2023 ANNUAL GROUNDWATER AND SURFACE WATER MONITORING REPORT

HAILEYBURY WASTE DISPOSAL SITE

THE CITY OF TEMISKAMING SHORES
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PROJECT NO.: TY131010
DATE: APRIL 2024

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1 INTRODUCTION

WSP Canada Inc. (WSP), formerly known as Wood Environment & Infrastructure Solutions, was retained by The City of Temiskaming Shores (the City) to prepare the 2023 annual groundwater and surface water monitoring report for the Haileybury Waste Disposal Site (the Site). The following report provides a detailed evaluation and summary of the 2023 monitoring data and was completed to constitute the 2023 Annual Monitoring Report to be submitted to the Ministry of the Environment, Conservation and Parks (MECP) in accordance with Subsection 6 of Condition 6 of Certificate of Approval (C of A) No. A570402, provided in Appendix A. This document also includes inferred groundwater flow directions and a review of the historical and current groundwater and surface water geochemical data and geochemical trends. The groundwater quality is evaluated with respect to MECP Guideline B-7 and both groundwater and surface water are assessed according to a previously established Trigger Mechanism for the Site.

1.1 SITE LOCATION

The Site is located approximately 9 kilometres (km) southwest of Haileybury, Ontario, Lot 1, Concession 2, within the City of Temiskaming Shores, in the District of Temiskaming. The Universal Transverse Mercator (UTM) coordinates of the Site are 593843 Easting and 5252782 Northing, Zone 17, relative to the North American Datum (NAD) 1983 (collected via handheld Global Positioning System (GPS), accuracy +/- 5 metres (m)). The location of the Site is presented on Figure 1; a Site plan, including all monitoring locations, is presented as Figure 2.

1.2 OWNERSHIP AND KEY PERSONNEL

Contact information for the Site contact representative and the Competent Environmental Practitioner (CEP) for both groundwater and surface water is outlined below.

Site Contact Representative:

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1.3 DESCRIPTION AND DEVELOPMENT OF THE SITE

The Site is operated under Provisional C of A No. A570402, issued on 10 November 1998 and amended on 10 November 1999, 27 April 2009 and 18 December 2009. The Provisional C of A allows for the use of a 5.8 hectare (ha) waste fill area within a total Site area of 32.4 ha (Appendix A), as illustrated on Figure 3. The Site was originally approved in 1998, but had been in operation prior to that time, since 1975 (Story Environmental Inc. (Story), 2013). The Site ceased accepting waste from the public on October 17, 2023. The Site was approved to accept solid non-hazardous municipal waste for disposal and had a maximum approved capacity of 470,000 cubic metres (m^3), including daily and intermediate cover. The service area for the Site included the City of Temiskaming Shores and the Town of Cobalt. Closure activities will be acquired in early 2024 and are set to begin in the spring of 2024.

The City completed the acquisition of additional land downgradient of the Site in the fall of 2013. The negotiations for the acquisition had been ongoing since 2004, at which time the City was issued a letter of non-compliance by the MECP and was required to obtain all applicable property for the use of a 28 ha Contaminant Attenuation Zone (CAZ). The purchase of this property was passed as By-Law No. 2013-198 in December 2013. The locations of the property purchased in 2013 and the CAZ are illustrated on Figure 4.

No operations problems were encountered at the Site in 2023, and no complaints were received. As required by the C of A, a battery-operated methane gas monitor is installed at the Site in order to ensure that the Site building is free of any potential landfill gas accumulation.

1.3.1 WASTE QUANTITIES RECEIVED

As weigh scales are not in place at the Site, daily records are kept in order to estimate the amount of uncompacted waste received at the Site. The Haileybury Landfill accepted approximately 24,658 m^3 of uncompacted waste in 2023. Monthly estimates of uncompacted waste are illustrated below in Table 1.

All refrigerators received at the Haileybury Landfill are tagged by licensed technicians, indicating that all potential ozone depleting substances (i.e., refrigerants) have been removed.

1.3.2 ON-SITE RESOURCE RECOVERY ACTIVITIES

Designated resource recovery areas are available at the landfill.

Tires: Tires are accepted at the Site in a designated area and stockpiled for shipment to a recycler. The number of tires collected from the landfill during 2023 and sent for recycling is unknown, as the City is not provided with this information under the new Full Producer Responsibility Program.

Scrap Metal: Scrap metal is accepted at the Site in a designated area and is sorted and removed from the Site regularly for recycling. Approximately 138.04 tonnes of scrap metal was transferred off-Site during 2023.

Table 1 – Waste Quantities Received in 2023

MONTH	TOTAL ANNUAL UNCOMPACTED WASTE (M3)
January	2,204
February	1,933
March	2,136

MONTH	TOTAL ANNUAL UNCOMPACTED WASTE (M3)
April	2,206
May	3,189
June	3,249
July	3,028
August	2,725
September	2,771
October	768
November	449
December	0
ANNUAL TOTAL	24,658

1.3.3 SITE CAPACTIY

Occasional topographical surveys are conducted at the Site in order to accurately track the landfill capacity consumed and remaining, and the associated estimated remaining life span of the Site. The remaining capacity of the Site is estimated on an annual basis, however an accurate estimate can only be calculated on the years that a Site survey is undertaken.

The most recent topographical survey conducted at the Site was undertaken on 25 March 2021 by Exp Services Inc. (Exp). No survey was completed in 2023, therefore contours within the fill area obtained from the 2021 survey are presented on Figure 3. The 2021 topographical survey was completed by Exp in conjunction with a technical memorandum dated 6 April 2021, which outlines the estimated site life of the landfill. Exp has calculated the available remaining capacity of the Site to be approximately 40,176 m^3 at the time of the March 2021 survey. However, Exp indicated that of the 40,176 m^3 remaining capacity, 29,557 m^3 will be difficult to fill with refuse and capped. This leaves only 10,619 m^3 of remaining feasible capacity. Exp used a waste generation rate of 21,703 m^3, estimated historically by Wood as part of a separate study, to calculate an approximate remaining life span of 5.8 months as of March 2021. Exp recommended that the City obtain a detailed survey of the landfill immediately prior to the estimated closure date of September 2021.

The Site ceased accepting waste from the public as of October 17, 2023. To determine the status of the site capacity, it is recommended that a topographical survey be conducted of the fill area in relation to the final Site contours.

1.4 MONITORING AND REPORTING PROGRAM OBJECTIVES AND REQUIREMENTS

In accordance with MECP correspondence dated 24 July 2020, various changes were made to the annual monitoring program since the 2021 monitoring period. All monitoring wells were sampled during all three sampling events; an additional downgradient monitoring well was installed prior to the spring 2021 sampling event, situated northwest of TW-15; and analyses of trends and Guideline B-7 will include nitrate, iron and manganese.

Previous investigations resulted in the instrumentation of the Site with a variety of groundwater monitoring wells and identification of the three existing surface water monitoring stations (SW-3 through SW-5). A total of 15 monitoring wells, including the newly installed monitoring well (MW21-01), are currently used for monitoring purposes and two additional wells have been confirmed destroyed (TW-1 and TW-3). Twelve of the 15 wells currently comprising the monitoring network are sampled three times annually (TW-4, TW-6, TW-8, TW-9, TW-10, TW-12, TW-13, TW-14, TW-15, TW-16, TW-17 and MW21-01). The other three remaining wells are not sampled, but are retained for water level measurements (TW-5, TW-7 and TW-11). Static groundwater levels are measured at each of the 15 wells in the monitoring network during each of the three annual monitoring events. Surface water is sampled concurrently with groundwater during the spring and fall events. The locations of groundwater and surface water monitoring stations composing the monitoring network are presented on Figure 2.

2 PHYSICAL SETTING

2.1 GEOLOGY AND HYDROGEOLOGY

Borehole logs detailing soil and groundwater conditions for the monitoring well network are provided in Appendix B. In summary, the subsurface conditions at the Site consist of sand and gravel over bedrock, with an additional layer of till between the sand unit and bedrock in some areas (Story, 2013). Bedrock outcrops are reported along the northern and eastern boundaries of the Site, with depths to bedrock in mid-Site areas varying from 16 m to 22 m below original grade (Story, 2013). The bedrock surface is reported to slope from the north and east towards the southwest (Story, 2013).

Static water levels were recorded by WSP at each of the wells during the spring, summer and fall 2023 groundwater monitoring events. Appendix C presents the groundwater elevations measured during the 2023 groundwater monitoring events. Figures 5A through 5C present the inferred groundwater elevation contours and groundwater flow directions for the 2023 monitoring events. In general, the recorded static groundwater levels indicate groundwater flow across the Site towards the west. The inferred groundwater flow direction appears to mimic the reported bedrock elevation contours, as described by Story (Story, 2013).

2.2 SURFACE WATER FEATURES

Surface water features on-Site include a small, intermittent stream, which flows from a swampy area east of the Site, and along the southern Site boundary, discharging to an unnamed tributary to South Wabi Creek after crossing Firstbrooke Line Road. The unnamed tributary is situated southwest of the Site, west of both Firstbrooke Line Road and the Trans Canada Pipeline right-of-way, and flows to the northwest, discharging to South Wabi Creek, which eventually discharges to Moose Lake before flowing into Lake Temiskaming via Wabi Creek.

3 DESCRIPTION OF MONITORING PROGRAM

3.1 MONITORING LOCATIONS

All monitoring locations for groundwater and surface water are illustrated on Figure 2. Detailed locations are provided in Table 2. Monitoring well elevations for top of casing are provided in Appendix C.

Table 2 – Monitoring Locations On-Site

MONITORING LOCATION	EASTING Zone 16 NAD 83	NORTHING Zone 16 NAD 83	COLLECTION METHOD	ACCURACY	COLLECTION PERSONNEL	DATE COLLECTED
TW-4	593656	5252867	Handheld GPS	+/- 5 m	Trained WSP field crew	26 May 2013
TW-5	593835	5252876				
TW-6	593605	5252915				
TW-7	593553	5252777				
TW-8	593910	5253100				
TW-9	593553	5252965				
TW-10	593486	5252824				
TW-11	593519	5252961				
TW-12	593356	5252963				
TW-13	593472	5253010				
TW-14	593381	5252937				
TW-15	593369	5253024				
TW-16	593282	5252995				
TW-17	593517	5252798				
MW21-01	593261	5253075				10 April 2021
SW-3	593258	5252942				26 May 2013
SW-4	593538	5252661				
SW-5	593843	5252782				

According to the groundwater elevation data collected to date, TW-8 is considered unlikely to be impacted by landfill leachate since it is located east and upgradient of the Site. TW-8 is therefore considered to be representative of background (i.e., non-impacted) water quality conditions, and allows a determination of Site compliance to be undertaken using MECP Guideline B-7.

Wells TW-4 and TW-6 are situated within the fill area and are consequently considered to be source monitoring wells. Located slightly downgradient of the waste fill area, wells TW-9 and TW-13 are representative of immediate downgradient water quality conditions. Wells TW-12, TW-14, TW-15,TW-16, and MW21-01 are located further downgradient of the waste deposits, with MW21-01 being representative of the downgradient property boundary,

as it is situated the furthest downgradient of the Site and within the property comprising the CAZ. Wells TW-10 and TW-17 are situated in a position crossgradient of the Site, as the inferred groundwater flow direction is toward the northwest in the vicinity of these wells.

Table 3 presents a summary of the available construction details and respective on-Site positions of the groundwater monitoring wells. Construction details are based on borehole logs prepared by others (Appendix B).

Table 3 – Groundwater Monitoring Well Construction Details

WELL ID	CONDITION	TOTAL DEPTH (mbgs)	SCREENED INTERVAL (mbgs)	UNIT SCREENED	ON-SITE POSITION
TW-3	Destroyed prior to spring 2015 monitoring event.				
TW-4	Good	10.67	7.67 – 10.67	Sand	Source
TW-6	Good	8.84	8.84 - 7.34	Sand	Source
TW-8	Good	2.44	0.94 – 2.44	Sand	Upgradient
TW-9	Good	12.95	11.45 – 12.95	Sand	Downgradient
TW-10	Good	6.7	5.2 – 6.7	Sand	Crossgradient
TW-12	Good	8.7	7.2 – 8.7	Sand and Bedrock	Downgradient
TW-13	Good	14.7	11.7 – 14.7	Sand	Downgradient
TW-14	Good	13.7	10.7 – 13.7	Sand	Downgradient
TW-15	Good	13.1	10.1 – 13.1	Sand	Downgradient
TW-16	Good	7.7	6.2 – 7.7	Sand	Downgradient
TW-17	Good	4.0	2.5 – 4.0	Silt	Crossgradient
MW21-01	Good	12.9	9.85 - 12.9	Silty Sand with cobbles	Downgradient

Table 4 presents a summary of the surface water monitoring locations. Surface water monitoring stations SW-3 and SW-4 are situated along the unnamed tributary to South Wabi Creek and are representative of downstream and upstream water quality conditions, respectively. Station SW-5 is situated adjacent to the Site, at the intermittent stream, on the downstream side of the Site access road. Locations of all sampling stations are indicated on Figure 2.

Table 4 – Surface Water Monitoring Stations Summary

STATION ID	WATERCOURSE	POSITION
SW-3	Unnamed Tributary to South Wabi Creek	Downstream
SW-4	Unnamed Tributary to South Wabi Creek	Upstream
SW-5	Intermittent Stream	Adjacent to Site

3.2 MONITORING FREQUENCY

As per previous annual monitoring events, groundwater was sampled three times annually by WSP, during the spring, summer and fall of 2023, and surface water was sampled two times, in the spring and fall. Sampling events occurred on the following dates:

- Spring – 19 June 2023;
- Summer – 28 August 2023; and,
- Fall – 16/17 October 2023.

3.3 FIELD AND LABORATORY PARAMETERS AND ANALYSIS

Geochemical analyses for general chemistry, metals and nitrogen cycle parameters were completed on all samples collected. A detailed list of laboratory results for these parameters is included in Appendix D. Field parameters for both groundwater and surface water comprised temperature, pH, conductivity and dissolved solids. Static water level measurements were also recorded for groundwater. All field equipment was maintained and calibrated appropriately prior to each use.

3.4 MONITORING PROCEDURES AND METHODS

Monitoring and sample collection followed typical industry standard practices. Each groundwater monitoring well was purged prior to sampling to ensure the sample was representative of the formation water. Dedicated well instrumentation (Waterra Tube and foot valve system) was used to obtain water samples from the groundwater monitoring wells, and samples were immediately transferred to laboratory-prepared sample vials and bottles. Samples identified for heavy metals analysis were field-filtered using a single use 0.45 □m filter unit, and the remaining samples were preserved following standard laboratory protocols as established in the MECP "*Guidance on Sampling for Use at Contaminated Sites in Ontario*" (revised December 1996). Care was taken during collection of surface water samples to ensure that a representative sample was collected, and that underlying sediments were not disturbed.

Samples were submitted under chain of custody, in a temperature controlled setting (i.e., in a cooler, on ice) to a Canadian Association for Laboratory Accreditation (CALA) accredited laboratory sub-contractor, SGS Canada Inc. (SGS), in Lakefield, Ontario for analysis. The analytical results were subsequently forwarded to WSP. Laboratory analytical reports for 2023 are provided in Appendix D.

The 2023 groundwater monitoring data were reviewed by comparison to the current MECP Ontario Drinking Water Standards (ODWS). Environmental compliance of groundwater quality was evaluated according to MECP Guideline B-7. The 2023 surface water monitoring data were reviewed by comparison to the current MECP Provincial Water Quality Objectives (PWQO), as well as the Canadian Water Quality Guidelines (CWQG) and the Aquatic Protection Values (APV) from Table 3.1 of the 2011 MECP document *Rationale for the Development of Soil and Groundwater Standards for use at Contaminated Sites in Ontario*.

3.5 QUALITY ASSURANCE FOR SAMPLING AND ANALYSIS

WSP uses recognized industry standards, including the Canadian Council of Ministers of the Environment (CCME) *Subsurface Assessment Handbook for Contaminated Sites and MECP's manual Guidance on Sampling and*

Analytical Methods for Use at Contaminated Sites in Ontario for conducting environmental assessments. For quality assurance, all work is supervised and internally reviewed by senior staff members.

Field sampling equipment decontamination was completed in accordance with accepted protocols. As a minimum, non-dedicated sampling equipment was washed with detergent solution and rinsed with distilled water between sampling locations. Decontamination procedures were undertaken to prevent any cross-contamination between monitoring locations and sampling sites. Screening instruments were calibrated prior to each use.

As a minimum, for every ten groundwater or surface water samples collected, one field duplicate sample was collected and included in the laboratory submission for analysis. Three field duplicate samples were collected during the spring sampling event, two for groundwater and one for surface water; two field duplicate samples were collected during the summer sampling event, two for groundwater; and, three field duplicate samples were collected during the fall sampling event, two for groundwater and one for surface water.

Samples were submitted to a CALA accredited laboratory that is MECP certified for the analysis of drinking water samples. Laboratory blanks and duplicates were used to ensure sample integrity. Relative Percent Differences (RPDs) were calculated and discussed where applicable. Samples were placed in appropriate sample containers provided by the laboratory and preserved (as required based on type of analysis) until delivered (shipped by courier or hand delivered) to the laboratory for analysis. A chain of custody form accompanied samples at all points of handling.

4 MONITORING RESULTS

4.1 HISTORICAL DATA

Historical data for groundwater and surface water are provided in Appendices E and F, respectively. Water quality data dating back to 2013 are presented for both groundwater and surface water.

4.2 DATA QUALITY EVALUATION

The analytical laboratory employed to perform the laboratory analyses (SGS) is accredited by the Standards Council of Canada/Canadian Association for Laboratory Accreditation in accordance with ISO/IEC 17025:1999 – "*General Requirements for the Competence of Testing and Calibration Laboratories*" for the tested parameters and has met the standards for proficiency testing developed by the Standards Council of Canada for parameters set out in the Soil, Ground Water and Sediment Standards.

Sample analysis dates provided on the laboratory analytical reports issued by SGS indicate that all sample analyses were performed within the required sample/extract hold times, as indicated by the dates presented in columns for each sample parameter on the analytical report with the exception of turbidity for all surface water samples taken during the spring 2023 sampling event. The laboratory minimum detection limits were reported to be at or lower than the required MECP reporting detection limits for the parameters analyzed, with the exception of organic nitrogen during the spring 2023 sampling event. A comparison of the internal laboratory duplicate samples indicates that all samples and the respective duplicates are within acceptable limits.

As a quality control measure, groundwater and/or surface water duplicate samples were collected during each sampling event. All duplicate data are provided in Appendix D and are summarized in Appendices E and F. Groundwater duplicate samples were collected from TW-15 and TW-17 during the spring monitoring event, from TW-15 and TW-17 during the summer monitoring event, and from TW-15 and TW-8 during the fall monitoring event. Surface water duplicate samples were collected from SW-4 during the spring monitoring event and SW-5 during the fall monitoring event.

When compared to concentrations reported in the original samples, duplicate water quality data reported that all parameters were within an acceptable range with respect to relative percent difference (i.e., the industry standard of less than 50%), with the exception of copper and tin in HB GW DUP1 and chemical oxygen demand in HB GW DUP2 during the spring event; total kjeldahl nitrogen, aluminum, selenium and tin in HB GW DUP1 and organic nitrogen and total kjeldahl nitrogen in HB GW DUP2 during the summer event; and total kjeldahl nitrogen and titanium in HB GW DUP1, chromium and ammonia in HB GW DUP2 and total dissolved solids in HB SW DUP during the fall event. The duplicate water quality data and associated calculated relative percent differences are not interpreted to indicate any sampling or laboratory biases during 2023.

4.3 GROUNDWATER FLOW MONITORING

As discussed in Section 2.1, the recorded static groundwater levels indicate groundwater flow from the fill area towards the west. Static groundwater elevations are presented in Appendix C. Groundwater elevations, inferred

groundwater elevation contours and groundwater flow directions for the 2023 groundwater monitoring events are illustrated on Figures 5A through 5C.

In addition to the current groundwater elevation data, historical groundwater elevations were reviewed in order to identify any trends or inconsistencies in the data. Overall, the reported static groundwater elevations are consistent with those recorded during historical sampling efforts. A time-elevation graph was developed for all monitoring wells from 2003 to 2023, presented in Appendix G. The available groundwater elevation data indicate relatively stable elevations over time.

4.4 GROUNDWATER QUALITY MONITORING

Samples were collected from all applicable wells during all three 2023 monitoring events except for TW-12 for all three 2023 monitoring events as the well was dry. Data summary tables are provided in Appendix E. A photographic inventory of the monitoring wells is provided in Appendix H. The condition of each monitoring well was confirmed during the 2023 monitoring events, with no noticeable requirement for maintenance or repair at the time of the fall event. As discussed above, TW-3 was destroyed prior to the spring 2015 monitoring event.

4.4.1 BACKGROUND WATER QUALITY

Background water quality at TW-8 is characterized by moderate concentrations of dissolved organic carbon (DOC), and low concentrations of alkalinity, chloride, sulphate, hardness, total dissolved solids (TDS) and most metals parameters. Iron and manganese are quantified at elevated levels compared to the ODWS and these parameters are therefore unreliable for evaluating landfill performance. Organic nitrogen has also been quantified at elevated concentrations at this location sporadically throughout the monitoring record. In accordance with the inferred groundwater flow direction, concentrations of landfill indicator parameters quantified at this location are considered to be representative of regional background water quality in the aquifer intersected by the well screen.

ODWS exceedances quantified in TW-8 during 2023 are shown as bold entries in the associated geochemical summary table provided in Appendix E and included iron, manganese and organic nitrogen. Iron and manganese are aesthetic objectives and have been established to assess potential taste, odour or colour problems that may interfere with good water quality control practices. Organic nitrogen is an operational guideline and specifically address potential treatment issues if the groundwater is used as a communal water supply. Exceedances of these parameters do not constitute a health hazard and can likely be attributed to elevated compounds produced by natural processes occurring in the aquifer.

4.4.2 SOURCE STRENGTH WATER QUALITY

On-Site (i.e., source) groundwater quality conditions are measured by monitoring wells TW-4 and TW-6. Water quality in TW-4 and TW-6 is generally characterized by elevated concentrations of most analytical parameters, in comparison to background water quality. It is noted, however, that these wells are situated immediately downgradient of recent waste deposits, but are crossgradient to historical waste deposits. Water quality is notably degraded in TW-4, as compared to TW-6. The varying water quality conditions reported across the fill area may be indicative of waste deposits of varying ages or possibly different types of waste in the vicinity of, or upgradient of, each of the source monitoring wells. Water quality in TW-4 and TW-6 indicates an increasing trend of higher than usual concentrations of indicator parameters, as compared to the historical monitoring record for these locations,

since the summer of 2023 for TW-4 and the summer of 2019 for TW-6. This increasing trend is likely attributed to continued waste deposition at the Site over time.

4.4.3 CROSSGRADIENT WATER QUALITY

Water quality conditions are similar in crossgradient wells TW-10 and TW-17. Groundwater in both wells is characterized by concentrations of most parameters at levels similar to, or lower than, background with the exceptions of chloride, and sodium, which are marginally elevated. These concentrations are not interpreted to be indicative of a landfill-derived impact to groundwater quality and could potentially be related to the proximity of these monitoring wells to Firstbrooke Line Road and winter maintenance practices (i.e. road salt).

An ODWS exceedance of aluminum at TW-17 during the fall 2022 and fall 2023 monitoring event is interpreted to be anomalous, given that concentrations appear to be stable over the historical monitoring record. Concentrations of aluminum are also quantified at lower levels within the source water quality indicating that impacts are potentially a result of an external source and are not interpreted to be landfill derived.

4.4.4 DOWNGRADIENT WATER QUALITY

Monitoring wells TW-9 and TW-13 measure water quality conditions immediately downgradient of the fill area, and directly downgradient of historical waste deposits. When compared to background conditions, concentrations of analytical parameters in both wells are elevated. Concentrations in these downgradient wells are higher than those reported in TW-4 and TW-6, likely as a result of their location slightly further north and more directly downgradient of the older waste deposits at the Site. Groundwater quality in TW-9 is slightly more degraded to that of TW-13, as TW-13 is situated at a distance slightly further downgradient. A seasonal trend is apparent at TW-13, which indicates lower concentrations of indicator parameters during the annual spring sampling events, compared to the summer and fall events each year. This trend is consistent over time, with the exception of the spring 2018 monitoring event, as illustrated in the data summary table provided in Appendix E.

Water quality further downgradient of the Site is measured by monitoring wells TW-12, TW-14, TW-15, and TW-16 situated immediately west of the pipeline right-of-way. All three wells are located generally downgradient of the fill area, however only TW-15 is situated directly hydraulically downgradient of the waste deposits. Groundwater flow in the immediate vicinity of TW-12 and TW-14 is towards the northwest, therefore these wells may not be within the groundwater plume. For the purposes of this report, they have been considered downgradient monitors, in order to ensure that any potential future impacts to groundwater at these locations are identified, should groundwater flow patterns in this area change as a result of Site activities or those on adjacent properties. At this time, the data available to date indicate that water quality in wells TW-12 and TW-14 is dissimilar to that of TW-15.

Due to dry conditions at TW-12 no water samples were collected at this location in 2023. Historically, water quality in TW-12 is generally similar to that of TW-14, with concentrations of parameters such as alkalinity, sulphate, hardness and barium quantified at slightly higher concentrations in TW-12. Both wells quantify levels of most indicator parameters that are similar to, or lower than, background well TW-8, with the exceptions of the parameters listed above in TW-12, which are marginally elevated. Water quality at downgradient monitoring locations TW-12 and TW-14 is comparable to characteristics reported at crossgradient wells TW-10 and TW-17, situated to the southeast of TW-12 and TW-14.

Groundwater quality in TW-15 is characterized by elevated concentrations of most parameters in comparison to background conditions, with the exception of iron, which is higher within the background water quality. An improvement in water quality is noted in TW-15, however, in comparison to TW-13. Nitrate and sulphate concentrations are elevated in TW-15 as compared to TW-13, while the opposite is observed for ammonia concentrations at these locations, indicative of leachate plume migration due to increased aerobic conditions with distance from the landfill. Slightly further downstream, groundwater quality in TW-16 is characterized by concentrations of most parameters at levels similar to, or lower than background water quality, with the exception of alkalinity, TDS, and hardness. As monitoring well TW-16 is located slightly crossgradient of TW-15, this location is likely at the southern extent of the leachate plume.

As of 2021, MW21-01 is the furthest downgradient monitoring well and is therefore considered to be representative of the downgradient property boundary. MW21-01 is located in the eastern portion of the CAZ property acquired in 2013, where groundwater quality is characterized by concentrations of most parameters at levels similar to, or lower than, those reported in background monitoring well TW-8. Several leachate indicator parameters are marginally elevated when compared to background concentrations, however, indicates a further improvement in water quality as compared to TW-15. A marginal impact to groundwater quality is noted at this downgradient location, however water quality indicates a strong natural attenuation downgradient of the Site with additional land available within the CAZ, downgradient of MW21-01, for continued natural attenuation.

4.4.5 FIELD PARAMETER MEASUREMENTS

Field parameters were measured at all monitoring wells at the time of sampling and are presented in Tables 5A through 5C.

Table 5A – Spring 2023 Groundwater Field Parameter Measurements

WELL ID	TEMPERATURE (C)	pH	CONDUCTIVITY (mS/cm)	TDS (mg/L)
TW-4	12.4	6.5	1097	549
TW-6	10.3	6.97	1289	645
TW-8	9.9	7.1	113.1	57
TW-9	13.1	6.96	2362	1181
TW-10	10.8	6.22	72.2	36
TW-13	12.2	5.89	575	288
TW-14	12.7	7.21	62.7	31
TW-15	12.2	6.9	1050	525
TW-16	9.6	7.8	218	109
TW-17	8.5	7.34	297	149
MW21-01	12.2	6.79	392	196

Table 5B: Summer 2023 Groundwater Field Parameter Measurements

WELL ID	TEMPERATURE (C)	pH	CONDUCTIVITY (mS/cm)	TDS (mg/L)
TW-4	11.6	6.56	1614	807
TW-6	10.7	6.53	2258	1129

WELL ID	TEMPERATURE (C)	pH	CONDUCTIVITY (mS/cm)	TDS (mg/L)
TW-8	12.9	7.33	224	112
TW-9	13.1	6.84	3218	1609
TW-10	9.6	7.23	133	67
TW-13	10.5	6.44	2219	1110
TW-14	8.4	7.41	107	54
TW-15	10.2	6.95	787	394
TW-16	8.3	7.09	246	123
TW-17	12.2	6.62	237	119
MW21-01	13.4	6.41	409	205

Table 5C: Fall 2023 Groundwater Field Parameter Measurements

WELL ID	TEMPERATURE (C)	pH	CONDUCTIVITY (mS/cm)	TDS (mg/L)
TW-4	9.14	6.24	2190	1095
TW-6	10.72	5.62	2490	1245
TW-8	10.77	7.42	190	95
TW-9	12.02	6.25	3690	1845
TW-10	8.5	7.33	152	76
TW-13	9.82	5.82	2410	1205
TW-14	8.96	6.96	297	148.5
TW-15	10.94	6.62	274	137
TW-16	9.13	7.33	300	150
TW-17	9.64	8.15	269	134.5
MW21-01	10.24	7.02	386	193

4.5 SURFACE WATER QUALITY MONITORING

As discussed in Section 3.1, surface water monitoring stations SW-3 and SW-4 are representative of downstream and upstream water quality conditions, respectively. Station SW-5 is situated adjacent to the Site, on the intermittent stream, on the downstream side of the Site access road.

Samples were obtained at all three surface water monitoring stations during the both the spring and fall 2023 monitoring events. A photographic inventory of the monitoring stations is provided in Appendix H. Data summary tables are provided in Appendix F.

The results of the 2023 surface water monitoring indicate that iron exceeded the PWQO and CWQG in SW-3, SW-4 and SW-5 during the summer sampling event and SW-5 during the fall sampling event. No APV exceedances were quantified during the 2023 monitoring period. Water quality downstream of the Site at SW-3 is almost identical to that upstream of any potential landfill-derived impact to surface water quality at SW-4.

Water quality at SW-5 is similar to that reported at SW-4, with the exception of high iron and aluminum concentrations. Remaining analytical parameters are typically similar to, or lower than, those reported at upstream station SW-4.

4.5.1 FIELD PARAMETER MEASUREMENTS

Field parameters were measured at all monitoring stations at the time of sampling and are presented in Tables 6A and 6B. Field measured pH was noted to be low at SW-5 however, it was within the acceptable ranged based on laboratory analysis.

Table 6A: Spring 2023 Surface Water Field Parameter Measurements

WELL ID	TEMPERATURE (C)	pH	CONDUCTIVITY (mS/cm)	DISSOLVED SOLIDS (mg/L)
SW-3	22.8	7.35	368.7	9.15
SW-4	25.5	7.16	402.2	8.54
SW-5	20.6	5.87	32.1	8.99

Table 6B: Fall 2023 Surface Water Field Parameter Measurements

WELL ID	TEMPERATURE (C)	pH	CONDUCTIVITY (mS/cm)	DISSOLVED SOLIDS (mg/L)
SW-3	8.97	7.79	262	7.73
SW-4	9.48	7.65	225	8.64
SW-5	8.59	6.34	54	5.53

5 ASSESSMENT, INTERPRETATION AND DISCUSSION

5.1 GROUNDWATER QUALITY

5.1.1 GROUNDWATER TREND ANALYSIS

The current and previous groundwater elevation and water quality data were reviewed with the objective of identifying any apparent trends or inconsistencies in the present monitoring record. With respect to groundwater elevations, the data available indicate that the seasonal water table fluctuation has been relatively consistent since 2003, with two atypically low water levels reported; one in TW-10 during the fall 2015 monitoring event and one in TW-14 during the fall 2016 monitoring event. An elevation chart featuring the water table elevation in each monitoring well from 2003 to 2023 is presented in Appendix G.

