the document was to amend the application and that the *Ministry* approved the amendment.
- (6) Where there is a conflict between any two documents listed in Schedule "A", the

document bearing the most recent date shall take precedence.

- (7) The conditions of this *Certificate* are severable. If any condition of this *Certificate*, or the application of any condition of this *Certificate* to any circumstance, is held invalid or unenforceable, the application of such condition to other circumstances and the remainder of this *Certificate* shall not be affected thereby.

Other Legal Obligations

- (8) The issuance of, and compliance with, this *Certificate* does not:
- (a) relieve any person of any obligation to comply with any provision of any applicable statute, regulation or other legal requirement; or
 - (b) limit in any way the authority of the *Ministry* to require certain steps be taken or to require the *Owner* and *Operator* to furnish any further information related to compliance with this *Certificate*.

Adverse Effect

- (9) The *Owner* shall take steps to minimize and ameliorate any adverse effect on the natural environment or impairment of water quality resulting from the *Site*, including such accelerated or additional monitoring as may be necessary to determine the nature and extent of the effect or impairment.
- (10) Despite an *Owner* or any other person fulfilling any obligations imposed by this *Certificate* the person remains responsible for any contravention of any other condition of this *Certificate* or any applicable statute, regulation, or other legal requirement resulting from any act or omission that caused the adverse effect to the natural environment or impairment of water quality.

Change of Ownership

- (11) The *Owner* shall notify the *Director*, in writing, and forward a copy of the notification to the *District Manager*, within 30 days of the occurrence of any changes in the following information:
- (a) the ownership of the *Site*;
 - (b) the *Operator* of the *Site*;
 - (c) the address of the *Owner* or *Operator*; and
 - (d) the partners, where the *Owner* or *Operator* is or at any time becomes a partnership and a copy of the most recent declaration filed under the *Business Names Act*, R. S. O. 1990, c. B.17, shall be included in the notification.
- (12) No portion of this *Site* shall be transferred or encumbered prior to or after closing of the *Site* unless the *Director* is notified in advance and sufficient financial assurance is deposited with the *Ministry* to ensure that these conditions will be carried out.

- (13) In the event of any change in *Ownership* of the works, other than change to a successor Owner, the *Owner* shall notify the successor of and provide the successor with a copy of this *Certificate*, and the *Owner* shall provide a copy of the notification to the *District Manager* and the *Director*.

Certificate of Requirement/Registration on Title -Site

- (14) The Owner shall:
- (a) Within two (2) years of the date of the issuance of this *Certificate*, submit to the *Director* for review, two copies of a completed Certificate of Requirement with a registerable description of the *Site*; and
 - (b) Within 10 calendar days of receiving the Certificate of Requirement authorized by the *Director*, register the Certificate of Requirement in the appropriate Land Registry Office on title to the *Site* and submit to the Director the duplicate registered copy immediately following registration.
- (15) Pursuant to Section 197 of the Environmental Protection Act, neither the *Owner* nor any person having an interest in the *Site* shall deal with the *Site* in any way without first giving a copy of this *Certificate* to each person acquiring an interest in the *Site* as a result of the dealing.

2. LANDFILL MONITORING

Compliance

- (1) The *Site* shall be operated in such a way as to ensure compliance with the following:
- (a) Reasonable Use Guideline B-7 for the protection of the groundwater at the *Site*; and
 - (b) Provincial Water Quality Objectives included in the July 1994 publication entitled *Water Management Policies, Guidelines, Provincial Water Quality Objectives*, as amended from time to time or limits set by the *Regional Director*, for the protection of the surface water at and off the *Site*.

Surface Water and Ground Water

- (2) The *Owner* shall monitor surface water and ground water as per documents in Schedule "A".

Annual Report

- (3) A written report on the development, operation and monitoring of the *Site*, shall be completed annually (the "Annual Report"). The Annual Report shall be submitted to the *District Manager*, by March 31st of the year following the period being reported upon.
- (4) The Annual Report shall include the following:
 - (a) the results and an interpretive analysis of the results of all leachate, groundwater surface water and landfill gas monitoring, including an assessment of the need to amend the monitoring programs;
 - (b) site plans showing the final contours of the *Site* and vegetative cover;
 - (c) a discussion of any operational problems encountered at the *Site* and corrective action taken;
 - (d) a report on the status of all monitoring wells and a statement as to compliance with *Ontario Regulation 903*;
 - (e) any other information with respect to the *Site* which the *Regional Director* may require from time to time; and
 - (f) a summary and analysis of all hydraulic and geochemical monitoring results.

Groundwater Wells and Monitors

- (5) The *Owner* shall ensure that all groundwater monitoring wells which form part of the monitoring program are properly capped, locked and protected from damage.
- (6) Where landfilling is to proceed around monitoring wells, suitable extensions shall be added to the wells and the wells shall be properly re-secured.
- (7) Any groundwater monitoring well included in the on-going monitoring program that are damaged shall be assessed, repaired, replaced or decommissioned by the *Owner*, as required.
 - (a) The *Owner* shall repair or replace any monitoring well which is destroyed or in any way made to be inoperable for sampling such that no more than one regular sampling event is missed.
 - (b) All monitoring wells which are no longer required as part of the groundwater monitoring program, and have been approved by the *District Manager* for abandonment, shall be decommissioned by the *Owner*, as required, in accordance with *O.Reg. 903*, that will prevent contamination through the abandoned well. A report on the decommissioning of the well shall be included in the Annual Report for the period during which the well was decommissioned.

Changes to the Monitoring Plan

- (8) The *Owner* may request to make changes to the monitoring program(s) to the *District Manager* in accordance with the recommendations of the annual report. The *Owner* shall make clear reference to the proposed changes in separate letter that shall accompany the

annual report.

- (9) Within fourteen (14) days of receiving the written correspondence from the *District Manager* confirming that the *District Manager* is in agreement with the proposed changes to the environmental monitoring program, the *Owner* shall forward a letter identifying the proposed changes and a copy of the correspondences from the *District Manager* and all other correspondences and responses related to the changes to the monitoring program, to the *Director* requesting the *Certificate* be amended to approve the proposed changes to the environmental monitoring plan prior to implementation.
- (10) In the event any other changes to the environmental monitoring program are proposed outside of the recommendation of the annual report, the *Owner* shall follow current ministry procedures for seeking approval for amending the *Certificate*.

3. CLOSURE PLAN

- (1) The Closure Plan titled "The Closure Plan, Matawatchan Waste Disposal Site (A412204), Township of Greater Madawaska, County of Renfrew, Ontario" dated September 19, 2008 and prepared by Greenview Environmental Management" is hereby approved.
- (2) The *Site* shall be closed in accordance with the Closure Plan as approved by the *Director*.
- (3) This landfill is now closed and no waste shall be accepted for disposal at the *Site*.

SCHEDULE "A"

1. Report titled "The Closure Plan, Matawatchan Waste Disposal Site (A412204), Township of Greater Madawaska, County of Renfrew, Ontario" dated September 19, 2008 and prepared by Greenview Environmental Management".
2. Application for a Provisional Certificate of Approval for a Waste Disposal Site dated September 17, 2008 and signed by Ms. Maureen Brennan, Acting CAO/Clerk.
3. Letter dated January 14, 2010 from Tyler Peters, P.Eng., Greenview Environmental Management Limited, to Ranjani Munasinghe, Ministry of the Environment.

The reasons for this amendment to the Certificate of Approval are as follows:

GENERAL

1. The reason for Conditions 1(1), (2), (4), (5), (6), (7), (8), (9) and (10) is to clarify the legal rights and responsibilities of the *Owner* under this Certificate of Approval.

2. The reasons for Condition 1(3) is to ensure that the *Site* is designed, operated, monitored and maintained in accordance with the application and supporting documentation submitted by the *Owner*, and not in a manner which the *Director* has not been asked to consider.
3. The reasons for Condition 1(11) are to ensure that the *Site* is operated under the corporate name which appears on the application form submitted for this approval and to ensure that the *Director* is informed of any changes.
4. The reasons for Condition 1(12) are to restrict potential transfer or encumbrance of the *Site* without the approval of the *Director* and to ensure that any transfer of encumbrance can be made only on the basis that it will not endanger compliance with this Certificate of Approval.
5. The reason for Condition 1(13) is to ensure that the successor is aware of its legal responsibilities.
6. Conditions 1 (14) and (15) are included, pursuant to subsection 197(1) of the *EPA* , to provide that any persons having an interest in the *Site* are aware that the land has been approved and used for the purposes of waste disposal.

LANDFILL MONITORING

7. Condition 2(1) is included to provide the groundwater and surface water limits to prevent water pollution at the *Site*.
8. Conditions 2(2) is included to require the *Owner* to demonstrate that the *Site* is performing as designed and the impacts on the natural environment are acceptable. Regular monitoring allows for the analysis of trends over time and ensures that there is an early warning of potential problems so that any necessary remedial/contingency action can be taken.
9. The reasons for Conditions 2(3) and 2(4) are to ensure that regular review of site development, operations and monitoring data is documented and any possible improvements to site design, operations or monitoring programs are identified. An annual report is an important tool used in reviewing site activities and for determining the effectiveness of site design.
10. Conditions 2(5), 2(6) and 2(7) are included to ensure the integrity of the groundwater monitoring network so that accurate monitoring results are achieved and the natural environment is protected.
11. Reasons for conditions 2(8), 2(9) and 2(10) are included to streamline the approval of the changes to the monitoring plan.

CLOSURE PLAN

12. The reasons for Condition 3 are to ensure that final closure of the *Site* is completed in an aesthetically pleasing manner, in accordance with Ministry standards, and to ensure the long-term

protection of the health and safety of the public and the environment.

This Notice shall constitute part of the approval issued under Provisional Certificate of Approval No. A412204 dated April 2, 1980 as amended

In accordance with Section 139 of the Environmental Protection Act, R.S.O. 1990, Chapter E-19, as amended, 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 142 of the Environmental Protection Act, provides that the Notice requiring the hearing shall state:

1. The portions of the approval or each term or condition in the approval 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.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;
7. The name of the Director;
8. The municipality within which the waste disposal site is located;

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, 15th Floor
Toronto, Ontario
MSG 1E5

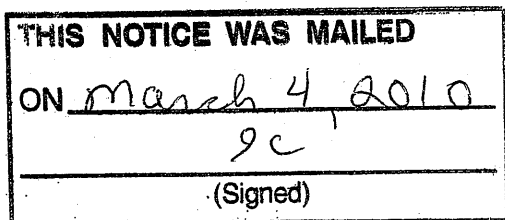
AND

The Director
Section 39, *Environmental Protection Act*
Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

* Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 314-4600, Fax: (416) 314-4506 or www.ert.gov.on.ca

The above noted waste disposal site is approved under Section 39 of the Environmental Protection Act.

DATED AT TORONTO this 26th day of February, 2010



Tesfaye Gebrezghi, P.Eng.
Director
Section 39, *Environmental Protection Act*

RM/

c: District Manager, MOE Ottawa
Tyler Peters, P. Eng., Greenview Environmental Management Limited ✓



Ministry of the Environment

Provisional Certificate No. A 412204

PROVISIONAL CERTIFICATE OF APPROVAL WASTE DISPOSAL SITE

Under The Environmental Protection Act, 1971 and the regulations and subject to the limitations thereof, this Provisional Certificate of Approval is issued to:

Townships of Griffith and Matawachan R.R. # 3 Dacre, Ontario KOJ 1N0

MINISTRY OF THE ENVIRONMENT

APR 16 1980

for the use and operation of a 2.3 hectare landfilling site

PENBROKE

all in accordance with the following plans and specifications:

Located: Lot 13, Concession 5 Township of Matawachan County of Renfrew

which includes the use of the site only for the disposal of the following categories of waste (NOTE: Use of the site for additional categories of wastes requires a new application and amendments to the Provisional Certificate of Approval) domestic waste.

and subject to the following conditions:

- 1. No operation shall be carried out at the site after sixty days from this condition becoming enforceable unless this Certificate including the reasons for this condition has been registered by the applicant as an instrument in the appropriate Land Registry Office against title to the site and a duplicate registered copy thereof has been returned by the applicant to the Director.

THIS IS A TRUE COPY OF THE ORIGINAL CERTIFICATE MAILED ON Apr 19/80 (Signed)

Dated this 2nd day of April 1980

Director, Section 39, The Environmental Protection Act, 1971



Ministry of the
Environment

Ontario

NOTICE

TO: Townships of Griffith and Matawatchan
R.R. # 3
Dacre, Ontario
K0J 1N0

You are hereby notified that Provisional Certificate of Approval No. A 412204 has been issued to you subject to the conditions outlined therein.

The reasons for the imposition of these conditions are as follows:

The reason for the condition requiring registration of the Certificate is that Section 46 of The Environmental Protection Act, 1971 prohibits any use being made of the lands after they cease to be used for waste disposal purposes in order to protect future occupants of the site and the environment from any hazards which might occur as a result of waste being disposed of on the site. This prohibition and potential hazard should be drawn to the attention of future owners and occupants by the Certificate being registered on title.

You may by written notice served upon me and the Environmental Appeal Board within 15 days after receipt of this Notice, require a hearing by the Board.


This Notice should be served upon:

The Secretary,
Environmental Appeal Board, AND
1 St. Clair Ave. West,
5th Floor,
Toronto, Ontario.
M4V 1K7

The Director,
Section 39
Ministry of the Environment,

DATED

this 2nd day of April, 19 80 .


Director,



Ontario

Ministry
of the
Environment

133 Dalton St., Box 820
Kingston, Ontario
K7L 4X6

April 2, 1980

Townships of Griffith and Matawatchan
R.R. # 3
Dacre, Ontario
K0J 1N0

RE: Landfilling Site
Lot 13, Concession 5
Township of Matawatchan
County of Renfrew

The enclosed revised Provisional Certificate of Approval contains a condition requiring it be registered on title. The reason for this condition is attached to the Certificate.

Two copies of the Certificate and reasons are on long paper to facilitate registration. Both of these should be taken to the Land Registry Office and one returned to the Director with registration particulars.

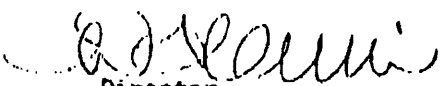
If your Certificate does not contain sufficient legal description for registration because you have not given one to the Director, you will have to provide one under Section 23(1) (e) of The Registry Act or in your application under The Land Titles Act.

In the event that the site including its buffer, is part of a larger parcel of land and you do not wish to prepare a new survey at this time, you may register the Certificate against the larger parcel of land. If you do so, the Director is prepared, if requested in the future.

1. In the case of land recorded under The Land Titles Act, to consent to an application to delete the registration from the title of lands not within the site including its buffer zone, and
2. In the case of land recorded under The Registry Act, to issue a Certificate that lands not used for the actual disposal of waste or buffer zone have not been so used.

Such documents would be issued after suitable draft documents including legal description were submitted by you or your successor. The purpose of such documents would be to assure subsequent purchasers that the lands in question were not affected by section 46 of the Environmental Protection Act.

Yours very truly


Director

The applicant(s) hereby applies to the Land Registrar.

Properties

PIN 57488 - 0008 LT

Description PT LT 13, CON 5, MATAWATCHAN, PT 1, 49R2184 ; T/W R301495 ; GRIFFITH & MATAWATCHAN

Address 3508 MATAWATCHAN ROAD
GRIFFITH

PIN 57488 - 0314 LT

Description PT LT 13 CON 5 MATAWATCHAN PT 1, 49R13546; T/W PT 2, 49R2184 ; TWP OF GREATER MADAWASKA

Address 3508 MATAWATCHAN ROAD
GRIFFITH**Party From(s)**

Name THE CORPORATION OF THE TOWNSHIP OF GREATER MADAWASKA

Address for Service P.O. Box 180
1101 Francis Street
Calabogie, Ontario, K0J 1H0

This document is not authorized under Power of Attorney by this party.

This document is being authorized by a municipal corporation Peter Emond, Mayor.

Party To(s)

Capacity

Share

Name THE MINISTRY OF THE ENVIRONMENT

Address for Service Director, Environmental Protection Act
2 St. Clair Avenue West, 12A
Toronto, Ontario, M4V 1L5**Statements**

Schedule: See Schedules

Signed ByStephen Arthur Ritchie 92 Centrepointe Drive acting for Signed 2013 03 05
Nepean
K1V 9K4 Party From(s)

Tel 6132246674

Fax 6137299105

I have the authority to sign and register the document on behalf of the Party From(s).

Submitted BySTEPHEN A. RITCHIE 92 Centrepointe Drive 2013 03 05
Nepean
K1V 9K4

Tel 6132246674

Fax 6137299105

Fees/Taxes/Payment

Statutory Registration Fee \$60.00

Total Paid \$60.00

The applicant(s) hereby applies to the Land Registrar.

File Number

Party From Client File Number : 3291

SCHEDULE "A"

CERTIFICATE OF REQUIREMENT

s. 197(2) of the *Environmental Protection Act*

This is to certify that pursuant to an AMENDMENT TO PROVISIONAL CERTIFICATE OF APPROVAL for WASTE DISPOSAL SITE NUMBER A412204, issued by TESHAYE GEBREZGHI, DIRECTOR, dated February 26, 2010 with respect to a Waste Disposal Site on:

FIRSTLY:

Pin No. 57488-0008 (LT)
Pt Lt 13, Con 5, Matawatchan, Pt 1, 49R2184; T/W R301495; Griffith & Matawatchan

SECONDLY:

Pin No. 57488-0314 (LT)
Pt Lt 13 Con 5 Matawatchan Pt1, 49R13546; T/W Pt 2, 49R2184 Twp of Greater Madawaska

The following person(s):

The Corporation of the Township of Greater Madawaska

and any other persons having an interest in:

FIRSTLY:

Pin No. 57488-0008 (LT)
PT Lt 13, Con 5, Matawatchan, Pt 1, 49R2184; T/W R301495; Griffith & Matawatchan

SECONDLY:

Pin No. 57488-0314 (LT)
Pt Lt 13 Con 5 Matawatchan Pt1, 49R13546; T/W Pt 2, 49R2184; Twp of Greater Madawaska

are required, before dealing with the land in any way, to give a copy of the Amendment to Provisional Certificate of Waste Disposal Site, No. A412204, including any amendments that may be made thereto to every person who will acquire an interest in the land as a result of the dealing. Under subsection 197(3) of the *Environmental Protection Act*, this requirement applies to each person who, subsequent to the registration of this certificate, acquires an interest in the land.



Appendix B

Photographs



91-2 A + B + C



91-4A



95-1



95-2 A + B



95-3B



95-4

DATE	March 2024
PROJECT	22-6213C
FIGURE	1



SW-1



SW-3



Appendix C

Sampling Protocol

STANDARD SAMPLING PROTOCOL

The following is a description of the monitoring procedures and protocols used for groundwater and surface water monitoring for landfill sites.

Equipment Cleaning and Calibration

Regardless of matrix, prior to traveling to the site to be sampled, all equipment such as water level indicators and multi-parameter meters must be cleaned and calibrated as specified by the equipment manufacturer. Details of the cleaning and calibration should be recorded in the field notes.

GROUNDWATER

Monitoring Well Assessment

Provide an assessment of the status of all monitoring wells at the site.

Note any changes to the well and/or protective casing and record the physical condition of the well; and

Label all observation wells clearly and accurately on both the protective casing and well pipe.

Groundwater Monitoring

Maintain and use an accurate, up-to-date list of all observation wells to be monitored.

Check all field equipment for cleanliness; and

Wear personnel protective equipment as required (i.e., gloves, protective glasses, splash guards) during all phases of work, and follow any appropriate health and safety plan procedures.