A series of time-concentration graphs were developed for several select landfill indicator parameters (including alkalinity, barium, boron, chloride, DOC, hardness and TDS) for each monitoring well location from 1994 to 2023. These time-concentration graphs are presented in Appendix G.

Historical groundwater quality data indicate consistent concentrations of most parameters over time, with a few exceptions. Elevated and erratic concentrations of barium were reported during the period from 1998 to 2001 and during the years of 2002 and 2004 for the majority of wells. The results from these periods were not produced by WSP and are potentially typographical errors contained in the inherited data. Elevated DOC concentrations were quantified in TW-10 during 2003 and in TW-16 during 2012; however, these concentrations appear to be anomalous when compared to the remainder of the historical monitoring record at these locations. All parameters graphed were quantified at elevated levels in TW-6 during the fall 2019 and fall 2022 monitoring event. These results are potentially indicative of a developing trend at this location, but additional data are necessary to confirm this interpretation.

All parameters graphed indicate high concentrations and a high range of fluctuation in TW-13, where a seasonal trend is apparent, with low concentrations quantified during the spring monitoring events and higher concentrations quantified during the summer and fall monitoring events throughout most of the historical monitoring record. Elevated concentrations of the selected parameters are quantified consistently over time in TW-4, TW-9, and TW-15, as compared to background levels; these results are consistent with the proximity of these wells to the fill area. Increasing trends are apparent for most leachate indicator parameters in TW-9. Elevated concentrations of barium are quantified at TW-17 during the 2023 fall sampling period. Water quality in the remaining monitoring wells is generally comparable to background conditions, with low and stable concentrations over time and no discernible trends.

5.1.2 GUIDELINE B-7 CALCULATIONS

In September 1986, a policy was introduced by the MECP to assist in the evaluation of groundwater impacts, especially for the case of landfill and/or lagoon operations. The policy was entitled “The Incorporation of the

Reasonable Use Concept into MECP Groundwater Management Activities" and is referred to now as Guideline B-7 (formerly Policy 15-08). Simply stated, the policy sets groundwater contaminant discharge criteria for landfills and/or lagoons that may impair local water quality; the criteria are based on maintaining the protection of groundwater resources on the adjacent lands or properties.

The contaminant discharge criteria, which represent the maximum acceptable levels of contaminants that should not be exceeded, are established using a simple mathematical relationship that incorporates background (existing) water quality and the highest provincial water quality standards for the adjacent land use. Under Guideline B-7, water quality impacts will not be allowed to exceed the maximum calculated discharge criteria at the landfill (or Site) property boundaries.

In order to apply Guideline B-7, the appropriate resource use of the adjacent properties must be selected. At the Haileybury Landfill Site, the highest end use for groundwater on the adjacent properties is for drinking water purposes, for which the ODWS - Table 1 through Table 4 have been established. The purpose of the ODWS is to protect public health through the provision of safe drinking water. Water intended for human consumption shall not contain unsafe concentrations of toxic chemicals (health related parameters). Health related standards are established for parameters that, when present above a certain concentration, have known or suspected adverse health effects. At the same time, water should also be aesthetically acceptable. Colour, odour and turbidity are parameters that, when controlled, result in water that is clear, colourless and without objectionable or unpleasant taste or odour (non-health related parameters). In addition, operational guidelines have been established for non-health related parameters that need to be controlled to ensure efficient and effective treatment and distribution of the water. As well, Guideline B-7 requires the identification of background water quality conditions in the underlying aquifer.

The background geochemical profile (based on the geometric mean of all results from TW-8) and the resultant values were applied along with the ODWS, to complete a Guideline B-7 analysis for all of the groundwater monitoring wells for the landfill indicator parameters. Appendix I presents the Guideline B-7 calculations for the 2023 monitoring results that have been developed using all valid background analytical data observed in TW-8.

It should be noted that these Guideline B-7 values are much lower (i.e., more stringent) than the ODWS, and a well-by-well comparison of the performance of each of the parameters at all of the groundwater monitoring wells is also presented in Appendix I for the 2023 monitoring events. By the present assessment, monitoring wells TW-4, TW-6, TW-9, TW-13, TW-15, TW-17 and MW21-01 exhibit non-compliance with Guideline B-7. Exceedances are indicated by bold and shaded entries in the tables provided in Appendix I.

Comparing concentrations observed in all groundwater monitoring wells during the 2023 sampling events to the maximum allowable concentrations (Appendix I), six health related (arsenic, barium, boron, chromium, lead and nitrate) and six non-health related (chloride, DOC, iron, manganese, sodium, sulphate and TDS) parameter exceedances were reported at source and downgradient monitoring wells. During the spring sampling event, the majority of the Guideline B-7 exceedances were quantified in well TW-9, with fewer exceeding concentrations reported in TW-4, TW-6, TW-13, TW-15 and MW21-01; during the summer sampling event, the majority of the Guideline B-7 exceedances were quantified in wells TW-6, TW-9 and TW-13, with fewer exceeding concentrations reported in TW-4, TW-15 and MW21-01; and during the fall sampling event, the majority of the Guideline B-7 exceedances were quantified in well TW-6, TW-9 and TW-13, with fewer exceeding concentrations reported in TW-4, TW-15, TW-17 and MW21-01. No exceedances of the Guideline B-7 maximum allowable concentrations were quantified in TW-10, TW-14 and TW-16 during all three events in 2023, and TW-17 during the spring and summer sampling events in 2023.

In summary, the monitoring record indicates that a measurable water quality impact is occurring in the immediate vicinity of the waste deposits and in downgradient areas. Exceedances of the Guideline B-7 maximum allowable concentrations have been recorded on-Site during the present monitoring review and are interpreted to be landfill-derived; however, with the exception of arsenic. Exceedances were quantified for nitrate at the monitoring well which is currently considered to be representative of the downgradient Site property boundary (i.e., MW21-01). Although these exceedances are interpreted to be landfill-derived leachate impacts, there is an improvement in water quality with increased distance from Site indicating a strong natural attenuation. Currently, the Site is not in compliance with respect to Guideline B-7, however additional land is available within the CAZ, downgradient of MW21-01, for continued natural attenuation. It is also noted that since the landfill ceased accepting waste as of October 17, 2023, closure activities are anticipated to reduce leachate generation and improve water quality downgradient. Confirmation of these results through additional, regularly scheduled sampling in 2024 is recommended.

5.1.3 TRIGGER LEVEL MONITORING PROGRAM

The 2012 annual monitoring report prepared by Story (Story, 2013) indicates that a Trigger Level Monitoring Program is in place for groundwater at the Site. Although no details of the program are provided in the report, it is stated that three trigger concentrations have been set, for chloride, sulphate and boron, to be evaluated at downgradient monitoring well TW-15. The trigger concentrations are 230 mg/L for chloride, 510 mg/L for sulphate and 3.5 mg/L for boron. No other trigger parameters are indicated.

By the present assessment, no trigger level exceedances were quantified in TW-15 during 2023. The Site is therefore in compliance with respect to groundwater quality, as determined by the trigger level monitoring program presented by Story in the 2012 annual monitoring report.

It should be noted that the indicated trigger concentration for sulphate has been set at a value that is actually higher than the ODWS value for this parameter (i.e., 500 mg/L). It is recommended that a more appropriate trigger concentration be developed for sulphate (i.e., lower than the ODWS value). The Guideline B-7 maximum allowable concentration of 253 mg/L is recommended for use as the revised sulphate trigger concentration. It is noted that no trigger level exceedances would be quantified in TW-15 for sulphate should this revised trigger value be used.

5.2 SURFACE WATER QUALITY

5.2.1 SURFACE WATER TREND ANALYSIS

The current and previous surface water quality data were reviewed with the objective of identifying any apparent trends or inconsistencies in the present monitoring record. A series of time-concentration graphs were developed for several select landfill indicator parameters (including barium, chloride, copper, sulphate and zinc) for each monitoring location from 2008 to 2023. These time-concentration graphs are presented in Appendix G.

Historical surface water quality data generally indicate consistent concentrations of most parameters over time. A seasonal trend is apparent at stations SW-3 and SW-4 for chloride and sulphate, which indicate almost identical patterns throughout the monitoring record. It is noted that water quality at SW-3 reported elevated concentrations of barium, copper and zinc between September 2015 and September 2017. Concentrations of

these parameters at SW-3 have since returned to within the historical range and are similar to those reported at SW-4. Low and stable concentrations of all parameters graphed are demonstrated at SW-4 throughout the historical monitoring record. Water quality at SW-5 is generally stable at low concentrations of most parameters, with the exception of an anomalous zinc concentration in 2013. In addition, many parameters were quantified at elevated levels at SW-5 during the fall 2019 monitoring event; these results are interpreted to be anomalous.

5.2.2 TRIGGER LEVEL MONITORING PROGRAM

The 2012 annual monitoring report prepared by Story (Story, 2013) indicates that a Trigger Level Monitoring Program is in place for surface water at the Site. Although no details of the Program are provided in the report, it is stated that two trigger concentrations have been set, for boron and unionized ammonia, to be evaluated at downstream surface water monitoring station SW-3. The trigger concentrations are 0.2 mg/L for boron and 0.02 mg/L for unionized ammonia (i.e., at the PWQO values). No other trigger parameters are indicated.

By the present assessment, no trigger level exceedances for boron and unionized ammonia were quantified at SW-3 during 2023. The Site is therefore in compliance with respect to surface water quality, as determined by the trigger level monitoring program presented by Story in the 2012 annual monitoring report.

Similar to the groundwater trigger level monitoring program, WSP recommends that the surface water trigger level concentrations be reduced to levels lower than the associated PWQO values. Trigger levels should not be set at the compliance values, but rather at slightly reduced levels, to allow time for modifications to Site operations should the trigger values be exceeded, and a resultant condition of non-compliance occur.

5.3 ADEQUACY OF THE MONITORING PROGRAM

It is WSP's opinion that the current groundwater and surface water monitoring program is adequate with respect to the characterization of Site conditions, the evaluation of Site performance and the assessment of Site compliance. The Monitoring and Screening Checklist is provided in Appendix J.

6 CONCLUSIONS

Based on the results of the current monitoring program, the following conclusions have been made:

1 Groundwater movement at the Site, as determined by water table elevations recorded at each of the monitoring wells, was determined as being directed away from the fill area to the west. TW-8 is situated (hydraulically) in a position considered to be representative of background conditions since it is located east of the Site. This monitoring well configuration allows a detailed evaluation of the Haileybury Landfill Site to be undertaken with respect to MECP Guideline B-7.

2 Groundwater quality suggests impacts (when compared to background) are occurring due to landfill-derived leachate in the wells immediate downgradient of the fill area, with a measurable improvement in groundwater quality with increased distance from the fill area. Furthest downgradient well MW21-01 indicates marginal impact to groundwater quality. Crossgradient wells TW-10 and TW-17 and downgradient wells TW-12, TW-14, and TW-16 indicate no landfill-derived impact, with water quality generally resembling background conditions.

3 A review of the 2023 surface water geochemical data from locations both upstream and downstream of the Site indicates no landfill-derived impact to surface water downstream of the Site at SW-3.

4 The current (2023) groundwater monitoring record indicates that the Site is continuing to operate as designed, as a natural attenuation type facility. The current water quality results, however, indicate that the Site is not in compliance with respect to Guideline B-7 at compliance well MW21-01 with exceedances of nitrate during all 3 events in 2023. These exceedances are interpreted to be landfill-derived impacts, however additional land is available within the CAZ, downgradient of MW21-01, for continued natural attenuation. Furthermore, as the landfill ceased accepting waste as of October 17, 2023, it is anticipated that closure activities will reduce leachate generation and improve water quality downgradient.

5 Both groundwater and surface water are in compliance with respect to the trigger concentrations, as stated in the 2012 annual monitoring report (Story, 2013).

6 No topographical survey was completed in 2023. As of March 2021, the Site had a calculated remaining capacity for waste of 10,619 m^3. This equates to a remaining Site life of 5.8 months.

7 RECOMMENDATIONS

The following recommendations should be considered for inclusion in next year's monitoring program:

1. The City should continue to monitor groundwater and surface water at the current sampling frequencies so that seasonal variations for certain parameters could be documented and understood.
2. Groundwater elevations at all existing monitoring wells should be measured during each groundwater sampling round to further confirm groundwater flow directions and establish seasonal fluctuations.
3. A topographical survey of the entire Site should be undertaken in 2024, prior to closure activities, to determine the status of the Site capacity to ensure that there is sufficient capacity remaining for the placement of the final cover.
4. The trigger level monitoring programs for both groundwater and surface water should be re-evaluated and revised, with trigger concentrations reduced appropriately, so as to serve as an early warning program to prevent non-compliance.
5. Should nitrate exceedances continue to be quantified at the furthest downgradient monitoring well MW21-01, consideration should be given to the installation of a monitoring well along the property boundary, within the northwest portion of the CAZ to determine compliance with respect to MECP Guideline B-7.
6. The laboratory reporting detecting limit for organic nitrogen should be established below the ODWS levels of 0.15 mg/L.

8 CLOSURE

This report has been prepared for the exclusive use of the City for specific application to this Site. The annual monitoring report was prepared in accordance with the verbal and written requests from the City and generally accepted assessment practices, restricting the investigations to the assessment of the environmental compliance associated with the Site. No other warranty, expressed or implied is made.

Respectfully Submitted,

WSP Canada Inc.

Prepared by:

Mikayla Bechard, B.Sc.
Environmental Scientist

Reviewed by:

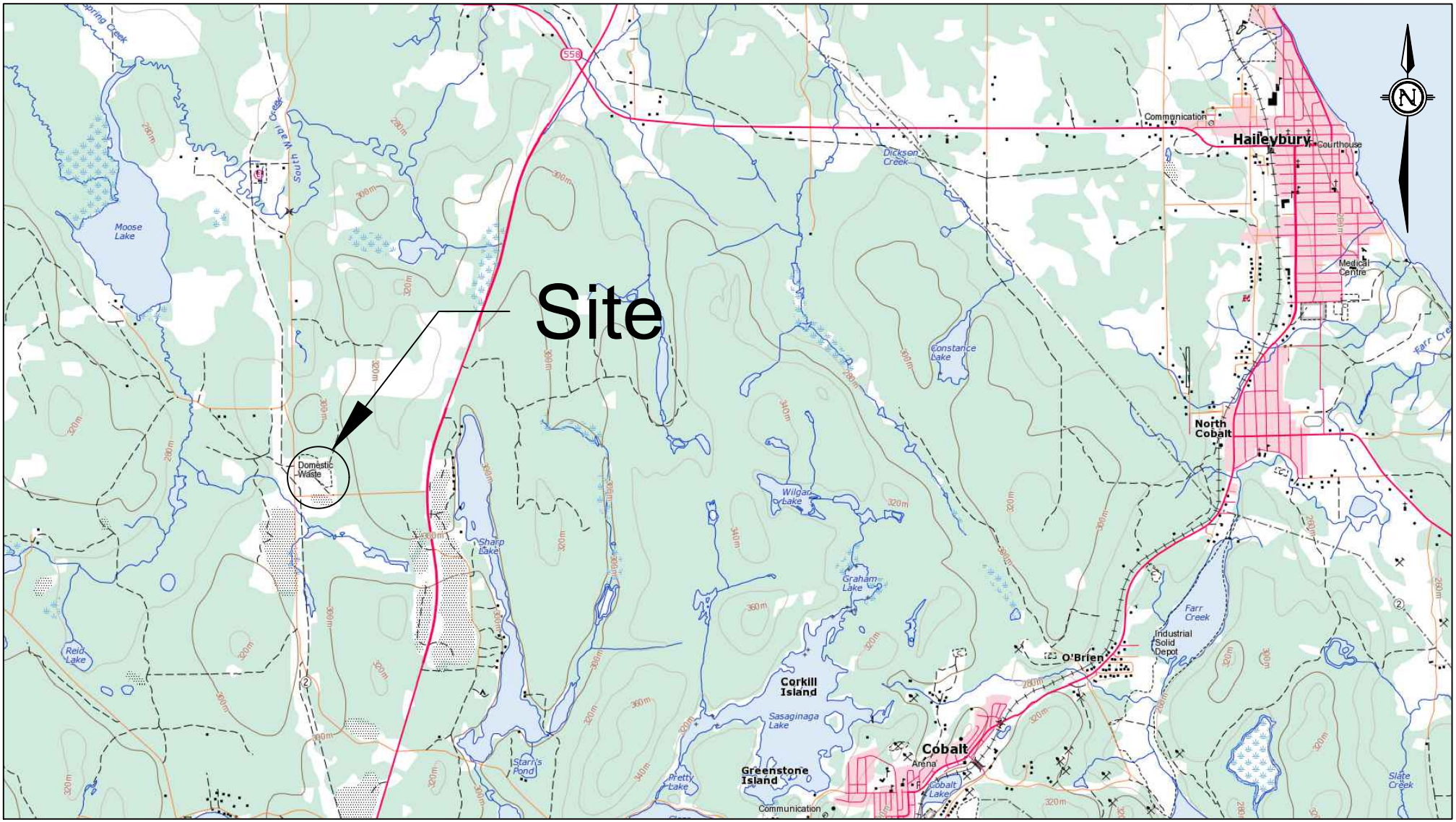
Larry Rodricks, P.Eng.
Senior Principal Engineer

Dirk Scheurlen, C. Tech
Senior Technical Consultant

9 REFERENCES

- Story Environmental Inc. 2013. 2012 Annual Monitoring Report Haileybury Landfill Site, Volume 1 of 2, April 2013.
- Exp Services Inc. 2016. Haileybury Landfill Site Closure Plan, City of Temiskaming Shores, Final Report, December 2016.
- Exp Services Inc. 2019. 2019 Haileybury Landfill Site, – Job # NWL-01901034, Technical Memorandum, October 2019.
- Exp Services Inc. 2020. 2020 Haileybury Landfill Site, – Job # NWL-02001008, Technical Memorandum, May 2020.
- Exp Services Inc. 2021. 2021 Haileybury Landfill Site, – Job # NWL-21005833, Technical Memorandum, April 2021.

Figures



Notes:

1. Topographic map from Natural Resources Canada.

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WSP Canada Inc. 33 Mackenzie Street, Suite 100 Sudbury, Ontario, P3C 4Y1	wsp	Datum: N.A. SCALE: as shown	TITLE Site Location Map	PROJECT NO: TY131010.2000 FIGURE NO: 1	

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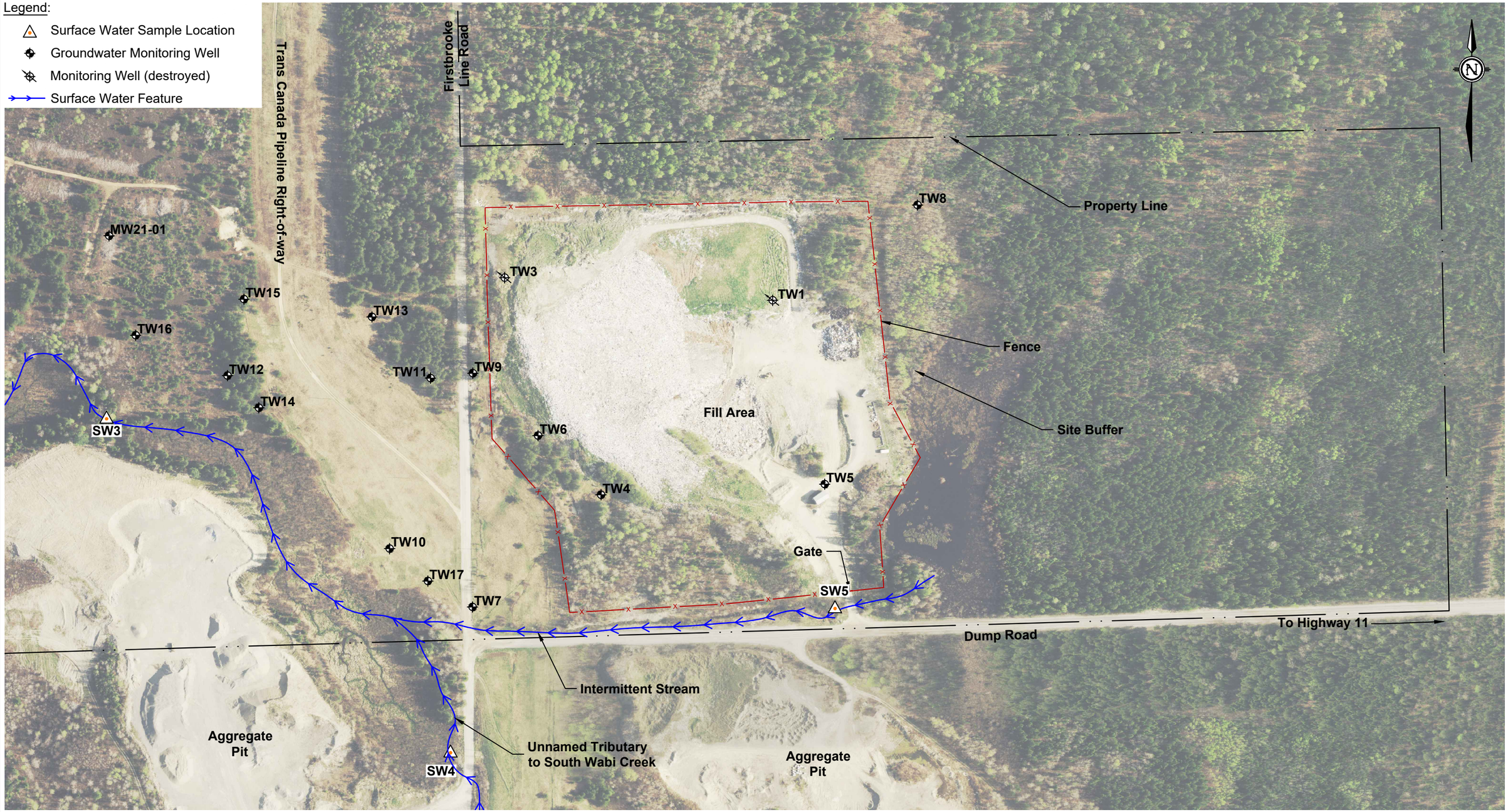

Notes:
1. Aerial photo from the Ministry of Natural Resources and Forestry.

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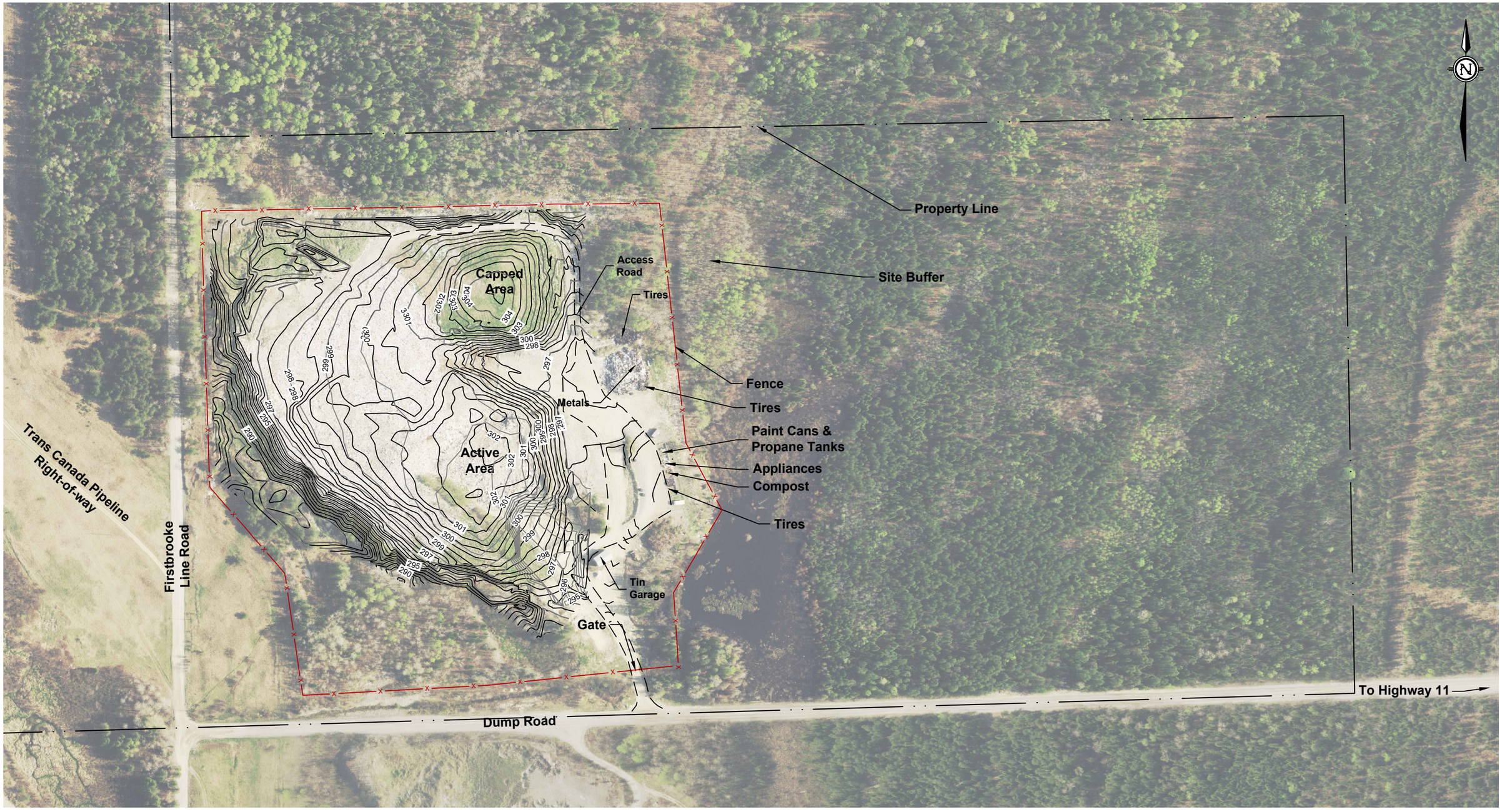

Notes:
1. Aerial photo from the Ministry of Natural Resources and Forestry.
2. Contours and site features surveyed by EXP in 2021.

0 25 50 75 100 125 150
Approximate Scale (m)

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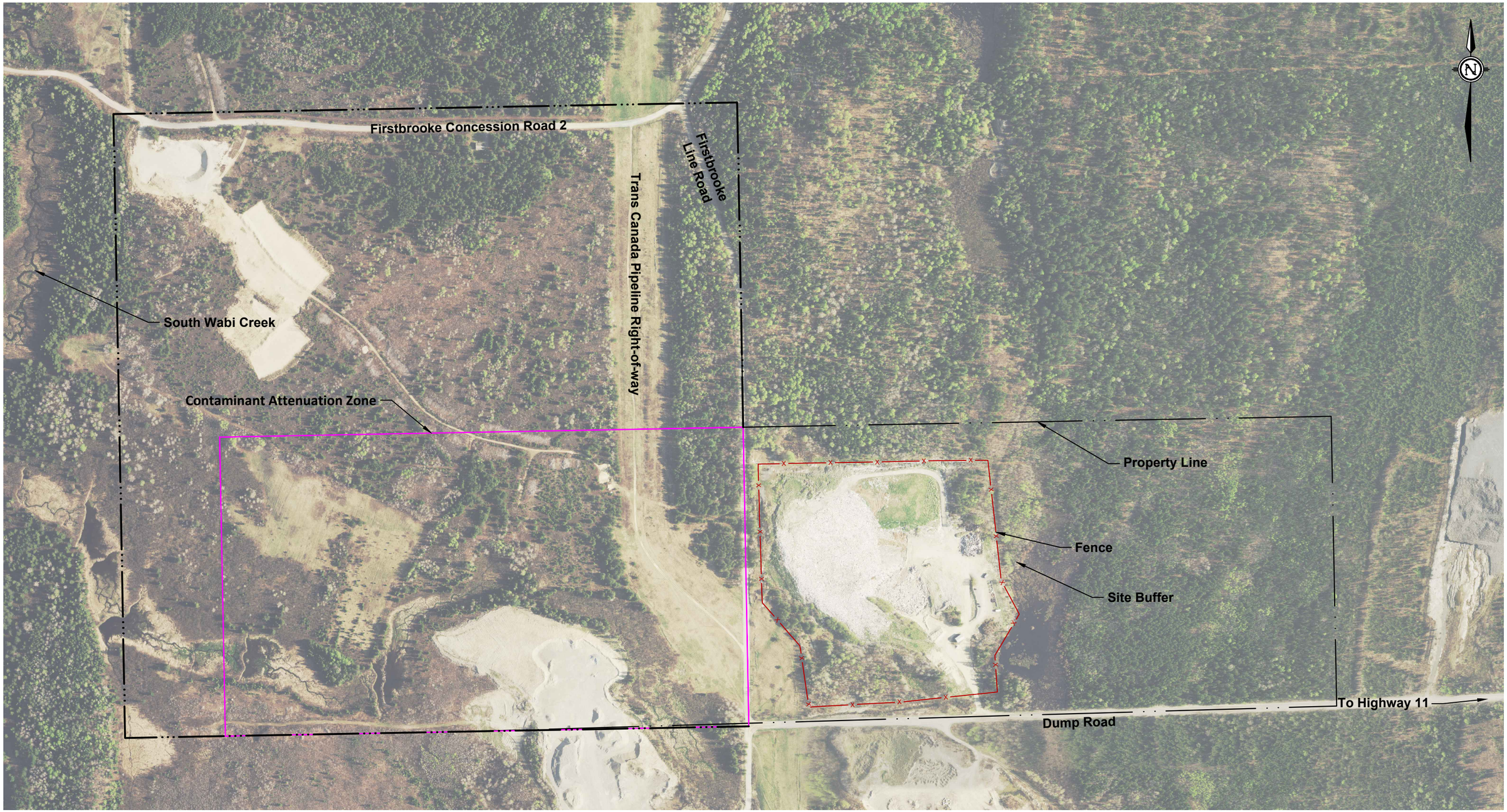

Notes:
1. Aerial photo from the Ministry of Natural Resources and Forestry.

CLIENT LOGO

CLIENT: The City of Temiskaming Shores

WSP Canada Inc.
33 Mackenzie Street, Suite 100
Sudbury, Ontario, P3C 4Y1

COMPANY LOGO

DWN BY:	KKJ
CHK'D BY:	DS
DATUM:	NAD 83
PROJECTION:	Zone 17
SCALE:	as shown

PROJECT: 2023 Annual Landfill Monitoring Report
Haileybury Waste Disposal Site
Temiskaming Shores, Ontario

TITLE: Contaminant Attenuation Zone

DATE:	April 2024
PROJECT NO:	TY131010.2000
REV. NO.:	1
FIGURE No.	4

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Legend:

- Surface Water Sample Location
- Groundwater Monitoring Well
- Monitoring Well (destroyed)
- Surface Water Feature
- (191.11) Inferred Groundwater Elevation (masl)
- 279 Inferred Groundwater Contour (masl)
- FLOW Inferred Groundwater Flow Direction

Trans Canada Pipeline Right-of-way

MW21-01 (277.29)
TW15 (278.27)
TW16 (278.23)
TW13 (278.58)
TW12 (278.26)
TW11 (279.45)
TW14 (278.33)
TW9
TW3
TW1
TW8 (294.43)
TW6 (283.60)
TW4 (284.12)
TW5 (289.84)
TW10 (281.86)
TW17 (283.22)
TW7 (283.23)
SW3
SW4
SW5
FLOW
Fill Area
Property Line
Fence
Site Buffer
Gate
Dump Road
To Highway 11
Intermittent Stream
Unnamed Tributary to South Wabi Creek
Aggregate Pit
Aggregate Pit

278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294

N

Notes:
1. Aerial photo from the Ministry of Natural Resources and Forestry.

0 50 100 150 200
Approximate Scale (m)

	CLIENT LOGO: City of Temiskaming Shores	CLIENT: The City of Temiskaming Shores WSP Canada Inc. 33 Mackenzie Street, Suite 100 Sudbury, Ontario, P3C 4Y1	COMPANY LOGO: wsp	DWN BY: KKJ CHK'D BY: DS DATUM: NAD 83 PROJECTION: Zone 17 SCALE: as shown	PROJECT: 2023 Annual Landfill Monitoring Report Haileybury Waste Disposal Site Temiskaming Shores, Ontario TITLE: Inferred Groundwater Contour Plan June 2023	DATE: April 2024 PROJECT NO: TY131010.2000 REV. NO.: 1 FIGURE No. 5A

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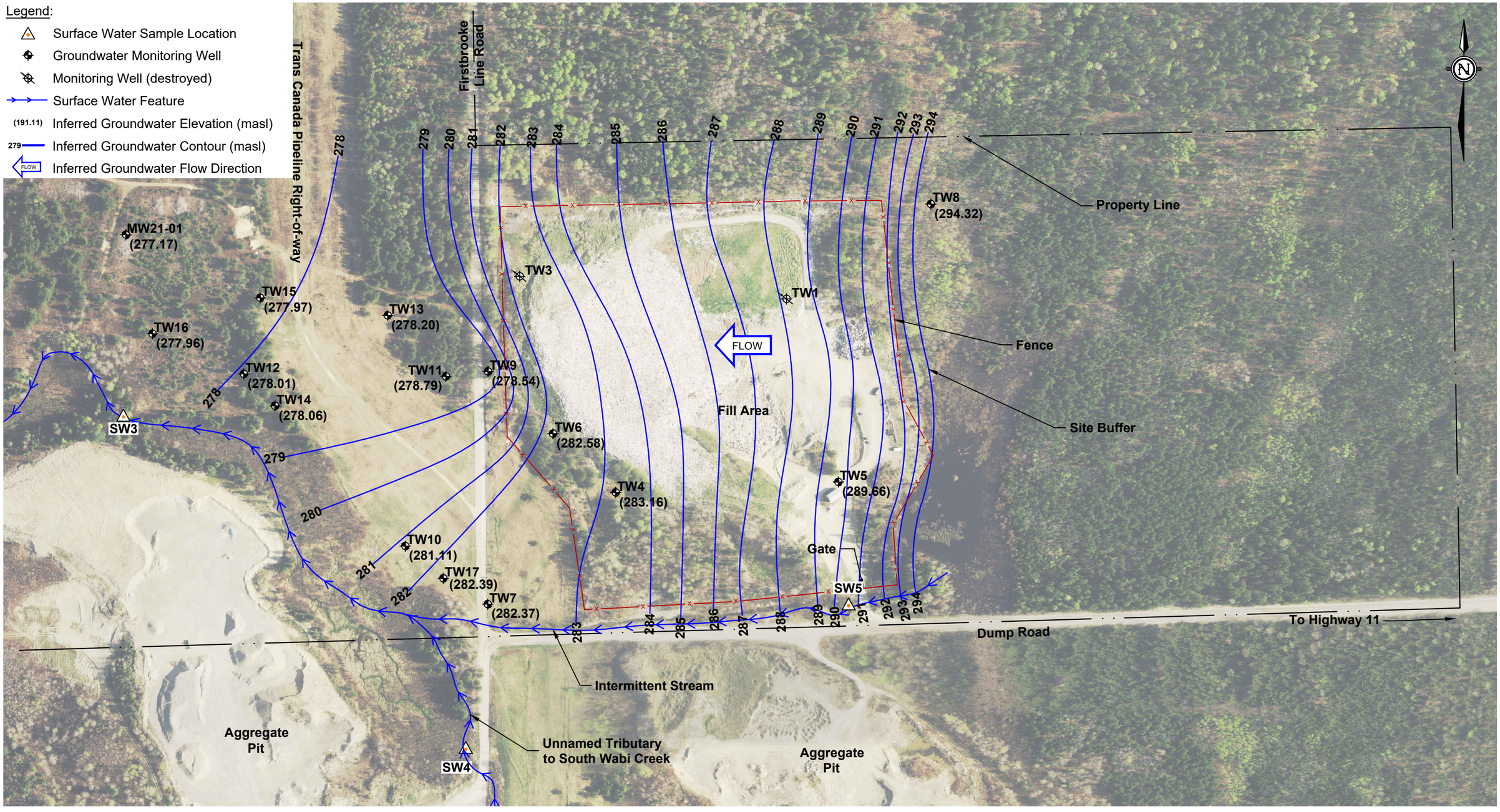

Notes:
1. Aerial photo from the Ministry of Natural Resources and Forestry.

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Approximate Scale (m)

	CLIENT LOGO: City of Temiskaming Shores	CLIENT: The City of Temiskaming Shores WSP Canada Inc. 33 Mackenzie Street, Suite 100 Sudbury, Ontario, P3C 4Y1	COMPANY LOGO: wsp	DWN BY: KKJ CHK'D BY: DS DATUM: NAD 83 PROJECTION: Zone 17 SCALE: as shown	PROJECT: 2023 Annual Landfill Monitoring Report Haileybury Waste Disposal Site Temiskaming Shores, Ontario TITLE: Inferred Groundwater Contour Plan August 2023	DATE: April 2024 PROJECT NO: TY131010.2000 REV. NO.: 1 FIGURE No. 5B

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Legend:

- Surface Water Sample Location
- Groundwater Monitoring Well
- Monitoring Well (destroyed)
- Surface Water Feature
- (191.11) Inferred Groundwater Elevation (masl)
- 279 Inferred Groundwater Contour (masl)
- FLOW Inferred Groundwater Flow Direction

Trans Canada Pipeline Right-of-way

Firstbrooke Line Road

MW21-01 (277.04)

TW15 (277.86)

TW16 (277.84)

TW12 (277.99)

TW14 (277.94)

TW13 (278.16)

TW11 (278.90)

TW9 (278.84)

TW3

TW1

TW8 (294.57)

Property Line

Fence

Site Buffer

FLOW

Fill Area

TW6 (283.82)

TW4 (284.82)

TW5 (289.87)

SW3

SW5

Gate

TW10 (281.58)

TW17 (283.83)

TW7 (283.87)

Dump Road

To Highway 11

Intermittent Stream

Aggregate Pit

Unnamed Tributary to South Wabi Creek

SW4

Aggregate Pit

278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294

0 50 100 150 200

Approximate Scale (m)

Notes:

1. Aerial photo from the Ministry of Natural Resources and Forestry.

	CLIENT LOGO: City of Temiskaming Shores	CLIENT: The City of Temiskaming Shores	COMPANY LOGO: wsp	DWN BY: KKJ CHK'D BY: DS DATUM: NAD 83 PROJECTION: Zone 17 SCALE: as shown	PROJECT: 2023 Annual Landfill Monitoring Report Haileybury Waste Disposal Site Temiskaming Shores, Ontario	DATE: April 2024 PROJECT NO: TY131010.2000 REV. NO.: 1 FIGURE No. 5C
		WSP Canada Inc. 33 Mackenzie Street, Suite 100 Sudbury, Ontario, P3C 4Y1			TITLE: Inferred Groundwater Contour Plan October 2023	

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Appendix A

CERTIFICATE OF APPROVAL NO. A570402

HANI

Ontario

Ministry of the Environment
Ministère de l'Environnement

AMENDMENT TO PROVISIONAL CERTIFICATE OF APPROVAL
WASTE DISPOSAL SITE
NUMBER A570402
Notice No. 2
Issue Date: December 18, 2009

The Corporation of the City of Temiskaming Shores
325 Farr Dr PO Box 2250
Temiskaming Shores, Ontario
P0J 1K0

Site Location: Haileybury Landfill
Lot 1, Concession 2
Haileybury Town, District of Timiskaming
P0J 1K0

You are hereby notified that I have amended Provisional Certificate of Approval No. A570402 issued on November 10, 1998 and amended on November 10, 1999 and April 27, 2009 for the use and operation of a 5.8 hectare Landfill Site within a 32.4 hectare total site area , as follows:

Conditions 1 to 27 in the Certificate dated November 10, 1998 and Condition 1 in the notice dated November 10, 1999 are hereby revoked.

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 A570402 document, issued in accordance with section 39 of the *EPA*, and includes any notices, 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;

"*Drainage Act*" means *Drainage Act,* R.S.O. 1990, c.D. 17, as amended;

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

"Fill Area" means the portion of the *Site* where waste may be disposed as delineated by the "Limit of Sanitary Landfill Fill Area" shown on Sheet 10 of Item 2 in Schedule "A" and described in Item 5 in Schedule "A";

"finished compost" means compost that meets the time, temperature and turning requirements specified in Condition 11(1)(h) and the parameters listed in Schedule "B";

"leaf and yard waste" means waste consisting of leaves, grass clippings, natural Christmas trees and other plant materials, but not tree stumps, limbs or other woody materials in excess of seven (7) centimetres in diameter;

"Ministry" means the Ontario Ministry of the Environment;

"*NMA* " means *Nutrient Management Act* , 2002, S.O. 2002, c. 4, as amended from time to time;

"*Operator"* means any person, other than the Owner's employees, authorized by the *Owner* as having the charge, management or control of any aspect of the *Site* and includes its successors or assigns;

"*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 City of Temiskaming Shores its successors and assigns;

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

"*PA* " means the *Pesticides Act* , R.S.O. 1990, c. P-11, as amended from time to time;

"Provincial Officer" means any person designated in writing by the Minister as a provincial officer pursuant to Section 5 of the *OWRA* or Section 5 of the *EPA* or Section 17 of *PA* or Section 4 of *NMA* or Section 8 of *SDWA* .

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

"*Regulation 347* " or "*Reg. 347* " means Regulation 347, R.R.O. 1990, made under the EPA, as amended;

"rejected compost" means waste that has gone through the composting process but did not meet the time, temperature or turning requirements specified in Condition 11 (1) (h) or exceeds the parameters listed in Schedule "B". Rejected compost is considered a waste and must be handled and disposed in accordance with Ontario Regulation 347.

"*SDWA"* means *Safe Drinking Water Act,* 2002, S.O. 2002, c. 32, as amended from time to time;

"*Site* " means the 32.4 hectare landfill site including the *Fill Area* and buffer zone on Lot 1, Concession 2 in the Town of Haileybury, District of Timiskaming as shown on the Plan of Survey, Sheet No. 2 of Item 2 in Schedule "A";

"Trained personnel" means knowledgeable in the following through instruction and/or practice:

a. relevant waste management legislation, regulations and guidelines;
b. major environmental concerns pertaining to the waste to be handled;
c. occupational health and safety concerns pertaining to the processes and wastes to be handled;
d. management procedures including the use and operation of equipment for the processes and wastes to be handled;
e. emergency response procedures;
f. specific written procedures for the control of nuisance conditions;
g. specific written procedures for refusal of unacceptable waste loads; and
h. the requirements of this *Certificate;* and

"unfinished compost" means waste that has gone through all but the final curing stage of the composting process.

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* and *Operator* 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, Operator* 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 sixty (60) days 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.

Certificate of Requirement/Registration on Title - Contaminant Attenuation Zone

(16) The *Owner* shall:

(a) Within 60 days of the date of the acquiring the ground water easement to the proposed contaminant attenuation zone and buffer lands, submit to the *Director* for review, two copies of a completed Certificate of Requirement with a registerable description of the Contaminant Attenuation Zone; 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 Contaminant Attenuation Zone and submit to the

Director the duplicate registered copy immediately following registration.

Inspections by the Ministry

(17) No person shall hinder or obstruct a *Provincial Officer* from carrying out any and all inspections authorized by the *OWRA, the EPA,* the *PA,* the *SDWA* or the *NMA,* of any place to which this *Certificate* relates, and without limiting the foregoing:

(a) to enter upon the premises where the approved works are located, or the location where the records required by the conditions of this *Certificate* are kept;

(b) to have access to, inspect, and copy any records required to be kept by the conditions of this *Certificate;*

(c) to inspect the *Site,* related equipment and appurtenances;

(d) to inspect the practices, procedures, or operations required by the conditions of this *Certificate;* and

(e) to sample and monitor for the purposes of assessing compliance with the terms and conditions of this *Certificate* or the *EPA,* the *OWRA,* the *PA,* the *SDWA* or the *NMA.*

Information and Record Retention

(18) Any information requested, by the *Ministry,* concerning the *Site* and its operation under this *Certificate,* including but not limited to any records required to be kept by this *Certificate* shall be provided to the *Ministry,* upon request, in a timely manner. Records shall be retained for *contaminating life span* of the *Site* except for as otherwise authorized in writing by the *Director.*

(19) The receipt of any information by the *Ministry* or the failure of the *Ministry* to prosecute any person or to require any person to take any action, under this *Certificate* or under any statute, regulation or other legal requirement, in relation to the information, shall not be construed as:

(a) an approval, waiver, or justification by the *Ministry* of any act or omission of any person that contravenes any term or condition of this *Certificate* or any statute, regulation or other legal requirement; or

(b) acceptance by the *Ministry* of the information's completeness or accuracy.

(20) The *Owner* shall ensure that a copy of this *Certificate,* in its entirety and including all its Notices of Amendment, and documentation listed in Schedule "A", are retained at the *Site* at all times.

2. SITE OPERATION

Operation

(1) The *Site* shall be operated and maintained at all time including management and disposal of all waste in accordance with the *EPA, Regulation 347,* and the conditions of this

Certificate. At no time shall the discharge of a contaminant that causes or is likely to cause an adverse effect be permitted

Signs

(2) A sign shall be installed and maintained at the main entrance/exit to the *Site* on which is legibly displayed the following information:
- (a) the name of the *Site* and *Owner;*
- (b) the number of the *Certificate;*
- (c) the name of the *Operator;*
- (d) the normal hours of operation;
- (e) the allowable and prohibited waste types;
- (f) the telephone number to which complaints may be directed;
- (g) a warning against unauthorized access;
- (h) a twenty-four (24) hour emergency telephone number (if different from above); and
- (i) a warning against dumping outside the *Site.*

(3) The *Owner* shall install and maintain signs to direct vehicles to working face and any other recycling and composting areas including, but not limited to, used tires, waste metal, composting and used oil.

(4) The *Owner* shall provide signs at all of the recycling and composting locations informing users what materials are acceptable and directing users to appropriate storage area.

Vermin, Vectors, Dust, Litter, Odour, Noise and Traffic

(5) The *Site* shall be operated and maintained such that the vermin, vectors, dust, litter, odour, noise and traffic do not create a nuisance.

Burning Waste Prohibited

(6) (a) Burning of waste at the *Site* is prohibited.

Site Access

(7) Waste shall only be accepted during the following time periods:
Tuesday to Saturday - 8:30 a.m. to 4:30 p.m.

(8) On-site equipment used for daily site preparation and closing activities may be operated one (1) hour before and one (1) hour after the hours of operation approved by this *Certificate.*

(9) With the prior written approval from the *District Manager,* the time periods may be extended to accommodate seasonal or unusual quantities of waste.

Site Security

(10) No waste shall be received, landfilled or removed from the *Site* unless a site supervisor or attendant is present and supervises the operations during operating hours. The *Site* shall be closed when a site attendant is not present to supervise landfilling operations.

(11) The *Site* shall be operated and maintained in a safe and secure manner. During non-operating hours, the *Site* entrance and exit gates shall be locked and the *Site* shall be secured against access by unauthorized persons.

3. EMPLOYEE TRAINING

(1) A training plan for all employees that operate any aspect of the *Site* shall be developed and implemented by the *Operator.* Only *Trained Personnel* shall operate any aspect of the *Site* or carry out any activity required under this *Certificate* .

4. COMPLAINTS RESPONSE PROCEDURE

(1) If at any time the *Owner* receives complaints regarding the operation of the *Site,* the *Owner* shall respond to these complaints according to the following procedure:

(a) The *Owner* shall record and number each complaint, either electronically or in a log book, and shall include the following information: the nature of the complaint, the name, address and the telephone number of the complainant if the complainant will provide this information and the time and date of the complaint;

(b) The *Owner,* upon notification of the complaint, shall initiate appropriate steps to determine all possible causes of the complaint, proceed to take the necessary actions to eliminate the cause of the complaint and forward a formal reply to the complainant; and

(c) The *Owner* shall complete and retain on-site a report written within one (1) week of the complaint date, listing the actions taken to resolve the complaint and any recommendations for remedial measures, and managerial or operational changes to reasonably avoid the recurrence of similar incidents.

5. EMERGENCY RESPONSE

(1) Any spills, fires or other emergency situations shall be forthwith reported directly to the *Ministry's* Spills Action Centre (1-800-268-6060) and shall be cleaned up immediately.

(2) In addition, the *Owner* shall submit, to the *District Manager* a written report within three (3) business days of the emergency situation, outlining the nature of the incident, remedial measures taken, handling of waste generated as a result of the emergency situation and the measures taken to prevent future occurrences at the *Site.*

(3) All wastes resulting from an emergency situation shall be managed and disposed of in accordance with *O.Reg. 347.*

(4) All equipment and materials required to handle the emergency situations shall be:
   (a) kept on hand at all times that waste landfilling and/or handling is undertaken at the *Site;* and
   (b) adequately maintained and kept in good repair.

(5) The *Owner* shall ensure that the emergency response personnel are familiar with the use of such equipment and its location(s).

6. RECORD KEEPING AND REPORTING

Daily Log Book

(1) A daily log shall be maintained in written format and shall include the following information:
   (a) the type, date and time of arrival, hauler, and quantity (tonnes) of all industrial and commercial waste and cover material received at the *Site;*
   (b) the area of the *Site* in which waste disposal operations are taking place;
   (c) a record of litter collection activities and the application of any dust suppressants;
   (d) a record of the daily inspections; and
   (e) a description of any out-of-service period of any control, treatment, disposal or monitoring facilities, the reasons for the loss of service, and action taken to restore and maintain service.

(2) Any information requested, by the *Director* or a *Provincial Officer,* concerning the *Site* and its operation under this *Certificate,* including but not limited to any records required to be kept by this *Certificate* shall be provided to the *Ministry,* upon request.

Daily Inspections and Log Book

(3) An inspection of the entire *Site* and all equipment on the *Site* shall be conducted each day the *Site* is in operation to ensure that: the *Site* is secure; that the operation of the *Site* is not causing any nuisances; that the operation of the *Site* is not causing any adverse effects on the environment and that the *Site* is being operated in compliance with this *Certificate.* Any deficiencies discovered as a result of the inspection shall be remedied immediately, including temporarily ceasing operations at the *Site* if needed.

(4) A record of the inspections shall be kept in a daily log book that includes:
   (a) the name and signature of person that conducted the inspection;
   (b) the date and time of the inspection;
   (c) the list of any deficiencies discovered;
   (d) the recommendations for remedial action; and
   (e) the date, time and description of actions taken.

(5) A record shall be kept in the daily log book of all refusals of waste shipments, the reason(s) for refusal, and the origin of the waste, if known.

Annual Report

(6) 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 April 30th of the year following the period being reported upon.

(7) 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) an assessment of the operation and performance of all engineered facilities, the need to amend the design or operation of the *Site* , and the adequacy of and need to implement the contingency plans;

(c) site plans showing the existing contours of the *Site;* areas of landfilling operation during the reporting period; areas of intended operation during the next reporting period; areas of excavation during the reporting period; the progress of final cover, vegetative cover, and any intermediate cover application; previously existing site facilities; facilities installed during the reporting period; and site preparations and facilities planned for installation during the next reporting period;

(d) calculations of the volume of waste, daily and intermediate cover, and final cover deposited or placed at the *Site* during the reporting period and a calculation of the total volume of *Site* capacity used during the reporting period;

(e) a calculation of the remaining capacity of the *Site* and an estimate of the remaining *Site* life;

(f) a summary of the weekly, maximum daily and total annual quantity (tonnes) of waste received at the *Site;*

(g) a summary of any complaints received and the responses made;

(h) a discussion of any operational problems encountered at the *Site* and corrective action taken;

(i) any changes to the Design and Operations Report and the Closure Plan that have been approved by the *Director* since the last *Annual Report;*

(j) a report on the status of all monitoring wells and a statement as to compliance with *Ontario Regulation 903;*

(k) any other information with respect to the *Site* which the *Regional Director* may require from time to time; and

(l) a summary and analysis of all hydraulic and geochemical monitoring results.

7. LANDFILL DESIGN AND DEVELOPMENT

Approved Waste Types

(1) Only solid non-hazardous municipal waste as defined under *Reg.* 347 shall be accepted at the *Site* for landfilling.

(2) The *Owner* shall develop and implement a program to inspect waste to ensure that the waste received at the *Site* is of a type approved for acceptance under this *Certificate.*

(3) The *Owner* shall ensure that all loads of waste are properly inspected by *Trained personnel* prior to acceptance at the *Site* and that the waste vehicles are directed to the appropriate areas for disposal or transfer of the waste. The *Owner* shall notify the *District Manager,* in writing, of load rejections at the *Site* within one (1) business day from their occurrence.

Capacity

(4) Waste disposal shall be limited to the *Fill Area.*

(5) (a) Waste may only be placed above ground level to the final contour elevations shown on Sheet No. 10 of Item 2 of Schedule "A";

(b) Waste may only be placed below ground level in trenches as shown in trenches on Sheet No. 4 of Item 2 of Schedule "A" and to depths of approximately 3 meters below ground level but not exceeding 3.66 meters;

(c) Approved maximum volumetric capacity of the *Site,* consisting of the waste, daily cover and intermediate cover, but excluding the final cover is 470,000 cubic metres.

(6) There shall be no further final disposal of Waste in the Bulk Material Storage Area shown on Sheet No. 10 of Item 2 of Schedule "A".

Service Area

(7) Only waste that is generated within the boundaries of the City of Temiskaming Shores and the Town of Cobalt may be accepted at the *Site.*

Cover

(8) Alternative materials to soil may be used as weekly and interim cover material, based on an application with supporting information and applicable fee for a trial use or permanent use, submitted by the *Owner* to the *Director,* copied to the *District Manager* and as approved by the *Director* via an amendment to this *Certificate.* The alternative material shall be non-hazardous according to *Reg. 347* and will be expected to perform at least as well as soil in relation to the following functions:

(a) Control of blowing litter, odours, dust, landfill gas, gulls, vectors, vermin and fires;
(b) Provision for an aesthetic condition of the landfill during the active life of the *Site;*
(c) Provision for vehicle access to the active tipping face; and
(d) Compatibility with the design of the *Site* for groundwater protection, leachate management and landfill gas management.

(9) Cover material shall be applied as follows:
(a) Daily Cover - Weather permitting, deposited waste should be covered at the end of each working day in a manner acceptable to the *District Manager* so that no waste is exposed to the atmosphere;
(b) Intermediate Cover - In areas where landfilling has been temporarily discontinued for six (6) months or more, a minimum thickness of 300 millimetre of soil cover or an approved thickness of alternative cover material shall be placed; and
(c) Final Cover - In areas where landfilling has been completed to final contours, a minimum 600 millimetre thick layer of soil of medium permeability and 150 millimetres of top soil (vegetative cover) shall be placed. Fill areas shall be progressively completed and rehabilitated as landfill development reaches final contours.

Stormwater Management Works Approvals

(10) This *Certificate* does not provide an approval for any works subject to approval under the *OWRA, Drainage Act,* or any other legislation that may be applicable.

(11) The *Owner* shall complete the construction of the swale ditches, the sedimentation ponds, and the diversion ditch as outlined in Section 3.2 of Item 3 of Schedule "A" within twelve (12) months from the date of this *Certificate.*

(12) Within six (6) months of the date of this *Certificate,* the *Owner* shall submit to the *Director* an application for approval under the *OWRA* of the on-site stormwater management works. The *Owner* shall fulfil the requirement under the *Drainage Act* , or any other legislation that may be applicable.

8. LANDFILL MONITORING

Landfill Gas

(1) The *Owner* shall ensure that any buildings or structures at the *Site* contain adequate ventilation systems to relieve any possible landfill gas accumulation. Routine monitoring for explosive methane gas levels shall be conducted in all buildings or structures at the *Site,* especially enclosed structures which at times are occupied by people.

Compliance Limits

(2) 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

(3) The *Owner* shall monitor surface water and groundwater as per documents in the Schedule "A".

(4) A certified Professional Geoscientist or Engineer possessing appropriate hydrogeologic training and experience shall execute or directly supervise the execution of the groundwater monitoring and reporting program.

Groundwater Wells and Monitors

(5) The *Owner* shall ensure that all groundwater monitoring wells which form part of the monitoring program are properly capped, secured 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.

Trigger Mechanisms and Contingency Plans

(8) (a) Within one (1) year from the date of this *Certificate* , the *Owner* shall submit to the *Director* , for approval, and copies to the *District Manager* , details of a trigger mechanisms plan for surface water and groundwater quality monitoring for the purpose of initiating investigative activities into the cause of increased contaminant concentrations at the Contaminant Attenuation Zone (CAZ) limit.

(b) Within one (1) year from the date of this *Certificate* , the *Owner* shall submit to the *Director* for approval, and copies to the *District Manager* , details of a contingency plan to be implemented in the event that the surface water or groundwater quality exceeds the a trigger mechanism at the CAZ limit.

(9) In the event of a confirmed exceedence of a site-specific trigger level relating to leachate mounding or groundwater or surface water impacts due to leachate, the *Owner* shall immediately notify the *District Manager,* and an investigation into the cause and the need for implementation of remedial or contingency actions shall be carried out by the *Owner* in accordance with the approved trigger mechanisms and associated contingency plans.

(10) If monitoring results, investigative activities and/or trigger mechanisms indicate the need to implement contingency measures, the *Owner* shall ensure that the following steps are taken:

(a) The *Owner* shall notify the *District Manager,* in writing of the need to implement contingency measures, no later than 30 days after confirmation of the exceedences;

(b) Detailed plans, specifications and descriptions for the design, operation and maintenance of the contingency measures shall be prepared and submitted by the *Owner* to the *District Manager* for approval; and

(c) The contingency measures shall be implemented by the *Owner* upon approval by the *District Manager* .

(11) The *Owner* shall ensure that any proposed changes to the site-specific trigger levels for leachate impacts to the surface water or groundwater, are approved in advance by the *Director* via an amendment to this *Certificate.*

Changes to the Monitoring Plan

(12) 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.

(13) 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.

(14) 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.*

Contaminant Attenuation Zone

(15) The proposed Contaminant Attenuation Zone of 28 hectares is hereby approved.

(16) Within one (1) year from the date of this *Certificate* , the *Owner* shall complete acquiring the ground water easement (property rights) to the proposed contaminant attenuation zone.

(17) The *Owner* must continue to own the property rights to the Contaminant Attenuation Zone for all of the contaminating life span of the *Site.*

(18) The ownership of the property rights must include the right to:
- (a) discharge contaminants from the operations at the *Site* into the Contaminant Attenuation Zone;
- (b) enter into the Contaminant Attenuation Zone and onto the surface above the Contaminant Attenuation Zone for purposes of testing, monitoring, intercepting contaminants and carrying out remedial work;
- (c) install, operate and maintain works, for the purposes mentioned in clause (b), in the Contaminant Attenuation Zone, including on the surface above the Contaminant Attenuation Zone; and
- (d) prevent the owner(s) of the land(s) in which the Contaminant Attenuation Zone is located from paving, erecting a structure or making any use of land(s) above or in the vicinity of the contaminant attenuation zone that would interfere with the functioning of the Contaminant Attenuation Zone or with the exercise of any of the rights mentioned in this subsection.

(19) The *Owner* shall notify the *Director* in writing within thirty (30) days after any change in his, her or its ownership of the property rights in the Contaminant Attenuation Zone.

(20) The *Owner* shall ensure that the written easement agreement, specified in Condition 8 (16) includes an agreement of the property owner(s) of the land(s) required for the Contaminant Attenuation Zone, to register a Certificate of Requirement on title to the land(s) to be used as the Contaminant Attenuation Zone.

9. CLOSURE PLAN

(1) At least 3 years prior to the anticipated date of closure of this *Site,* the *Owner* shall submit to the *Director* for approval, with copies to the *District Manager,* a detailed *Site* closure plan pertaining to the termination of landfilling operations at this *Site,* post-closure inspection, maintenance and monitoring, and end use. The plan shall include the following:

(a) a plan showing *Site* appearance after closure;

(b) a description of the proposed end use of the *Site;*

(c) a descriptions of the procedures for closure of the *Site,* including:

(i) advance notification of the public of the landfill closure;

(ii) posting of a sign at the *Site* entrance indicating the landfill is closed and identifying any alternative waste disposal arrangements;

(iii) completion, inspection and maintenance of the final cover and landscaping;

(iv) *Site* security;

(v) removal of unnecessary landfill-related structures, buildings and facilities;

(vi) final construction of any control, treatment, disposal and monitoring facilities for leachate, groundwater, surface water and landfill gas; and

(vii) a schedule indicating the time-period for implementing sub-conditions (i) to (vi) above;

(d) descriptions of the procedures for post-closure care of the *Site,* including:

(i) operation, inspection and maintenance of the control, treatment, disposal and monitoring facilities for leachate, groundwater, surface water and landfill gas;

(ii) record keeping and reporting; and

(iii) complaint contact and response procedures;

(e) an assessment of the adequacy of and need to implement the contingency plans for leachate and methane gas; and

(f) an updated estimate of the contaminating life span of the *Site,* based on the results of the monitoring programs to date.

(2) The *Site* shall be closed in accordance with the closure plan as approved by the *Director.*

10. WASTE DIVERSION

(1) The *Owner* shall ensure that:

(a) all bins and waste storage areas are clearly labelled;

(b) all lids or doors on bins shall be kept closed during non-operating hours and during the high wind events; and

(c) if necessary to prevent litter, waste storage areas shall be covered during the high winds events.

(2) The *Owner* shall provide a segregated area for the storage of *Refrigerant Appliances* so that the following are ensured:

(a) all *Refrigerant Appliances* have been tagged to indicate that the refrigerant has been removed by a licensed technician. The tag number shall be recorded in the log book and shall remain affixed to the appliance until transferred from the *Site;* **or**

(b) all *Refrigerant Appliances* accepted at the *Site,* which have not been tagged by a licensed technician to verify that the equipment no longer contains refrigerants, are stored segregated, in a clearly marked area, in an upright position and in a manner which allows for the safe handling and transfer from the *Site* for removal of refrigerants as required by O.Reg. 189; and

(c) all *Refrigerant Appliances* received on-site shall either have the refrigerant removed prior to being transferred from the *Site* or shall be shipped off-site only to facilities where the refrigerants can be removed by a licensed technician in accordance with O.Reg. 189.

(3) Propane cylinders shall be stored in a segregated area in a manner which prevents cylinders from being knocked over or cylinder valves from breaking.