Gas Detection in Wells (Prior to Measuring Water Levels)

Turn on gas meter and prepare for sampling atmospheric condition inside monitoring well.

Remove protective casing cover and well cap avoiding introduction of foreign materials into the well.

Immediately insert the probe attached to the gas meter into the well and wait for readings to stabilize.

Record the measurement in the appropriate column on the field data sheet or field book.

Water Level Measurements (Prior to Purging)

Record water level measurements prior to purging or sampling when required.

Do not move dedicated sampling devices such as the "Waterra" inertial pump prior to measuring the water level unless the well diameter dictates removal; reference the measurement from the same location each time (marked location or lowest point on pipe).

Lower the tape/probe into the wells - record the depth to water when the indicator (audible/visual) shows the water level has been reached.

Measure the water level twice by raising and lowering the tape/probe; and

Record the measurement to the nearest cm (0.5 cm) in the appropriate column on the field data sheet or field book.

Well Purging (Prior to Sampling)

The purpose of purging is to remove the stagnant water from within a monitor (removal of all stagnant water) so that a representative water sample may be collected. The procedures for purging are as follows.

Purge the well only after water levels have been confirmed.

Lift the tubing off the bottom of the well and "pump" at a minimum all stagnant water from the well into a graduated container such as a bucket, pail or cylinder so that the purged volume can be measured and recorded.

For low-yield wells, it is expected that either "no purge sampling techniques or low flow purging will be utilized (avoid purging well dry).

Under normal circumstances purged water may be discarded on the ground, away from the well to avoid the potential of water seeping back into the well; and

Allow a sufficient recovery period before sampling (not more than 48 hours).

Field Measurements

Field measurements are to be collected and recorded as outlined in the Environmental Compliance Approval or the approved monitoring program. Typically, these include at a minimum: temperature, pH and conductivity.

Well Sampling

Collect the water sample as soon as practical (not more than 48 hours) after purging starting at the least contaminated location and proceeding to the most contaminated.

Lift tubing and check valve off bottom of well to avoid introducing unnecessary sediment into the sample and transfer some representative sample water into a clean, well rinsed container to conduct measurements of field parameters.

Lift the tubing and gently transfer a sample into a clean container and thoroughly mix to form a single representative sample.

Transfer the sample into a pre-labelled sample bottle; labelling to consist of at a minimum, the project number, well ID and the date.

For samples that require filtering, attach the disposable filter onto the end of the tubing (typically a 0.45-micron membrane filter or as otherwise specified should be used).

Attempt to keep sample agitation to a minimum during sample transfer.

Store samples in a cooler, with ice packs to keep cool.

Transport samples to laboratory within the maximum hold time established by the laboratory (typically within a 48-hour period).

Volatile Organic Compound (VOC) Sampling

Volatile Organic Compounds (VOC) can be easily lost during sample collection, storage, and transportation. The following sampling and handling protocols are adhered to.

VOC samples are to be collected in special containers provided by the laboratory. These typically include glass vials, preferably amber, with a minimum capacity of 20 ml and sealed with Septum tops.

Vials must be filled just to overflowing in such a manner that no air bubbles pass through the vial as it is being filled (this is easier to accomplish by inserting a 4' length of ¼ " poly tubing into the existing Wattera tubing and filling the vial from the ¼" tubing).

Vials must then be sealed with the cap so that no air bubbles are entrapped within it; the septum is placed with the Teflon side face down toward the inside of the bottle.

Check for the presence of air bubbles by inverting the vial and tapping on hard surface; if air bubbles are present, discard the sample and re-sample.

All VOC samples must be preserved as specified by the laboratory (typically with 1 to 2 drops of Hydrochloric Acid (HCl)) and refrigerated or stored on ice until analysed; and

VOC samples should be submitted in duplicate at a ratio specified in the approved monitoring program (typically 1:10)

Surface Water Sampling (General)

Surface water samples should be collected at the same designated location during each sample event (do not collect samples from any station which is frozen, stagnant or otherwise not representative of normal conditions).

If you must stand in the stream, position yourself downstream of the sample location to avoid contaminating the sample with sediment, debris, and other floating materials.

All equipment must be thoroughly rinsed with distilled water at the beginning of each station to avoid cross-contamination.

Wear gloves as required to handle the sample bottles.

Fill all bottles using an unpreserved transfer bottle (to avoid overflowing pre-preserved bottles).

When sampling for dissolved metals, the sample must be filtered and placed in a separate metals bottle, while sampling for total metals, the sample is placed in a common bottle for metals that is provided by the laboratory.

Label and store all samples in the same manner as for groundwater samples; and

Conduct field measurements (these typically include temperature, pH, conductivity, Dissolved Oxygen and Flow).

Flow Measurements (General)

Discharge flow measurements must be taken at designated stations.

QA/QC Water Samples

A field quality assurance and quality control program for all monitoring events will be established as follows and or as dictated in the approved monitoring program.

Where groundwater or surface water samples are collected, and if stipulated in the approved monitoring program, a field blank in which a set of sample bottles is filled with distilled water at a known site or monitoring station is submitted to the laboratory for analysis along with the samples

Where VOC samples are taken, a trip blank, in which 1 set of VOC vials are filled with distilled water (at the laboratory or office) prior to going to the field and accompanies the sample bottles until they are returned to the lab; and

Duplicate of as outlined in the approved monitoring program or 1 duplicate for every 10 samples (do not identify the sample ID number to the laboratory, but have it recorded in the field notes) use the sampling technique as for observation wells.

SAMPLING

Station Sampling Order

The stations will be sampled beginning with those wells exhibiting the lowest chemical concentrations and then moving on to wells with greater chemical concentrations.

Monitoring Periods

The monitoring periods are as recommended in either the approved monitoring program or the Environmental Compliance Approval.

Analytical Parameters

Analysis will be as recommended in either the approved monitoring program and or the Environmental Compliance Approval.

Gas Detection of On-site Buildings

Gas detection in on-site buildings is to be included as part of regular monitoring.



Appendix D

Historic Static Levels, Ground and Surface Water Analysis

Table 3
Groundwater Elevations
Matawatchesan Waste Disposal Site

Monitor	Ground Elevation (m) ¹	Top of Pipe Elevation (m) ²	Original Stick-Up (m) ³	Measured Stick-Up (m) ⁴	Depth of Well (m) ⁷	Well Diameter (mm)	Groundwater Elevation (m)													
							26-May-16	26-Oct-16	04-May-17	25-Oct-17	08-May-18	30-Oct-18	14-May-19	17-Oct-19	23-Apr-20	27-Oct-20	18-May-21	16-Nov-21	31-May-22	01-Nov-22
91-2A ⁵	96.66	97.59	0.94	0.94	35.30	38.1	88.06	86.70	88.45	87.15	88.05	86.91	88.49	86.75	88.25	87.07	87.88	86.96	88.04	87.30
91-2B ⁵	96.66	97.62	0.96	0.95	24.45	38.1	87.97	86.73	88.79	87.10	88.35	86.92	88.97	86.76	88.72	87.12	87.94	86.80	88.08	87.12
91-2C ⁵	96.66	97.63	0.96	0.95	16.49	38.1	86.27	84.92	88.20	85.07	87.97	85.00	88.61	84.98	88.47	85.17	86.57	85.03	86.78	85.44
91-4A	77.76	78.48	0.72	0.74	9.38	38.1	flowing	77.62	flowing	77.81	flowing	77.61	flowing	77.63	flowing	77.55	flowing	77.89	flowing	78.19
95-1	99.67	100.72	0.99	0.97	4.64	38.1	98.58	98.29	99.78	97.99	99.83	97.76	99.65	98.30	99.06	98.45	98.66	98.28	98.45	98.02
95-2A	71.99	72.99	1.00	1.01	4.83	38.1	67.79	Dry	67.95	67.58	67.96	67.31	68.02	Dry	67.92	67.65	67.81	67.63	67.82	67.72
95-2B	71.97	73.07	1.10	0.88	7.50	38.1	67.17	66.97	67.24	67.08	67.24	66.99	67.27	66.98	67.24	67.15	67.19	67.10	67.17	67.13
95-3B ⁸	74.07	75.05	1.15	0.98	5.96	38.1	72.21	71.61	74.11	71.71	74.21	71.47	74.01	71.44	74.25	-	-	Dry	Dry	Dry
95-4	104.38	105.41	1.03	1.02	4.51	38.1	102.09	101.53	102.73	100.47	102.70	100.40	102.56	100.21	102.47	101.96	102.17	101.66	102.14	101.45

Notes:

1. Ground elevations from SGS Lakefield Research (2004).
2. Top of pipe elevation from SGS Lakefield Research (2004).
3. Original stick-up based on survey information from SGS Lakefield Research (2004).
4. Stick-up measured by Greenview on April 24, 2007.
5. Decommissioned on November 8, 2010.
6. Top of pipe, ground elevation, stick up based on survey completed by Greenview in September 2011.
7. Depth of well below ground surface (m).
8. Monitoring well 95-3B repaired by Greenview in 2021. Ground elevation, top of pipe, and measured stick-up updated based on a survey completed on November 16, 2021.

All elevations are relative to a site specific benchmark elevation of 100.00 m.

Groundwater elevations from April 2007 to present are calculated using top of pipe elevations.

* Well casing upgrade in 2002 increased top of pipe elevation.

“-” indicates data is not available.

Table 4
Groundwater Quality
Matawatchan Waste Disposal Site

Parameter	Background (median)	RUC ¹	ODWS ²	91-2C														5-year Trends (sparkline)
				26-May-16	26-Oct-16	04-May-17	25-Oct-17	08-May-18	30-Oct-18	14-May-19	17-Oct-19	23-Apr-20	27-Oct-20	18-May-21	16-Nov-21	31-May-22	01-Nov-22	
Alkalinity (as CaCO ₃)	78	289	30 - 500	467	461	468	450	407	390	401	413	395	377	416	414	401	411	
Ammonia, Total (as N)	0.03	N/L	N/L	0.08	0.06	0.05	0.07	0.14	0.12	0.08	0.10	0.05	0.06	0.05	0.05	0.04	0.04	
Boron	0.007	1.3	5	0.256	0.263	0.247	0.261	0.250	0.242	0.238	0.247	0.255	0.234	0.232	0.241	0.257	0.201	
Calcium	35	N/L	N/L	154	156	153	159	150	156	127	151	138	137	123	139	136	131	
Chemical Oxygen Demand	12	N/L	N/L	22	10	15	27	23	14	27	19	31	18	15	23	9	15	
Chloride	0.7	125	250	13.9	12.5	10.5	9.6	11.9	10.5	9.8	8.8	9.4	8.0	7.4	7.3	6.3	5.8	
Conductivity (µS/cm) ³	235	N/L	N/L	959	962	936	933	881	853	867	892	852	830	820	861	848	834	
Conductivity (µS/cm) ⁴	159	N/L	N/L	703	672	663	676	622	564	547	941	506	581	631	604	613	615	
Copper	0.002	0.5	1	0.003	< 0.002	< 0.002	< 0.002	0.005	0.002	< 0.002	< 0.002	0.002	< 0.002	0.0038	0.0034	0.0043	0.0020	
Iron	0.4	0.4	0.3	0.064	0.250	0.098	0.077	0.037	0.021	0.072	0.100	0.005	0.054	0.017	0.090	0.007	0.072	
Magnesium	3.9	N/L	N/L	26.2	29.6	26.4	27.8	26.4	25.5	23.6	26.6	25.0	25.4	23.1	24.6	24.7	22.0	
Manganese	0.078	0.078	0.05	1.57	0.700	0.932	0.725	0.662	0.710	0.490	0.653	0.596	0.624	0.722	0.536	0.424	0.495	
Nitrate (as N)	0.07	2.5	10	< 0.1	< 0.1	< 0.05	< 0.05	< 0.05	< 0.05	0.21	< 0.05	0.10	0.05	0.12	< 0.05	< 0.05	< 0.05	
Nitrite (as N)	0.05	0.29	1	< 0.1	< 0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.08	< 0.05	< 0.05	< 0.05	
pH (units) ⁴	7.00	6.5 - 8.5	6.5 - 8.5	7.31	7.08	7.20	7.75	7.96	6.65	7.16	7.39	7.01	7.18	7.51	7.50	7.07	7.17	
Phenols	0.002	N/L	N/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.001	< 0.001	
Potassium	2.3	N/L	N/L	12.6	13.5	12.3	14.1	14.6	14.3	12.2	13.5	13.3	13.1	12.0	13.1	13.1	11.2	
Sodium	1.4	101	200	19.4	16.6	17.8	15.6	16.9	15.5	18.4	15.5	17.6	13.9	16.7	15.8	17.6	16.0	
Strontium	0.058	N/L	N/L	0.942	1.00	0.888	0.965	0.908	0.888	0.840	0.931	0.876	0.841	0.808	0.868	0.855	0.750	
Sulphate	33	267	500	53	50	40	38	49	46	42	39	42	43	43	45	45	52	
Total Dissolved Solids	120	310	500	539	532	515	513	466	450	458	457	453	433	433	430	456	434	
Total Kjeldahl Nitrogen	0.4	N/L	N/L	0.5	0.5	0.5	0.4	0.4	0.3	0.4	0.4	0.5	0.4	0.4	0.3	0.4	0.4	
Cation Sum (meq/L)	-	N/L	N/L	11.1	11.3	11.0	11.3	10.8	11.0	9.42	10.8	10.1	9.90	9.10	10.0	9.94	9.36	
Anion Sum (meq/L)	-	N/L	N/L	10.80	10.60	10.50	10.00	9.49	9.05	9.18	9.30	9.04	8.64	9.43	9.41	9.12	9.46	
Anion-Cation Balance (% difference)	-	N/L	N/L	1.20	3.20	2.22	5.87	6.47	9.56	1.31	7.36	5.44	6.77	1.79	3.11	4.32	0.562	

Notes:
1. Reasonable Use Concept (RUC) criteria.
2. Ontario Drinking Water Standards (ODWS).
3. Results obtained from laboratory analysis.
4. Results obtained from field analysis.
All results are expressed in mg/L unless otherwise stated.
Bold and shaded values exceed the ODWS.
Bold and Italic values exceed RUC limits.
N/L indicates No Limit.
** indicates parameter not analyzed.

Table 4
Groundwater Quality
Matawatchan Waste Disposal Site

Parameter	Background (median)	RUC ¹	ODWS ²	91-4A														5-year Trends (sparkline)
				26-May-16	26-Oct-16	04-May-17	25-Oct-17	08-May-18	30-Oct-18	14-May-19	17-Oct-19	23-Apr-20	27-Oct-20	18-May-21	16-Nov-21	31-May-22	01-Nov-22	
Alkalinity (as CaCO ₃)	78	289	30 - 500	323	534	348	473	294	454	331	443	322	399	280	497	293	421	
Ammonia, Total (as N)	0.03	N/L	N/L	0.02	< 0.01	< 0.01	0.01	0.03	0.06	0.02	0.04	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Boron	0.007	1.3	5	0.243	0.400	0.233	0.374	0.204	0.378	0.228	0.363	0.219	0.359	0.184	0.370	0.204	0.271	
Calcium	35	N/L	N/L	107	178	115	165	104	183	108	158	113	149	82.7	163	101	132	
Chemical Oxygen Demand	12	N/L	N/L	14	9	6	22	14	12	15	23	8	8	7	18	< 5	14	
Chloride	0.7	125	250	3.8	8.9	2.4	5.2	1.9	5.6	2.6	5.6	2.7	4.7	2.5	4.3	2.3	1.7	
Conductivity (µS/cm) ³	235	N/L	N/L	699	1120	718	1030	612	998	723	954	695	899	566	1009	634	849	
Conductivity (µS/cm) ⁴	159	N/L	N/L	512	756	473	635	398	594	441	997	390	761	359	624	352	616	
Copper	0.002	0.5	1	0.0040	0.0030	0.0020	< 0.002	0.0040	0.0020	< 0.002	< 0.002	0.0020	0.0030	0.0023	0.0046	0.0027	0.0032	
Iron	0.4	0.4	0.3	< 0.005	0.010	0.009	0.020	0.011	0.018	0.006	0.012	< 0.005	0.014	0.121	0.021	0.010	0.025	
Magnesium	3.9	N/L	N/L	19.4	35.0	20.6	30.0	18.2	30.9	20.3	29.5	20.9	29.0	16.1	29.9	19.1	24.0	
Manganese	0.078	0.078	0.05	0.009	0.040	0.023	0.056	0.021	0.078	0.013	0.033	0.011	0.027	0.053	0.044	0.019	0.031	
Nitrate (as N)	0.07	2.5	10	0.6	0.6	1.05	0.94	0.68	0.52	1.20	0.31	0.89	0.34	0.41	0.65	0.33	< 0.05	
Nitrite (as N)	0.05	0.29	1	< 0.1	< 0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.07	< 0.05	< 0.05	< 0.05	
pH (units) ⁴	7.00	6.5 - 8.5	6.5 - 8.5	6.02	6.83	6.62	6.74	7.10	6.78	7.20	7.35	6.99	6.68	7.04	7.37	7.07	6.61	
Phenols	0.002	N/L	N/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.002	< 0.002	< 0.002	0.012	< 0.002	< 0.002	< 0.002	< 0.001	< 0.001	
Potassium	2.3	N/L	N/L	6.1	9.4	6.2	9.2	7.0	10.1	6.6	9.2	7.0	9.0	6.0	9.4	6.8	7.3	
Sodium	1.4	101	200	14.9	26.5	14.6	22.4	14.3	25.5	12.8	22.1	12.2	21.2	11.0	23.1	11.4	15.9	
Strontium	0.058	N/L	N/L	0.393	0.604	0.405	0.557	0.357	0.553	0.387	0.535	0.388	0.488	0.359	0.564	0.377	0.423	
Sulphate	33	267	500	51	101	39	69	30	77	43	60	38	59	31	69	34	66	
Total Dissolved Solids	120	310	500	389	634	395	566	318	532	377	504	369	464	291	521	329	447	
Total Kjeldahl Nitrogen	0.4	N/L	N/L	0.2	0.5	0.3	0.4	0.2	0.1	0.2	0.3	0.2	0.2	0.2	0.3	0.2	0.2	
Cation Sum (meq/L)	-	N/L	N/L	7.74	13.1	8.24	11.9	7.49	13.0	7.79	11.5	8.07	11.0	6.09	11.8	7.28	9.44	
Anion Sum (meq/L)	-	N/L	N/L	7.67	13.1	7.83	11.1	6.59	10.9	7.67	10.3	7.37	9.36	6.35	11.5	6.65	9.83	
Anion-Cation Balance (% difference)	-	N/L	N/L	0.479	0.289	2.53	3.53	6.37	9.15	0.736	5.60	4.55	7.95	2.05	1.31	4.54	2.01	


























Notes:
1. Reasonable Use Concept (RUC) criteria.
2. Ontario Drinking Water Standards (ODWS).
3. Results obtained from laboratory analysis.
4. Results obtained from field analysis.
All results are expressed in mg/L unless otherwise stated.
Bold and shaded values exceed the ODWS.
Bold and Italic values exceed RUC limits.
N/L indicates No Limit.
** indicates parameter not analyzed.

Table 4
Groundwater Quality
Matawatchesan Waste Disposal Site

Parameter	Background (median)	RUC ¹	ODWS ²	95-1 (Background)														5-year Trends (sparkline)
				26-May-16	26-Oct-16	04-May-17	25-Oct-17	08-May-18	30-Oct-18	14-May-19	17-Oct-19	23-Apr-20	27-Oct-20	18-May-21	16-Nov-21	31-May-22	01-Nov-22	
Alkalinity (as CaCO ₃)	78	289	30 - 500	80	79	58	77	53	63	57	67	49	68	84	83	67	85	
Ammonia, Total (as N)	0.03	N/L	N/L	0.03	< 0.01	< 0.01	0.01	0.02	0.10	0.02	0.04	0.02	0.01	< 0.01	0.02	< 0.01	< 0.01	
Boron	0.007	1.3	5	0.007	< 0.005	< 0.005	0.008	< 0.005	< 0.005	< 0.005	0.005	< 0.005	0.007	0.005	0.010	< 0.005	< 0.005	
Calcium	35	N/L	N/L	40.8	34.1	26.9	33.6	27.0	34.3	23.8	28.3	29.5	36.5	35.0	37.7	36.6	41.8	
Chemical Oxygen Demand	12	N/L	N/L	13	< 5	< 5	9	12	< 5	7	15	8	7	< 5	12	< 5	< 5	
Chloride	0.7	125	250	< 0.5	< 0.5	< 0.5	0.8	< 0.5	1.1	0.7	1.2	0.9	0.8	0.7	0.6	0.9	< 0.5	
Conductivity (µS/cm) ³	235	N/L	N/L	260	252	204	249	190	212	208	209	197	236	251	255	248	288	
Conductivity (µS/cm) ⁴	159	N/L	N/L	157	179	140	175	118	170	119	94	111	220	159	303	151	108	
Copper	0.002	0.5	1	< 0.002	< 0.002	< 0.002	0.002	< 0.002	< 0.002	< 0.002	< 0.002	0.002	< 0.002	0.0011	0.0042	0.0010	0.0017	
Iron	0.4	0.4	0.3	2.04	0.758	1.32	1.20	< 0.005	0.750	0.860	0.923	0.959	1.10	0.553	1.72	2.14	0.509	
Magnesium	3.9	N/L	N/L	5.28	5.49	3.94	4.96	4.01	4.69	3.77	4.07	4.46	5.45	5.39	5.60	5.64	5.73	
Manganese	0.078	0.078	0.05	0.183	0.105	0.103	0.073	0.113	0.069	0.078	0.063	0.121	0.147	0.085	0.136	0.198	0.101	
Nitrate (as N)	0.07	2.5	10	< 0.1	0.1	< 0.05	< 0.05	< 0.05	0.09	0.18	< 0.05	0.07	< 0.05	0.10	< 0.05	< 0.05	< 0.05	
Nitrite (as N)	0.05	0.29	1	< 0.1	0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.08	< 0.05	< 0.05	< 0.05	
pH (units) ⁴	7.00	6.5 - 8.5	6.5 - 8.5	7.28	6.71	6.33	6.22	7.41	6.84	6.87	7.04	6.55	6.41	7.44	7.73	7.01	6.29	
Phenols	0.002	N/L	N/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.002	< 0.002	0.003	< 0.002	< 0.002	< 0.002	< 0.002	< 0.001	< 0.001	
Potassium	2.3	N/L	N/L	3.1	3.2	2.2	3.3	2.8	3.2	2.1	2.8	2.8	3.4	3.2	3.8	3.6	3.2	
Sodium	1.4	101	200	1.4	1.7	1.2	1.4	1.4	1.5	1.4	1.5	1.5	1.4	1.2	1.7	1.4	1.3	
Strontium	0.058	N/L	N/L	0.075	0.053	0.040	0.048	0.038	0.051	0.038	0.044	0.047	0.056	0.055	0.060	0.055	0.060	
Sulphate	33	267	500	40	45	33	35	36	35	38	35	33	36	40	38	44	55	
Total Dissolved Solids	120	310	500	138	138	112	137	97	108	106	110	93	113	124	115	120	131	
Total Kjeldahl Nitrogen	0.4	N/L	N/L	0.1	0.2	1.3	0.1	0.1	0.3	< 0.1	0.1	0.2	0.1	0.1	0.1	0.1	< 0.1	
Cation Sum (meq/L)	-	N/L	N/L	2.72	2.36	1.85	2.30	1.82	2.29	1.66	1.94	2.03	2.48	2.36	2.61	2.57	2.73	
Anion Sum (meq/L)	-	N/L	N/L	2.45	2.54	1.86	2.29	1.81	2.04	1.96	2.10	1.71	2.12	2.55	2.45	2.28	2.84	
Anion-Cation Balance (% difference)	-	N/L	N/L	5.36	3.77	0.312	0.201	0.0285	5.84	8.26	3.92	8.55	8.03	3.97	3.12	6.00	2.08	

Notes:
1. Reasonable Use Concept (RUC) criteria.
2. Ontario Drinking Water Standards (ODWS).
3. Results obtained from laboratory analysis.
4. Results obtained from field analysis.
All results are expressed in mg/L unless otherwise stated.
Bold and shaded values exceed the ODWS.
Bold and Italic values exceed RUC limits.
N/L indicates No Limit.
** indicates parameter not analyzed.

Table 4
Groundwater Quality
Matawatchan Waste Disposal Site

Parameter	Background (median)	RUC ¹	ODWS ²	95-2A							5-year Trends (sparkline)
				26-May-16	04-May-17	08-May-18	14-May-19	23-Apr-20	18-May-21	31-May-22	
Alkalinity (as CaCO ₃)	78	289	30 - 500	253	161	104	139	135	223	224	
Ammonia, Total (as N)	0.03	N/L	N/L	0.04	< 0.01	0.03	0.03	0.02	0.02	< 0.01	
Boron	0.007	1.3	5	0.182	0.137	0.129	0.128	0.134	0.218	0.257	
Calcium	35	N/L	N/L	89.3	53.1	35.8	47.6	50.5	65.5	78.4	
Chemical Oxygen Demand	12	N/L	N/L	100	68	33	58	96	56	16	
Chloride	0.7	125	250	3.4	1.1	0.9	1.7	1.7	1.7	1.6	
Conductivity (µS/cm) ³	235	N/L	N/L	601	374	247	346	340	469	509	
Conductivity (µS/cm) ⁴	159	N/L	N/L	443	669	168	207	174	315	305	
Copper	0.002	0.5	1	0.0040	0.0030	0.0030	< 0.002	0.0030	0.0039	0.0051	
Iron	0.4	0.4	0.3	0.006	< 0.005	0.221	1.48	0.007	0.009	0.006	
Magnesium	3.9	N/L	N/L	12.2	7.34	5.02	7.34	7.42	10.3	11.6	
Manganese	0.078	0.078	0.05	< 0.001	0.005	0.012	0.064	0.001	0.003	< 0.001	
Nitrate (as N)	0.07	2.5	10	0.3	0.54	0.20	0.61	0.55	0.26	0.13	
Nitrite (as N)	0.05	0.29	1	< 0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
pH (units) ⁴	7.00	6.5 - 8.5	6.5 - 8.5	7.62	6.70	8.05	7.58	7.58	7.29	7.35	
Phenols	0.002	N/L	N/L	< 0.001	< 0.001	< 0.001	< 0.002	0.002	< 0.002	< 0.001	
Potassium	2.3	N/L	N/L	3.4	2.4	2.2	2.6	2.4	3.0	3.8	
Sodium	1.4	101	200	25.8	16.3	13.1	12.6	11.1	15.5	16.0	
Strontium	0.058	N/L	N/L	0.207	0.116	0.080	0.116	0.115	0.162	0.184	
Sulphate	33	267	500	53	27	15	31	28	33	35	
Total Dissolved Solids	120	310	500	327	206	126	178	173	242	262	
Total Kjeldahl Nitrogen	0.4	N/L	N/L	1.1	0.7	0.7	0.8	1.6	1.9	0.5	
Cation Sum (meq/L)	-	N/L	N/L	6.67	4.02	2.84	3.68	3.68	4.87	5.66	
Anion Sum (meq/L)	-	N/L	N/L	6.29	3.80	2.44	3.52	3.37	5.22	5.25	
Anion-Cation Balance (% difference)	-	N/L	N/L	2.89	2.87	7.67	2.16	4.33	3.48	3.78	

Notes:

1. Reasonable Use Concept (RUC) criteria.
2. Ontario Drinking Water Standards (ODWS).
3. Results obtained from laboratory analysis.
4. Results obtained from field analysis.

All results are expressed in mg/L unless otherwise stated.














Bold and shaded values exceed the ODWS.

Bold and Italic values exceed RUC limits.

N/L indicates No Limit.















** indicates parameter not analyzed.

Table 4
Groundwater Quality
Matawatchan Waste Disposal Site

Parameter	Background (median)	RUC ¹	ODWS ²	95-2B													5-year Trends (sparkline)
				26-May-16	26-Oct-16	04-May-17	25-Oct-17	08-May-18	30-Oct-18	14-May-19	23-Apr-20	27-Oct-20	18-May-21	16-Nov-21	31-May-22	01-Nov-22	
Alkalinity (as CaCO ₃)	78	289	30 - 500	197	259	167	243	181	239	178	172	210	212	297	201	269	
Ammonia, Total (as N)	0.03	N/L	N/L	0.04	0.01	< 0.01	0.02	0.05	0.07	0.05	0.03	0.04	0.01	0.01	< 0.01	0.02	
Boron	0.007	1.3	5	0.114	0.147	0.083	0.184	0.127	0.175	0.130	0.135	0.201	0.170	0.281	0.196	0.212	
Calcium	35	N/L	N/L	64.7	78.3	47.1	81.1	58.1	84.7	54.9	57.6	75.4	63.4	101	68.2	84.6	
Chemical Oxygen Demand	12	N/L	N/L	91	113	95	72	54	71	185	480	170	34	16	11	30	
Chloride	0.7	125	250	2.9	4.3	1.3	2.7	1.8	3.0	1.8	2.2	2.3	1.6	2.0	1.5	< 0.5	
Conductivity (µS/cm) ³	235	N/L	N/L	455	572	391	545	428	553	423	399	488	450	640	455	561	
Conductivity (µS/cm) ⁴	159	N/L	N/L	320	343	235	360	209	334	213	191	491	296	422	294	392	
Copper	0.002	0.5	1	0.0040	0.0030	0.0020	0.0040	0.0040	0.0050	< 0.002	0.0040	0.0050	0.0047	0.0055	0.0069	0.0109	
Iron	0.4	0.4	0.3	0.009	0.007	0.008	0.011	0.017	0.005	0.025	0.026	0.016	0.017	0.528	0.009	0.012	
Magnesium	3.9	N/L	N/L	8.6	11.5	6.14	10.7	8.05	10.7	7.96	8.08	10.9	9.31	14.1	9.84	11.3	
Manganese	0.078	0.078	0.05	< 0.001	0.001	< 0.001	0.001	< 0.001	0.001	< 0.001	< 0.001	0.001	0.002	0.009	< 0.001	< 0.001	
Nitrate (as N)	0.07	2.5	10	0.5	0.4	0.43	0.15	0.28	0.24	0.37	0.26	0.35	0.38	0.22	0.22	< 0.05	
Nitrite (as N)	0.05	0.29	1	< 0.1	< 0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.09	< 0.05	< 0.05	< 0.05	
pH (units) ⁴	7.00	6.5 - 8.5	6.5 - 8.5	7.76	6.98	6.52	6.85	7.86	7.25	7.54	7.50	7.01	7.51	7.56	7.13	6.95	
Phenols	0.002	N/L	N/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.003	< 0.002	0.004	< 0.002	< 0.002	< 0.002	< 0.001	< 0.001	
Potassium	2.3	N/L	N/L	2.9	3.3	2.1	3.8	3.0	3.8	2.8	2.9	3.6	3.1	4.2	3.4	3.4	
Sodium	1.4	101	200	18.0	22.4	11.9	22.5	15.5	20.9	15.8	13.6	16.3	14.8	21.5	15.6	15.9	
Strontium	0.058	N/L	N/L	0.149	0.168	0.115	0.167	0.130	0.169	0.125	0.127	0.168	0.146	0.221	0.148	0.167	
Sulphate	33	267	500	37	52	24	31	32	36	31	32	33	33	39	31	43	
Total Dissolved Solids	120	310	500	252	330	215	300	221	287	218	214	254	234	312	239	291	
Total Kjeldahl Nitrogen	0.4	N/L	N/L	0.8	0.8	1.5	0.6	0.7	0.6	3.3	4.8	0.5	0.7	0.5	0.4	0.3	
Cation Sum (meq/L)	-	N/L	N/L	4.80	5.91	3.43	6.00	4.32	6.12	4.16	4.21	5.46	4.65	7.27	4.98	5.93	
Anion Sum (meq/L)	-	N/L	N/L	4.81	6.42	3.88	5.59	4.36	5.63	4.28	4.17	4.96	5.00	6.82	4.71	6.28	
Anion-Cation Balance (% difference)	-	N/L	N/L	0.137	4.13	6.14	3.60	0.505	4.16	1.40	0.426	4.84	3.61	3.20	2.74	2.88	

Notes:
1. Reasonable Use Concept (RUC) criteria.
2. Ontario Drinking Water Standards (ODWS).
3. Results obtained from laboratory analysis.
4. Results obtained from field analysis.
All results are expressed in mg/L unless otherwise stated.
Bold and shaded values exceed the ODWS.
Bold and Italic values exceed RUC limits.
N/L indicates No Limit.
** indicates parameter not analyzed.

Table 4
Groundwater Quality
Matawatchan Waste Disposal Site

Parameter	Background (median)	RUC ¹	ODWS ²	95-3B										5-year Trends (sparkline)
				25-May-15	19-Oct-15	26-May-16	26-Oct-16	04-May-17	25-Oct-17	08-May-18	30-Oct-18	14-May-19	17-Oct-19	
Alkalinity (as CaCO ₃)	78	289	30 - 500	242	342	212	376	191	303	127	311	195	292	
Ammonia, Total (as N)	0.03	N/L	N/L	< 0.1	< 0.1	0.04	0.10	< 0.01	0.05	0.04	0.10	0.09	0.06	
Boron	0.007	1.3	5	0.160	0.246	0.133	0.235	0.146	0.258	0.111	0.258	0.172	0.219	
Calcium	35	N/L	N/L	84.2	112.0	72.5	113	64.5	103	46.4	109	58.4	84.4	
Chemical Oxygen Demand	12	N/L	N/L	13	16	93	222	164	114	156	132	401	81	
Chloride	0.7	125	250	5	9.0	2.9	5.3	1.6	3.2	1.2	3.5	2.0	3.9	
Conductivity (µS/cm) ³	235	N/L	N/L	-	-	504	784	443	660	304	685	416	594	
Conductivity (µS/cm) ⁴	159	N/L	N/L	329	538	339	555	283	433	189	441	249	635	
Copper	0.002	0.5	1	0.00353	0.00379	0.004	0.003	0.003	0.003	0.003	< 0.002	< 0.002	0.002	
Iron	0.4	0.4	0.3	< 0.007	0.06	0.008	< 0.005	0.006	0.012	0.019	0.010	0.031	0.667	
Magnesium	3.9	N/L	N/L	10.1	14.3	9.57	16.8	8.76	13.6	6.18	13.7	8.44	12.0	
Manganese	0.078	0.078	0.05	0.00068	0.6050	0.001	0.065	< 0.001	0.027	0.002	0.038	0.003	0.069	
Nitrate (as N)	0.07	2.5	10	0.45	0.14	0.6	0.5	0.78	0.21	0.42	0.43	0.89	0.58	
Nitrite (as N)	0.05	0.29	1	< 0.03	< 0.03	< 0.1	< 0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
pH (units) ⁴	7.00	6.5 - 8.5	6.5 - 8.5	7.73	7.10	6.09	6.84	6.90	6.64	8.11	7.01	7.72	7.36	
Phenols	0.002	N/L	N/L	0.003	< 0.002	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.005	< 0.002	< 0.002	
Potassium	2.3	N/L	N/L	3.47	5.29	3.2	4.7	2.5	4.8	2.5	5.0	2.7	4.2	
Sodium	1.4	101	200	20.8	32.0	21.8	33.1	17.0	29.9	13.5	27.7	13.6	22.0	
Strontium	0.058	N/L	N/L	0.178	0.272	0.174	0.261	0.146	0.222	0.108	0.229	0.145	0.194	
Sulphate	33	267	500	47	63	43	61	30	33	21	40	34	39	
Total Dissolved Solids	120	310	500	326	474	278	455	244	363	156	356	215	333	
Total Kjeldahl Nitrogen	0.4	N/L	N/L	0.6	< 0.5	1.6	2.8	3.9	3.5	3.7	2.1	9.9	0.4	
Cation Sum (meq/L)	-	N/L	N/L	-	8.29	5.43	8.57	4.74	7.69	3.48	7.91	4.28	6.31	-
Anion Sum (meq/L)	-	N/L	N/L	-	8.40	5.25	8.97	4.48	6.85	3.05	7.18	4.72	6.80	-
Anion-Cation Balance (% difference)	-	N/L	N/L	-	-0.62	1.68	2.28	2.80	5.78	6.56	4.84	4.93	3.75	-

Notes:

1. Reasonable Use Concept (RUC) criteria.

2. Ontario Drinking Water Standards (ODWS).

3. Results obtained from laboratory analysis.

4. Results obtained from field analysis.

All results are expressed in mg/L unless otherwise stated.

Bold and shaded values exceed the ODWS.

Bold and Italic values exceed RUC limits.

N/L indicates No Limit.

** indicates parameter not analyzed.

Table 4
Groundwater Quality
Matawatchan Waste Disposal Site

Parameter	Background (median)	RUC ¹	ODWS ²	95-4 (Background)												5-year Trends (sparkline)
				26-May-16	26-Oct-16	04-May-17	25-Oct-17	08-May-18	14-May-19	23-Apr-20	27-Oct-20	18-May-21	16-Nov-21	31-May-22	01-Nov-22	
Alkalinity (as CaCO ₃)	78	289	30 - 500	87	111	55	132	90	39	25	89	79	88	53		
Ammonia, Total (as N)	0.03	N/L	N/L	0.05	0.03	0.01	0.08	0.03	0.02	0.01	0.02	0.02	< 0.01	< 0.01	0.03	
Boron	0.007	1.3	5	0.011	0.005	< 0.005	0.016	0.009	0.005	0.006	0.010	0.010	0.013	< 0.005	< 0.005	
Calcium	35	N/L	N/L	43.4	43.2	24.1	57.4	31.4	18.0	13.0	37.2	40.7	43.2	20.0	34.8	
Chemical Oxygen Demand	12	N/L	N/L	17	< 5	18	28	33	15	13	9	22	16	9	15	
Chloride	0.7	125	250	< 0.5	< 0.5	< 0.5	0.9	< 0.5	0.7	0.7	0.7	0.7	0.9	0.8		
Conductivity (µS/cm) ³	235	N/L	N/L	244	263	152	319	235	111	86	226	231	244	141		
Conductivity (µS/cm) ⁴	159	N/L	N/L	179	140	161	168	137	124	64	183	173	173	120	148	
Copper	0.002	0.5	1	0.0030	< 0.002	< 0.002	< 0.002	0.0030	< 0.002	0.0030	0.0030	0.0031	0.0048	0.0121	0.0051	
Iron	0.4	0.4	0.3	0.0620	0.365	0.026	0.402	0.029	0.011	0.097	0.045	0.216	0.024	0.022	0.034	
Magnesium	3.9	N/L	N/L	3.85	3.58	3.01	4.62	3.43	1.98	1.45	3.52	3.81	3.46	2.16	2.82	
Manganese	0.078	0.078	0.05	0.076	0.129	0.017	0.357	0.022	0.010	0.010	0.018	0.057	0.025	0.007	0.015	
Nitrate (as N)	0.07	2.5	10	0.1	0.3	0.11	0.11	< 0.05	0.18	0.06	0.16	0.17	0.12	0.09		
Nitrite (as N)	0.05	0.29	1	< 0.1	0.2	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.07	< 0.05	< 0.05		
pH (units) ⁴	7.00	6.5 - 8.5	6.5 - 8.5	6.23	7.06	6.46	6.14	7.96	6.86	6.56	6.92	7.03	7.59	7.04	6.53	
Phenols	0.002	N/L	N/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	0.001	< 0.001	
Potassium	2.3	N/L	N/L	2.0	1.8	1.5	2.5	1.8	1.1	1.0	2.0	1.9	2.2	1.4	1.5	
Sodium	1.4	101	200	1.7	1.8	1.9	2.1	1.5	1.1	0.9	1.5	1.5	1.5	1.1	1.0	
Strontium	0.058	N/L	N/L	0.100	0.091	0.065	0.127	0.069	0.027	0.029	0.078	0.096	0.093	0.044	0.065	
Sulphate	33	267	500	23	24	17	23	22	13	11	21	23	23	17		
Total Dissolved Solids	120	310	500	122	150	84	175	120	56	42	120	102	111	72		
Total Kjeldahl Nitrogen	0.4	N/L	N/L	0.4	0.5	0.5	0.5	0.4	0.2	0.2	0.2	0.4	0.3	0.3	0.3	
Cation Sum (meq/L)	-	N/L	N/L	2.62	2.60	1.57	3.44	1.97	1.14	0.841	2.27	2.47	2.56	1.26		
Anion Sum (meq/L)	-	N/L	N/L	2.22	2.74	1.46	3.15	2.27	1.07	0.755	2.25	2.10	2.27	1.45		
Anion-Cation Balance (% difference)	-	N/L	N/L	8.23	2.56	3.68	4.53	7.08	3.34	5.36	0.371	8.14	5.97	6.94		

Notes:
1. Reasonable Use Concept (RUC) criteria.
2. Ontario Drinking Water Standards (ODWS).
3. Results obtained from laboratory analysis.
4. Results obtained from field analysis.
All results are expressed in mg/L unless otherwise stated.
Bold and shaded values exceed the ODWS.
Bold and italic values exceed RUC limits.
N/L indicates No Limit.
** indicates parameter not analyzed.