(4) The *Owner* shall transfer waste and recyclable materials from the *Site* as follows:

(a) recyclable materials shall be transferred off-site once their storage bins are full;

(b) scrap metal shall be transferred off-site at least twice a year;

(c) tires shall be transferred off-site as soon as a load for the contractor hired by the *Owner* has accumulated or as soon as the accumulated volume exceeds the storage capacity of its bunker; and

(d) immediately, in the event that waste is creating an odour or vector problem.

(5) The *Owner* shall notify the appropriate contractors that waste and recyclable wastes that are to be transferred off-site are ready for removal. Appropriate notice time, as determined by the contract shall be accommodated in the notification procedure.

11. LEAF AND YARD WASTE COMPOSTING

On site *Leaf and Yard Waste* Composting shall be carried out subject to the following conditions:

(1) The *Owner* shall ensure that composting is conducted in accordance with the "Interim Guidelines for the Production and Use of Aerobic Compost in Ontario" dated November 1991 or its latest amendment, and with the requirements as listed below:

(a) waste accepted for composting shall be limited to leaf and yard waste. Leaf and yard waste received at the Site shall not exceed the maximum concentrations for metals listed in Schedule "B";

(b) no more than 2000 tonnes of leaf and yard waste, unfinished compost and finished

compost shall be stored on Site at any one time;

(c) all activities associated with the composting operation shall take place on the designated pad constructed of wood chips;

(d) waste shall be incorporated into windrows within four (4) days of receipt. Finished compost shall be stored on Site for a maximum of twelve (12) months after the curing phase is complete;

(f) windrows shall be arranged in a manner which allows equipment access for efficient turning of windrows and to allow access for emergency vehicles;

(g) windrows shall be constructed at bulk densities and heights which promote aerobic conditions;

(h) all waste being composted shall be held at a temperature of at least 55 °C for a minimum of fifteen (15) cumulative days to ensure proper bacteria growth and pathogen inactivation. During this period, the temperature of the waste being composted shall be monitored and recorded on each day that the Site is in operation, and the windrows shall be turned a minimum of five (5) times. During the remainder of the composting process, the temperature shall be monitored and recorded on a weekly basis at a minimum; and

(i) compost shall be cured for a minimum of six (6) months.

(2) (a) For the first two (2) years of operation, a representative composite sample of compost that has completed the curing phase shall be taken at least once per year and analyzed for the parameters listed in Schedule "B".

(b) After two (2) years of operation, the sampling schedule may be adjusted with the prior written consent of the District Manager.

(3) (a) *Finished compost* may be released from the *Site* for unrestricted use.

(b) *Rejected compost* which meets the parameters listed in Schedule "B", but does not meet the requirements of Condition 10 (1), may be returned to the composting process as waste for re-processing.

(c) *Rejected compost,* which does not meet the parameters listed in Schedule "B" shall be disposed of as waste or as daily cover.

Following items are added to the Schedule "A"

SCHEDULE "A"

8. Report titled "City of Temiskaming Shores, Application to amend Provincial Certificate of Approval Waste Disposal Site No. A570402, Appendices" dated June 2008.

9. Letter dated June 10, 2008 from Maria Story, P.Eng., Story Environmental Services, to Mr. Tesfaye Gebrezghi, P.Eng., Ministry of the Environment, Environmental Assessment and Approvals Branch.

10. Letter dated October 30, 2009 addressed to Larry McCormack, Senior Environmental Officer, Ministry of the Environment from Maria Story, P.Eng., Story Environmental Services RE: Corporation of the City of Temiskaming Shores Haileybury Landfill Site No. A570402- Recommendation Regarding Ongoing Monitoring Program.

Schedule "B"

This Schedule "B" forms part of Certificate of Approval No. A600903.

Parameter	Maximum Concentration
Metal:	
arsenic	13 ppm
cadmium	3 ppm
chromium	210 ppm
cobalt	34 ppm
copper	100 ppm
lead	150 ppm
mercury	0.8 ppm
molybdenum	5 ppm
nickel	62 ppm
selenium	2 ppm
zinc	500 ppm
Foreign material:	
plastic particles greater than 3 mm in any direction	1%
non-biodegradable material greater than 3 mm in any direction	2%

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), (10), (18), (19) and (20) is to clarify the legal rights and responsibilities of the *Owner* and *Operator* 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), (15) and (16) 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.

7. The reason for Condition 1(17) is to ensure that appropriate Ministry staff has ready access to the Site for inspection of facilities, equipment, practices and operations required by the conditions in this Certificate of Approval. This Condition is supplementary to the powers of entry afforded a Provincial Officer pursuant to the *Act* , the *OWRA* , the *PA* , the *NMA* and the *SDWA* .

SITE OPERATION

8. The reasons for Conditions 2(1), 2(5) and 6(3) are to ensure that the *Site* is operated, inspected and maintained in an environmentally acceptable manner and does not result in a hazard or nuisance to the natural environment or any person.

9. The reason for Conditions 2 (2), 2(3) and 2(4) is to ensure that users of the *Site* are fully aware of important information and restrictions related to *Site* operations and access under this *Certificate.*

10. The reason for Condition 2(6) (a) is that open burning of municipal waste is unacceptable because of concerns with air emissions, smoke and other nuisance affects, and the potential fire hazard.

11. The reasons for Condition 2(7), 2(8) and 2(9) are to specify the hours of operation for the landfill site and a mechanism for amendment of the hours of operation, as required.

12. The reasons for Condition 2(10) and 2(11) are to ensure that the *Site* is supervised by properly trained staff in a manner which does not result in a hazard or nuisance to the natural environment or any person and to ensure the controlled access and integrity of the *Site* by preventing unauthorized access when the Site is closed and no site attendant is on duty.

EMPLOYEE TRAINING

13. The reason for Condition 3(1) is to ensure that the *Site* is supervised and operated by properly trained staff in a manner which does not result in a hazard or nuisance to the natural environment or any person.

COMPLAINTS RESPONSE PROCEDURE

14. The reason for Condition 4(1) is to ensure that any complaints regarding landfill operations at this *Site* are responded to in a timely and efficient manner.

EMERGENCY RESPONSE

15. Conditions 5(1) and 5(2) are included to ensure that emergency situations are reported to the Ministry to ensure public health and safety and environmental protection.

16. Conditions 5(3), 5(4) and 5(5) are included to ensure that emergency situations are handled in a manner to minimize the likelihood of an adverse effect and to ensure public health and safety and environmental protection.

RECORD KEEPING AND REPORTING

17. The reason for Conditions 6(1) and 6(2) is to ensure that accurate waste records are maintained to ensure compliance with the conditions in this Certificate of Approval (such as fill rate, site capacity, record keeping, annual reporting, and financial assurance requirements), the *EPA* and its regulations.

18. The reason for Conditions 6(4) and 6(5) is to ensure that detailed records of *Site* inspections are recorded and maintained for inspection and information purposes.

19. The reasons for Conditions 6(6) and 6(7) 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.

LANDFILL DESIGN AND DEVELOPMENT

20. The reason for Conditions 7(1) to 7(7) inclusive is to specify the approved areas from which waste may be accepted at the *Site* and the types and amounts of waste that may be accepted for disposal at the *Site,* based on the *Owner* 's application and supporting documentation.

21. Condition 7(8) is to provide the Owner the process for getting the approval for alternative daily and intermediate cover material.

22. The reasons for Condition 7(9) are to ensure that daily/weekly and intermediate cover are used to control potential nuisance effects, to facilitate vehicle access on the *Site,* and to ensure an acceptable site appearance is maintained. The proper closure of a landfill site requires the application of a final cover which is aesthetically pleasing, controls infiltration, and is suitable for the end use planned for the *Site.*

23. The reason for Conditions 7 (10), (11) and (12) are to make ensure that the *Owner* has obtained other approvals required to carry out the work and complete the construction of the swales and ditches in a timely manner.

LANDFILL MONITORING

24. Reasons for Condition 8(1) are to ensure that off-site migration of landfill gas is monitored and all buildings at the *Site* are free of any landfill gas accumulation, which due to a methane gas component may be explosive and thus create a danger to any persons at the *Site.*

25. Condition 8(2) is included to provide the groundwater and surface water limits to prevent water pollution at the *Site.*

26. Conditions 8(3) and 8(4) are 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.

27. Conditions 8(5), 8(6) and 8(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.

28. Conditions 8(8) to 8(11) inclusive are added to ensure the *Owner* has a plan with an organized set of procedures for identifying and responding to potential issues relating to groundwater and surface water contamination at the *Site's* compliance point.

29. Reasons for conditions 8(12), 8(13) and 8(14) are included to streamline the approval of the changes to the monitoring plan.

30. Condition 8(15) to 8(20) inclusive is included to require the *Owner* to obtain property rights to

land(s) that is required for a Contaminant Attenuation Zone that is necessary for attenuation of contamination resulting from the operation of the *Site* to bring the *Site* into compliance with Reasonable Use Policy Objectives.

CLOSURE PLAN

31. The reasons for Condition 9 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.

WASTE DIVERSION

32. Condition 10 is included to ensure that the recyclable materials are stored in their temporary storage location in a manner as to minimize a likelihood of an adverse effect or a hazard the natural environment or any person.

This Notice shall constitute part of the approval issued under Provisional Certificate of Approval No. A570402 dated November 10, 1998 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
M5G 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 18th day of December, 2009

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

RM/

c: District Manager, MOE North Bay
Maria Story, P.Eng., Story Environmental Services

Appendix B

BOREHOLE LOGS

LOG of BOREHOLE

JOB No. 1H014-A

CLIENT TOWN OF HAILEYBURY

Method Hollow Stem Auger

Diameter I.D. 3 3/4"

ELEV M.P.(S) 295.905 AGL (S) 0.775mAGL GL 295.130m

BOREHOLE No TW 1/91 S and D ELEV. M.P.(D) 295.659 AGL M.P. (D) 0.57 m AGL GL 295.089 m Date March 8, 1991

DEPTH meters	DESCRIPTION	SYMBOL	GROUND WATER	PIEZOMETER	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' Blows/ft.	REMARKS
0	Med. sand, light brown, slightly moist				1			TW 1/91(D) Piezometer construction is SCH 40 50 mm dia. pipe with 10 slot screen installed from 9.75m BGL to 8.23 m BGL
	Med./coarse sand, brown, dry				2	SS	15	Silica sand from 10.36 m BGL to 8.23 m BGL.
	Sandy silt, some clay, greyish brown, moist				3	SS.		Bentonite seal from 8.23 m BGL to 7.5 m BGL.
5	Silty clay, some gravel, minor sand, few boulders, brownish grey, saturated				4	SS		Backfill with drillings to .5 m bentonite seal at surface.
	Wet				5	SS	65	
					6	SS	46	
9.6	Bedrock, near vertical+horizontal fracturing				7	SS		TW 1/91(S) Piezometer construction is SCH 40 50 mm dia. pipe with 10 slot screen installed from 6.01 m BGL to 4.57m BGL
					8	RC		Silica sand from 6.01 m BGL to 4.0 m BGL
								Backfill with drillings to .5 m bentonite seal at surface
								Water level taken on March 26/91 at TW 1/91(D) 7.44m BMP

SAMPLE TYPES

AS	Auger	Sh	Shelby
RC	Rock Core	Sw	Sidewall
SS	Split Spoon		

International Water Consultants Ltd.

SASKATOON - BARRIE - MONTREAL

A-91170

LOG of BOREHOLE

JOB No. 1H014-A

CLIENT TOWN OF HAILEYBURY

Method Hollow Stem Auger Diam Drill HS - I.D. 3 3/4" DD - O.D. 3.78"

BOREHOLE No TW 3/91 ELEV. M.P. 296.627 AGL M.P. 0.879 AGL GL 295.818 Date March 21, 1991

DEPTH meters	DESCRIPTION	SYMBOL	GROUND WATER	PIEZOMETER	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES N Blows/ft.	REMARKS
0	Garbage & med. sand, dry, odour				1	SS		Piezometer construction is SCH 40 50 mm dia. pipe with 10 slot screen from 13.87 m BGL to 10.82 m BGL Silica sand from 14.63 m BGL to above the screen Backfill with drillings .5 m bentonite seal at surface Water level taken on March 26/91 10.89 m BMP
					2	SS		
					3	SS		
5					4	SS		
					5	SS		
					6	SS		
10	Med. sand, black, slightly moist, strong odour				7	SS	15	
			▼		8	SS	14	
	Bedrock, near vertical and subhorizontal fracturing				9	RC		
14.63					10	RC		

SAMPLE TYPES

AS	Auger	Sh	Shelby
RC	Rock Core	Sw	Sidewall
SS	Split Spoon		

International Water Consultants Ltd.
SASKATOON - BARRIE - MONTREAL

LOG of BOREHOLE

JOB No. 1H014-A

CLIENT TOWN OF HAILEYBURY

Method Hollow Stem Auger

Diameter I.D. 3 3/4"

BOREHOLE No TW 4/91 ELEV. M.P. 288.660 AGL M.P. 0.654mAGL GL 288.006m Date March 15, 1991

DEPTH meters	DESCRIPTION	SYMBOL	GROUND WATER	PIEZOMETER	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' Blows/ft.	REMARKS
0	Med./fine sand, reddish brown, slightly moist				1	SS		Piezometer construction is SCH 40 PVC 50 mm dia. pipe with 10 slot screen installed from 10.67 m BGL to 7.62 m BGL
					2	SS	14	
	Medium sand, brown, moist				3	SS	16	Silica sand from 10.67 m BGL to 6.1 m BGL
5			▼		4	SS	6	.5 m bentonite seal at surface
					5	SS	6	Water level taken on March 26/91 5.99 m BMP
					6	SS	4	
10					7	SS		
	Clay, some silt, minor sand, minor gravel, grey, moist				8	SS		
					9	SS	18	
					10	ss	100	
15								
	Clay, some rocks, minor silt, few pebbles grey, hard, dry				11	SS	100	
16.5								
	Refusal							

SAMPLE TYPES

AS	Auger	Sh	Shelby
RC	Rock Core	Sw	Sidewall
SS	Split Spoon		

International Water Consultants Ltd.

SASKATOON - BARRIE - MONTREAL

LOG of BOREHOLE

JOB No. 1H014-A

CLIENT TOWN OF HAILEYBURY

Method Hollow Stem Auger

Diameter I.D. 3 3/4"

BOREHOLE No TW 5/91 ELEV. M.P. 297.019 AGL M.P. 1.04m AGL GL. 295.979m Date March 12, 1991

SUBSURFACE PROFILE					SAMPLES			
DEPTH meters	DESCRIPTION	SYMBOL	GROUND WATER	PIEZOMETER	NUMBER	TYPE	'N' Blows/ft.	REMARKS
0	Med., light brown sand, few stringers of coarser sand, minor pebbles, slightly moist				1	SS		Piezometer construction is SCH 40 PVC 50 mm dia. pipe with 10 slot screen installed from 6.70m to 9.75m BGL.
					2	SS	23	
					3	SS	13	Bentonite bottom seal from 10.7m to 9.75m BGL, silica sand from 9.75m to 5.2m BGL, bentonite seal from 5.2 m to 4.5 m BGL, backfill to 0.5 m BGL, 0.5 m bentonite surface seal
5					4	SS	14	
	Silty clay, grey, very moist		▼		5	SS	4	
	Fine sand, some silt, minor clay, few coarser components, yellowish brown, saturated				6	SS	8	
10	Silty clay, minor sand, minor gravel, few larger rocks, grey, very hard, dry				7	SS	80	Water level taken on March 26/91 7.73 m BMP
					8	SS	>100	
	Clay, some to minor silt, minor gravel, grey, hard, dry				9	SS	>100	
	Wet				10	SS	>100	
14	Bedrock, some fracturing				11	RC		

SAMPLE TYPES

AS	Auger	Sh	Shelby
RC	Rock Core	Sw	Sidewall
SS	Split Spoon		

International Water Consultants Ltd.
SASKATOON - BARRIE - MONTREAL

LOG OF BOREHOLE

CLIENT TOWN OF HAILEYBURY

BOREHOLE No. TW 6/94

ELEV. M.P. 288.916 m.A.S.L. G.L. 288.112 m.A.S.L. M.P. 0.80 m

Method HSA

Diameter 10 cm ID

Date Nov 28/94

DEPTH metres	DESCRIPTION	LOG	WATER LEVEL (m.B.G.L.)	PIEZOMETER	SAMPLES: INTERVAL	SAMPLES: TYPE	SAMPLES: BLOWS/FT	REMARKS
	brown fine grained SAND trace silt. medium dense				1	SS	10/19	Piezometer Installation 50 mm PVC 10 slot screen
	brown SILT and CLAY				2	SS	9/27	Screen 7.32 - 8.84 m Sandpack 7.01 - 8.84 m Bentonite 0 - 7.01 m
3.61								
5	gray-brown fine to medium SAND. trace silt. medium dense to loose				3	SS	17/19	S.W.L. Dec 20/94 6.95 m.B.M.P.
	saturated below 6 metres		▼		4	SS	10/11	
					5	SS	9/13	SAND 1.5 m UP AUGERS WHEN RODS PULLED
9.75					6	SS	8/15	
10	end of hole 9.75 m							
15								

SUBSURFACE PROFILE

SAMPLES

SAMPLE TYPES

AS	Auger	Sh	Shelby
RC	Rock Core	Sw	Sidewall
SS	Split Spoon	CS	Continuous Sampler

International Water Consultants Ltd.

MONTREAL - BARRIE - SASKATOON

LOG OF BOREHOLE

CLIENT TOWN OF HAILEYBURY

BOREHOLE No. TW 7/98

ELEV. M.P. 284.961 m.A.S.L. G.L. 284.321 m.A.S.L. M.P. 0.64 m

Method HSA

Diameter 10 cm ID

Date Sept 10/98

SUBSURFACE PROFILE					SAMPLES			
DEPTH metres	DESCRIPTION	LOG	WATER LEVEL (m.B.G.L.)	PIEZOMETER	INTERVAL	TYPE	BLOWS/FT	REMARKS
	brown fine silty SAND							Piezometer Installation
					1	SS	7/6	50 mm PVC 10 slot screen
	saturated below 2 metres		▼					
	brown sandy SILT				2	SS	1/1	Bentonite 0 - 1.52 Sandpack 1.52 - 4.68 m Screen 4.68 - 6.2
5	brown silty SAND, gravel, stones				3	SS	30/58	S.W.L. Sept 10/98 3.2 m.B.M.P.
	end of hole 6.2 m Includes Stick-up							
10								
15								

SAMPLE TYPES

AS	Auger	Sh	Shelby Tube
RC	Rock Core	Sw	Sidewall
SS	Split Spoon	CS	Continuous Sampler

International Water Consultants Ltd.

MONTREAL - BARRIE - SASKATOON

LOG OF BOREHOLE

CLIENT TOWN OF HAILEYBURY — Method HSA

BOREHOLE No. TW 8/94 — Diameter 10 cm ID

ELEV. M.P. 295.778 m.A.S.L. G.L. 294.941 m.A.S.L. M.P. 0.90 m — Date Nov 29/94

DEPTH metres	DESCRIPTION	LOG	WATER LEVEL (m.B.G.L.)	PIEZOMETER	SAMPLES: INTERVAL	SAMPLES: TYPE	SAMPLES: BLOWS/FT	REMARKS
0.3	organic deposits		▼					Piezometer Installation
	gray silty fine SAND, trace gravel, saturated below 0.3 m							50 mm PVC 10 slot screen
2.44	REFUSAL TO AUGERING ON BEDROCK AT 2.44 m							Screen 0.92 - 2.44 m Sandpack 0.6 - 2.44 m Bentonite 0 - 0.6 m
5								S.W.L. Dec 20/94 1.25 m.B.M.P.
10								
15								

SAMPLE TYPES

AS	Auger	Sh	Shelby
RC	Rock Core	Sw	Sidewall
SS	Split Spoon	CS	Continuous Sampler

International Water Consultants Ltd.
MONTREAL - BARRIE - SASKATOON

LOG OF BOREHOLE

CLIENT TOWN OF HAILEYBURY — Method HSA

BOREHOLE No. TW 9/98 (Replaces MW2) — Diameter 10 cm ID

ELEV. M.P. 289.040 m.A.S.L. G.L. 288.300 m.A.S.L. M.P. 0.74 m — Date Sept 10/98

DEPTH metres	DESCRIPTION	LOG	WATER LEVEL (m.B.G.L.)	PIEZOMETER	SAMPLES: INTERVAL	TYPE	BLOWS/FT	REMARKS
0								Piezometer Installation
					1	SS	5/9	50 mm PVC 10 slot screen
					2	SS	10/15	Bentonite 0 - 10.53 Sandpack 10.53 - 11.43 m Screen 11.43 - 12.95
5					3	SS	11/10	S.W.L. Sept 10/98 10.64 m.B.M.P.
	brown fine to medium SAND some coarse layers				4	SS	4/5	
					5	SS	8/12	
					6	SS	10/11	
10	grey medium SAND				7	SS	9/12	
					8	SS	12/11	
	brown silty SAND w stones							
	end of hole 12.95 m							
15	Includes Stick-up							

SAMPLE TYPES

AS	Auger	Sh	Shelby Tube
RC	Rock Core	Sw	Sidewall
SS	Split Spoon	CS	Continuous Sampler

International Water Consultants Ltd.

MONTREAL - BARRIE - SASKATOON

LOG OF BOREHOLE

CLIENT TOWN OF HAILEYBURY — Method HSA

BOREHOLE No. TW 10/98 — Diameter 10 cm ID

ELEV. M.P. 283.981 m.A.S.L. G.L. 283.301 m.A.S.L. M.P. 0.68 m — Date Sept 10/98

DEPTH metres	DESCRIPTION	LOG	WATER LEVEL (m.B.G.L.)	PIEZOMETER	SAMPLES: INTERVAL	SAMPLES: TYPE	SAMPLES: BLOWS/FT	REMARKS
	grey medium to coarse SAND some silt		▼		1	SS	7/6	Piezometer Installation 50 mm PVC 10 slot screen
	grey medium to coarse SAND some silt				2	SS	1/1	Bentonite 0 - 4.58 Sandpack 4.58 - 5.18 m Screen 5.18 - 6.7
5	grey medium to coarse SAND with layers of silt (2 cm)				3	SS	30/58	S.W.L. Sept 10/98 3.48 m.B.M.P.
	grey medium to coarse SAND some silt				4	SS	7/13	
	end of hole 6.7 m Includes Stick-up							
10								
15								

SAMPLE TYPES

AS	Auger	Sh	Shelby Tube
RC	Rock Core	Sw	Sidewall
SS	Split Spoon	CS	Continuous Sampler

International Water Consultants Ltd.

MONTREAL - BARRIE - SASKATOON

BOREHOLE NO. TW-11

PROJECT NAME: HAILEYBURY LANDFILL SITE
PROJECT NO.: 041708.00
CLIENT: CITY OF TEMISKAMING SHORES
DATE: NOVEMBER 15, 2004
BOREHOLE TYPE: HOLLOW STEM AUGER, 203 mm (8") O.D.
SUPERVISOR: DJW
GROUND ELEVATION:
REVIEWER: BDT

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE RQD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 / Wp Wl	REMARKS
0	FINE SAND: MEDIUM BROWN FINE SAND, TRACE SILT, MOIST.										STICK UP IS 0.79 m.
4.9	FINE TO MEDIUM SAND: GREY FINE TO MEDIUM SAND, TRACE SILT, MOIST TO SATURATED.										STATIC WATER LEVEL AT 9.0 mBGL ON DECEMBER 1, 2004.
13.3	BOREHOLE TERMINATED AT 13.3 m IN SAND.										

BOREHOLE NO. TW-12

PROJECT NAME: HAILEYBURY LANDFILL SITE
PROJECT NO.: 041708.00
CLIENT: CITY OF TEMISKAMING SHORES
DATE: NOVEMBER 16, 2004
BOREHOLE TYPE: HOLLOW STEM AUGER, 203 mm (8") O.D.
SUPERVISOR: DJW
GROUND ELEVATION:
REVIEWER: BDT

DEPTH (m)	STRATIGRAPHIC DESCRIPTION	STRATIGRAPHY	MONITOR DETAILS	SAMPLE TYPE	SAMPLE 'N' VALUE	SAMPLE % WATER	SAMPLE % RECOVERY	SAMPLE RQD (%)	CONE PENETRATION "N" VALUE 10 20 30 / SHEAR STRENGTH	WATER CONTENT % 10 20 30 (W_P – W_L)	REMARKS
0	FINE SAND: LIGHT BROWN FINE SAND, TRACE TO SOME SILT, MOIST.										STICK UP IS 0.56 m.
7.3	MEDIUM TO COARSE SAND: GREYISH BROWN AND BLACK MEDIUM TO COARSE SAND, TRACE FINE TO MEDIUM GRAVEL, MOIST TO WET.										
8.1	BEDROCK:.										STATIC WATER LEVEL AT 8.4 mBGL ON DECEMBER 1, 2004.
8.7	BOREHOLE TERMINATED AT 8.7 m IN BEDROCK.										

Story Environmental Services

Monitoring Well No.: TW13
Ontario Well Tag: A046737

Project:	Location:
Haileybury Landfill	Haileybury, ON

Drilling Method:	Diameter (mm):	Project No.:	Date Drilled:	Logged By:
Hollow Stem Auger	200 mm	00608	15 11 2006	KJK

Ground Surface Elevation (m):	Top of Casing Elevation (m):
288.623	289.492

☒ SPLIT SPOON ■ SHELBY ☒ CUTTINGS ▼ WATER LEVEL

DEPTH (m)	MOISTURE CONTENT (%) 20 40 60 80	BLOW COUNT	SAMPLE NO.	SAMPLE TYPE	STRATIGRAPHY	SOIL DESCRIPTION	MONITORING WELL INSTALLATION
0						TOPSOIL, black, clayey, some silt, trace sand, low plasticity, organics (rootlets), damp.	
						SAND, brown, loose, poorly graded, fine to medium grained, rootlets to 1.0 m, homogeneous, damp.	
1		2/3				- light brown, fine grained at 1.7 m	
2		3/4 1/3 3/3				- damp to moist 3.0 m	
3		1/3 3/2				- moist at 3.7 m	
		2/5 5/5					
4		1/3 4/4					
5		2/4 4/4					▼ 17/11/2006
6		2/3 3/3					
7		0/5				- coarse grained from 7.7 m to 7.9 m	
		5/5					
8						- loose to medium dense at 8.2 m	
9		0/6 6/6				- medium dense at 9.1 m - silt seam (50 mm thick) at 9.4 m	

Legend
- 50 mm Ø PVC pipe
- 50 mm Ø slotted PVC pipe
- bentonite seal
- clean silica sand backfill

Story Environmental Services

Monitoring Well No.: TW13
Ontario Well Tag: A046737

Project:	Location:
Haileybury Landfill	Haileybury, ON

Drilling Method:	Diameter (mm):	Project No.:	Date Drilled:	Logged By:
Hollow Stem Auger	200 mm	00608	15 11 2006	KJK

Ground Surface Elevation (m):	Top of Casing Elevation (m):
288.623	289.492

☒ SPLIT SPOON ■ SHELBY ☒ CUTTINGS ▼ WATER LEVEL

DEPTH (m)	MOISTURE CONTENT (%) 20 40 60 80	BLOW COUNT	SAMPLE NO.	SAMPLE TYPE	STRATIGRAPHY	SOIL DESCRIPTION	MONITORING WELL INSTALLATION
10		0/5				- continued	▼ 15/11/2006
11		6/6				- brown, coarse grained and wet at 10.7 m	
12		0/0, 1/3				- blackish grey, coarse grained, poorly graded, trace gravel at 12.2 m	
13						- slight odour at 13.4 m	
14							
15						End of Borehole at 15.2 m	
16							
17							
18							
19							

Legend
- 50 mm Ø PVC pipe
- 50 mm Ø slotted PVC pipe
- bentonite seal
- clean silica sand backfill

Story Environmental Services

Monitoring Well No.: TW14
Ontario Well Tag: A046737

Project:	Location:
Haileybury Landfill	Haileybury, ON

Drilling Method:	Diameter (mm):	Project No.:	Date Drilled:	Logged By:
Hollow Stem Auger	200 mm	00608	15 11 2006	KJK

Ground Surface Elevation (m):	Top of Casing Elevation (m):
285.887	286.673

☒ SPLIT SPOON ■ SHELBY ☒ CUTTINGS ▼ WATER LEVEL

DEPTH (m)	MOISTURE CONTENT (%) 20 40 60 80	BLOW COUNT	SAMPLE NO.	SAMPLE TYPE	STRATIGRAPHY	SOIL DESCRIPTION	MONITORING WELL INSTALLATION
0						TOPSOIL, black, clayey, some silt, trace sand, low plasticity, organics (rootlets), damp.	
						SAND, brown (rustic), silty, loose, fine grained, some oxidation, organic odour, damp. - brown, poorly graded, homogeneous at 0.9 m	
1		2/4 4/4				- light brown to grey, some silt at 1.5 m	
2		2/3 3/4					
3		2/3 3/5				- light to olive brown at 3.7 m	
4		4/7 7/7				- medium dense, moist at 4.6 m - moist to wet at 4.9 m	
5							
6		3/6 6/6				- medium grained at 6.1 m	
7		2/5 6/8					▼ 16/11/2006
8						- wet at 8.5 m	
9		0/0 0/6				- sand is heaving at 9.1 m - coarse grained at 9.8 m	

Legend
- 50 mm Ø PVC pipe
- 50 mm Ø slotted PVC pipe
- bentonite seal
- clean silica sand backfill

Story Environmental Services

Monitoring Well No.: TW14
Ontario Well Tag: A046737

Project:	Location:
Haileybury Landfill	Haileybury, ON

Drilling Method:	Diameter (mm):	Project No.:	Date Drilled:	Logged By:
Hollow Stem Auger	200 mm	00608	15 11 2006	KJK

Ground Surface Elevation (m):	Top of Casing Elevation (m):
285.887	286.673

☒ SPLIT SPOON ■ SHELBY ☒ CUTTINGS ▼ WATER LEVEL

DEPTH (m)	MOISTURE CONTENT (%) 20 40 60 80	BLOW COUNT	SAMPLE NO.	SAMPLE TYPE	STRATIGRAPHY	SOIL DESCRIPTION	MONITORING WELL INSTALLATION
10						- continued	
11							
12							
13						End of Borehole at 13.7 m	
14							
15							
16							
17							
18							
19							

Legend
- 50 mm Ø PVC pipe
- 50 mm Ø slotted PVC pipe
- bentonite seal
- clean silica sand backfill

Story Environmental Services

Monitoring Well No.: TW15
Ontario Well Tag: A058780

Project:	Location:
Haileybury Landfill	Haileybury, ON

Drilling Method:	Diameter (mm):	Project No.:	Date Drilled:	Logged By:
Hollow Stem Auger	200 mm	00608	13 09 2007	KJK

Ground Surface Elevation (m):	Top of Casing Elevation (m):
286.883	287.791

☒ SPLIT SPOON ■ SHELBY ⊘ CUTTINGS ▼ WATER LEVEL

DEPTH (m)	MOISTURE CONTENT (%) 20 40 60 80	BLOW COUNT	SAMPLE NO.	SAMPLE TYPE	STRATIGRAPHY	SOIL DESCRIPTION	MONITORING WELL INSTALLATION
0						TOPSOIL, black, some clay and silt, trace sand, low plasticity, organics (rootlets), damp.	
						SAND, brown, loose to medium dense, poorly graded, medium grained, organic (rootlets), dry.	
1				⊘			
2						- coarse grained at 2.1 m	
3		2/3 3/4		☒		- slight grey and moist at 3.5 m	
4		2/3		☒			
5		4/6		☒		- dense at 5.0 m - auger resistance and pebble in split spoon at 5.2 m	
6		3/4 6/6		☒		- grey at 6.1 m	
7		6/16		☒			
8		14		☒		- cobble layer at 8.5 m	
9		6/13 16		☒		- water 9.3 m	

Legend
- 50 mm Ø PVC pipe
- 50 mm Ø slotted PVC pipe
- bentonite seal
- clean silica sand backfill
- slough native material

▼ 25/09/2007

Story Environmental Services

Monitoring Well No.: TW15
Ontario Well Tag: A058780

Project:	Location:
Haileybury Landfill	Haileybury, ON

Drilling Method:	Diameter (mm):	Project No.:	Date Drilled:	Logged By:
Hollow Stem Auger	200 mm	00608	13 09 2007	KJK

Ground Surface Elevation (m):	Top of Casing Elevation (m):
286.883	287.791

☒ SPLIT SPOON ■ SHELBY ☒ CUTTINGS ▼ WATER LEVEL

DEPTH (m)	MOISTURE CONTENT (%) 20 40 60 80	BLOW COUNT	SAMPLE NO.	SAMPLE TYPE	STRATIGRAPHY	SOIL DESCRIPTION	MONITORING WELL INSTALLATION
10						- continued	
11							
12							
13						End of Borehole at 13.4 m	
14							
15							
16							
17							
18							
19							

Legend

- 50 mm Ø PVC pipe
- 50 mm Ø slotted PVC pipe
- bentonite seal
- clean silica sand backfill
- slough native material

Story Environmental Services

Monitoring Well No.: TW16
Ontario Well Tag: A058780

Project:	Location:
Haileybury Landfill	Haileybury, ON

Drilling Method:	Diameter (mm):	Project No.:	Date Drilled:	Logged By:
Hollow Stem Auger	200 mm	00608	13 09 2007	KJK

Ground Surface Elevation (m):	Top of Casing Elevation (m):
284.530	285.514

☒ SPLIT SPOON ■ SHELBY ☒ CUTTINGS ▼ WATER LEVEL

DEPTH (m)	MOISTURE CONTENT (%) 20 40 60 80	BLOW COUNT	SAMPLE NO.	SAMPLE TYPE	STRATIGRAPHY	SOIL DESCRIPTION
0						TOPSOIL, black, some clay and silt, trace sand, low plasticity, organics (rootlets), damp.
						SAND, brown, loose, medium to coarse grained, dry.
1		5/5/6				- course grained sand seams present in split spoon (less than 50 mm thick) and dry at 1.5 m
2						
3		3/5/4/6				- trace pebbles, sand coarse grained, dry to moist at 3.0 m
4		3/4/4/4				- grey at 4.6 m
5						
6		5/11/8/6				- very dense and difficult to advance auger from 6.1 m to 7.9 m - water at 6.4 m
7		9				
8						End of Borehole, Refusal at 7.9 m
9		6/13/16				

MONITORING WELL INSTALLATION

▼ 25/09/2008

Legend

- 50 mm Ø PVC pipe
- 50 mm Ø slotted PVC pipe
- bentonite seal
- clean silica sand backfill
- slough native material

Story Environmental Services

Monitoring Well No.: TW17
Ontario Well Tag: A058780

Project:	Location:
Haileybury Landfill	Haileybury, ON

Drilling Method:	Diameter (mm):	Project No.:	Date Drilled:	Logged By:
Hollow Stem Auger	200 mm	00608	14 09 2007	KJK

Ground Surface Elevation (m):	Top of Casing Elevation (m):
284.224	285.072

☒ SPLIT SPOON ■ SHELBY ☒ CUTTINGS ▼ WATER LEVEL

DEPTH (m)	MOISTURE CONTENT (%) 20 40 60 80	BLOW COUNT	SAMPLE NO.	SAMPLE TYPE	STRATIGRAPHY	SOIL DESCRIPTION	MONITORING WELL INSTALLATION
0						TOPSOIL, black, clayey, some silt, organics (rootlets), damp.	
						SAND, brown, medium dense, medium grained, damp.	
1						SILT, brown, some clay, trace sand, firm, medium plasticity, moist. - wet at 1.2 m	
2						- soft at 2.1 m	▼ 24/09/2007
3		0/0, 1/2				- very soft at 3.0 m	
4						End of Borehole, Refusal at 4.0 m	
5							
6							
7							
8							
9							

Legend

- 50 mm Ø PVC pipe
- 50 mm Ø slotted PVC pipe
- bentonite seal
- clean silica sand backfill
- slough native material

RECORD OF BOREHOLE No. MW21-01 Co-Ord. 593261 E 5253075 N

wood.