Table 4
Groundwater Quality
Matawatchan Waste Disposal Site

Parameter	ODWS ¹	91-2C						
		26-May-16	04-May-17	08-May-18	14-May-19	23-Apr-20	18-May-21	31-May-22
Acetone	N/L	< 0.002	< 0.002	< 0.002	< 0.03	< 0.03	< 0.03	< 0.03
Benzene	0.001	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Bromobenzene	N/L	< 0.0001	< 0.0001	< 0.0001	< 0.0004	< 0.0004	< 0.0004	< 0.0004
Bromodichloromethane	N/L	< 0.0001	< 0.0001	< 0.0001	< 0.002	< 0.002	< 0.002	< 0.002
Bromofom	N/L	< 0.0001	< 0.0001	< 0.0001	< 0.005	< 0.005	< 0.005	< 0.005
Bromomethane	N/L	< 0.0003	< 0.0003	< 0.0003	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Carbon tetrachloride	0.002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Monochlorobenzene (Chlorobenzene)	0.08	< 0.0002	< 0.0002	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Chloroethane	N/L	< 0.0001	< 0.0001	< 0.0001	< 0.003	< 0.003	< 0.003	< 0.003
Chloroform	N/L	< 0.0003	< 0.0003	< 0.0003	< 0.001	< 0.001	< 0.001	< 0.001
Chloromethane	N/L	< 0.0003	< 0.0003	< 0.0003	< 0.002	< 0.002	< 0.002	< 0.002
Chlorotoluene, 2-	N/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Chlorotoluene, 4-	N/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Dibromo-3-Chloropropane, 1,2-	N/L	< 0.001	< 0.001	< 0.001	< 0.0006	< 0.0006	< 0.0006	< 0.0006
Dibromochloromethane	N/L	< 0.0001	< 0.0001	< 0.0001	< 0.002	< 0.002	< 0.002	< 0.002
Dibromoethane, 1,2- (Ethylene Dibromide)	N/L	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Dibromomethane	N/L	< 0.001	< 0.001	< 0.001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Dichlorobenzene, 1,2-	0.2	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dichlorobenzene, 1,3-	N/L	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dichlorobenzene, 1,4-	0.005	0.0003	< 0.0002	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dichlorodifluoromethane	N/L	< 0.001	< 0.001	< 0.001	< 0.002	< 0.002	< 0.002	< 0.002
Dichloroethane, 1,1-	N/L	0.0002	< 0.0001	0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dichloroethane, 1,2-	0.005	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dichloroethene, cis-1,2-	N/L	0.0013	0.0008	0.0009	0.0005	< 0.0005	0.0006	< 0.0005
Dichloroethene, trans-1,2-	N/L	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dichloroethene, 1,1-	0.014	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dichloromethane (Methylene Chloride)	0.05	< 0.0003	< 0.0003	< 0.0003	< 0.005	< 0.005	< 0.005	< 0.005
Dichloropropane, 1,2-	N/L	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dichloropropane, 1,3-	N/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Dichloropropane, 2,2-	N/L	< 0.0002	< 0.0002	< 0.0002	-	-	-	-
Dichloropropene, cis-1,3-	N/L	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dichloropropene, trans-1,3-	N/L	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Dichloropropene, 1,1-	N/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Ethylbenzene	0.14	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Hexachlorobutadiene	N/L	< 0.001	< 0.001	< 0.001	< 0.0006	< 0.0006	< 0.0006	< 0.0006
Hexane	N/L	< 0.001	< 0.001	< 0.001	< 0.005	< 0.005	< 0.005	< 0.005
Isopropylbenzene	N/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Isopropyltoluene, 4-	N/L	< 0.0004	< 0.0004	< 0.0004	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Methyl Butyl Ketone	N/L	< 0.01	< 0.01	< 0.01	< 0.005	< 0.005	< 0.005	< 0.005
Methyl Ethyl Ketone	N/L	< 0.001	< 0.001	< 0.001	< 0.02	< 0.02	< 0.02	< 0.02
Methyl Isobutyl Ketone	N/L	< 0.001	< 0.001	< 0.001	< 0.02	< 0.02	< 0.02	< 0.02
Methyl-t-butyl Ether	N/L	< 0.001	< 0.001	< 0.001	< 0.002	< 0.002	< 0.002	< 0.002
Naphthalene	N/L	< 0.0007	< 0.0007	< 0.0007	< 0.0004	< 0.0004	< 0.0004	< 0.0004
n-Butylbenzene	N/L	< 0.0007	< 0.0007	< 0.0007	< 0.0004	< 0.0004	< 0.0004	< 0.0004
n-Propylbenzene	N/L	< 0.0004	< 0.0004	< 0.0004	< 0.0001	< 0.0001	< 0.0001	< 0.0001
sec-Butylbenzene	N/L	< 0.0005	< 0.0005	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Styrene	N/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
tert-Butylbenzene	N/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Tetrachloroethane 1,1,1,2-	N/L	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Tetrachloroethane 1,1,2,2-	N/L	< 0.0004	< 0.0004	< 0.0004	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Tetrachloroethene	0.03	< 0.0002	< 0.0002	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Toluene	0.06	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Total Purgeables (Gasoline, C6-C10)	N/L	< 0.050	-	-	-	-	-	-
Trichlorobenzene, 1,2,3-	N/L	< 0.0002	< 0.0002	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Trichlorobenzene, 1,2,4-	N/L	< 0.0002	< 0.0002	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Trichloroethane, 1,1,1-	N/L	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Trichloroethane, 1,1,2-	N/L	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Trichloroethylene	0.005	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Trichlorofluoromethane	N/L	< 0.0001	< 0.0001	< 0.0001	< 0.005	< 0.005	< 0.005	< 0.005
Trichloropropane, 1,2,3-	N/L	< 0.0002	< 0.0002	< 0.0002	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Trimethylbenzene, 1,2,4-	N/L	< 0.002	< 0.002	< 0.002	< 0.001	< 0.001	< 0.001	< 0.001
Trimethylbenzene, 1,3,5-	N/L	< 0.0006	< 0.0006	< 0.0006	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Vinyl Chloride	0.001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Xylene (Total)	0.09	< 0.0005	< 0.0005	< 0.0005	< 0.0015	< 0.0015	< 0.0015	< 0.0015
Xylene, m,p-	N/L	< 0.0004	< 0.0004	< 0.0004	< 0.001	< 0.001	< 0.001	< 0.001
Xylene, o-	N/L	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.0005	< 0.0005	< 0.0005

Notes:
1. Ontario Drinking Water Standards (ODWS).

All results are expressed in mg/L unless otherwise stated.
Bold and shaded values exceed the ODWS.
N/L indicates No Limit.
** indicates parameter not analyzed.

Table 5
Groundwater Quality Compared to PWQO
Matawatchan Waste Disposal Site

Parameter	PWQO ¹	95-1 (Background)													
		26-May-16	26-Oct-16	04-May-17	25-Oct-17	08-May-18	30-Oct-18	14-May-19	17-Oct-19	23-Apr-20	27-Oct-20	18-May-21	16-Nov-21	31-May-22	01-Nov-22
Alkalinity (as CaCO ₃)	25% Decrease	80	79	58	77	53	63	57	67	49	68	84	83	67	85
Ammonia, Total (as N)	N/L	0.03	< 0.01	< 0.01	0.01	0.02	0.10	0.02	0.04	0.02	0.01	< 0.01	0.02	< 0.01	< 0.01
Boron	0.2	0.007	< 0.005	< 0.005	0.008	< 0.005	< 0.005	< 0.005	0.005	< 0.005	0.007	0.005	0.010	< 0.005	< 0.005
Calcium	N/L	40.8	34.1	26.9	33.6	27.0	34.3	23.8	28.3	29.5	36.5	35.0	37.7	36.6	41.8
Chemical Oxygen Demand	N/L	13	< 5	< 5	9	12	< 5	7	15	8	7	< 5	12	< 5	< 5
Chloride	N/L	< 0.5	< 0.5	< 0.5	0.8	< 0.5	1.1	0.7	1.2	0.9	0.8	0.7	0.6	0.9	< 0.5
Conductivity (µS/cm) ²	N/L	260	252	204	249	190	212	208	209	197	236	251	255	248	288
Conductivity (µS/cm) ³	N/L	157	179	140	175	118	170	119	94	111	220	159	303	151	108
Copper	0.005	< 0.002	< 0.002	< 0.002	0.002	< 0.002	< 0.002	< 0.002	< 0.002	0.002	< 0.002	0.001	0.004	0.0010	0.0017
Iron	0.3	2.04	0.758	1.32	1.20	< 0.005	0.750	0.860	0.923	0.959	1.10	0.55	1.72	2.14	0.509
Magnesium	N/L	5.28	5.49	3.94	4.96	4.01	4.69	3.77	4.07	4.46	5.45	5.39	5.60	5.64	5.73
Manganese	N/L	0.183	0.105	0.103	0.073	0.113	0.069	0.078	0.063	0.121	0.147	0.085	0.136	0.198	0.101
Nitrate (as N)	N/L	< 0.1	0.1	< 0.05	< 0.05	< 0.05	0.09	0.18	< 0.05	0.07	< 0.05	0.10	< 0.05	< 0.05	< 0.05
Nitrite (as N)	N/L	< 0.1	0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.08	< 0.05	< 0.05	< 0.05
pH (units) ³	6.5 - 8.5	7.28	6.71	6.33	6.22	7.41	6.84	6.87	7.04	6.55	6.41	7.44	7.73	7.01	6.29
Phenols	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.002	< 0.002	0.003	< 0.002	< 0.002	< 0.002	< 0.002	< 0.001	< 0.001
Potassium	N/L	3.1	3.2	2.2	3.3	2.8	3.2	2.1	2.8	2.8	3.4	3.2	3.8	3.6	3.2
Sodium	N/L	1.4	1.7	1.2	1.4	1.4	1.5	1.4	1.5	1.5	1.4	1.2	1.7	1.4	1.3
Strontium	N/L	0.075	0.053	0.040	0.048	0.038	0.051	0.038	0.044	0.047	0.056	0.055	0.060	0.055	0.060
Sulphate	N/L	40	45	33	35	36	35	38	35	33	36	40	38	44	55
Total Dissolved Solids	N/L	138	138	112	137	97	108	106	110	93	113	124	115	120	131
Total Kjeldahl Nitrogen	N/L	0.1	0.2	1.3	0.1	0.1	0.3	< 0.1	0.1	0.2	0.1	0.1	0.1	0.1	< 0.1
Cation Sum (meq/L)	N/L	2.72	2.36	1.85	2.30	1.82	2.29	1.66	1.94	2.03	2.48	2.36	2.61	2.57	2.73
Anion Sum (meq/L)	N/L	2.45	2.54	1.86	2.29	1.81	2.04	1.96	2.10	1.71	2.12	2.55	2.45	2.28	2.84
Anion-Cation Balance (% difference)	N/L	5.36	3.77	0.312	0.201	0.0285	5.84	8.26	3.92	8.55	8.03	3.97	3.12	6.00	2.08

Notes:
1. Provincial Water Quality Objectives (PWQO).
2. Results obtained from laboratory analysis.
3. Results obtained from field analysis.
All results are expressed in mg/L unless otherwise stated.
Bold and shaded values exceed the PWQO.
N/L indicates No Limit.
*- indicates parameter not analyzed.

Table 5
Groundwater Quality Compared to PWQO
Matawatchan Waste Disposal Site

Parameter	PWQO ¹	95-4 (Background)											
		26-May-16	26-Oct-16	04-May-17	25-Oct-17	08-May-18	14-May-19	23-Apr-20	27-Oct-20	18-May-21	16-Nov-21	31-May-22	01-Nov-22
Alkalinity (as CaCO ₃)	25% Decrease	87	111	55	132	90	39	25	89	79	88	53	
Ammonia, Total (as N)	N/L	0.05	0.03	0.01	0.08	0.03	0.02	0.01	0.02	0.02	< 0.01	< 0.01	0.03
Boron	0.2	0.011	0.005	< 0.005	0.016	0.009	0.005	0.006	0.010	0.010	0.013	< 0.005	< 0.005
Calcium	N/L	43.4	43.2	24.1	57.4	31.4	18.0	13.0	37.2	40.7	43.2	20.0	34.8
Chemical Oxygen Demand	N/L	17	< 5	18	28	33	15	13	9	22	16	9	15
Chloride	N/L	< 0.5	< 0.5	< 0.5	0.9	< 0.5	0.7	0.7	0.7	0.7	0.9	0.8	
Conductivity (µS/cm) ²	N/L	244	263	152	319	235	111	86	226	231	244	141	
Conductivity (µS/cm) ³	N/L	179	140	161	168	137	124	64	183	173	173	120	148
Copper	0.005	0.003	< 0.002	< 0.002	< 0.002	0.003	< 0.002	0.003	0.003	0.0031	0.0048	0.0121	0.0051
Iron	0.3	0.062	0.365	0.026	0.402	0.029	0.011	0.097	0.045	0.216	0.024	0.022	0.034
Magnesium	N/L	3.85	3.58	3.01	4.62	3.43	1.98	1.45	3.52	3.81	3.46	2.16	2.82
Manganese	N/L	0.076	0.129	0.017	0.357	0.022	0.010	0.010	0.018	0.057	0.025	0.007	0.015
Nitrate (as N)	N/L	0.1	0.3	0.11	0.11	< 0.05	0.18	0.06	0.16	0.17	0.12	0.09	
Nitrite (as N)	N/L	< 0.1	0.2	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.07	< 0.05	< 0.05	
pH (units) ³	6.5 - 8.5	6.23	7.06	6.46	6.14	7.96	6.86	6.56	6.92	7.03	7.59	7.04	6.53
Phenols	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	0.001	< 0.001
Potassium	N/L	2.0	1.8	1.5	2.5	1.8	1.1	1.0	2.0	1.9	2.2	1.4	1.5
Sodium	N/L	1.7	1.8	1.9	2.1	1.5	1.1	0.9	1.5	1.5	1.5	1.1	1.0
Strontium	N/L	0.100	0.091	0.065	0.127	0.069	0.027	0.029	0.078	0.096	0.093	0.044	0.065
Sulphate	N/L	23	24	17	23	22	13	11	21	23	23	17	
Total Dissolved Solids	N/L	122	150	84	175	120	56	42	120	102	111	72	
Total Kjeldahl Nitrogen	N/L	0.4	0.5	0.5	0.5	0.4	0.2	0.2	0.2	0.4	0.3	0.3	0.3
Cation Sum (meq/L)	N/L	2.62	2.60	1.57	3.44	1.97	1.14	0.841	2.27	2.47	2.56	1.26	
Anion Sum (meq/L)	N/L	2.22	2.74	1.46	3.15	2.27	1.07	0.755	2.25	2.10	2.27	1.45	
Anion-Cation Balance (% difference)	N/L	8.23	2.56	3.68	4.53	7.08	3.34	5.36	0.371	8.14	5.97	6.94	

Notes:

1. Provincial Water Quality Objectives (PWQO).
 2. Results obtained from laboratory analysis.
 3. Results obtained from field analysis.
- All results are expressed in mg/L unless otherwise stated.
 Bold and shaded values exceed the PWQO.
 N/L indicates No Limit.
 "-" indicates parameter not analyzed.





























Table 5
Groundwater Quality Compared to PWQO
Matawatchesan Waste Disposal Site

Parameter	PWQO ¹	91-4A													
		26-May-16	26-Oct-16	04-May-17	25-Oct-17	08-May-18	30-Oct-18	14-May-19	17-Oct-19	23-Apr-20	27-Oct-20	18-May-21	16-Nov-21	31-May-22	01-Nov-22
Alkalinity (as CaCO ₃)	25% Decrease	323	534	348	473	294	454	331	443	322	399	280	497	293	421
Ammonia, Total (as N)	N/L	0.02	< 0.01	< 0.01	0.01	0.03	0.06	0.02	0.04	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Boron	0.2	0.243	0.400	0.233	0.374	0.204	0.378	0.228	0.363	0.219	0.359	0.184	0.370	0.204	0.271
Calcium	N/L	107	178	115	165	104	183	108	158	113	149	82.7	163	101	132
Chemical Oxygen Demand	N/L	14	9	6	22	14	12	15	23	8	8	7	18	< 5	14
Chloride	N/L	3.8	8.9	2.4	5.2	1.9	5.6	2.6	5.6	2.7	4.7	2.5	4.3	2.3	1.7
Conductivity (µS/cm) ²	N/L	699	1120	718	1030	612	998	723	954	695	899	566	1009	634	849
Conductivity (µS/cm) ³	N/L	512	756	473	635	398	594	441	997	390	761	359	624	352	616
Copper	0.005	0.0040	0.0030	0.0020	< 0.002	0.0040	0.0020	< 0.002	< 0.002	0.0020	0.0030	0.0023	0.0046	0.0027	0.0032
Iron	0.3	< 0.005	0.010	0.009	0.020	0.011	0.018	0.006	0.012	< 0.005	0.014	0.121	0.021	0.010	0.025
Magnesium	N/L	19.4	35.0	20.6	30.0	18.2	30.9	20.3	29.5	20.9	29.0	16.1	29.9	19.1	24.0
Manganese	N/L	0.009	0.040	0.023	0.056	0.021	0.078	0.013	0.033	0.011	0.027	0.053	0.044	0.019	0.031
Nitrate (as N)	N/L	0.6	0.6	1.05	0.94	0.68	0.52	1.20	0.31	0.89	0.34	0.41	0.65	0.33	< 0.05
Nitrite (as N)	N/L	< 0.1	< 0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.07	< 0.05	< 0.05	< 0.05
pH (units) ³	6.5 - 8.5	6.02	6.83	6.62	6.74	7.10	6.78	7.20	7.35	6.99	6.68	7.04	7.37	7.07	6.61
Phenols	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.002	< 0.002	< 0.002	0.012	< 0.002	< 0.002	< 0.002	< 0.001	< 0.001
Potassium	N/L	6.1	9.4	6.2	9.2	7.0	10.1	6.6	9.2	7.0	9.0	6.0	9.4	6.8	7.3
Sodium	N/L	14.9	26.5	14.6	22.4	14.3	25.5	12.8	22.1	12.2	21.2	11.0	23.1	11.4	15.9
Strontium	N/L	0.393	0.604	0.405	0.557	0.357	0.553	0.387	0.535	0.388	0.488	0.359	0.564	0.377	0.423
Sulphate	N/L	51	101	39	69	30	77	43	60	38	59	31	69	34	66
Total Dissolved Solids	N/L	389	634	395	566	318	532	377	504	369	464	291	521	329	447
Total Kjeldahl Nitrogen	N/L	0.2	0.5	0.3	0.4	0.2	0.1	0.2	0.3	0.2	0.2	0.2	0.3	0.2	0.2
Cation Sum (meq/L)	N/L	7.74	13.1	8.24	11.9	7.49	13.0	7.79	11.5	8.07	11.0	6.1	11.8	7.28	9.44
Anion Sum (meq/L)	N/L	7.67	13.1	7.83	11.1	6.59	10.9	7.67	10.3	7.37	9.36	6.35	11.5	6.65	9.83
Anion-Cation Balance (% difference)	N/L	0.479	0.289	2.53	3.53	6.37	9.15	0.736	5.60	4.55	7.95	2.05	1.31	4.54	2.01

Notes:

1. Provincial Water Quality Objectives (PWQO).
 2. Results obtained from laboratory analysis.
 3. Results obtained from field analysis.
- All results are expressed in mg/L unless otherwise stated.
 Bold and shaded values exceed the PWQO.
 N/L indicates No Limit.
 "-" indicates parameter not analyzed.

Table 6
Surface Water Quality
Matawatchesan Waste Disposal Site

Parameter	Background (75th Percentile)	PWQO ¹	SW-1						5-year Trends (sparkline)
			25-May-15	26-May-16	04-May-17	08-May-18	14-May-19	23-Apr-20	
Alkalinity (as CaCO ₃)	132	25 % Decrease	236	316	192	132	169	191	
Ammonia, Total (as N)	0.1	N/L	0.1	0.02	< 0.01	0.02	0.09	0.02	
Ammonia, Un-ionized (as N) ²	0.00038	0.02	0.0002	0.00003	0.00001	0.00028	0.00037	0.00007	
Biological Oxygen Demand	4	N/L	< 4	< 2	< 2	< 2	< 3	< 3	
Boron	0.0083	0.2	0.183	0.260	0.201	0.126	0.192	0.228	
Cadmium	0.000022	0.0002	0.000205	0.00005	0.000098	0.000019	0.000029	0.000024	
Calcium	51	N/L	81.7	105	62.9	51.7	66.4	74.9	
Chemical Oxygen Demand	15	N/L	14	28	12	15	15	18	
Chloride	15	N/L	5	4.7	1.5	1.6	2.0	2.2	
Conductivity (µS/cm) ³	342	N/L	-	707	451	304	424	470	
Conductivity (µS/cm) ⁴	241	N/L	120	532	298	212	255	232	
Copper	0.0015	0.005	0.0129	0.0041	0.0068	0.0023	0.0027	0.0024	
Dissolved Oxygen ⁴	14.04	5	10.22	12.66	11.99	10.80	12.23	15.82	
Iron	0.104	0.3	0.836	0.060	0.036	0.046	0.056	0.012	
Magnesium	7.86	N/L	10.5	14.7	8.87	7.32	8.58	10.2	
Manganese	0.013	N/L	0.363	0.064	0.015	0.019	0.016	0.013	
Nitrate (as N)	0.09	N/L	0.96	0.5	0.76	0.46	0.90	0.92	
Nitrite (as N)	0.06	N/L	< 0.03	< 0.1	< 0.05	< 0.05	< 0.05	< 0.05	
pH (units) ⁴	8.01	6.5 - 8.5	6.99	6.87	6.83	7.87	7.46	7.44	
Phenols	0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.002	< 0.002	
Phosphorus, Total	0.02	0.03	0.088	0.03	0.02	0.01	0.02	< 0.01	
Potassium	2.1	N/L	3.81	3.9	2.6	2.3	2.7	3.1	
Sodium	7.2	N/L	24.3	29.7	16.7	14.9	13.5	15.0	
Strontium	0.12	N/L	0.182	0.260	0.148	0.151	0.152	0.170	
Sulphate	14	N/L	55	59	31	22	34	35	
Total Dissolved Solids	192	N/L	331	391	248	156	229	236	
Total Kjeldahl Nitrogen	0.5	N/L	< 0.5	0.5	0.6	0.4	0.4	0.4	
Zinc	0.009	0.02	0.007	< 0.005	0.008	0.018	0.012	< 0.005	
Cation Sum (meq/L)	-	N/L	6.10	7.86	4.66	3.89	4.68	5.31	-
Anion Sum (meq/L)	-	N/L	6.01	7.71	4.52	3.16	4.21	4.67	-
Anion-Cation Balance (% Difference)	-	N/L	0.67	0.950	1.59	10.40	5.28	6.38	-

Notes:

1. Provincial Water Quality Objectives (PWQO).
2. Calculated using Total Ammonia and field analysis.
3. Results obtained from laboratory analysis.
4. Results obtained from field analysis.

All results are expressed in mg/L unless otherwise stated.

Bold and shaded values exceed the PWQO.

N/L indicates No Limit.

-* indicates parameter not analyzed.
































Table 6
Surface Water Quality
Matawatchan Waste Disposal Site

Parameter	Background (75th Percentile)	PWQO ¹	SW-2										5-year Trends (sparkline)
			26-May-16	26-Oct-16	04-May-17	25-Oct-17	08-May-18	14-May-19	23-Apr-20	18-May-21	16-Nov-21	31-May-22	
Alkalinity (as CaCO ₃)	132	25 % Decrease	140	171	91	178	101	91	89	134	166	142	
Ammonia, Total (as N)	0.1	N/L	0.02	0.01	< 0.01	0.10	0.02	0.03	0.01	< 0.01	0.02	< 0.01	
Ammonia, Un-ionized (as N) ²	0.00038	0.02	0.00004	0.00008	0.00001	0.00012	0.00001	0.00027	0.00005	0.00011	0.00022	0.00007	
Biological Oxygen Demand	4	N/L	< 2	< 2	< 2	9	< 2	< 3	< 3	< 3	< 3	< 3	
Boron	0.0083	0.2	0.007	< 0.005	0.017	0.066	0.005	0.005	< 0.005	0.008	< 0.005	< 0.005	
Cadmium	0.000022	0.0002	0.00002	< 0.00002	0.000083	0.00147	0.000025	0.000061	< 0.000015	< 0.000015	< 0.000015	0.000018	
Calcium	51	N/L	48.0	60.8	34.7	82.1	42.3	36.6	36.2	49.5	55.2	51.5	
Chemical Oxygen Demand	15	N/L	19	< 5	6	575	27	17	11	< 5	6	5	
Chloride	15	N/L	4.2	5.3	10.6	6.3	7.8	9.3	9.1	5.7	5.7	7.1	
Conductivity (µS/cm) ³	342	N/L	303	373	251	381	235	234	241	307	354	323	
Conductivity (µS/cm) ⁴	241	N/L	201	225	166	270	165	140	121	216	246	217	
Copper	0.0015	0.005	0.0018	0.0003	0.0054	0.0551	0.0019	0.0033	0.0009	0.0009	0.0011	0.0013	
Dissolved Oxygen ⁴	14.04	5	16.07	8.05	13.53	7.00	11.51	12.57	14.09	7.58	12.20	6.09	
Iron	0.104	0.3	0.276	0.478	0.019	44.8	0.387	0.941	0.006	0.080	0.022	0.228	
Magnesium	7.86	N/L	7.20	9.47	5.16	17.0	6.21	5.11	5.00	6.64	9.35	7.09	
Manganese	0.013	N/L	0.033	0.089	0.003	7.14	0.089	0.192	0.001	0.013	0.009	0.046	
Nitrate (as N)	0.09	N/L	0.2	0.1	0.06	0.05	0.12	0.21	0.07	0.11	0.10	< 0.05	
Nitrite (as N)	0.06	N/L	< 0.1	< 0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.07	< 0.05	< 0.05	
pH (units) ⁴	8.01	6.5 - 8.5	7.12	7.79	6.95	6.80	6.56	7.82	7.65	7.71	7.91	7.53	
Phenols	0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.002	< 0.002	< 0.001	< 0.001	< 0.001	
Phosphorus, Total	0.02	0.03	0.05	0.02	0.02	2.97	0.05	0.12	< 0.01	0.04	0.02	0.04	
Potassium	2.1	N/L	1.3	1.6	1.3	3.0	1.5	1.3	1.4	1.4	1.9	1.2	
Sodium	7.2	N/L	3.4	3.7	6.0	5.4	6.6	5.3	5.6	5.5	4.1	5.4	
Strontium	0.12	N/L	0.104	0.113	0.085	0.181	0.112	0.080	0.083	0.100	0.111	0.106	
Sulphate	14	N/L	10	12	11	6	8	10	12	10	11	11	
Total Dissolved Solids	192	N/L	169	204	138	210	120	123	118	147	183	157	
Total Kjeldahl Nitrogen	0.5	N/L	0.4	0.5	2.5	17.4	0.4	0.9	0.2	0.2	0.2	0.3	
Zinc	0.009	0.02	< 0.005	< 0.005	0.007	0.623	0.019	0.015	< 0.005	0.013	0.010	< 0.005	
Cation Sum (meq/L)	-	N/L	3.19	4.05	2.46	8.53	2.97	2.57	2.50	3.30	3.75	3.43	
Anion Sum (meq/L)	-	N/L	3.13	3.82	2.35	3.85	2.43	2.30	2.30	3.06	3.71	3.27	
Anion-Cation Balance (% Difference)	-	N/L	0.898	2.87	2.28	37.8	10.1	5.55	4.22	3.70	0.538	2.51	

Notes:

- 1. Provincial Water Quality Objectives (PWQO).
 - 2. Calculated using Total Ammonia and field analysis.
 - 3. Results obtained from laboratory analysis.
 - 4. Results obtained from field analysis.
- All results are expressed in mg/L unless otherwise stated.
 Bold and shaded values exceed the PWQO.
 N/L indicates No Limit.
 "-" indicates parameter not analyzed.

Table 6
Surface Water Quality
Matawatchan Waste Disposal Site

Parameter	Background (75th Percentile)	PWQO ¹	SW-3 (Background)											5-year Trends (sparkline)
			26-May-16	04-May-17	25-Oct-17	08-May-18	14-May-19	23-Apr-20	27-Oct-20	18-May-21	16-Nov-21	31-May-22	01-Nov-22	
Alkalinity (as CaCO ₃)	132	25 % Decrease	127	82	162	92	78	96	132	129	139	138	170	
Ammonia, Total (as N)	0.1	N/L	0.02	< 0.01	0.01	0.01	< 0.01	0.01	0.01	0.01	0.01	< 0.01	< 0.01	
Ammonia, Un-ionized (as N) ²	0.00038	0.02	0.00004	0.00001	0.00001	0.00000	0.00000	0.00005	0.00002	0.00034	0.00009	0.00011	0.00015	
Biological Oxygen Demand	4	N/L	< 2	< 2	< 2	< 2	< 3	< 3	< 3	< 3	< 3	< 3	< 3	
Boron	0.0083	0.2	0.008	0.014	0.009	0.005	< 0.005	< 0.005	0.006	0.010	< 0.005	< 0.005	< 0.005	
Cadmium	0.000022	0.0002	< 0.00002	< 0.000014	0.000016	< 0.000015	< 0.000015	< 0.000015	< 0.000015	0.000053	0.000027	0.000043	0.000038	
Calcium	51	N/L	43.0	33.6	56.0	40.1	32.3	38.6	50.6	46.3	51.7	49.2	58.8	
Chemical Oxygen Demand	15	N/L	10	13	5	19	< 5	9	13	39	25	24	16	
Chloride	15	N/L	5.8	13.0	14.4	9.2	10.7	8.1	15.4	7.1	17.9	7.9	16.0	
Conductivity (µS/cm) ³	342	N/L	284	244	390	227	217	253	342	299	371	315	400	
Conductivity (µS/cm) ⁴	241	N/L	211	120	273	148	130	131	275	214	252	223	240	
Copper	0.0015	0.005	0.0006	0.0009	0.0005	0.0008	0.0008	0.0009	0.0008	0.0029	0.0019	0.0029	0.0025	
Dissolved Oxygen ⁴	14.04	5	18.68	15.01	12.25	11.63	13.72	11.75	17.20	11.84	12.72	8.16	12.72	
Iron	0.104	0.3	0.012	0.034	0.026	0.051	0.043	0.009	0.050	0.874	0.386	0.675	0.555	
Magnesium	7.86	N/L	5.86	4.97	8.42	5.69	4.15	5.52	7.67	6.08	9.17	6.37	8.82	
Manganese	0.013	N/L	0.002	0.004	0.003	0.009	0.003	0.003	0.003	0.137	0.048	0.098	0.059	
Nitrate (as N)	0.09	N/L	0.1	< 0.05	0.07	< 0.05	0.17	0.09	< 0.05	0.09	< 0.05	< 0.05	0.06	
Nitrite (as N)	0.06	N/L	< 0.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0.06	< 0.05	< 0.05	< 0.05	
pH (units) ⁴	8.01	6.5 - 8.5	6.96	6.93	6.72	6.07	8.20	7.61	7.28	8.20	7.89	7.69	7.90	
Phenols	0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.002	< 0.002	< 0.002	< 0.001	< 0.001	< 0.001	< 0.001	
Phosphorus, Total	0.02	0.03	< 0.01	0.02	0.02	0.01	0.01	0.01	0.03	0.14	0.07	0.09	0.05	
Potassium	2.1	N/L	1.6	1.4	2.2	1.5	1.4	1.4	2.2	1.7	2.1	1.7	2.2	
Sodium	7.2	N/L	5.5	6.9	8.1	7.1	6.6	5.2	10.1	6.6	8.7	7.1	8.9	
Strontium	0.12	N/L	0.111	0.083	0.137	0.115	0.075	0.086	0.112	0.108	0.121	0.114	0.130	
Sulphate	14	N/L	11	11	9	9	10	13	11	11	22	10	16	
Total Dissolved Solids	192	N/L	161	134	215	116	112	124	176	144	194	153	189	
Total Kjeldahl Nitrogen	0.5	N/L	0.2	0.2	0.2	0.2	0.3	0.1	0.3	0.6	0.5	0.7	0.6	
Zinc	0.009	0.02	0.006	< 0.005	0.006	0.018	0.015	< 0.005	< 0.005	0.018	0.014	0.009	0.008	
Cation Sum (meq/L)	-	N/L	2.91	2.42	3.90	2.82	2.28	2.65	3.66	3.19	3.79	3.37	4.13	
Anion Sum (meq/L)	-	N/L	2.94	2.24	3.84	2.29	2.08	2.43	3.28	3.01	3.74	3.18	4.18	
Anion-Cation Balance (% Difference)	-	N/L	0.437	3.90	0.764	10.4	4.45	4.23	5.36	2.97	0.748	2.97	0.489	

Notes:

1. Provincial Water Quality Objectives (PWQO).
2. Calculated using Total Ammonia and field analysis.
3. Results obtained from laboratory analysis.
4. Results obtained from field analysis.

All results are expressed in mg/L unless otherwise stated.

Bold and shaded values exceed the PWQO.

N/L indicates No Limit.

"-" indicates parameter not analyzed.



Appendix E

Groundwater Elevations 2023

**Groundwater Elevations
Matawatchan WDS (Closed)**

Monitor	Top of Pipe Elevation (Assumed Datum)	Ground Elevation (Assumed Datum)	Well of Bottom Depth (M)	Date	Water Depth From Top of Pipe (m)	Water elevation (Assumed Datum)
91-2A Greenview measured Depth 35.30	97.59	96.66	35.19	Jul-23	9.76	87.83
	97.59	96.66	35.19	Oct-23	10.73	86.86
91-2B Greenview measured Depth 24.45	97.62	96.66	24.29	Jul-23	9.98	87.64
	97.62	96.66	24.29	Oct-23	10.77	86.85
91-2C Greenview measured Depth 16.49	97.63	96.66	16.52	Jul-23	12.07	85.56
	97.63	96.66	16.52	Oct-23	12.64	84.99
91-4A Greenview measured Depth 9.38	78.48	77.76	10.34	Jul-23	0.00	78.48
	78.48	77.76	10.34	Oct-23	0.88	77.60
95-1 Greenview measured Depth 4.64	100.72	99.67	5.63	Jul-23	2.30	98.42
	100.72	99.67	5.63	Oct-23	2.91	97.81
95-2A Greenview measured Depth 4.83	72.99	71.99	5.86	Jul-23	DRY	DRY
	72.99	71.99	5.86	Oct-23	DRY	DRY
95-2B Greenview measured Depth 7.50	73.07	71.97	8.41	Jul-23	1.86	71.21
	73.07	71.97	8.41	Oct-23	6.04	67.03
95-3B Greenview measured Depth 5.96	75.05	74.07	1.52	Jul-23	DRY	DRY
	75.05	74.07	1.52	Oct-23	DRY	DRY
95-4 Greenview measured Depth 4.51	105.41	104.38	5.58	Jul-23	3.61	101.80
	105.41	104.38	5.58	Oct-23	5.04	100.37

- Note: 1. Well depths based on Jp2g measurements in 2023
2. MW 95-3B was repaired by Greenview 2021 surveyed Nov 16, 2021
3. Elevations based on Greenview 2011 Survey
4. Elevations are assumed



Appendix F

Laboratory Certificates of Analysis 2023

C.O.C.: G 107342

REPORT No: 23-016597 - Rev. 0

Report To:

Jp2g Consultants Inc
 1150 Morrison Dr.
 Ottawa, ON K2H 8S9

CADUCEON Environmental Laboratories

2378 Holly Lane
 Ottawa, ON K1V 7P1

Attention: Nick Weston

DATE RECEIVED: 2023-Jul-06
 DATE REPORTED: 2023-Jul-21
 SAMPLE MATRIX: Ground Water


CUSTOMER PROJECT: Matawachan 22-6213B
 P.O. NUMBER:

Analyses	Qty	Site Analyzed	Authorized	Date Analyzed	Lab Method	Reference Method
Anions (Liquid)	6	OTTAWA	PCURIEL	2023-Jul-07	A-IC-01	SM 4110B
COD (Liquid)	6	KINGSTON	KWELCH	2023-Jul-11	COD-001	SM 5220D
Cond/pH/Alk Auto (Liquid)	6	OTTAWA	SBOUDREAU	2023-Jul-07	COND-02/PH-02/A LK-02	SM 2510B/4500H/ 2320B
Ion Balance (Calc.)	6	OTTAWA	STAILLON		CP-028	MECP E3196
ICP/MS (Liquid)	6	OTTAWA	TPRICE	2023-Jul-10	D-ICPMS-01	EPA 200.8
ICP/OES (Liquid)	6	OTTAWA	NHOGAN	2023-Jul-07	D-ICP-01	SM 3120B
Ammonia (Liquid)	6	KINGSTON	AMANIYA	2023-Jul-17	NH3-001	SM 4500NH3
Phenols (Liquid)	6	KINGSTON	KWELCH	2023-Jul-10	PHEN-01	MECP E3179
TP & TKN (Liquid)	6	KINGSTON	KDIBBITS	2023-Jul-17	TPTKN-001	MECP E3516.2
VOC-Volatiles Full (Water)	1	RICHMOND_HILL	FLENA	2023-Jul-11	C-VOC-02	EPA 8260