Project Number:	TY131010.2021.3000	Drilling Location:	Haileybury Landfill	Logged by:	ARL
Project Client:	City of Temiskaming Shores	Drilling Method:	HQ mm Casing and Rods	Compiled by:	ARL
Project Name:	Haileybury Well Installation	Drilling Machine:	Track Mounted Drill	Reviewed by:	ESL
Project Location:	Haileybury, ON	Date Started:	10 Apr 2021 Date Completed: 10 Apr 2021	Revision No.:	2, 9/7/21

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS
Lithology Plot	DESCRIPTION Local Ground Surface Elevation: 286.3 m	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	✖ Pocket Penetrometer (kg/cm²) 1 2 3 4 Penetration Testing ○ SPT ● DCPT MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_P W W_L Plastic Liquid ✳ Passing 75 um (%) ○ Moisture Content (%) 20 40 60 80		1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand
	No surface spoon taken due to frozen ground and tree branches under snow 285.5					0	286.0				STICKUP: 1.22 m
	grey 0.8 SAND trace silt dry	SS	1	84	26	0.5	285.5				
	284.6					1.0	285.0				
	brown 1.7 SANDY SILT some clay	SS	2	75	19	1.5	284.5				
	284.0					2.0	284.0				
	grey 2.3 SILTY SAND dry	SS	3	33	22	2.5	283.5				
		SS	4	33	16	3.0	283.0				
		SS	5	41	18	3.5	282.5				
						4.0	282.0				
						4.5	281.5				
						5.0	281.0				
	280.2					5.5	280.5				
	grey 6.1 SILTY SAND with COBBLES poor sample recovery due to cobble sizes	SS	6	0	N/A	6.0	280.0				
						6.5					

Wood Environment & Infrastructure Solutions
131 Fielding Road
Lively, Ontario
Canada P3Y 1L7
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▽ Groundwater depth on completion of drilling: 9.05 m.

■ Cave in depth recorded on completion of drilling at N/A m.

Scale: 1 : 35

RECORD OF BOREHOLE No. MW21-01 Co-Ord. 593261 E 5253075 N

wood.

Project Number: TY131010.2021.3000 Drilling Location: Haileybury Landfill Logged by: ARL

Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	FIELD TESTING	LAB TESTING	INSTRUMENTATION INSTALLATION	COMMENTS
	grey SILTY SAND with COBBLES poor sample recovery due to cobble sizes	SS	7	0	N/A	7.0	279.5	Pocket Penetrometer (kg/cm²) 1 2 3 4 Penetration Testing: SPT ○ DCPT ● MTO Vane* △ Intact ▲ Remould Nilcon Vane* ◇ Intact ◆ Remould * Undrained Shear Strength (kPa) 15 30 45 60	Atterberg Limits W_P W W_L Plastic Liquid ✱ Passing 75 um (%) ○ Moisture Content (%) 20 40 60 80		1 riser pipe in bentonite 1 riser pipe in sand 1 slotted pipe in sand
	278.1					7.5	279.0				
	Auger refusal at 8.23 m on cobbles or boulders. 8.2 Hole continued with casing and water without sampling.					8.0	278.5				
						8.5	278.0				
						9.0	277.5				
						9.5	277.0				
						10.0	276.5				
						10.5	276.0				
						11.0	275.5				
						11.5	275.0				
						12.0	274.5				
						12.5	274.0				
	273.4						273.5				
	END OF HOLE, TARGET DEPTH FOR WELL 12.9 INSTALL										

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and requires interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commissioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 35

Appendix C

GROUNDWATER ELEVATIONS

Summary of Groundwater Elevations

Monitor No.	UTM Coordinates		Measuring Point Elevation (masl)[1]	Elevation of Water (masl)[1]																														
	Easting	Northing		May-03	Aug-03	Nov-03	May-04	Aug-04	Nov-04	May-05	Sep-05	Nov-05	May-06	Sep-06	Dec-06	Jun-07	Sep-07	Nov-07	May-08	Sep-08	Dec-08	May-09	Sep-09	Nov-09	May-10	Aug-10	Nov-10	May-11	Aug-11	Nov-11	May-12	Aug-12	Nov-12
TW1	593793	5253023	295.66	288.95	288.50	288.93	289.08	288.45	288.35	288.80	289.22	288.87	288.85	288.36	288.90	288.65	288.22	288.23	289.03	288.35	288.45	289.22	288.23	Destroyed										
TW3	593578	5253041	296.70	285.34	285.31	285.38	285.39	285.26	285.09	285.30	286.13	285.27	285.28	285.14	ND	285.27	285.10	285.01	285.31	285.22	285.29	285.32	285.18	285.29	285.30	285.10	285.30	285.34	285.21	285.22	285.30	285.11	285.15
TW4	593656	5252867	288.66	283.78	283.40	284.05	284.61	283.92	282.90	283.99	282.64	283.85	284.42	282.99	284.51	283.89	282.64	282.26	285.02	283.54	283.80	285.37	283.40	284.31	283.74	282.60	283.70	285.02	283.48	284.58	284.34	282.72	284.16
TW5	593835	5252876	297.02	289.74	289.67	289.60	289.72	289.84	289.45	289.72	289.29	289.65	289.96	289.43	289.61	289.56	289.18	289.14	289.61	289.50	289.50	289.97	289.52	289.58	289.56	289.36	289.60	289.89	289.67	289.62	289.79	289.32	289.56
TW6	593605	5252915	288.92	283.04	282.70	283.10	283.80	283.28	282.23	283.17	282.04	282.92	283.67	282.35	283.53	283.06	282.06	281.73	283.99	282.84	282.97	284.46	282.72	283.37	283.00	282.07	282.93	284.17	282.86	283.42	283.57	282.19	282.86
TW7	593553	5252777	284.96	283.31	282.79	283.69	283.74	283.25	282.51	283.26	282.17	283.31	283.54	282.56	283.71	283.40	282.12	281.75	283.86	283.08	283.24	284.09	282.94	283.51	283.06	282.26	283.05	283.80	282.89	283.68	283.46	282.14	283.93
TW8	593910	5253100	295.78	294.56	294.44	294.63	294.61	294.49	294.47	294.55	294.25	294.58	294.52	294.37	294.57	294.52	293.84	294.17	294.54	294.42	294.53	294.56	294.39	294.56	294.54	294.38	294.53	294.55	294.03	294.56	294.52	294.15	294.64
TW9	593553	5252965	289.04	279.09	279.20	279.14	280.04	280.12	278.74	279.35	278.21	278.55	280.18	278.97	279.69	279.52	278.41	277.90	279.92	279.34	279.15	281.01	279.52	279.48	279.17	278.14	278.82	280.13	279.39	279.01	279.94	278.52	278.11
TW10	593486	5252824	283.98	281.40	281.50	281.69	282.07	281.99	281.48	281.75	280.69	281.44	282.16	281.49	281.99	281.96	280.28	280.77	281.95	281.75	281.58	282.51	281.82	282.02	281.78	281.60	281.79	282.22	281.77	281.83	282.07	280.92	281.08
TW11	593519	5252961	288.80					ND	278.98	279.01	278.24	278.41	279.96	279.19	279.57	279.56	278.63	278.12	279.48	279.39	279.12	280.91	279.77	279.51	279.10	278.25	278.61	279.80	279.47	279.06	279.94	278.81	278.28
TW12	593356	5252963	287.26					ND	278.32	DRY	DRY	DRY	278.53	278.34	278.33	278.48	DRY	DRY	DRY	278.37	278.13	279.28	278.89	278.44	DRY	DRY	DRY	278.13	278.44	278.02	278.69	278.08	DRY
TW13	593472	5253010	289.49												278.65	278.77	278.10	277.68	278.19	278.66	278.39	279.81	279.17	278.74	278.25	277.70	277.74	278.53	278.74	278.28	279.04	278.29	277.77
TW14	593381	5252937	286.67												278.39	278.52	277.95	277.58	277.88	278.43	278.17	279.37	278.94	278.49	278.01	277.55	277.55	278.18	278.49	278.07	278.76	278.12	277.64
TW15	593369	5253024	287.79														277.87	277.50	277.77	278.34	278.09	279.27	278.85	278.41	277.92	277.48	277.46	278.10	278.40	277.99	278.65	278.05	277.58
TW16	593282	5252995	285.51														277.84	277.39	277.76	278.31	278.07	279.22	278.82	278.37	277.89	277.45	277.43	278.07	278.37	277.96	278.61	278.02	277.56
TW17	593517	5252798	285.07														282.11	281.75	283.91	283.06	283.20	284.05	282.92	283.49	283.07	282.25	283.06	283.76	282.88	283.67	283.44	282.14	283.88
MW21-01	593261	5253075	287.52																															

Notes:
(1) masl - metres above sea level.
(2) ND - no data available.
(4) mbmp - metres below measuring point.

Summary of Groundwater Elevations

Monitor No.	UTM Coordinates		Measuring Point Elevation (masl)[1]	Elevation of Water (masl)[1]																																		
	Easting	Northing		May-13	Jul-13	Sep-13	Jun-14	Jul-14	Sep-14	May-15	Jul-15	Sep-15	May-16	Jul-16	Sep-16	May-17	Jul-17	Sep-17	May-18	Jul-18	Oct-18	May-19	Jul-19	Sep-19	Jun-20	Aug-20	Oct-20	Jun-21	Aug-21	Oct-21	May-22	Aug-22	Oct-22	Jun-23	Aug-23	Oct-23
TW1	593793	5253023	295.66	Destroyed																																		
TW3	593578	5253041	296.70	285.28	285.20	285.14	285.30	285.21	285.31	Destroyed																												
TW4	593656	5252867	288.66	285.33	283.72	283.08	285.37	283.82	284.51	284.56	283.47	282.91	285.47	283.86	283.22	285.26	283.92	282.93	285.42	283.55	282.93	285.83	284.26	283.41	284.73	284.31	284.30	283.77	284.15	ND	285.27	283.03	282.49	284.12	283.16	284.82
TW5	593835	5252876	297.02	289.98	289.56	289.36	290.15	ND	290.05	290.02	289.86	289.26	290.31	290.02	289.68	290.02	289.92	289.47	289.97	289.68	289.47	290.58	290.12	289.69	290.05	289.97	289.96	289.51	289.96	289.74	ND	289.58	289.55	289.84	289.66	289.87
TW6	593605	5252915	288.92	284.42	283.11	282.49	284.62	283.22	283.70	283.87	282.91	282.34	284.56	283.29	282.65	284.35	283.32	282.40	284.46	283.00	282.40	285.16	283.76	282.90	284.13	283.70	283.61	283.32	283.64	282.67	284.54	282.57	282.05	283.60	282.58	283.82
TW7	593553	5252777	284.96	284.03	283.08	282.58	284.02	ND	283.76	284.44	282.94	281.96	284.04	283.21	282.74	283.93	283.22	282.49	284.00	283.02	282.49	284.19	283.41	282.99	283.72	283.51	283.72	283.07	283.31	282.54	ND	282.29	281.84	283.23	282.37	283.87
TW8	593910	5253100	295.78	294.58	294.40	294.47	294.57	294.50	294.59	294.56	294.22	293.68	294.56	294.25	293.97	294.53	294.47	294.25	294.54	294.43	294.25	294.57	294.37	294.56	294.52	294.53	294.58	294.52	294.52	294.52	294.57	294.27	ND	294.43	294.32	294.57
TW9	593553	5252965	289.04	280.66	279.78	278.92	281.02	279.96	279.90	280.14	279.36	278.15	280.91	279.92	278.98	280.01	279.44	277.26	279.56	279.09	277.26	281.52	280.39	279.35	280.29	279.49	279.26	278.78	279.19	278.61	279.91	278.69	278.58	ND	278.54	278.84
TW10	593486	5252824	283.98	282.39	281.81	281.40	282.46	ND	282.13	282.16	281.50	278.64	282.45	281.86	281.26	282.11	281.79	280.86	282.03	281.43	280.86	282.75	282.12	281.74	282.32	282.15	282.13	281.50	282.09	281.68	282.11	280.98	280.68	281.86	281.11	281.58
TW11	593519	5252961	288.80	280.45	279.96	279.23	280.82	ND	279.98	280.20	279.63	278.50	280.84	280.17	279.33	279.70	279.49	278.50	279.36	279.22	278.50	281.13	280.65	279.71	280.12	279.65	279.41	278.92	279.19	278.84	ND	278.90	278.37	279.45	278.79	278.90
TW12	593356	5252963	287.26	278.74	278.94	278.48	279.10	ND	278.86	278.93	278.73	278.19	279.08	279.19	278.59	<277.99	278.39	278.13	DRY	278.27	DRY	279.01	279.51	278.93	278.77	278.66	278.48	<278.09	278.18	<278.09	ND	278.13	278.04	278.26	278.01	277.99
TW13	593472	5253010	289.49	279.20	279.24	278.70	279.59	279.29	279.17	279.30	278.99	277.99	279.61	279.47	278.80	278.39	278.68	277.85	278.23	278.48	277.85	279.63	279.93	279.19	279.12	278.95	278.74	278.50	278.47	278.27	278.33	277.06	278.10	278.58	278.20	278.16
TW14	593381	5252937	286.67	278.81	278.98	278.51	279.17	ND	277.91	279.00	278.78	278.25	279.15	279.20	<273.36	278.04	278.45	277.84	277.96	278.32	277.84	279.06	279.60	278.97	278.84	278.72	278.52	277.98	278.23	278.08	278.02	279.04	277.78	278.33	278.06	277.94
TW15	593369	5253024	287.79	278.72	278.89	278.43	279.05	279.13	278.82	278.90	278.68	278.15	279.04	279.02	278.54	277.94	278.35	277.78	277.99	277.84	277.78	278.94	279.52	278.90	278.73	278.64	278.43	277.89	278.14	278.02	277.93	278.12	277.06	278.27	277.97	277.86
TW16	593282	5252995	285.51	278.66	278.86	278.40	279.02	279.38	278.78	278.90	278.64	278.11	279.01	279.07	278.48	277.91	278.31	277.75	277.88	278.19	277.75	278.92	279.46	278.86	278.67	278.58	278.39	277.99	278.23	277.99	277.90	278.04	277.08	278.23	277.96	277.84
TW17	593517	5252798	285.07	284.00	283.05	282.55	283.98	ND	283.71	283.59	282.90	281.73	283.99	283.19	282.71	283.90	283.22	282.47	283.96	283.00	282.47	284.16	283.40	282.97	283.69	283.48	283.70	282.36	283.29	282.53	283.78	282.26	281.81	283.22	282.39	283.83
MW21-01	593261	5253075	287.52																									277.04	277.28	277.14	276.92	277.25	276.93	277.29	277.17	277.04

Notes:
(1) masl - metres above sea level.
(2) ND - no data available.
(4) mbmp - metres below measuring point.

Appendix D

2023 LABORATORY ANALYTICAL REPORTS

FINAL REPORT

CA15699-JUN23 R1

C023701288, TY131010.2023.2000.1142.5730-00, Hailey GW

Prepared for

WSP Environment & Infrastructure Canada Limited

FINAL REPORT

CA15699-JUN23 R1

First Page

CLIENT DETAILS		LABORATORY DETAILS	
Client	WSP Environment & Infrastructure Canada Limited	Project Specialist	Brad Moore Hon. B.Sc
		Laboratory	SGS Canada Inc.
Address	131 Fielding Road Lively, ON P3Y 1L7. Canada	Address	185 Concession St., Lakefield ON, K0L 2H0
Contact	Dominique Gagnon	Telephone	705-652-2143
Telephone	705-665-0159	Facsimile	705-652-6365
Facsimile		Email	brad.moore@sgs.com
Email	Dominique.Gagnon@wsp.com; meg.russell@wsp.com	SGS Reference	CA15699-JUN23
Project	C023701288, TY131010.2023.2000.1142.5730-00, Hailey GW	Received	06/21/2023
Order Number		Approved	06/28/2023
Samples	Ground Water (13)	Report Number	CA15699-JUN23 R1
		Date Reported	06/28/2023

COMMENTS

Temperature of Sample upon Receipt: 10
Cooling Agent Present:
Custody Seal Present:

Chain of Custody Number:NA

Phenol tag 10 RL raised due to sample matrix

SIGNATORIES

Brad Moore Hon. B.Sc

TABLE OF CONTENTS

Client: WSP Environment & Infrastructure Canada Limited

Project: C023701288, TY131010.2023.2000.1142.5730-00, Hailey GW

Project Manager: Dominique Gagnon

Samplers: Aedon Lemon

MATRIX: WATER

L1 = ODWS_AO_OG / WATER / - - Table 4 - Drinking Water - Reg O.169_03

L2 = ODWS_MAC / WATER / - - Table 1,2 and 3 - Drinking Water - Reg O.169_03

Parameter	Units	RL	L1	L2	Sample Number	7	8	9	10	11	12	13	14
					Sample Name	TW-4	TW-6	TW-8	TW-9	TW-10	TW-13	TW-14	TW-15
					Sample Matrix	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
					Sample Date	19/06/2023	19/06/2023	19/06/2023	19/06/2023	19/06/2023	19/06/2023	19/06/2023	19/06/2023
						Result	Result	Result	Result	Result	Result	Result	Result
General Chemistry													
Biochemical Oxygen Demand (BOD5)	mg/L	2				< 4↑	12	< 4↑	23	< 4↑	< 4↑	< 4↑	< 4↑
Alkalinity	mg/L as CaCO3	2	500			698	328	97	1070	26	216	31	326
Conductivity	uS/cm	2				1840	1200	194	2940	122	657	94	946
Total Dissolved Solids	mg/L	30	500			1240	734	120	1400	97	346	71	586
Dissolved Organic Carbon	mg/L	1.0	5			14.2	12.5	2.1	54.4	2.9	14.0	1.0	4.3
Chemical Oxygen Demand	mg/L	8				50	35	< 8	255	8	65	< 8	13
Total Kjeldahl Nitrogen (N)	as N mg/L	0.05				2.54	9.79	< 0.05	148	0.08	25.5	< 0.05	0.82
Ammonia+Ammonium (N)	as N mg/L	0.04				0.84	7.59	0.08	151	< 0.04	24.4	< 0.04	0.39
Organic Nitrogen	mg/L	0.5	0.15			1.7	2.2	< 0.5	< 0.5	< 0.5	1.1	< 0.5	< 0.5
Total Reactive Phosphorous (o-phosphate as P)	mg/L	0.03				< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Metals and Inorganics													
Fluoride	mg/L	0.06		1.5		< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
Sulphate	mg/L	2	500			190	120	4	100	4	5	3	62
Nitrite (as N)	as N mg/L	0.03		1		0.04	0.05	< 0.03	< 0.3↑	< 0.03	< 0.3↑	< 0.03	0.06
Nitrate (as N)	as N mg/L	0.06		10		1.24	12.8	< 0.06	< 0.06	1.18	< 0.06	1.24	9.79
Hardness (dissolved)	mg/L as CaCO3	0.05	100			767	372	96.8	545	27.8	173	34.9	361
Aluminum (dissolved)	mg/L	0.001				0.002	0.004	0.002	0.014	0.022	0.076	0.002	0.001
Arsenic (dissolved)	mg/L	0.0002		0.01		0.0005	0.0005	0.0013	0.0135	< 0.0002	0.0059	< 0.0002	0.0003
Barium (dissolved)	mg/L	0.00008		1		0.161	0.156	0.00484	0.318	0.00434	0.0704	0.00197	0.0956
Boron (dissolved)	mg/L	0.002		5		0.896	1.25	0.013	1.55	0.008	0.114	0.017	0.889
Beryllium (dissolved)	mg/L	0.000007				< 0.000007	< 0.000007	< 0.000007	< 0.000007	0.000007	0.000027	< 0.000007	< 0.000007

Client: WSP Environment & Infrastructure Canada Limited

Project: C023701288, TY131010.2023.2000.1142.5730-00, Hailey GW

Project Manager: Dominique Gagnon

Samplers: Aedon Lemon

MATRIX: WATER

L1 = ODWS_AO_OG / WATER / - - Table 4 - Drinking Water - Reg O.169_03

L2 = ODWS_MAC / WATER / - - Table 1,2 and 3 - Drinking Water - Reg O.169_03

Parameter	Units	RL	L1	L2	Sample Number	7	8	9	10	11	12	13	14
					Sample Name	TW-4	TW-6	TW-8	TW-9	TW-10	TW-13	TW-14	TW-15
					Sample Matrix	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
					Sample Date	19/06/2023	19/06/2023	19/06/2023	19/06/2023	19/06/2023	19/06/2023	19/06/2023	19/06/2023
						Result	Result	Result	Result	Result	Result	Result	Result
Metals and Inorganics (continued)													
Bismuth (dissolved)	mg/L	0.00001				< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	0.00002	< 0.00001	< 0.00001
Calcium (dissolved)	mg/L	0.01				226	102	22.8	126	7.42	45.4	9.32	103
Cadmium (dissolved)	mg/L	0.000003		0.005		0.000056	0.000112	0.000009	0.000012	0.000005	0.000005	< 0.000003	0.000040
Chromium (dissolved)	mg/L	0.00008		0.05		0.00067	0.00072	0.00023	0.0117	0.00059	0.00323	0.00148	0.00086
Cobalt (dissolved)	mg/L	0.000004				0.00288	0.00407	0.000315	0.00979	0.000068	0.00305	0.000040	0.00596
Copper (dissolved)	mg/L	0.0002	1			0.0105	0.0333	0.0013	0.0031	0.0022	0.0064	0.0012	0.0177
Iron (dissolved)	mg/L	0.007	0.3			0.067	0.010	0.761	19.5	0.016	13.8	< 0.007	< 0.007
Potassium (dissolved)	mg/L	0.009				21.2	44.7	0.513	66.8	0.561	19.0	0.415	14.4
Magnesium (dissolved)	mg/L	0.001				49.3	28.8	9.71	56.3	2.25	14.4	2.82	25.4
Manganese (dissolved)	mg/L	0.00001	0.05			1.57	1.34	0.228	3.47	0.00238	1.53	0.00064	0.759
Sodium (dissolved)	mg/L	0.01	200	20		72.5	71.7	2.22	175	12.1	11.0	4.32	53.2
Lead (dissolved)	mg/L	0.00009		0.01		< 0.00009	< 0.00009	< 0.00009	< 0.00009	< 0.00009	0.00020	< 0.00009	< 0.00009
Molybdenum (dissolved)	mg/L	0.00004				0.00060	0.00209	0.00030	0.00073	< 0.00004	0.00017	0.00007	0.00012
Nickel (dissolved)	mg/L	0.0001				0.0071	0.0113	0.0005	0.0178	0.0002	0.0049	0.0002	0.0071
Phosphorus (dissolved)	mg/L	0.003				0.004	< 0.003	0.007	0.130	< 0.003	0.015	< 0.003	0.003
Selenium (dissolved)	mg/L	0.00004		0.05		0.00019	0.00020	< 0.00004	0.00041	< 0.00004	0.00016	0.00005	0.00011
Silicon (dissolved)	mg/L	0.02				8.06	3.69	6.76	12.8	4.22	7.38	5.93	7.34
Silver (dissolved)	mg/L	0.00005				< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Strontium (dissolved)	mg/L	0.00008				0.714	0.512	0.0401	0.748	0.0261	0.193	0.0231	0.291
Sulfur (dissolved)	mg/L	3				63	46	< 3	32	< 3	< 3	< 3	24
Thallium (dissolved)	mg/L	0.000005				0.000026	0.000050	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
Tin (dissolved)	mg/L	0.00006				0.00010	0.00011	0.00007	0.00040	< 0.00006	0.00043	< 0.00006	0.00008

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L1 = ODWS_AO_OG / WATER / - - Table 4 - Drinking Water - Reg O.169_03

L2 = ODWS_MAC / WATER / - - Table 1,2 and 3 - Drinking Water - Reg O.169_03

Parameter	Units	RL	L1	L2	Sample Number 7	8	9	10	11	12	13	14
					Sample Name TW-4	TW-6	TW-8	TW-9	TW-10	TW-13	TW-14	TW-15
					Sample Matrix Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
					Sample Date 19/06/2023	19/06/2023	19/06/2023	19/06/2023	19/06/2023	19/06/2023	19/06/2023	19/06/2023
					Result	Result	Result	Result	Result	Result	Result	Result
Metals and Inorganics (continued)												
Titanium (dissolved)	mg/L	0.00007			0.00010	0.00015	0.00020	0.00425	0.00036	0.00539	0.00012	< 0.00007
Uranium (dissolved)	mg/L	0.000002		0.02	0.000542	0.00151	0.000150	0.000696	0.000028	0.000120	0.000011	0.000593
Vanadium (dissolved)	mg/L	0.00001			0.00023	0.00045	0.00025	0.0113	0.00022	0.00451	0.00063	0.00037
Zinc (dissolved)	mg/L	0.002	5		< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Other (ORP)												
pH	No unit	0.05	8.5		7.65	7.69	7.82	7.70	7.06	7.00	7.47	7.83
Chloride	mg/L	1	250		140	75	< 1	360	17	84	7	38
Mercury (dissolved)	mg/L	0.00001		0.001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Phenols												
4AAP-Phenolics	mg/L	0.02			< 0.002↓	< 0.002↓	< 0.002↓	< 0.02	< 0.002↓	0.003	< 0.002↓	< 0.002↓

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L2 = ODWS_MAC / WATER / - - Table 1,2 and 3 - Drinking Water - Reg O.169_03

				Sample Number	15	16	17	18	19
				Sample Name	TW-16	TW-17	MW21-01	HB GW DUP 1	HB GW DUP 2
				Sample Matrix	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
				Sample Date	19/06/2023	19/06/2023	19/06/2023	19/06/2023	19/06/2023
Parameter	**Units**	**RL**	**L1**	**L2**	**Result**	**Result**	**Result**	**Result**	**Result**
General Chemistry									
Biochemical Oxygen Demand (BOD5)	mg/L	2			< 4 ↑	< 4 ↑	< 4 ↑	4	< 4 ↑
Alkalinity	mg/L as CaCO3	2	500		81	137	138	355	135
Conductivity	uS/cm	2			187	344	362	1030	339
Total Dissolved Solids	mg/L	30	500		111	237	226	509	186
Dissolved Organic Carbon	mg/L	1.0	5		1.1	2.8	1.6	4.4	2.7
Chemical Oxygen Demand	mg/L	8			< 8	10	8	16	17
Total Kjeldahl Nitrogen (N)	as N mg/L	0.05			< 0.05	0.18	< 0.05	0.67	0.20
Ammonia+Ammonium (N)	as N mg/L	0.04			0.06	< 0.04	0.04	0.60	0.05
Organic Nitrogen	mg/L	0.5	0.15		< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Total Reactive Phosphorous (o-phosphate as P)	mg/L	0.03			< 0.03	0.05	< 0.03	< 0.03	0.06
Metals and Inorganics									
Fluoride	mg/L	0.06		1.5	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
Sulphate	mg/L	2	500		3	10	20	63	10
Nitrite (as N)	as N mg/L	0.03		1	< 0.03	< 0.03	< 0.03	0.05	< 0.03
Nitrate (as N)	as N mg/L	0.06		10	< 0.06	0.66	3.57	9.75	0.66
Hardness (dissolved)	mg/L as CaCO3	0.05	100		85.0	102	152	372	107
Aluminum (dissolved)	mg/L	0.001			0.001	0.018	0.005	0.001	0.022
Arsenic (dissolved)	mg/L	0.0002		0.01	0.0006	< 0.0002	0.0003	0.0003	< 0.0002
Barium (dissolved)	mg/L	0.00008		1	0.00708	0.00737	0.0265	0.107	0.00785
Boron (dissolved)	mg/L	0.002		5	0.006	0.058	0.165	1.02	0.053
Beryllium (dissolved)	mg/L	0.000007			< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007