R.L. = Reporting Limit

NC = Not Calculated

Test methods may be modified from specified reference method unless indicated by an *

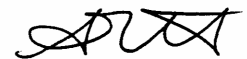


Steve Garrett
Director of Laboratory Services

CADUCEON Environmental Laboratories Certificate of Analysis

Final Report
REPORT No: 23-016597 - Rev. 0

Parameter	Units	R.L.	Client I.D.	95-2B	91-4A	91-2C	95-4	91-5
			Sample I.D.	23-016597-1	23-016597-2	23-016597-3	23-016597-4	23-016597-5
			Date Collected	2023-07-05	2023-07-05	2023-07-05	2023-07-05	2023-07-05
				-	-	-	-	-
Alkalinity(CaCO3) to pH4.5	mg/L	5		149	431	424	84	70
TDS (Calc. from Cond.)	mg/L	3		167	470	450	92	117
Chloride	mg/L	0.5		2.1	4.1	6.9	1.5	1.5
Sulphate	mg/L	1		22	67	46	15	39
Total Kjeldahl Nitrogen	mg/L	0.1	0.5	0.2	0.4	0.4	0.4	<0.1
Ammonia (N)-Total (NH3+NH4)	mg/L	0.05	<0.05	<0.05	0.08	<0.05	<0.05	<0.05
Phenolics	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
COD	mg/L	5	26	12	13	27	8	
Boron	mg/L	0.005	0.139	0.298	0.244	0.012	0.005	
Calcium	mg/L	0.02	50.7	132	127	28.6	33.2	
Iron	mg/L	0.005	0.011	0.017	0.148	0.090	0.529	
Magnesium	mg/L	0.02	6.61	24.2	22.7	2.68	4.74	
Manganese	mg/L	0.001	<0.001	0.023	0.637	0.038	0.099	
Potassium	mg/L	0.1	2.6	7.4	11.5	1.5	2.8	
Sodium	mg/L	0.2	9.6	14.1	13.9	1.0	1.2	
Strontium	mg/L	0.001	0.133	0.456	0.808	0.063	0.052	
Copper	mg/L	0.0001	0.0054	0.0049	0.0026	0.0143	0.0010	
Anion Sum	meq/L	-	3.53	10.1	9.63	2.04	2.26	
Cation Sum	meq/L	-	3.56	9.39	9.15	1.74	2.21	
% Difference	%	-	0.491	3.82	2.56	8.03	1.17	
Ion Ratio	-	-	0.990	1.08	1.05	1.17	1.02	



Steve Garrett
Director of Laboratory Services

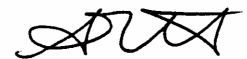
The analytical results reported herein refer to the samples as received. Reproduction of this analytical report in full or in part is prohibited without prior consent from Caduceon Environmental Laboratories.

CADUCEON Environmental Laboratories Certificate of Analysis

Final Report

REPORT No: 23-016597 - Rev. 0

Parameter	Client I.D.		95-2B	91-4A	91-2C	95-4	91-5
	Sample I.D.		23-016597-1	23-016597-2	23-016597-3	23-016597-4	23-016597-5
	Date Collected		2023-07-05	2023-07-05	2023-07-05	2023-07-05	2023-07-05
	Units	R.L.	-	-	-	-	-
Sodium Adsorption Ratio	-	-	0.337	0.296	0.298	0.0479	0.0537
TDS (Ion Sum Calc)	mg/L	1	185	509	484	101	125
TDS(calc.)/EC(actual)	-	-	0.570	0.574	0.568	0.559	0.547
Conductivity Calc	µmho/cm	-	341	860	829	189	232
Conductivity Calc / Conductivity	-	-	1.05	0.970	0.973	1.04	1.01
Langelier Index(25°C)	-	-	-0.286	0.772	0.989	-1.23	-1.40
Saturation pH (25°C)	-	-	7.54	6.71	6.73	7.99	8.02
pH (Client Data)	pH units	-	7.8	7.4	7.5	7.6	7.4
Temperature (Client Data)	°C	-	10.6	10.4	12.4	12.7	9.5



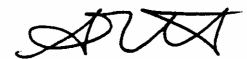
Steve Garrett
Director of Laboratory Services

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Final Report
REPORT No: 23-016597 - Rev. 0

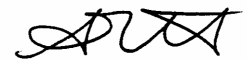
Parameter	Units	R.L.	Client I.D.
			Dup#1
			Sample I.D.
			23-016597-6
Date Collected	2023-07-05		
			-
Alkalinity(CaCO3) to pH4.5	mg/L	5	427
TDS (Calc. from Cond.)	mg/L	3	467
Chloride	mg/L	0.5	4.0
Sulphate	mg/L	1	66
Total Kjeldahl Nitrogen	mg/L	0.1	0.2
Ammonia (N)-Total (NH3+NH4)	mg/L	0.05	<0.05
Phenolics	mg/L	0.001	<0.001
COD	mg/L	5	8
Boron	mg/L	0.005	0.295
Calcium	mg/L	0.02	132
Iron	mg/L	0.005	0.012
Magnesium	mg/L	0.02	24.2
Manganese	mg/L	0.001	0.023
Potassium	mg/L	0.1	7.4
Sodium	mg/L	0.2	14.1
Strontium	mg/L	0.001	0.457
Copper	mg/L	0.0001	0.0029
Anion Sum	meq/L	-	10.0
Cation Sum	meq/L	-	9.39
% Difference	%	-	3.38
Ion Ratio	-	-	1.07



Steve Garrett
Director of Laboratory Services

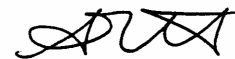
The analytical results reported herein refer to the samples as received. Reproduction of this analytical report in full or in part is prohibited without prior consent from Caduceon Environmental Laboratories.

Parameter	Units	R.L.	Client I.D.
			Dup#1
			Sample I.D.
			23-016597-6
			Date Collected
			2023-07-05
Parameter	Units	R.L.	
Sodium Adsorption Ratio	-	-	0.296
TDS (Ion Sum Calc)	mg/L	1	506
TDS(calc.)/EC(actual)	-	-	0.573
Conductivity Calc	µmho/cm	-	857
Conductivity Calc / Conductivity	-	-	0.970
Langelier Index(25°C)	-	-	0.849
Saturation pH (25°C)	-	-	6.71



Steve Garrett
 Director of Laboratory Services

Parameter	Units	R.L.	Client I.D.
			91-2C
			Sample I.D.
			23-016597-3
			Date Collected
			2023-07-05
			-
Acetone	µg/L	30	<30
Benzene	µg/L	0.5	<0.5
Bromodichloromethane	µg/L	2	<2
Bromoform	µg/L	5	<5
Bromomethane	µg/L	0.5	<0.5
Carbon Tetrachloride	µg/L	0.2	<0.2
Chlorobenzene	µg/L	0.5	<0.5
Chloroform	µg/L	1	<1
Dibromochloromethane	µg/L	2	<2
Ethylene Dibromide	µg/L	0.2	<0.2
Dichlorobenzene,1,2-	µg/L	0.5	<0.5
Dichlorobenzene,1,3-	µg/L	0.5	<0.5
Dichlorobenzene,1,4-	µg/L	0.5	<0.5
Dichlorodifluoromethane (Freon 12)	µg/L	2	<2
Dichloroethane,1,1-	µg/L	0.5	<0.5
Dichloroethane,1,2-	µg/L	0.5	<0.5
Dichloroethylene,1,1-	µg/L	0.5	<0.5
Dichloroethylene,1,2-cis-	µg/L	0.5	0.7
Dichloroethylene,1,2-trans-	µg/L	0.5	<0.5
Dichloropropane,1,2-	µg/L	0.5	<0.5
Dichloropropene,1,3-cis-	µg/L	0.5	<0.5

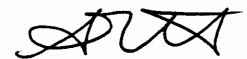


Steve Garrett
 Director of Laboratory Services

CADUCEON Environmental Laboratories Certificate of Analysis

Final Report
REPORT No: 23-016597 - Rev. 0

Parameter	Units	R.L.	Client I.D.
			91-2C
			Sample I.D.
			23-016597-3
			Date Collected
			2023-07-05
			-
Dichloropropene, 1,3-cis+trans- (Calculated)	µg/L	0.5	<0.5
Dichloropropene, 1,3-trans-	µg/L	0.5	<0.5
Ethylbenzene	µg/L	0.5	<0.5
Hexane	µg/L	5	<5
Dichloromethane (Methylene Chloride)	µg/L	5	<5
Methyl Ethyl Ketone	µg/L	20	<20
Methyl Isobutyl Ketone	µg/L	20	<20
Methyl tert-Butyl Ether (MTBE)	µg/L	2	<2
Styrene	µg/L	0.5	<0.5
Tetrachloroethane, 1,1,1,2-	µg/L	0.5	<0.5
Tetrachloroethane, 1,1,2,2-	µg/L	0.5	<0.5
Tetrachloroethylene	µg/L	0.5	<0.5
Toluene	µg/L	0.5	<0.5
Trichloroethane, 1,1,1,-	µg/L	0.5	<0.5
Trichloroethane, 1,1,2,-	µg/L	0.5	<0.5
Trichloroethylene	µg/L	0.5	<0.5
Trichlorofluoromethane (Freon 11)	µg/L	5	<5
Vinyl Chloride	µg/L	0.2	<0.2
Xylene, m,p-	µg/L	1	<1
Xylene, m,p,o-	µg/L	1.1	<1.1
Xylene, o-	µg/L	0.5	<0.5



Steve Garrett
Director of Laboratory Services

The analytical results reported herein refer to the samples as received. Reproduction of this analytical report in full or in part is prohibited without prior consent from Caduceon Environmental Laboratories.

C.O.C.: G 107342

REPORT No: 23-016595 - Rev. 0

Report To:

Jp2g Consultants Inc
 1150 Morrison Dr.
 Ottawa, ON K2H 8S9

CADUCEON Environmental Laboratories

2378 Holly Lane
 Ottawa, ON K1V 7P1

Attention: Nick Weston

DATE RECEIVED: 2023-Jul-06
 DATE REPORTED: 2023-Jul-21
 SAMPLE MATRIX: Surface Water

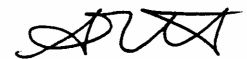
CUSTOMER PROJECT: Matawachan 22-6213B
 P.O. NUMBER:

Analyses	Qty	Site Analyzed	Authorized	Date Analyzed	Lab Method	Reference Method
Anions (Liquid)	1	OTTAWA	VKASYAN	2023-Jul-10	A-IC-01	SM 4110B
BOD5 (Liquid)	1	KINGSTON	MDUBIEN	2023-Jul-13	BOD-001	SM 5210B
COD (Liquid)	1	KINGSTON	KWELCH	2023-Jul-11	COD-001	SM 5220D
Cond/pH/Alk Auto (Liquid)	1	OTTAWA	SBOUDREAU	2023-Jul-07	COND-02/PH-02/A LK-02	SM 2510B/4500H/ 2320B
Ion Balance (Calc.)	1	OTTAWA	STAILLON		CP-028	MECP E3196
ICP/MS Total (Liquid)	1	OTTAWA	TPRICE	2023-Jul-11	D-ICPMS-01	EPA 6020
ICP/OES Total (Liquid)	1	OTTAWA	NHOGAN	2023-Jul-10	D-ICP-01	SM 3120B
Ammonia (Liquid)	1	KINGSTON	AMANIYA	2023-Jul-17	NH3-001	SM 4500NH3
Phenols (Liquid)	1	KINGSTON	KWELCH	2023-Jul-10	PHEN-01	MECP E3179
TP & TKN (Liquid)	1	KINGSTON	KDIBBITS	2023-Jul-14	TPTKN-001	MECP E3516.2

R.L. = Reporting Limit

NC = Not Calculated

Test methods may be modified from specified reference method unless indicated by an *



Steve Garrett
Director of Laboratory Services

CADUCEON Environmental Laboratories Certificate of Analysis

Final Report
REPORT No: 23-016595 - Rev. 0

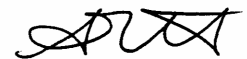
Parameter	Units	R.L.	Client I.D.
			SW3
			Sample I.D.
			23-016595-1
			Date Collected
			2023-07-05
			-
Alkalinity(CaCO3) to pH4.5	mg/L	5	154
TDS (Calc. from Cond.)	mg/L	3	166
Chloride	mg/L	0.5	7.2
Nitrate (N)	mg/L	0.05	0.15
Nitrite (N)	mg/L	0.05	<0.05
Sulphate	mg/L	1	5
BOD5	mg/L	3	<3
Phosphorus (Total)	mg/L	0.01	<0.01
Total Kjeldahl Nitrogen	mg/L	0.1	0.2
Ammonia (N)-Total (NH3+NH4)	mg/L	0.05	<0.05
Phenolics	mg/L	0.001	<0.001
COD	mg/L	5	10
Boron (Total)	mg/L	0.005	0.007
Calcium (Total)	mg/L	0.02	52.4
Iron (Total)	mg/L	0.005	0.063
Magnesium (Total)	mg/L	0.02	6.82
Manganese (Total)	mg/L	0.001	0.007
Potassium (Total)	mg/L	0.1	2.2
Sodium (Total)	mg/L	0.2	8.0
Strontium (Total)	mg/L	0.001	0.127
Zinc (Total)	mg/L	0.005	<0.005



Steve Garrett
Director of Laboratory Services

The analytical results reported herein refer to the samples as received. Reproduction of this analytical report in full or in part is prohibited without prior consent from Caduceon Environmental Laboratories.

Parameter	Units	R.L.	Client I.D.
			SW3
			Sample I.D.
			23-016595-1
			Date Collected
			2023-07-05
Parameter	Units	R.L.	
Cadmium (Total)	mg/L	0.000015	<0.000015
Copper (Total)	mg/L	0.0001	0.0008
Anion Sum	meq/L	-	3.40
Cation Sum	meq/L	-	3.59
% Difference	%	-	2.74
Ion Ratio	-	-	0.947
Sodium Adsorption Ratio	-	-	0.276
TDS (Ion Sum Calc)	mg/L	1	175
TDS(calc.)/EC(actual)	-	-	0.540
Conductivity Calc	µmho/cm	-	334
Conductivity Calc / Conductivity	-	-	1.03
Langelier Index(25°C)	-	-	0.364
Saturation pH (25°C)	-	-	7.51
pH (Client Data)	pH units	-	7.7
Temperature (Client Data)	°C	-	16.0



Steve Garrett
 Director of Laboratory Services

C.O.C.: G 110187

REPORT No: 23-030571 - Rev. 0

Report To:

Jp2g Consultants Inc
 1150 Morrison Dr.
 Ottawa, ON K2H 8S9

CADUCEON Environmental Laboratories

2378 Holly Lane
 Ottawa, ON K1V 7P1

Attention: Nick Weston

DATE RECEIVED: 2023-Oct-31
 DATE REPORTED: 2023-Nov-29
 SAMPLE MATRIX: Ground Water

CUSTOMER PROJECT: Matawachan 22-6213B
 P.O. NUMBER:

Analyses	Qty	Site Analyzed	Authorized	Date Analyzed	Lab Method	Reference Method
Anions (Liquid)	5	OTTAWA	LMACGREGOR	2023-Nov-15	A-IC-01	SM 4110B
COD (Liquid)	5	KINGSTON	EHINCH	2023-Nov-08	COD-001	SM 5220D
Cond/pH/Alk Auto (Liquid)	5	OTTAWA	SBOUDREAU	2023-Nov-06	COND-02/PH-02/A LK-02	SM 2510B/4500H/ 2320B
Ion Balance (Calc.)	5	OTTAWA	ASCHNEIDER		CP-028	MECP E3196
ICP/MS (Liquid)	5	OTTAWA	AOZKAYMAK	2023-Nov-03	D-ICPMS-01	EPA 200.8
ICP/OES (Liquid)	5	OTTAWA	NHOGAN	2023-Nov-01	D-ICP-01	SM 3120B
Ammonia & o-Phosphate (Liquid)	5	KINGSTON	KDIBBITS	2023-Nov-23	NH3-001	SM 4500NH3
Phenols (Liquid)	5	KINGSTON	JMACINNES	2023-Nov-28	PHEN-01	MECP E3179
TP & TKN (Liquid)	5	KINGSTON	KDIBBITS	2023-Nov-27	TPTKN-001	MECP E3516.2

R.L. = Reporting Limit

NC = Not Calculated

Test methods may be modified from specified reference method unless indicated by an *



Michelle Dubien
Data Specialist

CADUCEON Environmental Laboratories Certificate of Analysis

Final Report
REPORT No: 23-030571 - Rev. 0

Parameter	Units	R.L.	Client I.D.	95-2B	91-4A	91-2C	95-1	Dup#1
			Sample I.D.	23-030571-1	23-030571-2	23-030571-3	23-030571-4	23-030571-5
			Date Collected	2023-10-30	2023-10-30	2023-10-30	2023-10-30	2023-10-30
				-	-	-	-	-
Alkalinity(CaCO3) to pH4.5	mg/L	5		227	439	419	75	81
Conductivity @25°C	uS/cm	1		485	897	831	249	267
Chloride	mg/L	0.5		1.5	3.6	6.0	0.7	0.8
Sulphate	mg/L	1		29	58	38	45	48
Total Kjeldahl Nitrogen	mg/L	0.1		0.4	0.1	0.3	<0.1	<0.1
Ammonia (N)-Total (NH3+NH4)	mg/L	0.05		<0.05	<0.05	0.07	<0.05	<0.05
Phenolics	mg/L	0.001		<0.001	<0.001	<0.001	<0.001	<0.001
COD	mg/L	5		19	20	18	10	8
Calcium	mg/L	0.02		80.4	144	136	41.2	42.3
Iron	mg/L	0.005		0.008	0.019	0.114	1.27	1.13
Magnesium	mg/L	0.02		11.7	27.7	24.5	5.91	6.02
Manganese	mg/L	0.001		0.006	0.048	0.681	0.138	0.141
Potassium	mg/L	0.1		4.0	9.0	13.2	3.9	4.0
Sodium	mg/L	0.2		15.7	17.6	14.6	1.5	1.6
Strontium	mg/L	0.001		0.176	0.526	0.833	0.067	0.069
Copper	mg/L	0.0001		0.0034	0.0031	0.0014	0.0003	0.0010
Anion Sum	meq/L	-		5.22	10.1	9.35	2.46	2.65
Cation Sum	meq/L	-		5.76	10.5	9.82	2.78	2.84
% Difference	%	-		4.97	1.78	2.47	6.17	3.58
Ion Ratio	-	-		0.905	0.965	0.952	0.884	0.931
Sodium Adsorption Ratio	-	-		0.433	0.352	0.303	0.0571	0.0591



Michelle Dubien
Data Specialist

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CADUCEON Environmental Laboratories Certificate of Analysis

Final Report

REPORT No: 23-030571 - Rev. 0

Parameter	Client I.D.		95-2B	91-4A	91-2C	95-1	Dup#1
	Sample I.D.		23-030571-1	23-030571-2	23-030571-3	23-030571-4	23-030571-5
	Date Collected		2023-10-30	2023-10-30	2023-10-30	2023-10-30	2023-10-30
	Units	R.L.	-	-	-	-	-
TDS (Ion Sum Calc)	mg/L	1	280	525	485	145	153
TDS(calc.)/EC(actual)	-	-	0.578	0.586	0.584	0.581	0.573
Conductivity Calc	µmho/cm	-	511	903	847	269	282
Conductivity Calc / Conductivity	-	-	1.05	1.01	1.02	1.08	1.06
Langelier Index(25°C)	-	-	0.789	1.09	1.26	-0.412	-0.310
Saturation pH (25°C)	-	-	7.18	6.66	6.71	7.90	7.87
pH (Client Data)	pH units	-	7.3	6.8	7.3	7.7	
Temperature (Client Data)	°C	-	9.9	8.6	8.6	9.4	



Michelle Dubien
Data Specialist

The analytical results reported herein refer to the samples as received. Reproduction of this analytical report in full or in part is prohibited without prior consent from Caduceon Environmental Laboratories.