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L2 = ODWS_MAC / WATER / - - Table 1,2 and 3 - Drinking Water - Reg O.169_03

Parameter	Units	RL	L1	L2	Sample Number: 15	16	17	18	19
					Sample Name: TW-16	TW-17	MW21-01	HB GW DUP 1	HB GW DUP 2
					Sample Matrix: Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
					Sample Date: 19/06/2023	19/06/2023	19/06/2023	19/06/2023	19/06/2023
					Result	Result	Result	Result	Result
Metals and Inorganics (continued)									
Bismuth (dissolved)	mg/L	0.00001			< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Calcium (dissolved)	mg/L	0.01			26.8	28.6	46.2	104	30.1
Cadmium (dissolved)	mg/L	0.000003		0.005	< 0.000003	0.000009	0.000008	0.000062	0.000007
Chromium (dissolved)	mg/L	0.00008		0.05	0.00118	0.00025	0.00056	0.00079	0.00040
Cobalt (dissolved)	mg/L	0.000004			0.000028	0.000215	0.00110	0.00767	0.000211
Copper (dissolved)	mg/L	0.0002	1		0.0030	0.0038	0.0045	0.0321	0.0038
Iron (dissolved)	mg/L	0.007	0.3		< 0.007	0.014	< 0.007	< 0.007	0.017
Potassium (dissolved)	mg/L	0.009			0.388	0.652	4.09	16.3	0.651
Magnesium (dissolved)	mg/L	0.001			4.42	7.51	8.86	27.2	7.79
Manganese (dissolved)	mg/L	0.00001	0.05		0.00011	0.00755	0.0180	0.960	0.00884
Sodium (dissolved)	mg/L	0.01	200	20	4.56	9.33	11.6	60.9	9.33
Lead (dissolved)	mg/L	0.00009		0.01	< 0.00009	< 0.00009	< 0.00009	0.00017	< 0.00009
Molybdenum (dissolved)	mg/L	0.00004			0.00006	< 0.00004	0.00022	0.00017	0.00019
Nickel (dissolved)	mg/L	0.0001			0.0002	0.0013	0.0089	0.0090	0.0013
Phosphorus (dissolved)	mg/L	0.003			0.010	< 0.003	< 0.003	0.004	< 0.003
Selenium (dissolved)	mg/L	0.00004		0.05	< 0.00004	< 0.00004	0.00007	0.00015	0.00005
Silicon (dissolved)	mg/L	0.02			6.67	4.00	5.89	7.47	3.93
Silver (dissolved)	mg/L	0.00005			< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Strontium (dissolved)	mg/L	0.00008			0.0353	0.0775	0.0868	0.312	0.0807
Sulfur (dissolved)	mg/L	3			< 3	3	6	25	3
Thallium (dissolved)	mg/L	0.000005			< 0.000005	0.000009	< 0.000005	0.000006	0.000008
Tin (dissolved)	mg/L	0.00006			0.00016	0.00008	0.00006	0.00038	0.00008

Client: WSP Environment & Infrastructure Canada Limited

Project: C023701288, TY131010.2023.2000.1142.5730-00, Hailey GW

Project Manager: Dominique Gagnon

Samplers: Aedon Lemon

MATRIX: WATER

L1 = ODWS_AO_OG / WATER / - - Table 4 - Drinking Water - Reg O.169_03

L2 = ODWS_MAC / WATER / - - Table 1,2 and 3 - Drinking Water - Reg O.169_03

				Sample Number	15	16	17	18	19
				Sample Name	TW-16	TW-17	MW21-01	HB GW DUP 1	HB GW DUP 2
				Sample Matrix	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
				Sample Date	19/06/2023	19/06/2023	19/06/2023	19/06/2023	19/06/2023
Parameter	**Units**	**RL**	**L1**	**L2**	**Result**	**Result**	**Result**	**Result**	**Result**
Metals and Inorganics (continued)									
Titanium (dissolved)	mg/L	0.00007			0.00008	0.00087	< 0.00007	0.00007	0.00093
Uranium (dissolved)	mg/L	0.000002		0.02	0.000022	0.000044	0.000242	0.000624	0.000044
Vanadium (dissolved)	mg/L	0.00001			0.00178	0.00050	0.00080	0.00036	0.00053
Zinc (dissolved)	mg/L	0.002	5		< 0.002	< 0.002	0.007	< 0.002	< 0.002
Other (ORP)									
pH	No unit	0.05	8.5		7.92	7.72	7.94	7.93	7.73
Chloride	mg/L	1	250		8	24	13	38	23
Mercury (dissolved)	mg/L	0.00001		0.001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Phenols									
4AAP-Phenolics	mg/L	0.02			< 0.002↓	< 0.002↓	< 0.002↓	< 0.002↓	< 0.002↓

EXCEEDANCE SUMMARY

Parameter	Method	Units	Result	ODWS_AO_OG / WATER / - - Table 4 - Drinking Water - Reg O.169_03 L1	ODWS_MAC / WATER / - - Table 1,2 and 3 - Drinking Water - Reg O.169_03 L2
TW-4					
Organic Nitrogen	N/A - Calculation	mg/L	1.7	0.15	
Alkalinity	SM 2320	mg/L as CaCO3	698	500	
Total Dissolved Solids	SM 2540C	mg/L	1240	500	
Hardness (dissolved)	SM 3030/EPA 200.7	mg/L as CaCO3	767	100	
Manganese (dissolved)	SM 3030/EPA 200.8	mg/L	1.57	0.05	
Sodium (dissolved)	SM 3030/EPA 200.8	mg/L	72.5		20
Dissolved Organic Carbon	SM 5310B	mg/L	14.2	5	
TW-6					
Nitrate as Nitrogen	EPA300/MA300-Ions1.3	as N mg/L	12.8		10
Organic Nitrogen	N/A - Calculation	mg/L	2.2	0.15	
Total Dissolved Solids	SM 2540C	mg/L	734	500	
Hardness (dissolved)	SM 3030/EPA 200.7	mg/L as CaCO3	372	100	
Manganese (dissolved)	SM 3030/EPA 200.8	mg/L	1.34	0.05	
Sodium (dissolved)	SM 3030/EPA 200.8	mg/L	71.7		20
Dissolved Organic Carbon	SM 5310B	mg/L	12.5	5	
TW-8					
Organic Nitrogen	N/A - Calculation	mg/L	< 0.5	0.15	
Iron (dissolved)	SM 3030/EPA 200.8	mg/L	0.761	0.3	
Manganese (dissolved)	SM 3030/EPA 200.8	mg/L	0.228	0.05	
TW-9					
Organic Nitrogen	N/A - Calculation	mg/L	< 0.5	0.15	
Alkalinity	SM 2320	mg/L as CaCO3	1070	500	
Total Dissolved Solids	SM 2540C	mg/L	1400	500	
Hardness (dissolved)	SM 3030/EPA 200.7	mg/L as CaCO3	545	100	
Arsenic (dissolved)	SM 3030/EPA 200.8	mg/L	0.0135		0.01
Iron (dissolved)	SM 3030/EPA 200.8	mg/L	19.5	0.3	
Manganese (dissolved)	SM 3030/EPA 200.8	mg/L	3.47	0.05	
Sodium (dissolved)	SM 3030/EPA 200.8	mg/L	175		20
Dissolved Organic Carbon	SM 5310B	mg/L	54.4	5	
Chloride	US EPA 325.2	mg/L	360	250	
TW-10					
Organic Nitrogen	N/A - Calculation	mg/L	< 0.5	0.15	
TW-13					
Organic Nitrogen	N/A - Calculation	mg/L	1.1	0.15	
Hardness (dissolved)	SM 3030/EPA 200.7	mg/L as CaCO3	173	100	
Iron (dissolved)	SM 3030/EPA 200.8	mg/L	13.8	0.3	

EXCEEDANCE SUMMARY

Parameter	Method	Units	Result	ODWS_AO_OG / WATER / - - Table 4 - Drinking Water - Reg O.169_03 L1	ODWS_MAC / WATER / - - Table 1,2 and 3 - Drinking Water - Reg O.169_03 L2
TW-13 (continued)					
Manganese (dissolved)	SM 3030/EPA 200.8	mg/L	1.53	0.05	
Dissolved Organic Carbon	SM 5310B	mg/L	14.0	5	
TW-14					
Organic Nitrogen	N/A - Calculation	mg/L	< 0.5	0.15	
TW-15					
Organic Nitrogen	N/A - Calculation	mg/L	< 0.5	0.15	
Total Dissolved Solids	SM 2540C	mg/L	586	500	
Hardness (dissolved)	SM 3030/EPA 200.7	mg/L as CaCO3	361	100	
Manganese (dissolved)	SM 3030/EPA 200.8	mg/L	0.759	0.05	
Sodium (dissolved)	SM 3030/EPA 200.8	mg/L	53.2		20
TW-16					
Organic Nitrogen	N/A - Calculation	mg/L	< 0.5	0.15	
TW-17					
Organic Nitrogen	N/A - Calculation	mg/L	< 0.5	0.15	
Hardness (dissolved)	SM 3030/EPA 200.7	mg/L as CaCO3	102	100	
MW21-01					
Organic Nitrogen	N/A - Calculation	mg/L	< 0.5	0.15	
Hardness (dissolved)	SM 3030/EPA 200.7	mg/L as CaCO3	152	100	
HB GW DUP 1					
Organic Nitrogen	N/A - Calculation	mg/L	< 0.5	0.15	
Total Dissolved Solids	SM 2540C	mg/L	509	500	
Hardness (dissolved)	SM 3030/EPA 200.7	mg/L as CaCO3	372	100	
Manganese (dissolved)	SM 3030/EPA 200.8	mg/L	0.960	0.05	
Sodium (dissolved)	SM 3030/EPA 200.8	mg/L	60.9		20
HB GW DUP 2					
Organic Nitrogen	N/A - Calculation	mg/L	< 0.5	0.15	
Hardness (dissolved)	SM 3030/EPA 200.7	mg/L as CaCO3	107	100	

QC SUMMARY

Alkalinity

Method: SM 2320 I Internal ref.: ME-CA-[ENV]EWL-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Alkalinity	EWL0538-JUN23	mg/L as CaCO3	2	< 2	0	20	100	80	120	NA		

Ammonia by SFA

Method: SM 4500 I Internal ref.: ME-CA-[ENV]SFA-LAK-AN-007

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Ammonia+Ammonium (N)	SKA0221-JUN23	mg/L	0.04	<0.04	ND	10	106	90	110	97	75	125
Ammonia+Ammonium (N)	SKA0246-JUN23	mg/L	0.04	<0.04	1	10	99	90	110	97	75	125
Ammonia+Ammonium (N)	SKA0265-JUN23	mg/L	0.04	<0.04	ND	10	100	90	110	95	75	125

QC SUMMARY

Anions by discrete analyzer

Method: US EPA 325.2 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-026

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Chloride	DIO5088-JUN23	mg/L	1	Error!	0	20	100	80	120	96	75	125
Sulphate	DIO5088-JUN23	mg/L	2	<2	6	20	111	80	120	110	75	125

Anions by IC

Method: EPA300/MA300-Ions1.3 | Internal ref.: ME-CA-[ENV]IC-LAK-AN-001

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Nitrite (as N)	DIO0663-JUN23	mg/L	0.03	<0.03	ND	20	96	90	110	101	75	125
Nitrate (as N)	DIO0663-JUN23	mg/L	0.06	<0.06	0	20	97	90	110	96	75	125
Nitrite (as N)	DIO0670-JUN23	mg/L	0.03	<0.03	ND	20	101	90	110	106	75	125
Nitrate (as N)	DIO0670-JUN23	mg/L	0.06	<0.06	ND	20	102	90	110	103	75	125
Nitrite (as N)	DIO0671-JUN23	mg/L	0.03	<0.03	ND	20	97	90	110	100	75	125
Nitrate (as N)	DIO0671-JUN23	mg/L	0.06	<0.06	0	20	97	90	110	95	75	125
Nitrite (as N)	DIO0706-JUN23	mg/L	0.03	<0.03	8	20	100	90	110	103	75	125

QC SUMMARY

Biochemical Oxygen Demand

Method: SM 5210 I Internal ref.: ME-CA-[ENVIEWL-LAK-AN-007

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Biochemical Oxygen Demand (BOD5)	BOD0047-JUN23	mg/L	2	< 2	22	30	110	70	130	NV	70	130

Carbon by Combustion/Oxidation

Method: SM 5310B I Internal ref.: ME-CA-[ENVIEWL-LAK-AN-023

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Dissolved Organic Carbon	EWL0541-JUN23	mg/L	1.0	<1.0	1	20	100	90	110	104	75	125
Dissolved Organic Carbon	EWL0581-JUN23	mg/L	1.0	<1.0	4	20	100	90	110	106	75	125

QC SUMMARY

Chemical Oxygen Demand

Method: HACH 8000 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-009

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Chemical Oxygen Demand	EWL0559-JUN23	mg/L	8	<8	12	20	110	80	120	104	75	125
Chemical Oxygen Demand	EWL0568-JUN23	mg/L	8	<8	ND	20	104	80	120	94	75	125
Chemical Oxygen Demand	EWL0632-JUN23	mg/L	8	<8	15	20	102	80	120	86	75	125

Conductivity

Method: SM 2510 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Conductivity	EWL0538-JUN23	uS/cm	2	< 2	0	20	100	90	110	NA		

QC SUMMARY

Fluoride by Specific Ion Electrode

Method: SM 4500 I Internal ref.: ME-CA-[ENVIEWL-LAK-AN-014

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Fluoride	EWL0600-JUN23	mg/L	0.06	<0.06	ND	10	100	90	110	103	75	125

Mercury by CVAAS

Method: EPA 7471A/SM 3112B I Internal ref.: ME-CA-[ENVISPE-LAK-AN-004

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Mercury (dissolved)	EHG0045-JUN23	mg/L	0.00001	< 0.00001	ND	20	93	80	120	88	70	130

QC SUMMARY

Metals in aqueous samples - ICP-MS

Method: SM 3030/EPA 200.8 | Internal ref.: ME-CA-IENVISPE-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Silver (dissolved)	EMS0211-JUN23	mg/L	0.00005	<0.00005	ND	20	101	90	110	86	70	130
Aluminum (dissolved)	EMS0211-JUN23	mg/L	0.001	<0.001	11	20	102	90	110	123	70	130
Arsenic (dissolved)	EMS0211-JUN23	mg/L	0.0002	<0.0002	2	20	102	90	110	108	70	130
Barium (dissolved)	EMS0211-JUN23	mg/L	0.00008	<0.00008	2	20	100	90	110	105	70	130
Beryllium (dissolved)	EMS0211-JUN23	mg/L	0.000007	<0.000007	ND	20	105	90	110	95	70	130
Boron (dissolved)	EMS0211-JUN23	mg/L	0.002	<0.002	0	20	102	90	110	97	70	130
Bismuth (dissolved)	EMS0211-JUN23	mg/L	0.00001	<0.00001	ND	20	98	90	110	97	70	130
Calcium (dissolved)	EMS0211-JUN23	mg/L	0.01	<0.01	1	20	101	90	110	106	70	130
Cadmium (dissolved)	EMS0211-JUN23	mg/L	0.000003	<0.000003	ND	20	102	90	110	103	70	130
Cobalt (dissolved)	EMS0211-JUN23	mg/L	0.000004	<0.000004	2	20	98	90	110	89	70	130
Chromium (dissolved)	EMS0211-JUN23	mg/L	0.00008	<0.00008	ND	20	95	90	110	90	70	130
Copper (dissolved)	EMS0211-JUN23	mg/L	0.0002	<0.0002	9	20	100	90	110	91	70	130
Iron (dissolved)	EMS0211-JUN23	mg/L	0.007	<0.007	0	20	105	90	110	125	70	130
Potassium (dissolved)	EMS0211-JUN23	mg/L	0.009	<0.009	0	20	106	90	110	104	70	130
Magnesium (dissolved)	EMS0211-JUN23	mg/L	0.001	<0.001	1	20	105	90	110	104	70	130
Manganese (dissolved)	EMS0211-JUN23	mg/L	0.00001	<0.00001	0	20	104	90	110	105	70	130
Molybdenum (dissolved)	EMS0211-JUN23	mg/L	0.00004	<0.00004	6	20	100	90	110	91	70	130
Sodium (dissolved)	EMS0211-JUN23	mg/L	0.01	<0.01	4	20	96	90	110	103	70	130
Nickel (dissolved)	EMS0211-JUN23	mg/L	0.0001	<0.0001	10	20	103	90	110	91	70	130
Lead (dissolved)	EMS0211-JUN23	mg/L	0.00009	<0.00009	ND	20	103	90	110	94	70	130

QC SUMMARY

Metals in aqueous samples - ICP-MS (continued)

Method: SM 3030/EPA 200.8 | Internal ref.: ME-CA-IENVISPE-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Phosphorus (dissolved)	EMS0211-JUN23	mg/L	0.003	<0.003	ND	20	100	90	110	NV	70	130
Selenium (dissolved)	EMS0211-JUN23	mg/L	0.00004	<0.00004	16	20	101	90	110	122	70	130
Sulfur (dissolved)	EMS0211-JUN23	mg/L	3	<1	1	20	103	90	110	NV	70	130
Silicon (dissolved)	EMS0211-JUN23	mg/L	0.02	<0.02	1	20	97	90	110	NV	70	130
Tin (dissolved)	EMS0211-JUN23	mg/L	0.00006	<0.00006	2	20	100	90	110	NV	70	130
Strontium (dissolved)	EMS0211-JUN23	mg/L	0.00008	<0.00008	2	20	101	90	110	101	70	130
Titanium (dissolved)	EMS0211-JUN23	mg/L	0.00007	<0.00005	1	20	100	90	110	NV	70	130
Thallium (dissolved)	EMS0211-JUN23	mg/L	0.000005	<0.000005	10	20	98	90	110	97	70	130
Uranium (dissolved)	EMS0211-JUN23	mg/L	0.000002	<0.000002	1	20	98	90	110	78	70	130
Vanadium (dissolved)	EMS0211-JUN23	mg/L	0.00001	<0.00001	0	20	96	90	110	93	70	130
Zinc (dissolved)	EMS0211-JUN23	mg/L	0.002	<0.002	4	20	97	90	110	124	70	130
Boron (dissolved)	EMS0230-JUN23	mg/L	0.002	<0.002	5	20	98	90	110	93	70	130

QC SUMMARY

pH

Method: SM 4500 I Internal ref.: ME-CA-[ENVIEWL-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%) Low	Recovery Limits (%) High	Spike Recovery (%)	Recovery Limits (%) Low	Recovery Limits (%) High
pH	EWL0538-JUN23	No unit	0.05	NA	0		99			NA		

Phenols by SFA

Method: SM 5530B-D I Internal ref.: ME-CA-[ENVISFA-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%) Low	Recovery Limits (%) High	Spike Recovery (%)	Recovery Limits (%) Low	Recovery Limits (%) High
4AAP-Phenolics	SKA0237-JUN23	mg/L	0.02	<0.002	ND	10	100	80	120	92	75	125
4AAP-Phenolics	SKA0279-JUN23	mg/L	0.02	<0.002	ND	10	101	80	120	91	75	125

QC SUMMARY

Reactive Phosphorus by SFA

Method: SM 4500-P F | Internal ref.: ME-CA-[ENV]SFA-LAK-AN-004

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Total Reactive Phosphorous (o-phosphate as P)	SKA0235-JUN23	mg/L	0.03	<0.03	ND	10	108	90	110	105	75	125

Solids Analysis

Method: SM 2540C | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-005

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Total Dissolved Solids	EWL0515-JUN23	mg/L	30	<30	0	20	101	80	120	NA		
Total Dissolved Solids	EWL0517-JUN23	mg/L	30	<30	0	20	102	80	120	NA		

QC SUMMARY

Total Nitrogen

Method: SM 4500-N C/4500-NO3- F | Internal ref.: ME-CA-[ENV]SFA-LAK-AN-002

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Total Kjeldahl Nitrogen (N)	SKA0238-JUN23	mg/L	0.05	<0.05	ND	10	102	90	110	100	75	125
Total Kjeldahl Nitrogen (N)	SKA0253-JUN23	mg/L	0.05	<0.05	ND	10	101	90	110	103	75	125

Method Blank: a blank matrix that is carried through the entire analytical procedure. Used to assess laboratory contamination.

Duplicate: Paired analysis of a separate portion of the same sample that is carried through the entire analytical procedure. Used to evaluate measurement precision.

LCS/Spike Blank: Laboratory control sample or spike blank refer to a blank matrix to which a known amount of analyte has been added. Used to evaluate analyte recovery and laboratory accuracy without sample matrix effects.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate laboratory accuracy with sample matrix effects.

Reference Material: a material or substance matrix matched to the samples that contains a known amount of the analyte of interest. A reference material may be used in place of a matrix spike.

RL: Reporting limit

RPD: Relative percent difference

AC: Acceptance criteria

Multielement Scan Qualifier: as the number of analytes in a scan increases, so does the chance of a limit exceedance by random chance as opposed to a real method problem. Thus, in multielement scans, for the LCS and matrix spike, up to 10% of the analytes may exceed the quoted limits by up to 10% absolute and the spike is considered acceptable.

Duplicate Qualifier: for duplicates as the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Matrix Spike Qualifier: for matrix spikes, as the concentration of the native analyte increases, the uncertainty of the matrix spike recovery increases. Thus, the matrix spike acceptance limits apply only when the concentration of the matrix spike is greater than or equal to the concentration of the native analyte.

LEGEND

FOOTNOTES

NSS Insufficient sample for analysis.
RL Reporting Limit.
↑ Reporting limit raised.
↓ Reporting limit lowered.
NA The sample was not analysed for this analyte
ND Non Detect

Results relate only to the sample tested.
Data reported represent the sample as submitted to SGS. Solid samples expressed on a dry weight basis.
"Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.
Analysis conducted on samples submitted pursuant to or as part of Reg. 153/04, are in accordance to the "Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act and Excess Soil Quality" published by the Ministry and dated March 9, 2004 as amended.

SGS provides criteria information (such as regulatory or guideline limits and summary of limit exceedances) as a service. Every attempt is made to ensure the criteria information in this report is accurate and current, however, it is not guaranteed. Comparison to the most current criteria is the responsibility of the client and SGS assumes no responsibility for the accuracy of the criteria levels indicated.

SGS Canada Inc. statement of conformity decision rule does not consider uncertainty when analytical results are compared to a specified standard or regulation.

This report supersedes all previous versions.

-- End of Analytical Report --

SGS

Request for Laboratory Services and CHAIN OF CUSTODY (General)

SGS Environmental Services - Lakefield: 185 Concession St., Lakefield, ON K0L 2H0 Phone: 705-652-2000 Toll Free: 877-747-7658 Fax: 705-652-6365 Web: www.ca.sgs.com {4}

SGS Environmental Services - London: 657 Consortium Court, London, ON, N6E 2S8 Phone: 519-672-4500 Toll Free: 877-848-8060 Fax: 519-672-0361 Web: www.ca.sgs.com {4}

Laboratory Information Section

Received Date (mm/dd/yyyy): __/__/____ LAB LIMS #: CA15699-jun23

Received Time (After Hours Only): __:__ Temperature Upon Receipt (°C): 10x3

Billing & Reporting Information

Invoice/Receipt to {3}:

Company: WSP E&I Canada Limited

Attention: Dominique Gagnon

Address: 131 Fielding Rd, Lively, Ontario, P3Y 1L7

Email: dominique.gagnon@wsp.com

Quote #: 2021 1426

Attached Parameter List: ☐ YES ☐ NO

Turnaround Time

Is *Rush Turnaround Time Required? ☐ YES ☐ NO

Specify:

* Rush TA Requests Require Lab Approval

Project Name/Number: TY131010 HAILEYBURY LF GW P.O. #:

Client Information/Report To:

Client Lab #:

Company Name:	WSP E&I Canada Limited	Phone Number:	705-682-2632
Contact Name:		Fax Number:	
Address:		E-mail:	
Copy to:			

Sample Information

Sample Identifier	Date Sampled (mm/dd/yy)	Time Sampled	# of Bottles	Analysis Requested: Field Filtered	SW as per quote	GW as per quote					
TW-4	6/19/23	4:00	9	X		X					
TW-6	6/19/23	4:00 pm	9	X		X					
TW-8	6/20/23	2:35	9	X		X					
TW-9	6/19/23	4:35 pm	9	X		X					
TW-10	6/19/23	4:55	9	X		X					
~~TW-12~~						~~X~~					
TW-13	6/19/23	2:25	9	X		X					
TW-14	6/19/23	1:24	9	X		X					
TW-15	6/19/23	2:30 pm	9	X		X					
TW-16	06/19/23	1:12 pm	~~9~~	~~X~~		X					
TW-17	6/19/23	5:00 pm	9	X		X					
MW21-01	6/19/23	1:49 pm	9	X		X					
HB GW Dup1	6/19/23	~~1:49 pm~~	9	X		X					
HB GW Dup 2	6/19/23		9	X		X					
	~~6/19/23~~										

Sampled By {1}:	(Name) Aedan Lemon	(Signature)		Date: 06/19/23	(mm/dd/yy)
Relinquished by {2}:	(Name) Aedan Lemon	(Signature)		Date: 06/20/23	(mm/dd/yy)

Note: {1} Submission of samples to SGS is acknowledgement that you have been provided direction on sample collection/handling and transportation of samples. {2} Submission of samples to SGS is considered authorization for completion of work. Signatures may appear on this form or be retained on file in the contract, or in an alternative format (e.g. shipping documents). {3} Results may be sent by email to an unlimited number of addresses for no additional cost. Fax is available upon request. {4} Completion of work may require the subcontracting of samples between the London and Lakefield laboratories.

Revision #: 2.3
Date of Issue: 24 Jun. 2014

334151514232 334151514208 RTN ne 945

FINAL REPORT

CA15704-JUN23 R1

TY131010.2023.2000.1142.5730-00, Haileybury SW

Prepared for

WSP E & I Canada Ltd

FINAL REPORT

First Page

CLIENT DETAILS

Client	WSP E & I Canada Ltd
Address	131 Fielding Road Lively, ON P3Y 1L7. Canada
Contact	Dominique Gagnon
Telephone	705-665-0159
Facsimile	
Email	Dominique.Gagnon@wsp.com; meg.russell@wsp.com
Project	TY131010.2023.2000.1142.5730-00, Haileybury SW
Order Number	
Samples	Surface Water (4)

LABORATORY DETAILS

Project Specialist	Brad Moore Hon. B.Sc
Laboratory	SGS Canada Inc.
Address	185 Concession St., Lakefield ON, K0L 2H0
Telephone	705-652-2143
Facsimile	705-652-6365
Email	brad.moore@sgs.com
SGS Reference	CA15704-JUN23
Received	06/21/2023
Approved	07/05/2023
Report Number	CA15704-JUN23 R1
Date Reported	07/05/2023

COMMENTS

Temperature of Sample upon Receipt: 3
Cooling Agent Present:
Custody Seal Present:

Chain of Custody Number:NA

SIGNATORIES

Brad Moore Hon. B.Sc

TABLE OF CONTENTS

Client: WSP E & I Canada Ltd
Project: TY131010.2023.2000.1142.5730-00, Haileybury SW
Project Manager: Dominique Gagnon
Samplers: Aedon Lemon

MATRIX: WATER

L1 = PWQO_L / WATER / - - Table 2 - General - July 1999 PIBS 3303E

Sample Number				6	7	8	9
Sample Name				SW-3	SW-4	SW-5	HB SW Dup
Sample Matrix				Surface Water	Surface Water	Surface Water	Surface Water
Sample Date				19/06/2023	19/06/2023	19/06/2023	19/06/2023
Parameter	**Units**	**RL**	**L1**	**Result**	**Result**	**Result**	**Result**
General Chemistry							
Unionized Ammonia	mg/L as N	0.001	0.02	< 0.001	< 0.001	< 0.001	< 0.001
Total Suspended Solids	mg/L	2		3	3	8	2
Alkalinity	mg/L as CaCO3	2		77	79	10	78
Conductivity	uS/cm	2		473	478	38	488
Total Dissolved Solids	mg/L	30		271	271	< 30	286
Turbidity	NTU	0.10		1.4	1.0	3.0	1.0
Chemical Oxygen Demand	mg/L	8		26	22	24	23
Dissolved Organic Carbon	mg/L	1.0		7.8	7.9	8.1	7.9
Ammonia+Ammonium (N)	as N mg/L	0.04		0.07	0.07	0.06	0.06
Metals and Inorganics							
Sulphate	mg/L	2		5	5	< 2	4
Hardness	mg/L as CaCO3	0.05		110	106	16.2	110
Silver (total)	mg/L	0.00005	0.0001	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Aluminum (total)	mg/L	0.001		0.044	0.021	0.102	0.022
Arsenic (total)	mg/L	0.0002	0.005	0.0010	0.0010	0.0015	0.0009
Barium (total)	mg/L	0.00008		0.01636	0.01626	0.00382	0.01614
Beryllium (total)	mg/L	0.000007	0.011 1.1	< 0.000007	< 0.000007	0.000012	< 0.000007
Boron (total)	mg/L	0.002	0.2	0.008	0.007	0.005	0.008
Bismuth (total)	mg/L	0.00001		< 0.00001	< 0.00001	0.00001	< 0.00001
Calcium (total)	mg/L	0.01		31.1	29.3	4.49	30.8

Client: WSP E & I Canada Ltd

Project: TY131010.2023.2000.1142.5730-00, Haileybury SW

Project Manager: Dominique Gagnon

Samplers: Aedon Lemon

MATRIX: WATER

L1 = PWQO_L / WATER / - - Table 2 - General - July 1999 PIBS 3303E

Sample Number				6	7	8	9
Sample Name				SW-3	SW-4	SW-5	HB SW Dup
Sample Matrix				Surface Water	Surface Water	Surface Water	Surface Water
Sample Date				19/06/2023	19/06/2023	19/06/2023	19/06/2023
Parameter	**Units**	**RL**	**L1**	**Result**	**Result**	**Result**	**Result**
Metals and Inorganics (continued)							
Cadmium (total)	mg/L	0.000003	0.0001 0.0005	0.000003	0.000003	0.000007	< 0.000003
Cobalt (total)	mg/L	0.000004	0.0009	0.000114	0.000093	0.000839	0.000097
Chromium (total)	mg/L	0.00008	0.1	0.00036	0.00038	0.00060	0.00035
Copper (total)	mg/L	0.0002	0.001 0.005	0.0010	0.0008	0.0017	0.0009
Iron (total)	mg/L	0.007	0.3	0.362	0.394	1.88	0.397
Potassium (total)	mg/L	0.009		0.991	0.916	0.192	0.918
Magnesium (total)	mg/L	0.001		7.88	8.01	1.22	8.04
Manganese (total)	mg/L	0.00001		0.06078	0.03662	0.07944	0.03677
Molybdenum (total)	mg/L	0.00004	0.04	0.00071	0.00063	0.00007	0.00059
Sodium (total)	mg/L	0.01		49.7	49.9	1.43	51.1
Nickel (total)	mg/L	0.0001	0.025	0.0004	0.0004	0.0009	0.0004
Lead (total)	mg/L	0.00009	0.005 0.02	< 0.00009	< 0.00009	0.00035	< 0.00009
Phosphorus (total)	mg/L	0.003	0.01	0.012	0.011	0.038	0.013
Selenium (total)	mg/L	0.00004	0.1	0.00010	0.00009	0.00006	0.00011
Silicon (total)	mg/L	0.02		0.44	0.34	0.31	0.34
Sulfur (total)	mg/L	3		< 3	< 3	< 3	< 3
Strontium (total)	mg/L	0.00008		0.08119	0.08031	0.02362	0.08077
Thallium (total)	mg/L	0.000005	0.0003	< 0.000005	< 0.000005	< 0.000005	< 0.000005
Tin (total)	mg/L	0.00006		< 0.00006	0.00009	< 0.00006	< 0.00006
Titanium (total)	mg/L	0.00007		0.00187	0.00047	0.00294	0.00061

Client: WSP E & I Canada Ltd
Project: TY131010.2023.2000.1142.5730-00, Haileybury SW
Project Manager: Dominique Gagnon
Samplers: Aedon Lemon

MATRIX: WATER

L1 = PWQO_L / WATER / - - Table 2 - General - July 1999 PIBS 3303E

Sample Number				6	7	8	9
Sample Name				SW-3	SW-4	SW-5	HB SW Dup
Sample Matrix				Surface Water	Surface Water	Surface Water	Surface Water
Sample Date				19/06/2023	19/06/2023	19/06/2023	19/06/2023
Parameter	**Units**	**RL**	**L1**	**Result**	**Result**	**Result**	**Result**
Metals and Inorganics (continued)							
Uranium (total)	mg/L	0.000002	0.005	0.000124	0.000108	0.000012	0.000106
Vanadium (total)	mg/L	0.00001	0.006	0.00031	0.00023	0.00053	0.00025
Zinc (total)	mg/L	0.002	0.02	< 0.002	< 0.002	0.004	< 0.002
Other (ORP)							
pH	No unit	0.05	8.6	7.91	7.94	7.01	8.00
Chloride	mg/L	1		90	96	6	95
Phenols							
4AAP-Phenolics	mg/L	0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001

EXCEEDANCE SUMMARY

Parameter	Method	Units	Result	PWQO_L / WATER / - - Table 2 - General - July 1999 PIBS 3303E L1
SW-3				
Iron	SM 3030/EPA 200.8	mg/L	0.362	0.3
Phosphorus	SM 3030/EPA 200.8	mg/L	0.012	0.01
SW-4				
Iron	SM 3030/EPA 200.8	mg/L	0.394	0.3
Phosphorus	SM 3030/EPA 200.8	mg/L	0.011	0.01
SW-5				
Copper	SM 3030/EPA 200.8	mg/L	0.0017	0.001
Iron	SM 3030/EPA 200.8	mg/L	1.88	0.3
Phosphorus	SM 3030/EPA 200.8	mg/L	0.038	0.01
HB SW Dup				
Iron	SM 3030/EPA 200.8	mg/L	0.397	0.3
Phosphorus	SM 3030/EPA 200.8	mg/L	0.013	0.01

QC SUMMARY

Alkalinity

Method: SM 2320 I Internal ref.: ME-CA-IENVIEWL-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Alkalinity	EWL0538-JUN23	mg/L as CaCO3	2	< 2	0	20	100	80	120	NA		

Ammonia by SFA

Method: SM 4500 I Internal ref.: ME-CA-IENVISFA-LAK-AN-007

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Ammonia+Ammonium (N)	SKA0221-JUN23	mg/L	0.04	<0.04	ND	10	106	90	110	97	75	125

QC SUMMARY

Anions by discrete analyzer

Method: US EPA 325.2 | Internal ref.: ME-CA-[ENVIEWL-LAK-AN-026

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Chloride	DIO5004-JUL23	mg/L	1	<1	ND	20	101	80	120	109	75	125
Sulphate	DIO5004-JUL23	mg/L	2	<2	ND	20	112	80	120	108	75	125

Carbon by Combustion/Oxidation

Method: SM 5310B | Internal ref.: ME-CA-[ENVIEWL-LAK-AN-023

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Dissolved Organic Carbon	EWL0541-JUN23	mg/L	1.0	<1.0	1	20	100	90	110	104	75	125

QC SUMMARY

Chemical Oxygen Demand

Method: HACH 8000 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-009

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Chemical Oxygen Demand	EWL0530-JUN23	mg/L	8	<8	4	20	106	80	120	105	75	125
Chemical Oxygen Demand	EWL0559-JUN23	mg/L	8	<8	12	20	110	80	120	104	75	125
Chemical Oxygen Demand	EWL0568-JUN23	mg/L	8	<8	ND	20	104	80	120	94	75	125

Conductivity

Method: SM 2510 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Conductivity	EWL0538-JUN23	uS/cm	2	< 2	0	20	100	90	110	NA		

QC SUMMARY

Metals in aqueous samples - ICP-MS

Method: SM 3030/EPA 200.8 | Internal ref.: ME-CA-IENVISPE-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Silver (total)	EMS0210-JUN23	mg/L	0.00005	<0.00005	ND	20	100	90	110	101	70	130
Aluminum (total)	EMS0210-JUN23	mg/L	0.001	<0.001	6	20	100	90	110	102	70	130
Arsenic (total)	EMS0210-JUN23	mg/L	0.0002	<0.0002	4	20	103	90	110	106	70	130
Barium (total)	EMS0210-JUN23	mg/L	0.00008	<0.00008	4	20	96	90	110	100	70	130
Beryllium (total)	EMS0210-JUN23	mg/L	0.000007	<0.000007	ND	20	95	90	110	89	70	130
Boron (total)	EMS0210-JUN23	mg/L	0.002	<0.002	4	20	97	90	110	91	70	130
Bismuth (total)	EMS0210-JUN23	mg/L	0.00001	<0.00001	9	20	93	90	110	91	70	130
Calcium (total)	EMS0210-JUN23	mg/L	0.01	<0.01	1	20	101	90	110	109	70	130
Cadmium (total)	EMS0210-JUN23	mg/L	0.000003	<0.000003	3	20	100	90	110	101	70	130
Cobalt (total)	EMS0210-JUN23	mg/L	0.000004	<0.000004	1	20	97	90	110	94	70	130
Chromium (total)	EMS0210-JUN23	mg/L	0.00008	<0.00008	3	20	101	90	110	109	70	130
Copper (total)	EMS0210-JUN23	mg/L	0.0002	<0.0002	4	20	102	90	110	101	70	130
Iron (total)	EMS0210-JUN23	mg/L	0.007	<0.007	1	20	103	90	110	125	70	130
Potassium (total)	EMS0210-JUN23	mg/L	0.009	<0.009	2	20	100	90	110	129	70	130
Magnesium (total)	EMS0210-JUN23	mg/L	0.001	<0.001	3	20	100	90	110	116	70	130
Manganese (total)	EMS0210-JUN23	mg/L	0.00001	<0.00001	4	20	103	90	110	103	70	130
Molybdenum (total)	EMS0210-JUN23	mg/L	0.00004	<0.00004	6	20	99	90	110	106	70	130
Sodium (total)	EMS0210-JUN23	mg/L	0.01	<0.01	4	20	98	90	110	99	70	130
Nickel (total)	EMS0210-JUN23	mg/L	0.0001	<0.0001	2	20	100	90	110	102	70	130
Lead (total)	EMS0210-JUN23	mg/L	0.00009	<0.00009	0	20	99	90	110	95	70	130

QC SUMMARY

Metals in aqueous samples - ICP-MS (continued)

Method: SM 3030/EPA 200.8 | Internal ref.: ME-CA-[ENV]SPE-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Phosphorus (total)	EMS0210-JUN23	mg/L	0.003	<0.003	7	20	101	90	110	NV	70	130
Selenium (total)	EMS0210-JUN23	mg/L	0.00004	<0.00004	17	20	101	90	110	113	70	130
Sulfur (total)	EMS0210-JUN23	mg/L	3	<1	8	20	101	90	110	NV	70	130
Silicon (total)	EMS0210-JUN23	mg/L	0.02	<0.02	16	20	101	90	110	NV	70	130
Tin (total)	EMS0210-JUN23	mg/L	0.00006	<0.00006	15	20	98	90	110	NV	70	130
Strontium (total)	EMS0210-JUN23	mg/L	0.00008	<0.00008	5	20	101	90	110	104	70	130
Titanium (total)	EMS0210-JUN23	mg/L	0.00007	<0.00005	7	20	100	90	110	NV	70	130
Thallium (total)	EMS0210-JUN23	mg/L	0.000005	<0.000005	17	20	97	90	110	95	70	130
Uranium (total)	EMS0210-JUN23	mg/L	0.000002	2e-006	7	20	96	90	110	98	70	130
Vanadium (total)	EMS0210-JUN23	mg/L	0.00001	<0.00001	5	20	100	90	110	112	70	130
Zinc (total)	EMS0210-JUN23	mg/L	0.002	<0.002	10	20	100	90	110	112	70	130

pH

Method: SM 4500 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
pH	EWL0538-JUN23	No unit	0.05	NA	0		99			NA		

QC SUMMARY

Phenols by SFA

Method: SM 5530B-D | Internal ref.: ME-CA-[ENV]SFA-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
4AAP-Phenolics	SKA0237-JUN23	mg/L	0.001	<0.001	ND	10	100	80	120	92	75	125
4AAP-Phenolics	SKA0248-JUN23	mg/L	0.001	<0.001	1	10	100	80	120	89	75	125

Solids Analysis

Method: SM 2540C | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-005

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Total Dissolved Solids	EWL0515-JUN23	mg/L	30	<30	0	20	101	80	120	NA		

Suspended Solids

Method: SM 2540D | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-004

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Total Suspended Solids	EWL0560-JUN23	mg/L	2	< 2	0	10	98	90	110	NA		

QC SUMMARY

Turbidity

Method: SM 2130 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-003

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Turbidity	EWL0512-JUN23	NTU	0.10	< 0.10	0	10	100	90	110	NA		

Method Blank: a blank matrix that is carried through the entire analytical procedure. Used to assess laboratory contamination.

Duplicate: Paired analysis of a separate portion of the same sample that is carried through the entire analytical procedure. Used to evaluate measurement precision.

LCS/Spike Blank: Laboratory control sample or spike blank refer to a blank matrix to which a known amount of analyte has been added. Used to evaluate analyte recovery and laboratory accuracy without sample matrix effects.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate laboratory accuracy with sample matrix effects.

Reference Material: a material or substance matrix matched to the samples that contains a known amount of the analyte of interest. A reference material may be used in place of a matrix spike.

RL: Reporting limit

RPD: Relative percent difference

AC: Acceptance criteria

Multielement Scan Qualifier: as the number of analytes in a scan increases, so does the chance of a limit exceedance by random chance as opposed to a real method problem. Thus, in multielement scans, for the LCS and matrix spike, up to 10% of the analytes may exceed the quoted limits by up to 10% absolute and the spike is considered acceptable.

Duplicate Qualifier: for duplicates as the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Matrix Spike Qualifier: for matrix spikes, as the concentration of the native analyte increases, the uncertainty of the matrix spike recovery increases. Thus, the matrix spike acceptance limits apply only when the concentration of the matrix spike is greater than or equal to the concentration of the native analyte.

LEGEND

FOOTNOTES

NSS	Insufficient sample for analysis.
RL	Reporting Limit.
↑	Reporting limit raised.
↓	Reporting limit lowered.
NA	The sample was not analysed for this analyte
ND	Non Detect

Results relate only to the sample tested.
Data reported represent the sample as submitted to SGS. Solid samples expressed on a dry weight basis.
"Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.
Analysis conducted on samples submitted pursuant to or as part of Reg. 153/04, are in accordance to the "Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act and Excess Soil Quality" published by the Ministry and dated March 9, 2004 as amended.

SGS provides criteria information (such as regulatory or guideline limits and summary of limit exceedances) as a service. Every attempt is made to ensure the criteria information in this report is accurate and current, however, it is not guaranteed. Comparison to the most current criteria is the responsibility of the client and SGS assumes no responsibility for the accuracy of the criteria levels indicated.

SGS Canada Inc. statement of conformity decision rule does not consider uncertainty when analytical results are compared to a specified standard or regulation.

This report supersedes all previous versions.

-- End of Analytical Report --

SGS

Request for Laboratory Services and CHAIN OF CUSTODY (General)

SGS Environmental Services - Lakefield: 185 Concession St., Lakefield, ON K0L 2H0 Phone: 705-652-2000 Toll Free: 877-747-7658 Fax: 705-652-6365 Web: www.ca.sgs.com {4}

SGS Environmental Services - London: 657 Consortium Court, London, ON, N6E 2S8 Phone: 519-672-4500 Toll Free: 877-848-8060 Fax: 519-672-0361 Web: www.ca.sgs.com {4}

Laboratory Information Section

Received Date (mm/dd/yyyy): JUN 2 1 2023 ne

LAB LIMS #: CA15704-Jun23

Received Time (After Hours Only): __:__

Temperature Upon Receipt (°C): 3.3, 1

Billing & Reporting Information

Invoice/Receipt to {3}:

Company: WSP E&I Canada Limited

Attention: Dominique Gagnon

Address: 131 Fielding Rd, Lively, Ontario, P3Y 1L7

Email: dominique.gagnon@wsp.com

Quote #: 2021 1426

Attached Parameter List: ☐ YES ☐ NO

Turnaround Time

Is *Rush Turnaround Time Required? ☐ YES ☐ NO

Specify:

* Rush TA Requests Require Lab Approval

Project Name/Number: TY131010 HAILEYBURY SW

P.O. #:

Client Information/Report To:

Client Lab #:

Company Name: WSP E&I Canada Limited

Phone Number: 705-682-2632

Contact Name:

Fax Number:

Address:

E-mail:

Copy to:

Sample Information

Sample Identifier	Date Sampled (mm/dd/yy)	Time Sampled	# of Bottles	Analysis Requested (please enter the analysis required below and check off which analysis applies to each sample)							
				Field Filtered	SW as per quote	GW as per quote					
SW-3	6/19/23	1:55pm	9		X						
SW-4	6/19/23	5:22pm	9		X						
SW-5	6/19/23	5:33pm	9		X						
HB SW Dup	6/19/23		9		X						

Sampled By {1}: (Name) Aedan Vernon (Signature) [signature] Date: 06/19/23 (mm/dd/yy)

Relinquished by {2}: (Name) Aedan Vernon (Signature) [signature] Date: 06/20/23 (mm/dd/yy)

Note: {1} Submission of samples to SGS is acknowledgement that you have been provided direction on sample collection/handling and transportation of samples. {2} Submission of samples to SGS is considered authorization for completion of work. Signatures may appear on this form or be retained on file in the contract, or in an alternative format (e.g. shipping documents). {3} Results may be sent by email to an unlimited number of addresses for no additional cost. Fax is available upon request. {4} Completion of work may require the subcontracting of samples between the London and Lakefield laboratories.

Revision #: 2.3
Date of Issue: 24 Jun. 2014

33415184437 RTN 945 ne

FINAL REPORT

CA19736-AUG23 R1

TY131010.2023.2000.1142.5730-00 Haileybury LF GW

Prepared for

WSP E & I Canada Ltd

FINAL REPORT

CA19736-AUG23 R1

First Page

CLIENT DETAILS

Client	WSP E & I Canada Ltd
Address	131 Fielding Road, Lively Canada, P3Y 1L7 Phone: 705-665-0159. Fax:
Contact	Dominique Gagnon
Telephone	705-665-0159
Facsimile	
Email	Dominique.Gagnon@wsp.com; meg.russell@wsp.com
Project	TY131010.2023.2000.1142.5730-00 Haileybury LF GW
Order Number	
Samples	Ground Water (13)

LABORATORY DETAILS

Project Specialist	Maarit Wolfe, Hon.B.Sc
Laboratory	SGS Canada Inc.
Address	185 Concession St., Lakefield ON, K0L 2H0
Telephone	705-652-2000
Facsimile	705-652-6365
Email	Maarit.Wolfe@sgs.com
SGS Reference	CA19736-AUG23
Received	08/30/2023
Approved	09/07/2023
Report Number	CA19736-AUG23 R1
Date Reported	09/07/2023

COMMENTS

Temperature of Sample upon Receipt: 12 degrees C
Cooling Agent Present: Yes
Custody Seal Present: Yes

Chain of Custody Number: n/a

SIGNATORIES

Maarit Wolfe, Hon.B.Sc

TABLE OF CONTENTS

Client: WSP E & I Canada Ltd
Project: TY131010.2023.2000.1142.5730-00 Haileybury LF GW
Project Manager: Dominique Gagnon
Samplers: Clement Cheung

MATRIX: WATER

Sample Number				7	8	9	10	11	13	14	15
Sample Name				TW-4	TW-6	TW-8	TW-9	TW-10	TW-13	TW-14	TW-15
Sample Matrix				Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
Sample Date				28/08/2023	28/08/2023	28/08/2023	28/08/2023	28/08/2023	28/08/2023	28/08/2023	28/08/2023
Parameter	**Units**	**RL**		**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
General Chemistry											
Biochemical Oxygen Demand (BOD5)	mg/L	2		< 4↑	< 4↑	< 4↑	13	< 4↑	< 4↑	< 4↑	< 4↑
Alkalinity	mg/L as CaCO3	2		683	649	99	1340	24	944	33	288
Conductivity	uS/cm	2		1700	2470	200	3480	121	2170	97	781
Total Dissolved Solids	mg/L	30		1060	1640	129	1620	103	890	66	494
Dissolved Organic Carbon	mg/L	1.0		22.4	61.5	2.2	94.2	2.3	34.8	< 1.0	5.6
Chemical Oxygen Demand	mg/L	8		54	114	< 8	300	9	104	< 8	16
Total Kjeldahl Nitrogen (N)	as N mg/L	0.05		2.47	12.2	0.05	153	0.10	106	< 0.05	0.64
Ammonia+Ammonium (N)	as N mg/L	0.04		0.80	8.58	0.08	136	< 0.04	96.2	< 0.04	0.42
Organic Nitrogen	mg/L	0.05		1.67	3.59	< 0.05	16.3	0.08	9.65	< 0.05	0.22
Total Reactive Phosphorous (o-phosphate as P)	mg/L	0.03		< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Metals and Inorganics											
Fluoride	mg/L	0.06		< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
Sulphate	mg/L	2		140	350	4	77	13	< 2	3	60
Nitrite (as N)	as N mg/L	0.03		< 0.03	< 0.03	< 0.03	< 0.3↑	< 0.03	0.03	< 0.03	0.05
Nitrate (as N)	as N mg/L	0.06		0.76	10.1	< 0.06	0.15	0.70	0.13	1.26	6.13
Hardness (dissolved)	mg/L as CaCO3	0.05		703	843	99.5	719	27.8	469	33.1	317
Aluminum (dissolved)	mg/L	0.001		0.002	0.006	0.001	0.032	0.017	0.048	0.002	0.001
Arsenic (dissolved)	mg/L	0.0002		0.0007	0.0011	0.0016	0.0212	0.0002	0.0107	0.0002	0.0004
Barium (dissolved)	mg/L	0.00008		0.163	0.351	0.00576	0.454	0.00477	0.267	0.00179	0.08220
Boron (dissolved)	mg/L	0.002		0.981	2.97	0.006	2.21	0.006	1.33	0.009	0.688
Beryllium (dissolved)	mg/L	0.000007		< 0.000007	< 0.000007	< 0.000007	0.000016	< 0.000007	0.000029	< 0.000007	< 0.000007

Client: WSP E & I Canada Ltd
Project: TY131010.2023.2000.1142.5730-00 Haileybury LF GW
Project Manager: Dominique Gagnon
Samplers: Clement Cheung

MATRIX: WATER

Sample Number				7	8	9	10	11	13	14	15	
Sample Name				TW-4	TW-6	TW-8	TW-9	TW-10	TW-13	TW-14	TW-15	
Sample Matrix				Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	
Sample Date				28/08/2023	28/08/2023	28/08/2023	28/08/2023	28/08/2023	28/08/2023	28/08/2023	28/08/2023	
Parameter	**Units**	**RL**		**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	
Metals and Inorganics (continued)												
Bismuth (dissolved)	mg/L	0.00001		< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	
Calcium (dissolved)	mg/L	0.01		205	224	23.2	166	7.47	111	8.90	90.1	
Cadmium (dissolved)	mg/L	0.000003		0.000063	0.000291	0.000003	0.000023	0.000004	0.000004	0.000007	0.000036	
Chromium (dissolved)	mg/L	0.00008		0.00080	0.00257	0.00019	0.0222	0.00066	0.00633	0.00159	0.00087	
Cobalt (dissolved)	mg/L	0.000004		0.00268	0.00764	0.000277	0.0108	0.000063	0.00664	0.000027	0.00284	
Copper (dissolved)	mg/L	0.0002		0.0122	0.0838	0.0014	0.0020	0.0015	0.0009	0.0008	0.0110	
Iron (dissolved)	mg/L	0.007		0.073	0.012	0.716	26.8	0.024	24.6	< 0.007	< 0.007	
Potassium (dissolved)	mg/L	0.009		20.4	64.8	0.504	92.5	0.570	57.8	0.354	11.0	
Magnesium (dissolved)	mg/L	0.001		46.7	68.9	10.1	74.2	2.22	46.9	2.65	22.3	
Manganese (dissolved)	mg/L	0.00001		1.50	3.47	0.223	4.14	0.00313	3.28	0.00018	0.532	
Sodium (dissolved)	mg/L	0.01		88.3	173	2.43	250	9.65	131	4.05	40.2	
Lead (dissolved)	mg/L	0.00009		< 0.00009	< 0.00009	< 0.00009	0.00020	< 0.00009	< 0.00009	< 0.00009	< 0.00009	
Molybdenum (dissolved)	mg/L	0.00004		0.00060	0.00370	0.00042	0.00134	0.00005	0.00033	0.00012	0.00010	
Nickel (dissolved)	mg/L	0.0001		0.0085	0.0286	0.0004	0.0247	0.0001	0.0100	0.0001	0.0049	
Phosphorus (dissolved)	mg/L	0.003		0.012	0.029	0.010	0.252	< 0.003	0.050	0.006	0.006	
Selenium (dissolved)	mg/L	0.00004		0.00018	0.00132	< 0.00004	0.00418	0.00005	0.00093	0.00004	0.00007	
Silicon (dissolved)	mg/L	0.02		7.37	4.03	7.31	13.2	4.35	6.12	5.64	6.63	
Silver (dissolved)	mg/L	0.00005		< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	
Strontium (dissolved)	mg/L	0.00008		0.643	1.08	0.0412	0.977	0.0254	0.457	0.0219	0.234	
Sulfur (dissolved)	mg/L	3		53	116	< 3	28	< 3	< 3	< 3	18	
Thallium (dissolved)	mg/L	0.000005		0.000027	0.000069	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	
Tin (dissolved)	mg/L	0.00006		0.00018	0.00029	< 0.00006	0.00048	0.00008	0.00029	0.00006	0.00026	

Client: WSP E & I Canada Ltd

Project: TY131010.2023.2000.1142.5730-00 Haileybury LF GW

Project Manager: Dominique Gagnon

Samplers: Clement Cheung

MATRIX: WATER

	Sample Number	7	8	9	10	11	13	14	15
	Sample Name	TW-4	TW-6	TW-8	TW-9	TW-10	TW-13	TW-14	TW-15
	Sample Matrix	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
	Sample Date	28/08/2023	28/08/2023	28/08/2023	28/08/2023	28/08/2023	28/08/2023	28/08/2023	28/08/2023
Parameter	**Units**	**RL**		**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Metals and Inorganics (continued)										
Titanium (dissolved)	mg/L	0.00007		0.00020	0.00048	0.00020	0.00910	0.00024	0.00355	0.00018	0.00011
Uranium (dissolved)	mg/L	0.000002		0.000540	0.00470	0.000164	0.00148	0.000027	0.00179	0.000007	0.000545
Vanadium (dissolved)	mg/L	0.00001		0.00028	0.00089	0.00025	0.0233	0.00025	0.00918	0.00070	0.00056
Zinc (dissolved)	mg/L	0.002		< 0.002	0.003	0.002	0.003	< 0.002	0.002	< 0.002	< 0.002
Other (ORP)										
pH	No unit	0.05		7.64	7.66	7.83	7.89	6.92	7.64	7.26	8.00
Chloride	mg/L	1		91	270	< 1	320	20	170	5	43
Mercury (dissolved)	mg/L	0.00001		< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Phenols										
4AAP-Phenolics	mg/L	0.002		0.002	0.002	< 0.002	0.010	< 0.002	0.005	< 0.002	< 0.002

Client: WSP E & I Canada Ltd
Project: TY131010.2023.2000.1142.5730-00 Haileybury LF GW
Project Manager: Dominique Gagnon
Samplers: Clement Cheung

MATRIX: WATER

Sample Number				16	17	18	19	20	
Sample Name				TW-16	TW-17	MW21-01	HB GW DUP 2	HB GW DUP 1	
Sample Matrix				Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	
Sample Date				28/08/2023	28/08/2023	28/08/2023	28/08/2023	28/08/2023	
Parameter	**Units**	**RL**		**Result**	**Result**	**Result**	**Result**	**Result**	
General Chemistry									
Biochemical Oxygen Demand (BOD5)	mg/L	2		< 4 ↑	< 4 ↑	< 4 ↑	< 4 ↑	< 4 ↑	
Alkalinity	mg/L as CaCO3	2		103	91	145	90	297	
Conductivity	uS/cm	2		221	239	383	243	815	
Total Dissolved Solids	mg/L	30		146	210	237	169	494	
Dissolved Organic Carbon	mg/L	1.0		1.1	2.4	1.5	2.3	5.6	
Chemical Oxygen Demand	mg/L	8		< 8	< 8	< 8	9	13	
Total Kjeldahl Nitrogen (N)	as N mg/L	0.05		0.09	0.07	0.11	0.13	0.37	
Ammonia+Ammonium (N)	as N mg/L	0.04		< 0.04	< 0.04	< 0.04	< 0.04	0.43	
Organic Nitrogen	mg/L	0.05		0.07	0.05	0.09	0.11	< 0.05	
Total Reactive Phosphorous (o-phosphate as P)	mg/L	0.03		< 0.03	0.11	< 0.03	0.10	< 0.03	
Metals and Inorganics									
Fluoride	mg/L	0.06		< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	
Sulphate	mg/L	2		4	7	28	7	59	
Nitrite (as N)	as N mg/L	0.03		< 0.03	< 0.03	< 0.03	< 0.03	0.04	
Nitrate (as N)	as N mg/L	0.06		< 0.06	0.99	3.47	0.98	6.07	
Hardness (dissolved)	mg/L as CaCO3	0.05		103	80.9	155	81.5	324	
Aluminum (dissolved)	mg/L	0.001		0.001	0.007	0.004	0.008	0.002	
Arsenic (dissolved)	mg/L	0.0002		0.0006	0.0002	0.0004	0.0002	0.0003	
Barium (dissolved)	mg/L	0.00008		0.00777	0.00709	0.02756	0.00712	0.08640	
Boron (dissolved)	mg/L	0.002		0.008	0.046	0.154	0.051	0.613	
Beryllium (dissolved)	mg/L	0.000007		< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	

Client: WSP E & I Canada Ltd
Project: TY131010.2023.2000.1142.5730-00 Haileybury LF GW
Project Manager: Dominique Gagnon
Samplers: Clement Cheung

MATRIX: WATER

Sample Number			16	17	18	19	20
Sample Name			TW-16	TW-17	MW21-01	HB GW DUP 2	HB GW DUP 1
Sample Matrix			Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
Sample Date			28/08/2023	28/08/2023	28/08/2023	28/08/2023	28/08/2023
Parameter	**Units**	**RL**	**Result**	**Result**	**Result**	**Result**	**Result**
Metals and Inorganics (continued)							
Bismuth (dissolved)	mg/L	0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Calcium (dissolved)	mg/L	0.01	32.9	22.5	46.8	22.5	92.2
Cadmium (dissolved)	mg/L	0.000003	0.000003	0.000014	0.000005	0.000009	0.000028
Chromium (dissolved)	mg/L	0.00008	0.00123	0.00027	0.00080	0.00025	0.00075
Cobalt (dissolved)	mg/L	0.000004	0.000026	0.000165	0.00130	0.000172	0.002835
Copper (dissolved)	mg/L	0.0002	0.0009	0.0031	0.0032	0.0034	0.0111
Iron (dissolved)	mg/L	0.007	< 0.007	0.008	< 0.007	0.011	< 0.007
Potassium (dissolved)	mg/L	0.009	0.329	0.525	3.88	0.545	11.1
Magnesium (dissolved)	mg/L	0.001	5.01	6.00	9.35	6.15	22.6
Manganese (dissolved)	mg/L	0.00001	0.00011	0.0105	0.0232	0.0110	0.517
Sodium (dissolved)	mg/L	0.01	2.95	8.34	11.3	8.38	40.7
Lead (dissolved)	mg/L	0.00009	< 0.00009	< 0.00009	< 0.00009	< 0.00009	< 0.00009
Molybdenum (dissolved)	mg/L	0.00004	0.00007	0.00006	0.00049	0.00006	0.00014
Nickel (dissolved)	mg/L	0.0001	0.0002	0.0009	0.0084	0.0011	0.0047
Phosphorus (dissolved)	mg/L	0.003	0.015	< 0.003	< 0.003	< 0.003	0.004
Selenium (dissolved)	mg/L	0.00004	< 0.00004	0.00004	0.00004	< 0.00004	0.00014
Silicon (dissolved)	mg/L	0.02	5.89	3.78	5.50	3.81	6.47
Silver (dissolved)	mg/L	0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Strontium (dissolved)	mg/L	0.00008	0.0398	0.0615	0.0946	0.0623	0.242
Sulfur (dissolved)	mg/L	3	< 3	< 3	7	< 3	17
Thallium (dissolved)	mg/L	0.000005	< 0.000005	0.000008	< 0.000005	0.000007	< 0.000005
Tin (dissolved)	mg/L	0.00006	0.00008	0.00006	0.00008	0.00009	0.00011

Client: WSP E & I Canada Ltd
Project: TY131010.2023.2000.1142.5730-00 Haileybury LF GW
Project Manager: Dominique Gagnon
Samplers: Clement Cheung

MATRIX: WATER

Sample Number				16	17	18	19	20
Sample Name				TW-16	TW-17	MW21-01	HB GW DUP 2	HB GW DUP 1
Sample Matrix				Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
Sample Date				28/08/2023	28/08/2023	28/08/2023	28/08/2023	28/08/2023
Parameter	**Units**	**RL**		**Result**	**Result**	**Result**	**Result**	**Result**
Metals and Inorganics (continued)								
Titanium (dissolved)	mg/L	0.00007		0.00008	0.00044	0.00011	0.00049	0.00014
Uranium (dissolved)	mg/L	0.000002		0.000041	0.000038	0.000327	0.000038	0.000525
Vanadium (dissolved)	mg/L	0.00001		0.00159	0.00049	0.00080	0.00057	0.00048
Zinc (dissolved)	mg/L	0.002		< 0.002	< 0.002	0.007	0.002	< 0.002
Other (ORP)								
pH	No unit	0.05		8.02	7.51	8.11	7.51	7.69
Chloride	mg/L	1		5	16	14	17	44
Mercury (dissolved)	mg/L	0.00001		< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Phenols								
4AAP-Phenolics	mg/L	0.002		< 0.002	< 0.002	< 0.002	< 0.002	< 0.002