Appendix G

Chemistry Analysais 2023

Groundwater Quality**Project Name: Matawachan**

Monitor Number->	ODWS	91-2C					
		Jun-23	Oct-23				
Parameters mg/L							
Alkalinity(CaCO3) to pH4.5	30-500	424	419				
pH @25°C	6.5 - 8.5						
Conductivity @25°C			831				
TDS (Calc. from Cond.)		450					
Chloride	250	6.9	6				
Nitrate (N)	10						
Nitrite (N)	1						
Sulphate	500	46	38				
Phosphorus (Total)							
Total Kjeldahl Nitrogen		0.4	0.3				
Ammonia (N)-Total (NH3+NH4)		0.08	0.07				
Dissolved Organic Carbon	5						
Phenolics		<0.001	<0.001				
COD		13	18				
Hardness (as CaCO3)	500						
Aluminum	0.10						
Barium	1						
Boron	5	0.244					
Calcium		127	136				
Iron	0.3	0.148	0.114				
Magnesium		22.7	24.5				
Manganese	0.05	0.637	0.681				
Potassium		11.5	13.2				
Silicon							
Sodium	200	13.9	14.6				
Strontium		0.808	0.833				
Zinc	5						
Arsenic	0.01						
Cadmium	0.005						
Chromium	0.050						
Cobalt							
Copper	1	0.0026	0.0014				
Lead	0.01						
Mercury	0.001						
Anion Sum		9.63	9.35				
Cation Sum		9.15	9.82				
% Difference		2.56	2.47				
Ion Ratio		1.05	0.952				
Sodium Adsorption Ratio		0.298	0.303				
TDS (Ion Sum Calc)	500	484	485				
TDS(calc.)/EC(actual)		0.568	0.584				
Conductivity Calc		829	847				
Conductivity Calc / Conductivity		0.973	1.02				
Langelier Index(25°C)		0.989	1.26				
Saturation pH (25°C)		6.73	6.71				
Field Measured							
Water Temp. (°C)		12.4	8.6				
Conductivity (microS/cm)		940	930				
pH (pH units)		7.5	7.3				

Notes:

All values reported in mg/L unless otherwise noted

ODWS = Ontario Drinking Water Standards

Shaded values exceed ODWS

NS = No Sample

Groundwater Quality
Project Name: Matawachan

Monitor Number->	ODWS	91-4A				
		Jun-23	Jun-23	Oct-23		
Parameters mg/L			Dup #1			
Alkalinity(CaCO3) to pH4.5	30-500	431	427	439		
pH @25°C	6.5 - 8.5					
Conductivity @25°C				897		
TDS (Calc. from Cond.)		470	467			
Chloride	250	4.1	4	3.6		
Nitrate (N)	10					
Nitrite (N)	1					
Sulphate	500	67	66	58		
Phosphorus (Total)						
Total Kjeldahl Nitrogen		0.2	0.2	0.1		
Ammonia (N)-Total (NH3+NH4)		<0.05	<0.05	<0.05		
Dissolved Organic Carbon	5					
Phenolics		<0.001	<0.001	<0.001		
COD		12	8	20		
Hardness (as CaCO3)	500					
Aluminum	0.10					
Barium	1					
Boron	5	0.298	0.295			
Calcium		132	132	144		
Iron	0.3	0.017	0.012	0.019		
Magnesium		24.2	24.2	27.7		
Manganese	0.05	0.023	0.023	0.048		
Potassium		7.4	7.4	9		
Silicon						
Sodium	200	14.1	14.1	17.6		
Strontium		0.456	0.457	0.53		
Zinc	5					
Arsenic	0.01					
Cadmium	0.005					
Chromium	0.050					
Cobalt						
Copper	1	0.0049	0.0029	0.0031		
Lead	0.01					
Mercury	0.001					
Anion Sum		10.1	10	10.1		
Cation Sum		9.39	9.39	10.5		
% Difference		3.82	3.38	1.78		
Ion Ratio		1.08	1.07	0.965		
Sodium Adsorption Ratio		0.296	0.296	0.352		
TDS (Ion Sum Calc)	500	509	506	525		
TDS(calc.)/EC(actual)		0.574	0.573	0.586		
Conductivity Calc		860	857	903		
Conductivity Calc / Conductivity		0.97	0.97	1.01		
Langelier Index(25°C)		0.772	0.849	1.09		
Saturation pH (25°C)		6.71	6.71	6.66		
Field Measured						
Water Temp. (°C)		10.4		8.6		
Conductivity (microS/cm)		990		990		
pH (pH units)		7.4		6.8		

Notes:

All values reported in mg/L unless otherwise noted

ODWS = Ontario Drinking Water Standards

Shaded values exceed ODWS

NS = No Sample

Groundwater Quality
Project Name: Matawachan

Monitor Number->	ODWS	95-1				
		Jun-23	Oct-23	Oct-23		
Parameters mg/L				Dup #1		
Alkalinity(CaCO3) to pH4.5	30-500	70	75	81		
pH @25°C	6.5 - 8.5					
Conductivity @25°C			249	267		
TDS (Calc. from Cond.)		117				
Chloride	250	1.5	0.7	0.8		
Nitrate (N)	10					
Nitrite (N)	1					
Sulphate	500	39	45	48		
Phosphorus (Total)						
Total Kjeldahl Nitrogen		<0.1	<0.1	<0.1		
Ammonia (N)-Total (NH3+NH4)		<0.05	<0.05	<0.05		
Dissolved Organic Carbon	5					
Phenolics		<0.001	<0.001	<0.001		
COD		8	10	8		
Hardness (as CaCO3)	500					
Aluminum	0.10					
Barium	1					
Boron	5	0.005				
Calcium		33.2	41.2	42.3		
Iron	0.3	0.529	1.27	1.13		
Magnesium		4.74	5.91	6.02		
Manganese	0.05	0.099	0.138	0.141		
Potassium		2.8	3.9	4		
Silicon						
Sodium	200	1.2	1.5	1.6		
Strontium		0.05	0.07	0.069		
Zinc	5					
Arsenic	0.01					
Cadmium	0.005					
Chromium	0.050					
Cobalt						
Copper	1	0.001	0.0003	0.001		
Lead	0.01					
Mercury	0.001					
Anion Sum		2.26	2.46	2.65		
Cation Sum		2.21	2.78	2.84		
% Difference		1.17	6.17	3.58		
Ion Ratio		1.02	0.884	0.931		
Sodium Adsorption Ratio		0.0537	0.0571	0.0591		
TDS (Ion Sum Calc)	500	125	145	153		
TDS(calc.)/EC(actual)		0.547	0.581	0.573		
Conductivity Calc		232	269	282		
Conductivity Calc / Conductivity		1.01	1.08	1.06		
Langelier Index(25°C)		-1.4	-0.412	-0.31		
Saturation pH (25°C)		8.02	7.9	7.87		
Field Measured						
Water Temp. (°C)		9.5	9.4			
Conductivity (microS/cm)		310	310			
pH (pH units)		7.4	7.7			

Notes:

All values reported in mg/L unless otherwise noted

ODWS = Ontario Drinking Water Standards

Shaded values exceed ODWS

NS = No Sample

Groundwater Quality
Project Name: Matawachan

Monitor Number->	ODWS	95-2A					
		Jun-23	Oct-23				
Parameters mg/L							
Alkalinity(CaCO3) to pH4.5	30-500	NS	NS				
pH @25°C	6.5 - 8.5						
Conductivity @25°C							
TDS (Calc. from Cond.)							
Chloride	250						
Nitrate (N)	10						
Nitrite (N)	1						
Sulphate	500						
Phosphorus (Total)							
Total Kjeldahl Nitrogen							
Ammonia (N)-Total (NH3+NH4)							
Dissolved Organic Carbon	5						
Phenolics							
COD							
Hardness (as CaCO3)	500						
Aluminum	0.10						
Barium	1						
Boron	5						
Calcium							
Iron	0.3						
Magnesium							
Manganese	0.05						
Potassium							
Silicon							
Sodium	200						
Strontium							
Zinc	5						
Arsenic	0.01						
Cadmium	0.005						
Chromium	0.050						
Cobalt							
Copper	1						
Lead	0.01						
Mercury	0.001						
Anion Sum							
Cation Sum							
% Difference							
Ion Ratio							
Sodium Adsorption Ratio							
TDS (Ion Sum Calc)	500						
TDS(calc.)/EC(actual)							
Conductivity Calc							
Conductivity Calc / Conductivity							
Langelier Index(25°C)							
Saturation pH (25°C)							
Field Measured							
Water Temp. (°C)							
Conductivity (microS/cm)							
pH (pH units)							

Notes:

All values reported in mg/L unless otherwise noted

ODWS = Ontario Drinking Water Standards

Shaded values exceed ODWS

NS = No Sample

Groundwater Quality
Project Name: Matawachan

Monitor Number->	ODWS	95-2B					
		Jun-23	Oct-23				
Parameters mg/L							
Alkalinity(CaCO3) to pH4.5	30-500	149	227				
pH @25°C	6.5 - 8.5						
Conductivity @25°C			485				
TDS (Calc. from Cond.)		167					
Chloride	250	2.1	1.5				
Nitrate (N)	10						
Nitrite (N)	1						
Sulphate	500	22	29				
Phosphorus (Total)							
Total Kjeldahl Nitrogen		0.5	0.4				
Ammonia (N)-Total (NH3+NH4)		<0.05	<0.05				
Dissolved Organic Carbon	5						
Phenolics		<0.001	<0.001				
COD		26	19				
Hardness (as CaCO3)	500						
Aluminum	0.10						
Barium	1						
Boron	5	0.14					
Calcium		50.7	80.4				
Iron	0.3	0.01	0.01				
Magnesium		6.61	11.7				
Manganese	0.05	<0.001	0.01				
Potassium		2.6	4				
Silicon							
Sodium	200	9.6	16				
Strontium		0.133	0.176				
Zinc	5						
Arsenic	0.01						
Cadmium	0.005						
Chromium	0.050						
Cobalt							
Copper	1	0.005	0.003				
Lead	0.01						
Mercury	0.001						
Anion Sum		3.53	5.22				
Cation Sum		4	6				
% Difference		0	5				
Ion Ratio		0.99	0.905				
Sodium Adsorption Ratio		0.337	0.433				
TDS (Ion Sum Calc)	500	185	280				
TDS(calc.)/EC(actual)		0.57	0.578				
Conductivity Calc		341	511				
Conductivity Calc / Conductivity		1.05	1.05				
Langelier Index(25°C)		-0.29	0.79				
Saturation pH (25°C)		7.54	7.18				
Field Measured							
Water Temp. (°C)		10.6	9.9				
Conductivity (microS/cm)		400	580				
pH (pH units)		7.8	7.3				

Notes:

All values reported in mg/L unless otherwise noted

ODWS = Ontario Drinking Water Standards

Shaded values exceed ODWS

NS = No Sample

Groundwater Quality
Project Name: Matawachan

Monitor Number->	ODWS	95-3B					
		Jun-23	Oct-23				
Parameters mg/L							
Alkalinity(CaCO3) to pH4.5	30-500	NS	NS				
pH @25°C	6.5 - 8.5						
Conductivity @25°C							
TDS (Calc. from Cond.)							
Chloride	250						
Nitrate (N)	10						
Nitrite (N)	1						
Sulphate	500						
Phosphorus (Total)							
Total Kjeldahl Nitrogen							
Ammonia (N)-Total (NH3+NH4)							
Dissolved Organic Carbon	5						
Phenolics							
COD							
Hardness (as CaCO3)	500						
Aluminum	0.10						
Barium	1						
Boron	5						
Calcium							
Iron	0.3						
Magnesium							
Manganese	0.05						
Potassium							
Silicon							
Sodium	200						
Strontium							
Zinc	5						
Arsenic	0.01						
Cadmium	0.005						
Chromium	0.050						
Cobalt							
Copper	1						
Lead	0.01						
Mercury	0.001						
Anion Sum							
Cation Sum							
% Difference							
Ion Ratio							
Sodium Adsorption Ratio							
TDS (Ion Sum Calc)	500						
TDS(calc.)/EC(actual)							
Conductivity Calc							
Conductivity Calc / Conductivity							
Langelier Index(25°C)							
Saturation pH (25°C)							
Field Measured							
Water Temp. (°C)							
Conductivity (microS/cm)							
pH (pH units)							

Notes:

All values reported in mg/L unless otherwise noted

ODWS = Ontario Drinking Water Standards

Shaded values exceed ODWS

NS = No Sample

Groundwater Quality
Project Name: Matawachan

Monitor Number->	ODWS	95-4					
		Jun-23	Oct-23				
Parameters mg/L							
Alkalinity(CaCO3) to pH4.5	30-500	84	NS				
pH @25°C	6.5 - 8.5						
Conductivity @25°C							
TDS (Calc. from Cond.)		92					
Chloride	250	1.5					
Nitrate (N)	10						
Nitrite (N)	1						
Sulphate	500	15					
Phosphorus (Total)							
Total Kjeldahl Nitrogen		0.4					
Ammonia (N)-Total (NH3+NH4)		<0.05					
Dissolved Organic Carbon	5						
Phenolics		<0.001					
COD		27					
Hardness (as CaCO3)	500						
Aluminum	0.10						
Barium	1						
Boron	5	0.012					
Calcium		28.6					
Iron	0.3	0.09					
Magnesium		2.68					
Manganese	0.05	0.038					
Potassium		1.5					
Silicon							
Sodium	200	1					
Strontium		0.063					
Zinc	5						
Arsenic	0.01						
Cadmium	0.005						
Chromium	0.050						
Cobalt							
Copper	1	0.0143					
Lead	0.01						
Mercury	0.001						
Anion Sum		2.04					
Cation Sum		1.74					
% Difference		8.03					
Ion Ratio		1.17					
Sodium Adsorption Ratio		0.0479					
TDS (Ion Sum Calc)	500	101					
TDS(calc.)/EC(actual)		0.559					
Conductivity Calc		189					
Conductivity Calc / Conductivity		1.04					
Langelier Index(25°C)		-1.23					
Saturation pH (25°C)		7.99					
Field Measured							
Water Temp. (°C)		12.7					
Conductivity (microS/cm)		280					
pH (pH units)		7.6					

Notes:

All values reported in mg/L unless otherwise noted

ODWS = Ontario Drinking Water Standards

Shaded values exceed ODWS

NS = No Sample

Surface Water Quality
Project Name: Matawatchan

Monitor Number ->				SW 1					
Parameters	Limit	PWQO	CWQG	23-Jul	Oct-23				
Alkalinity(CaCO3) to pH4.5 pH @25°C	IPWQO	a		NS	NS				
Conductivity @25°C									
TDS (Calc. from Cond.)									
Chloride			120.00						
Nitrate (N)			3.000						
Nitrite (N)			0.600						
Sulphate									
BOD5									
Total Suspended Solids									
Phosphorus (Total)	IPWQO	0.030							
Total Kjeldahl Nitrogen									
Ammonia (N)-Total (NH3+NH4)									
Dissolved Organic Carbon									
Phenolics									
COD									
Hardness (as CaCO3)									
Barium (Total)									
Boron (Total)	IPWQO	0.200	1.500						
Calcium (Total)									
Iron (Total)	PWQO	0.300	0.300						
Magnesium (Total)									
Manganese (Total)									
Potassium (Total)									
Sodium (Total)									
Strontium (Total)									
Zinc (Total)	PWQO IPWQO	0.03 0.02	0.007						
Arsenic (Total)									
Cadmium (Total)	PWQO	0.00020	0.00009						
Chromium (Total)	PWQO	0.00100	0.00100						
Copper (Total)	PWQO IPWQO	0.005 d	Max 0.004 min 0.002 (based on hardness)						
Lead (Total)	PWQO	0.005	0.001						
Mercury	PWQO	0.0002	0.000026						
Anion Sum									
Cation Sum									
% Difference									
Ion Ratio									
Sodium Adsorption Ratio									
TDS (Ion Sum Calc)									
TDS(calc.)/EC(actual)									
Conductivity Calc									
Conductivity Calc / Conductivity									
Langelier Index(25°C)									
Saturation pH (25°C)									
Field Measured									
Water Temp. (°C)									
Conductivity (microS/cm)									
pH (pH units)		6.5 - 8.5	6.5 - 9						
DO									
FLOW L/S									

Notes:
 All values reported in mg/L unless otherwise noted
 PWQO- Provincial Water Quality Objectives
 CWQG - Canadian Water Quality Guidelines
 NS - No Sample Taken

Surface Water Quality
Project Name: Matawatchan

Monitor Number ->			SW 2				
Parameters	Limit	PWQO	23-Jul	Oct-23			
Alkalinity(CaCO3) to pH4.5	IPWQO	a	NS	NS			
pH @25°C							
Conductivity @25°C							
TDS (Calc. from Cond.)							
Chloride							
Nitrate (N)							
Nitrite (N)							
Sulphate							
BOD5							
Total Suspended Solids							
Phosphorus (Total)	IPWQO	0.030					
Total Kjeldahl Nitrogen							
Ammonia (N)-Total (NH3+NH4)							
Dissolved Organic Carbon							
Phenolics							
COD							
Hardness (as CaCO3)							
Barium (Total)							
Boron (Total)	IPWQO	0.200					
Calcium (Total)							
Iron (Total)	PWQO	0.300					
Magnesium (Total)							
Manganese (Total)							
Potassium (Total)							
Sodium (Total)							
Strontium (Total)							
Zinc (Total)	PWQO IPWQO	0.03 0.02					
Arsenic (Total)							
Cadmium (Total)	PWQO	0.00020					
Chromium (Total)	PWQO	0.00100					
Copper (Total)	PWQO IPWQO	0.005 d					
Lead (Total)	PWQO	0.005					
Mercury	PWQO	0.0002					
Anion Sum							
Cation Sum							
% Difference							
Ion Ratio							
Sodium Adsorption Ratio							
TDS (Ion Sum Calc)							
TDS(calc.)/EC(actual)							
Conductivity Calc							
Conductivity Calc / Conductivity							
Langelier Index(25°C)							
Saturation pH (25°C)							
Field Measured							
Water Temp. (°C)							
Conductivity (microS/cm)							
pH (pH units)		6.5 - 8.5					
DO							
FLOW L/S							

Notes:
 All values reported in mg/L unless otherwise noted
 PWQO- Provincial Water Quality Objectives
 CWQG - Canadian Water Quality Guidelines
 NS - No Sample Taken

Surface Water Quality
Project Name: Matawatchan

Monitor Number ->			SW 3				
Parameters	Limit	PWQO	23-Jul	Oct-23			
Alkalinity(CaCO3) to pH4.5 pH @25°C	IPWQO	a	154	NS			
Conductivity @25°C							
TDS (Calc. from Cond.)			166				
Chloride			7.2				
Nitrate (N)			0.15				
Nitrite (N)			<0.05				
Sulphate			5				
BOD5			<3				
Total Suspended Solids							
Phosphorus (Total)	IPWQO	0.030	<0.01				
Total Kjeldahl Nitrogen			0.2				
Ammonia (N)-Total (NH3+NH4)			<0.05				
Dissolved Organic Carbon							
Phenolics			<0.001				
COD			10				
Hardness (as CaCO3)							
Barium (Total)							
Boron (Total)	IPWQO	0.200	0.007				
Calcium (Total)			52.4				
Iron (Total)	PWQO	0.300	0.063				
Magnesium (Total)			6.82				
Manganese (Total)			0.007				
Potassium (Total)			2.2				
Sodium (Total)			8				
Strontium (Total)			0.127				
Zinc (Total)	PWQO IPWQO	0.03 0.02	<0.005				
Arsenic (Total)							
Cadmium (Total)	PWQO	0.00020	<0.000015				
Chromium (Total)	PWQO	0.00100					
Copper (Total)	PWQO IPWQO	0.005 d	0.0008				
Lead (Total)	PWQO	0.005					
Mercury	PWQO	0.0002					
Anion Sum			3.4				
Cation Sum			3.59				
% Difference			2.74				
Ion Ratio			0.947				
Sodium Adsorption Ratio			0.276				
TDS (Ion Sum Calc)			175				
TDS(calc.)/EC(actual)			0.54				
Conductivity Calc			334				
Conductivity Calc / Conductivity			1.03				
Langelier Index(25°C)			0.364				
Saturation pH (25°C)			7.51				
Field Measured							
Water Temp. (°C)			16				
Conductivity (microS/cm)			380				
pH (pH units)		6.5 - 8.5	7.7				
DO			6.3				
FLOW L/S			NA				

Notes:
 All values reported in mg/L unless otherwise noted
 PWQO- Provincial Water Quality Objectives
 CWQG - Canadian Water Quality Guidelines
 NS - No Sample Taken



Appendix H

Monitoring and Screening Checklist

Appendix D-Monitoring and Screening Checklist

General Information and Instructions

General Information: The checklist is to be completed, and submitted with the Monitoring Report.

Instructions: A complete checklist consists of:

- (a) a completed and signed checklist, including any additional pages of information which can be attached as needed to provide further details where indicated.
- (b) completed contact information for the Competent Environmental Practitioner (CEP)
- (c) self-declaration that CEP(s) meet(s) the qualifications as set out below and in Section 1.2 of the Technical Guidance Document.

Definition of Groundwater CEP:

For groundwater, the CEP must have expertise in hydrogeology and meet one of the following:

- (a) the person holds a licence, limited licence or temporary licence under the *Professional Engineers Act*; or
- (b) the person holds a certificate of registration under the *Professional Geoscientists Act, 2000* and is a practicing member, temporary, member or limited member of the Association of Professional Geoscientists of Ontario. O. Reg. 66/08, s. 2..

Definition of Surface water CEP:

A CEP for surface water assessments is a scientist, professional engineer or professional geoscientist as described in (a) and (b) above with demonstrated experience and post-secondary education, either a diploma or degree, in hydrology, aquatic ecology, limnology, aquatic biology, physical geography with specialization in surface water, and/or water resource management.

The type of scientific work that a CEP performs must be consistent with that person's education and experience. If an individual has appropriate training and credentials in both groundwater and surface water and is responsible for both areas of expertise, the CEP may then complete and validate both sections of the checklist.

Monitoring Report and Site Information	
Waste Disposal Site Name	Matawatchan WDS
Location (e.g. street address, lot, concession)	Part of Lot 13, Concession 5, geographic Township of Matawatchan, Township of Greater Madawaska
GPS Location (taken within the property boundary at front gate/ front entry)	NAD 83, UTM Zone 18, 333853E 5002303N
Municipality	Township of Greater Madawaska
Client and/or Site Owner	Township of Greater Madawaska
Monitoring Period (Year)	2023
This Monitoring Report is being submitted under the following:	
Environmental Compliance Approval Number:	ECA # A412204
Director's Order No.:	NA
Provincial Officer's Order No.:	NA
Other:	NA

Report Submission Frequency	<input checked="" type="radio"/> Annual <input type="radio"/> Other		
The site is: (Operation Status)	<input type="radio"/> Open <input type="radio"/> Inactive <input checked="" type="radio"/> Closed		
Does your Site have a Total Approved Capacity?	<input type="radio"/> Yes <input checked="" type="radio"/> No		
If yes, please specify Total Approved Capacity		<i>Units</i>	Cubic Metres
Does your Site have a Maximum Approved Fill Rate?	<input type="radio"/> Yes <input checked="" type="radio"/> No		
If yes, please specify Maximum Approved Fill Rate		<i>Units</i>	<input type="text"/>
Total Waste Received within Monitoring Period (Year)		<i>Units</i>	Cubic Metres
Total Waste Received within Monitoring Period (Year) <i>Methodology</i>			
Estimated Remaining Capacity		<i>Units</i>	Cubic Metres
Estimated Remaining Capacity <i>Methodology</i>			
Estimated Remaining Capacity <i>Date Last Determined</i>			
Non-Hazardous Approved Waste Types	<input checked="" type="checkbox"/> Domestic <input type="checkbox"/> Industrial, Commercial & Institutional (IC&I) <input type="checkbox"/> Source Separated Organics (Green Bin) <input type="checkbox"/> Tires	<input type="checkbox"/> Contaminated Soil <input type="checkbox"/> Wood Waste <input type="checkbox"/> Blue Box Material <input type="checkbox"/> Processed Organics <input type="checkbox"/> Leaf and Yard Waste	<input type="checkbox"/> Food Processing/Preparation Operations Waste <input type="checkbox"/> Hauled Sewage Other: <input type="text"/>
Subject Waste Approved Waste Classes: Hazardous & Liquid Industrial <i>(separate waste classes by comma)</i>			
Year Site Opened <i>(enter the Calendar Year only)</i>	1960	Current ECA Issue Date	April 1980 last amended Feb.2010
Is your Site required to submit Financial Assurance?	<input type="radio"/> Yes <input checked="" type="radio"/> No		
Describe how your Landfill is designed.	<input checked="" type="radio"/> Natural Attenuation only <input type="radio"/> Fully engineered Facility <input type="radio"/> Partially engineered Facility		
Does your Site have an approved Contaminant Attenuation Zone?	<input checked="" type="radio"/> Yes <input type="radio"/> No		

If closed, specify C of A, control or authorizing document closure date:

Has the nature of the operations at the site changed during this monitoring period?

- Yes
- No

If yes, provide details:

Have any measurements been taken since the last reporting period that indicate landfill gas volumes have exceeded the MOE limits for subsurface or adjacent buildings? (i.e. exceeded the LEL for methane)

- Yes
- No

Groundwater WDS Verification:

Based on all available information about the site and site knowledge, it is my opinion that:

Sampling and Monitoring Program Status:

<p>1) The monitoring program continues to effectively characterize site conditions and any groundwater discharges from the site. All monitoring wells are confirmed to be in good condition and are secure:</p>	<p><input checked="" type="radio"/> Yes</p> <p><input type="radio"/> No</p>	
<p>2) All groundwater, leachate and WDS gas sampling and monitoring for the monitoring period being reported on was successfully completed as required by Certificate(s) of Approval or other relevant authorizing/control document (s):</p>	<p><input type="radio"/> Yes</p> <p><input checked="" type="radio"/> No</p> <p><input type="radio"/> Not Applicable</p>	<p>If no, list exceptions below or attach information.</p>

Groundwater Sampling Location	Description/Explanation for change (change in name or location, additions, deletions)	Date
92-5A	Dry	July and October 2023
95-3B	Dry	July and October 2023
95-4	Dry	October 2023

3) a) Is landfill gas being monitored or controlled at the site?	<input type="radio"/> Yes <input checked="" type="radio"/> No
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If yes to 3(a), please answer the next two questions below.

b) Have any measurements been taken since the last reporting period that indicate landfill gas is present in the subsurface at levels exceeding criteria established for the site?	<input type="radio"/> Yes <input checked="" type="radio"/> No
--	--

c) Has the sampling and monitoring identified under 3(a) for the monitoring period being reported on was successfully completed in accordance with established protocols, frequencies, locations, and parameters developed as per the Technical Guidance Document:	<input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> Not Applicable	If no, list exceptions below or attach additional information.
--	--	--

Groundwater Sampling Location	Description/Explanation for change (change in name or location, additions, deletions)	Date
All sampling completed in general accordance with our sampling protocols		

4) All field work for groundwater investigations was done in accordance with standard operating procedures as established/outlined per the Technical Guidance Document (including internal/external QA/QC requirements) (Note: A SOP can be from a published source, developed internally by the site owner's consultant, or adopted by the consultant from another organization):	<input checked="" type="radio"/> Yes <input type="radio"/> No	All sampling completed in general accordance with our sampling protocols
--	--	--

Sampling and Monitoring Program Results/WDS Conditions and Assessment:

<p>5) The site has an adequate buffer, Contaminant Attenuation Zone (CAZ) and/or contingency plan in place. Design and operational measures, including the size and configuration of any CAZ, are adequate to prevent potential human health impacts and impairment of the environment.</p>	<p><input checked="" type="radio"/> Yes <input type="radio"/> No</p>		
<p>6) The site meets compliance and assessment criteria.</p>	<p><input checked="" type="radio"/> Yes <input type="radio"/> No</p>	All parameters met the Reasonable Use Criteria in 2023	
<p>7) The site continues to perform as anticipated. There have been no unusual trends/ changes in measured leachate and groundwater levels or concentrations.</p>	<p><input checked="" type="radio"/> Yes <input type="radio"/> No</p>	Site closed in 2009 , however it is noted that there have been no unusual trends or changes since 2009.	
<p>1) Is one or more of the following risk reduction practices in place at the site:</p> <p>(a) There is minimal reliance on natural attenuation of leachate due to the presence of an effective waste liner and active leachate collection/ treatment; or</p> <p>(b) There is a predictive monitoring program in-place (modeled indicator concentrations projected over time for key locations); or</p> <p>(c) The site meets the following two conditions (typically achieved after 15 years or longer of site operation):</p> <p><i>i.</i> The site has developed stable leachate mound(s) and stable leachate plume geometry/concentrations; and</p> <p><i>ii.</i> Seasonal and annual water levels and water quality fluctuations are well understood.</p>	<p><input checked="" type="radio"/> Yes <input type="radio"/> No</p>	<p>Note which practice(s):</p>	<p><input type="checkbox"/> (a) <input type="checkbox"/> (b) <input checked="" type="checkbox"/> (c)</p>
<p>9) Have trigger values for contingency plans or site remedial actions been exceeded (where they exist):</p>	<p><input type="radio"/> Yes <input checked="" type="radio"/> No <input type="radio"/> Not Applicable</p>		

Groundwater CEP Declaration:

I am a licensed professional Engineer or a registered professional geoscientist in Ontario with expertise in hydrogeology, as defined in Appendix D under Instructions. Where additional expertise was needed to evaluate the site monitoring data, I have relied on individuals who I believe to be experts in the relevant discipline, who have co-signed the compliance monitoring report or monitoring program status report, and who have provided evidence to me of their credentials.

I have examined the applicable Certificate of Approval and any other environmental authorizing or control documents that apply to the site. I have read and followed the Monitoring and Reporting for Waste Disposal Sites Groundwater and Surface Water Technical Guidance Document (MOE, 2010, or as amended), and associated monitoring and sampling guidance documents, as amended from time to time. I have reviewed all of the data collected for the above-referenced site for the monitoring period(s) identified in this checklist. Except as otherwise agreed with the ministry for certain parameters, all of the analytical work has been undertaken by a laboratory which is accredited for the parameters analysed to *ISO/IEC 17025:2005 (E)- General requirements for the competence of testing and calibration laboratories*, or as amended from time to time by the ministry.

If any exceptions or potential concerns have been noted in the questions in the checklist attached to this declaration, it is my opinion that these exceptions and concerns are minor in nature and will be rectified for the next monitoring/reporting period. Where this is not the case, the circumstances concerning the exception or potential concern and my client's proposed action have been documented in writing to the Ministry of the Environment District Manager in a letter from me dated:

Recommendations:

Based on my technical review of the monitoring results for the waste disposal site:

<p><input checked="" type="radio"/> No changes to the monitoring program are recommended</p> <p><input type="radio"/> The following change(s) to the monitoring program is/are recommended:</p>	Continue to monitor with no changes from 2023 monitoring program
<p><input checked="" type="radio"/> No Changes to site design and operation are recommended</p> <p><input type="radio"/> The following change(s) to the site design and operation is/are recommended:</p>	

Name:	Andrew Buzza, P.Geo Note: Report signed and stamped.		
Seal:	Add Image		
Signature:	<input type="text"/>	Date:	March 2024
CEP Contact Information:	Andrew Buzza, p.Geo		
Company:	Jp2g Consultants Inc.		
Address:	1150 Morrison Drive Suite 410 Ottawa ON K2H 8S9		
Telephone No.:	613 828-7800	Fax No. :	613 828-2600
E-mail Address:	andrewb@jp2g.com		
Co-signers for additional expertise provided:			
Signature:	<input type="text"/>	Date:	
Signature:	<input type="text"/>	Date:	

Surface Water WDS Verification:

Provide the name of surface water body/bodies potentially receiving the WDS effluent and the approximate distance to the waterbody (including the nearest surface water body/bodies to the site):

Name (s)	Un-named intermittent creek
Distance(s)	Approximately 120m south of the site

Based on all available information and site knowledge, it is my opinion that:

Sampling and Monitoring Program Status:

1) The current surface water monitoring program continues to effectively characterize the surface water conditions, and includes data that relates upstream/background and downstream receiving water conditions:	<input checked="" type="radio"/> Yes <input type="radio"/> No	
2) All surface water sampling for the monitoring period being reported was successfully completed in accordance with the Certificate(s) of Approval or relevant authorizing/control document(s) (if applicable):	<input type="radio"/> Yes <input checked="" type="radio"/> No <input type="radio"/> Not applicable (No C of A, authorizing / control document applies)	If no, specify below or provide details in an attachment.

Surface Water Sampling Location	Description/Explanation for change (change in name or location, additions, deletions)	Date
SW-1	Dry	July and October 2023
SW-2	Not sampled	July and October 2023
SW-3	Not sampled	October 2023

<p>3) a) Some or all surface water sampling and monitoring program requirements for the monitoring period have been established outside of a ministry C of A or authorizing/control document.</p>	<p><input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Not Applicable</p>	
<p>b) If yes, all surface water sampling and monitoring identified under 3 (a) was successfully completed in accordance with the established program from the site, including sampling protocols, frequencies, locations and parameters) as developed per the Technical Guidance Document:</p>	<p><input checked="" type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Not Applicable</p>	<p>If no, specify below or provide details in an attachment.</p>
<p>Surface Water Sampling Location</p>	<p>Description/Explanation for change (change in name or location, additions, deletions)</p>	<p>Date</p>
<p>All surface water sampling completed in general accordance with our sampling procedures.</p>		
<p>4) All field work for surface water investigations was done in accordance with standard operating procedures, including internal/external QA/QC requirements, as established/outlined as per the Technical Guidance Document, MOE 2010, or as amended. (Note: A SOP can be from a published source, developed internally by the site owner's consultant, or adopted by the consultant from another organization):</p>	<p><input checked="" type="radio"/> Yes <input type="radio"/> No</p>	<p>All surface water sampling completed in general accordance with our sampling procedures.</p>

Sampling and Monitoring Program Results/WDS Conditions and Assessment:

5) The receiving water body meets surface water-related compliance criteria and assessment criteria: i.e., there are no exceedances of criteria, based on MOE legislation, regulations, Water Management Policies, Guidelines and Provincial Water Quality Objectives and other assessment criteria (e.g., CWQGs, APVs), as noted in Table A or Table B in the Technical Guidance Document (Section 4.6):	<input checked="" type="radio"/> Yes <input type="radio"/> No
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If no, list parameters that exceed criteria outlined above and the amount/percentage of the exceedance as per the table below or provide details in an attachment:

Parameter	Compliance or Assessment Criteria or Background	Amount by which Compliance or Assessment Criteria or Background Exceeded
e.g. Nickel	e.g. C of A limit, PWQO, background	e.g. X% above PWQO

6) In my opinion, any exceedances listed in Question 5 are the result of non-WDS related influences (such as background, road salting, sampling site conditions)?	<input checked="" type="radio"/> Yes <input type="radio"/> No	
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<p>7) All monitoring program surface water parameter concentrations fall within a stable or decreasing trend. The site is not characterized by historical ranges of concentrations above assessment and compliance criteria.</p>	<p><input checked="" type="radio"/> Yes</p> <p><input type="radio"/> No</p>	
<p>8) For the monitoring program parameters, does the water quality in the groundwater zones adjacent to surface water receivers exceed assessment or compliance criteria (e.g., PWQOs, CWQGs, or toxicity values for aquatic biota (APVs)):</p>	<p><input type="radio"/> Yes</p> <p><input checked="" type="radio"/> No</p> <p><input type="radio"/> Not Known</p> <p><input type="radio"/> Not Applicable</p>	<p>Overall the results of the surface and groundwater sampling do not indicate that the landfill activities before site closure at this location is having a negative effect on the surface water around the Landfill site.</p>
<p>9) Have trigger values for contingency plans or site remedial actions been exceeded (where they exist):</p>	<p><input type="radio"/> Yes</p> <p><input checked="" type="radio"/> No</p> <p><input type="radio"/> Not Applicable</p>	

Surface Water CEP Declaration:

I, the undersigned hereby declare that I am a Competent Environmental Practitioner as defined in Appendix D under Instructions, holding the necessary level of experience and education to design surface water monitoring and sampling programs, conduct appropriate surface water investigations and interpret the related data as it pertains to the site for this monitoring period.

I have examined the applicable Certificate of Approval and any other environmental authorizing or control documents that apply to the site. I have read and followed the Monitoring and Reporting for Waste Disposal Sites Groundwater and Surface Water Technical Guidance Document (MOE, 2010, or as amended) and associated monitoring and sampling guidance documents, as amended from time to time. I have reviewed all of the data collected for the above-referenced site for the monitoring period(s) identified in this checklist. Except as otherwise agreed with the ministry for certain parameters, all of the analytical work has been undertaken by a laboratory which is accredited for the parameters analysed to *ISO/IEC 17025:2005 (E)- General requirements for the competence of testing and calibration laboratories*, or as amended from time to time by the ministry.

If any exceptions or potential concerns have been noted in the questions in the checklist attached to this declaration, it is my opinion that these exceptions and concerns are minor in nature or will be rectified for future monitoring events. Where this is not the case, the circumstances concerning the exception or potential concern and my client's proposed action have been documented in writing to the Ministry of the Environment District Manager in a letter from me dated:

Recommendations:

Based on my technical review of the monitoring results for the waste disposal site:

<p><input checked="" type="radio"/> No Changes to the monitoring program are recommended</p> <p><input type="radio"/> The following change(s) to the monitoring program is/are recommended:</p>	<p>Continue to monitor with no changes from 2023 monitoring program</p>
<p><input type="radio"/> No changes to the site design and operation are recommended</p> <p><input checked="" type="radio"/> The following change(s) to the site design and operation is/are recommended:</p>	

CEP Signature	
Relevant Discipline	Education with 30 years experience
Date:	March 2024
CEP Contact Information:	Andrew Buzzza, P.Geo
Company:	Jp2g Consultants Inc.
Address:	1150 Morrison Drive Suite 410 Ottawa ON K2H 8S9
Telephone No.:	613 828-7800
Fax No. :	613 828-2600
E-mail Address:	andrewb@jp2g.com
Save As	Print Form