QC SUMMARY

Alkalinity

Method: SM 2320 I Internal ref.: ME-CA-IENVIEWL-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Alkalinity	EWL0626-AUG23	mg/L as CaCO3	2	< 2	0	20	100	80	120	NA		
Alkalinity	EWL0651-AUG23	mg/L as CaCO3	2	< 2	0	20	102	80	120	NA		

Ammonia by SFA

Method: SM 4500 I Internal ref.: ME-CA-IENVISFA-LAK-AN-007

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Ammonia+Ammonium (N)	SKA0004-SEP23	mg/L	0.04	<0.04	ND	10	100	90	110	96	75	125
Ammonia+Ammonium (N)	SKA0005-SEP23	mg/L	0.04	<0.04	0	10	100	90	110	96	75	125
Ammonia+Ammonium (N)	SKA0026-SEP23	mg/L	0.04	<0.04	1	10	100	90	110	88	75	125
Ammonia+Ammonium (N)	SKA0279-AUG23	mg/L	0.04	<0.04	0	10	101	90	110	97	75	125

QC SUMMARY

Anions by discrete analyzer

Method: US EPA 325.2 | Internal ref.: ME-CA-[ENVIEWL-LAK-AN-026

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Chloride	DIO5005-SEP23	mg/L	1	<1	ND	20	98	80	120	102	75	125
Sulphate	DIO5005-SEP23	mg/L	2	<2	4	20	105	80	120	103	75	125
Chloride	DIO5006-SEP23	mg/L	1	<1	ND	20	99	80	120	104	75	125
Sulphate	DIO5006-SEP23	mg/L	2	<2	1	20	110	80	120	100	75	125
Chloride	DIO5007-SEP23	mg/L	1	<1	ND	20	99	80	120	99	75	125
Sulphate	DIO5007-SEP23	mg/L	2	<2	3	20	110	80	120	112	75	125
Sulphate	DIO5009-SEP23	mg/L	2	<2	3	20	112	80	120	116	75	125

QC SUMMARY

Anions by IC

Method: EPA300/MA300-Ions1.3 I Internal ref.: ME-CA-IENVIIC-LAK-AN-001

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Nitrite (as N)	DIO0026-SEP23	mg/L	0.03	<0.03	ND	20	98	90	110	102	75	125
Nitrite (as N)	DIO0811-AUG23	mg/L	0.03	<0.03	ND	20	98	90	110	103	75	125
Nitrate (as N)	DIO0811-AUG23	mg/L	0.06	<0.06	ND	20	99	90	110	103	75	125
Nitrite (as N)	DIO0827-AUG23	mg/L	0.03	<0.03	ND	20	98	90	110	102	75	125
Nitrate (as N)	DIO0827-AUG23	mg/L	0.06	<0.06	0	20	99	90	110	102	75	125
Nitrite (as N)	DIO0828-AUG23	mg/L	0.03	<0.03	ND	20	98	90	110	104	75	125
Nitrate (as N)	DIO0828-AUG23	mg/L	0.06	<0.06	ND	20	98	90	110	102	75	125
Nitrite (as N)	DIO0832-AUG23	mg/L	0.03	<0.03	ND	20	97	90	110	100	75	125
Nitrate (as N)	DIO0832-AUG23	mg/L	0.06	<0.06	0	20	98	90	110	101	75	125

Biochemical Oxygen Demand

Method: SM 5210 I Internal ref.: ME-CA-IENVIEWL-LAK-AN-007

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Biochemical Oxygen Demand (BOD5)	BOD0060-AUG23	mg/L	2	< 2	3	30	102	70	130	NV	70	130

QC SUMMARY

Carbon by Combustion/Oxidation

Method: SM 5310B | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-023

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Dissolved Organic Carbon	EWL0024-SEP23	mg/L	1.0	<1.0	ND	20	101	90	110	93	75	125
Dissolved Organic Carbon	EWL0033-SEP23	mg/L	1.0	<1.0	ND	20	100	90	110	98	75	125
Dissolved Organic Carbon	EWL0061-SEP23	mg/L	1.0	<1.0	0	20	101	90	110	105	75	125

Chemical Oxygen Demand

Method: HACH 8000 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-009

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Chemical Oxygen Demand	EWL0018-SEP23	mg/L	8	<8	0	20	116	80	120	109	75	125
Chemical Oxygen Demand	EWL0648-AUG23	mg/L	8	<8	ND	20	96	80	120	109	75	125

QC SUMMARY

Conductivity

Method: SM 2510 | Internal ref.: ME-CA-[ENVIEWL-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Conductivity	EWL0626-AUG23	uS/cm	2	< 2	0	20	100	90	110	NA		
Conductivity	EWL0651-AUG23	uS/cm	2	< 2	0	20	99	90	110	NA		

Fluoride by Specific Ion Electrode

Method: SM 4500 | Internal ref.: ME-CA-[ENVIEWL-LAK-AN-014

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Fluoride	EWL0099-SEP23	mg/L	0.06	<0.06	ND	10	96	90	110	98	75	125

Mercury by CVAAS

Method: EPA 7471A/SM 3112B | Internal ref.: ME-CA-[ENVISPE-LAK-AN-004

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Mercury (dissolved)	EHG0056-AUG23	mg/L	0.00001	< 0.00001	0	20	95	80	120	97	70	130

QC SUMMARY

Metals in aqueous samples - ICP-MS

Method: SM 3030/EPA 200.8 | Internal ref.: ME-CA-IENVISPE-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Silver (dissolved)	EMS0043-SEP23	mg/L	0.00005	<0.00005	11	20	99	90	110	84	70	130
Aluminum (dissolved)	EMS0043-SEP23	mg/L	0.001	<0.001	8	20	98	90	110	99	70	130
Arsenic (dissolved)	EMS0043-SEP23	mg/L	0.0002	<0.0002	4	20	98	90	110	106	70	130
Barium (dissolved)	EMS0043-SEP23	mg/L	0.00008	<0.00008	6	20	98	90	110	97	70	130
Beryllium (dissolved)	EMS0043-SEP23	mg/L	0.000007	<0.000007	0	20	95	90	110	96	70	130
Boron (dissolved)	EMS0043-SEP23	mg/L	0.002	<0.002	5	20	92	90	110	91	70	130
Bismuth (dissolved)	EMS0043-SEP23	mg/L	0.00001	<0.00001	ND	20	90	90	110	94	70	130
Calcium (dissolved)	EMS0043-SEP23	mg/L	0.01	<0.01	4	20	100	90	110	99	70	130
Cadmium (dissolved)	EMS0043-SEP23	mg/L	0.000003	<0.000003	15	20	99	90	110	107	70	130
Cobalt (dissolved)	EMS0043-SEP23	mg/L	0.000004	<0.000004	5	20	95	90	110	94	70	130
Chromium (dissolved)	EMS0043-SEP23	mg/L	0.00008	<0.00008	11	20	100	90	110	118	70	130
Copper (dissolved)	EMS0043-SEP23	mg/L	0.0002	<0.0002	17	20	100	90	110	98	70	130
Iron (dissolved)	EMS0043-SEP23	mg/L	0.007	<0.007	5	20	101	90	110	125	70	130
Potassium (dissolved)	EMS0043-SEP23	mg/L	0.009	<0.009	5	20	101	90	110	89	70	130
Magnesium (dissolved)	EMS0043-SEP23	mg/L	0.001	<0.001	3	20	105	90	110	95	70	130
Manganese (dissolved)	EMS0043-SEP23	mg/L	0.00001	<0.00001	3	20	100	90	110	99	70	130
Molybdenum (dissolved)	EMS0043-SEP23	mg/L	0.00004	<0.00004	7	20	101	90	110	105	70	130
Sodium (dissolved)	EMS0043-SEP23	mg/L	0.01	<0.01	5	20	100	90	110	97	70	130
Nickel (dissolved)	EMS0043-SEP23	mg/L	0.0001	<0.0001	7	20	99	90	110	104	70	130
Lead (dissolved)	EMS0043-SEP23	mg/L	0.00009	<0.00009	13	20	96	90	110	93	70	130

QC SUMMARY

Metals in aqueous samples - ICP-MS (continued)

Method: SM 3030/EPA 200.8 | Internal ref.: ME-CA-IENVISPE-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Phosphorus (dissolved)	EMS0043-SEP23	mg/L	0.003	<0.003	5	20	98	90	110	NV	70	130
Selenium (dissolved)	EMS0043-SEP23	mg/L	0.00004	<0.00004	1	20	99	90	110	114	70	130
Sulfur (dissolved)	EMS0043-SEP23	mg/L	3	<1	8	20	99	90	110	NV	70	130
Silicon (dissolved)	EMS0043-SEP23	mg/L	0.02	<0.02	8	20	96	90	110	NV	70	130
Tin (dissolved)	EMS0043-SEP23	mg/L	0.00006	<0.00006	ND	20	96	90	110	NV	70	130
Strontium (dissolved)	EMS0043-SEP23	mg/L	0.00008	<0.00008	2	20	99	90	110	99	70	130
Titanium (dissolved)	EMS0043-SEP23	mg/L	0.00007	<0.00005	12	20	100	90	110	NV	70	130
Thallium (dissolved)	EMS0043-SEP23	mg/L	0.000005	<0.000005	ND	20	95	90	110	95	70	130
Uranium (dissolved)	EMS0043-SEP23	mg/L	0.000002	<0.000002	2	20	95	90	110	94	70	130
Vanadium (dissolved)	EMS0043-SEP23	mg/L	0.00001	<0.00001	9	20	99	90	110	112	70	130
Zinc (dissolved)	EMS0043-SEP23	mg/L	0.002	<0.002	3	20	96	90	110	96	70	130
Silver (dissolved)	EMS0044-SEP23	mg/L	0.00005	<0.00005	ND	20	98	90	110	91	70	130
Aluminum (dissolved)	EMS0044-SEP23	mg/L	0.001	<0.001	7	20	93	90	110	100	70	130
Arsenic (dissolved)	EMS0044-SEP23	mg/L	0.0002	<0.0002	1	20	98	90	110	93	70	130
Barium (dissolved)	EMS0044-SEP23	mg/L	0.00008	<0.00008	1	20	95	90	110	123	70	130
Beryllium (dissolved)	EMS0044-SEP23	mg/L	0.000007	<0.000007	ND	20	95	90	110	98	70	130
Boron (dissolved)	EMS0044-SEP23	mg/L	0.002	<0.002	0	20	101	90	110	103	70	130
Bismuth (dissolved)	EMS0044-SEP23	mg/L	0.00001	<0.00001	ND	20	96	90	110	85	70	130
Calcium (dissolved)	EMS0044-SEP23	mg/L	0.01	<0.01	1	20	97	90	110	100	70	130
Cadmium (dissolved)	EMS0044-SEP23	mg/L	0.000003	<0.000003	ND	20	101	90	110	101	70	130

QC SUMMARY

Metals in aqueous samples - ICP-MS (continued)

Method: SM 3030/EPA 200.8 | Internal ref.: ME-CA-IENVISPE-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Cobalt (dissolved)	EMS0044-SEP23	mg/L	0.000004	<0.000004	1	20	93	90	110	88	70	130
Chromium (dissolved)	EMS0044-SEP23	mg/L	0.00008	<0.00008	11	20	96	90	110	98	70	130
Copper (dissolved)	EMS0044-SEP23	mg/L	0.0002	<0.0002	13	20	99	90	110	82	70	130
Iron (dissolved)	EMS0044-SEP23	mg/L	0.007	<0.007	1	20	98	90	110	75	70	130
Potassium (dissolved)	EMS0044-SEP23	mg/L	0.009	<0.009	0	20	96	90	110	70	70	130
Magnesium (dissolved)	EMS0044-SEP23	mg/L	0.001	<0.001	2	20	92	90	110	87	70	130
Manganese (dissolved)	EMS0044-SEP23	mg/L	0.00001	<0.00001	1	20	103	90	110	98	70	130
Molybdenum (dissolved)	EMS0044-SEP23	mg/L	0.00004	<0.00004	8	20	103	90	110	101	70	130
Sodium (dissolved)	EMS0044-SEP23	mg/L	0.01	<0.01	1	20	94	90	110	92	70	130
Nickel (dissolved)	EMS0044-SEP23	mg/L	0.0001	<0.0001	3	20	102	90	110	90	70	130
Lead (dissolved)	EMS0044-SEP23	mg/L	0.00009	<0.00009	ND	20	99	90	110	97	70	130
Phosphorus (dissolved)	EMS0044-SEP23	mg/L	0.003	<0.003	13	20	97	90	110	NV	70	130
Selenium (dissolved)	EMS0044-SEP23	mg/L	0.00004	<0.00004	ND	20	98	90	110	113	70	130
Sulfur (dissolved)	EMS0044-SEP23	mg/L	3	<1	ND	20	106	90	110	NV	70	130
Silicon (dissolved)	EMS0044-SEP23	mg/L	0.02	<0.02	1	20	96	90	110	NV	70	130
Tin (dissolved)	EMS0044-SEP23	mg/L	0.00006	<0.00006	ND	20	106	90	110	NV	70	130
Strontium (dissolved)	EMS0044-SEP23	mg/L	0.00008	<0.00008	0	20	96	90	110	96	70	130
Titanium (dissolved)	EMS0044-SEP23	mg/L	0.00007	<0.00005	15	20	108	90	110	NV	70	130
Thallium (dissolved)	EMS0044-SEP23	mg/L	0.000005	<0.000005	0	20	98	90	110	99	70	130
Uranium (dissolved)	EMS0044-SEP23	mg/L	0.000002	2e-006	5	20	98	90	110	99	70	130

QC SUMMARY

Metals in aqueous samples - ICP-MS (continued)

Method: SM 3030/EPA 200.8 | Internal ref.: ME-CA-[ENV]SPE-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Vanadium (dissolved)	EMS0044-SEP23	mg/L	0.00001	<0.00001	10	20	99	90	110	99	70	130
Zinc (dissolved)	EMS0044-SEP23	mg/L	0.002	<0.002	ND	20	93	90	110	92	70	130

pH

Method: SM 4500 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
pH	EWL0626-AUG23	No unit	0.05	NA	0		100			NA		
pH	EWL0651-AUG23	No unit	0.05	NA	0		100			NA		

QC SUMMARY

Phenols by SFA

Method: SM 5530B-D | Internal ref.: ME-CA-[ENVISFA-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
4AAP-Phenolics	SKA0006-SEP23	mg/L	0.002	<0.002	ND	10	98	80	120	93	75	125

Reactive Phosphorus by SFA

Method: SM 4500-P F | Internal ref.: ME-CA-[ENVISFA-LAK-AN-004

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Total Reactive Phosphorous (o-phosphate as P)	SKA0007-SEP23	mg/L	0.03	<0.03	ND	10	100	90	110	78	75	125

QC SUMMARY

Solids Analysis

Method: SM 2540C | Internal ref.: ME-CA-[ENVIEWL-LAK-AN-005

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Total Dissolved Solids	EWL0641-AUG23	mg/L	30	<30	1	20	100	80	120	NA		
Total Dissolved Solids	EWL0664-AUG23	mg/L	30	<30	3	20	96	80	120	NA		
Total Dissolved Solids	EWL0668-AUG23	mg/L	30	<30	2	20	98	80	120	NA		

Total Nitrogen

Method: SM 4500-N C/4500-NO3- F | Internal ref.: ME-CA-[ENVISFA-LAK-AN-002

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Total Kjeldahl Nitrogen (N)	SKA0010-SEP23	mg/L	0.05	<0.05	ND	10	103	90	110	87	75	125
Total Kjeldahl Nitrogen (N)	SKA0022-SEP23	mg/L	0.05	<0.05	ND	10	104	90	110	101	75	125
Total Kjeldahl Nitrogen (N)	SKA0051-SEP23	mg/L	0.05	<0.05	ND	10	100	90	110	92	75	125
Total Kjeldahl Nitrogen (N)	SKA0286-AUG23	mg/L	0.05	<0.05	6	10	100	90	110	102	75	125

QC SUMMARY

Method Blank: a blank matrix that is carried through the entire analytical procedure. Used to assess laboratory contamination.

Duplicate: Paired analysis of a separate portion of the same sample that is carried through the entire analytical procedure. Used to evaluate measurement precision.

LCS/Spike Blank: Laboratory control sample or spike blank refer to a blank matrix to which a known amount of analyte has been added. Used to evaluate analyte recovery and laboratory accuracy without sample matrix effects.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate laboratory accuracy with sample matrix effects.

Reference Material: a material or substance matrix matched to the samples that contains a known amount of the analyte of interest. A reference material may be used in place of a matrix spike.

RL: Reporting limit

RPD: Relative percent difference

AC: Acceptance criteria

Multielement Scan Qualifier: as the number of analytes in a scan increases, so does the chance of a limit exceedance by random chance as opposed to a real method problem. Thus, in multielement scans, for the LCS and matrix spike, up to 10% of the analytes may exceed the quoted limits by up to 10% absolute and the spike is considered acceptable.

Duplicate Qualifier: for duplicates as the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Matrix Spike Qualifier: for matrix spikes, as the concentration of the native analyte increases, the uncertainty of the matrix spike recovery increases. Thus, the matrix spike acceptance limits apply only when the concentration of the matrix spike is greater than or equal to the concentration of the native analyte.

LEGEND

FOOTNOTES

NSS	Insufficient sample for analysis.
RL	Reporting Limit.
↑	Reporting limit raised.
↓	Reporting limit lowered.
NA	The sample was not analysed for this analyte
ND	Non Detect

Results relate only to the sample tested.
Data reported represent the sample as submitted to SGS. Solid samples expressed on a dry weight basis.
"Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.
Analysis conducted on samples submitted pursuant to or as part of Reg. 153/04, are in accordance to the "Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act and Excess Soil Quality" published by the Ministry and dated March 9, 2004 as amended.

SGS provides criteria information (such as regulatory or guideline limits and summary of limit exceedances) as a service. Every attempt is made to ensure the criteria information in this report is accurate and current, however, it is not guaranteed. Comparison to the most current criteria is the responsibility of the client and SGS assumes no responsibility for the accuracy of the criteria levels indicated.

SGS Canada Inc. statement of conformity decision rule does not consider uncertainty when analytical results are compared to a specified standard or regulation.

This report supersedes all previous versions.

-- End of Analytical Report --

SGS

Request for Laboratory Services and CHAIN OF CUSTODY (General)

SGS Environmental Services - Lakefield: 185 Concession St., Lakefield, ON K0L 2H0 Phone: 705-652-2000 Toll Free: 877-747-7658 Fax: 705-652-6365 Web: www.ca.sgs.com {4}

SGS Environmental Services - London: 657 Consortium Court, London, ON, N6E 2S8 Phone: 519-672-4500 Toll Free: 877-848-8060 Fax: 519-672-0361 Web: www.ca.sgs.com {4}

Laboratory Information Section

Received Date (mm/dd/yyyy): AUG 30 2023 JC

LAB LIMS #: Aug 19736

Received Time (After Hours Only): __ : __

Temperature Upon Receipt (°C): 12x3

Billing & Reporting Information

Invoice/Receipt to {3}:

Company: WSP E & I

Attention: Dominique Gagnon

Address: 131 Fielding Rd, Lively, Ontario, P3Y 1L7

Email: dominique.gagnon@wsp.com, APInvoice.Canada@woodplc.com, meg.russell@wsp.com

Quote #: 2021 1246

Attached Parameter List: ☐ YES ☐ NO

Turnaround Time

Is *Rush Turnaround Time Required? ☐ YES ☐ NO

Specify:

* Rush TA Requests Require Lab Approval

Project Name/Number: TY131010.2023.2000.1142.5730-00 - Haileybury LF GW

P.O. #: C023701288

Client Information/Report To:

Client Lab #:

Company Name:	**WSP E & I**	**Phone Number:**	**705-682-2632**
Contact Name:	**Dominique Gagnon & Meg Russell**	**Fax Number:**	
Address:		**E-mail:**	
Copy to:	**dominique.gagnon@wsp.com, meg.russell@wsp.com**		

Sample Information

Sample Identifier	Date Sampled (mm/dd/yy)	Time Sampled	# of Bottles	Field Filtered	SW as per quote	GW as per quote		pTemp	pH		
TW-4	08/28/23		9			X		11.6	6.56		
TW-6	08/28/23		9			X		10.7	6.53		
TW-8	08/28/23		9			X		12.9	7.33		
TW-9	08/28/23		9			X		13.1	6.84		
TW-10	08/28/23		9			X		9.6	7.23		
TW-12	08/28/23		9			X		/	/		
TW-13	08/28/23		9			X		10.5	6.44		
TW-14	08/28/23		9			X		8.4	7.41		
TW-15	08/28/23		9			X		10.2	6.95		
TW-16	08/28/23		9			X		8.3	7.09		
TW-17	08/28/23		9			X		12.2	6.62		
MW21-01	08/28/23		9			X		13.4	6.41		
HB GW Dup2	08/28/23		9			X		10.2	6.44		
HB GW Dup1	"		"			X					
as per client confirmation KW											

Sampled By {1}: (Name) CLEMENT CHEUNG (Signature) Date: 08/29/23 (mm/dd/yy)

Relinquished by {2}: (Name) CLEMENT CHEUNG (Signature) Date: 08/29/23 (mm/dd/yy)

Note: {1} Submission of samples to SGS is acknowledgement that you have been provided direction on sample collection/handling and transportation of samples. {2} Submission of samples to SGS is considered authorization for completion of work. Signatures may appear on this form or be retained on file in the contract, or in an alternative format (e.g. shipping documents). {3} Results may be sent by email to an unlimited number of addresses for no additional cost. Fax is available upon request. {4} Completion of work may require the subcontracting of samples between the London and Lakefield laboratories.

Revision #: 2.3
Date of Issue: 24 Jun. 2014

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FINAL REPORT

CA15288-OCT23 R1

TY131010.2023.2000.1142.5730-00 GW, Haileybury LF GW

Prepared for

WSP E & I Canada Ltd

FINAL REPORT

CA15288-OCT23 R1

First Page

CLIENT DETAILS

Client	WSP E & I Canada Ltd
Address	131 Fielding Road, Lively Canada, P3Y 1L7 Phone: 705-665-0159. Fax:
Contact	Dominique Gagnon
Telephone	705-665-0159
Facsimile	
Email	Dominique.Gagnon@wsp.com; meg.russell@wsp.com
Project	TY131010.2023.2000.1142.5730-00 GW, Haileybury LF GW
Order Number	
Samples	Ground Water (13)

LABORATORY DETAILS

Project Specialist	Maarit Wolfe, Hon.B.Sc
Laboratory	SGS Canada Inc.
Address	185 Concession St., Lakefield ON, K0L 2H0
Telephone	705-652-2000
Facsimile	705-652-6365
Email	Maarit.Wolfe@sgs.com
SGS Reference	CA15288-OCT23
Received	10/18/2023
Approved	10/31/2023
Report Number	CA15288-OCT23 R1
Date Reported	10/31/2023

COMMENTS

Temperature of Sample upon Receipt: 5 degrees C
Cooling Agent Present: Yes
Custody Seal Present: Yes

Chain of Custody Number: n/a

BOD spike low, accepted based on all other QC

SIGNATORIES

Maarit Wolfe, Hon.B.Sc

TABLE OF CONTENTS

Client: WSP E & I Canada Ltd

Project: TY131010.2023.2000.1142.5730-00 GW, Haileybury LF GW

Project Manager: Dominique Gagnon

Samplers: Mikayla Bechard

MATRIX: WATER

Sample Number				7	8	9	10	11	12	13	14
Sample Name				TW-4	TW-6	TW-8	TW-9	TW-10	TW-13	TW-14	TW-15
Sample Matrix				Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
Sample Date				17/10/2023	17/10/2023	17/10/2023	16/10/2023	16/10/2023	16/10/2023	16/10/2023	16/10/2023
Parameter	**Units**	**RL**		**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
General Chemistry											
Biochemical Oxygen Demand (BOD5)	mg/L	2		9	< 4↑	4	13	< 4↑	9	< 4↑	< 4↑
Alkalinity	mg/L as CaCO3	2		881	634	96	1440	31	1090	30	250
Conductivity	uS/cm	2		1890	2160	162	3170	124	2310	94	669
Total Dissolved Solids	mg/L	30		1400	1670	131	1710	111	1060	89	500
Dissolved Organic Carbon	mg/L	1.0		45.3	22.8	1.8	96.7	2.8	56.8	< 1.0	5.0
Chemical Oxygen Demand	mg/L	8		78	53	< 8	262	< 8	115	< 8	21
Total Kjeldahl Nitrogen (N)	as N mg/L	0.05		3.74	13.4	< 0.05	164	0.22	108	0.07	1.97
Ammonia+Ammonium (N)	as N mg/L	0.04		1.09	11.0	0.04	155	< 0.04	93.9	< 0.04	0.92
Organic Nitrogen	mg/L	0.05		2.65	2.44	< 0.05	8.08	0.22	14.2	0.07	1.05
Total Reactive Phosphorous (o-phosphate as P)	mg/L	0.03		< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Metals and Inorganics											
Fluoride	mg/L	0.06		< 0.06	< 0.06	0.06	0.09	< 0.06	< 0.06	0.06	< 0.06
Sulphate	mg/L	2		140	370	4	76	6	< 2	2	110
Nitrite (as N)	as N mg/L	0.03		< 0.3↑	0.04	< 0.03	< 0.3↑	< 0.03	< 0.3↑	< 0.03	< 0.03
Nitrate (as N)	as N mg/L	0.06		< 0.06	24.9	< 0.06	< 0.06	0.62	< 0.06	1.24	7.98
Hardness (dissolved)	mg/L as CaCO3	0.05		984	857	91.3	716	34.5	533	35.9	373
Aluminum (dissolved)	mg/L	0.001		0.003	0.005	0.002	0.023	0.019	0.044	0.003	0.016
Arsenic (dissolved)	mg/L	0.0002		0.0007	0.0009	0.0012	0.0193	< 0.0002	0.0079	< 0.0002	0.0003
Barium (dissolved)	mg/L	0.00008		0.209	0.351	0.00459	0.493	0.00558	0.316	0.00180	0.0993
Boron (dissolved)	mg/L	0.002		0.849	3.56	0.005	2.09	0.005	1.58	0.011	0.415
Beryllium (dissolved)	mg/L	0.000007		< 0.000007	< 0.000007	< 0.000007	0.000014	< 0.000007	0.000028	< 0.000007	< 0.000007

Client: WSP E & I Canada Ltd
Project: TY131010.2023.2000.1142.5730-00 GW, Haileybury LF GW
Project Manager: Dominique Gagnon
Samplers: Mikayla Bechard

MATRIX: WATER

Sample Number				7	8	9	10	11	12	13	14
Sample Name				TW-4	TW-6	TW-8	TW-9	TW-10	TW-13	TW-14	TW-15
Sample Matrix				Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
Sample Date				17/10/2023	17/10/2023	17/10/2023	16/10/2023	16/10/2023	16/10/2023	16/10/2023	16/10/2023
Parameter	**Units**	**RL**		**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Metals and Inorganics (continued)											
Bismuth (dissolved)	mg/L	0.00001		< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Calcium (dissolved)	mg/L	0.01		294	242	20.7	170	8.94	119	9.24	108
Cadmium (dissolved)	mg/L	0.000003		0.000076	0.000186	< 0.000003	0.000010	0.000004	0.000007	< 0.000003	0.000032
Chromium (dissolved)	mg/L	0.00008		0.00085	0.00128	0.00015	0.0215	0.00034	0.00637	0.00123	0.00073
Cobalt (dissolved)	mg/L	0.000004		0.00517	0.0119	0.000248	0.0117	0.000070	0.00583	0.000039	0.00366
Copper (dissolved)	mg/L	0.0002		0.0149	0.0706	0.0020	0.0016	0.0020	0.0020	0.0019	0.0103
Iron (dissolved)	mg/L	0.007		1.35	0.008	0.494	25.5	0.007	15.9	0.010	0.037
Potassium (dissolved)	mg/L	0.009		23.4	74.7	0.413	96.1	0.596	71.5	0.357	14.6
Magnesium (dissolved)	mg/L	0.001		61.0	61.6	9.61	70.8	2.95	57.0	3.11	25.1
Manganese (dissolved)	mg/L	0.00001		2.48	2.34	0.123	4.16	0.00186	2.16	0.00085	0.662
Sodium (dissolved)	mg/L	0.01		114	200	2.39	263	13.4	152	4.51	31.5
Lead (dissolved)	mg/L	0.00009		< 0.00009	< 0.00009	< 0.00009	< 0.00009	< 0.00009	< 0.00009	< 0.00009	< 0.00009
Molybdenum (dissolved)	mg/L	0.00004		0.00064	0.00597	0.00031	0.00106	0.00004	0.00025	0.00008	0.00009
Nickel (dissolved)	mg/L	0.0001		0.0128	0.0208	0.0006	0.0227	0.0003	0.0101	0.0004	0.0053
Phosphorus (dissolved)	mg/L	0.003		0.028	0.021	0.007	0.263	< 0.003	0.062	0.007	0.008
Selenium (dissolved)	mg/L	0.00004		0.00025	0.00062	< 0.00004	0.00045	0.00005	0.00026	0.00004	0.00010
Silicon (dissolved)	mg/L	0.02		8.26	3.67	7.49	14.7	4.61	6.22	5.89	6.67
Silver (dissolved)	mg/L	0.00005		< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Strontium (dissolved)	mg/L	0.00008		0.909	1.18	0.0371	1.07	0.0302	0.510	0.0232	0.296
Sulfur (dissolved)	mg/L	3		50	140	< 3	30	< 3	< 3	< 3	27
Thallium (dissolved)	mg/L	0.000005		0.000026	0.000074	< 0.000005	< 0.000005	0.000005	< 0.000005	< 0.000005	< 0.000005
Tin (dissolved)	mg/L	0.00006		0.00016	0.00017	< 0.00006	0.00042	< 0.00006	0.00027	< 0.00006	< 0.00006

Client: WSP E & I Canada Ltd
Project: TY131010.2023.2000.1142.5730-00 GW, Haileybury LF GW
Project Manager: Dominique Gagnon
Samplers: Mikayla Bechard

MATRIX: WATER

Sample Number				7	8	9	10	11	12	13	14
Sample Name				TW-4	TW-6	TW-8	TW-9	TW-10	TW-13	TW-14	TW-15
Sample Matrix				Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
Sample Date				17/10/2023	17/10/2023	17/10/2023	16/10/2023	16/10/2023	16/10/2023	16/10/2023	16/10/2023
Parameter	**Units**	**RL**		**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**	**Result**
Metals and Inorganics (continued)											
Titanium (dissolved)	mg/L	0.00007		0.00018	0.00032	0.00014	0.00877	0.00026	0.00390	0.00021	0.00094
Uranium (dissolved)	mg/L	0.000002		0.000538	0.00578	0.000091	0.00115	0.000023	0.00122	0.000010	0.000607
Vanadium (dissolved)	mg/L	0.00001		0.00039	0.00072	0.00019	0.0216	0.00021	0.00963	0.00060	0.00051
Zinc (dissolved)	mg/L	0.002		< 0.002	0.003	< 0.002	< 0.002	< 0.002	0.003	< 0.002	< 0.002
Other (ORP)											
pH	No unit	0.05		7.52	7.46	7.05	7.66	6.51	7.39	7.20	7.70
Chloride	mg/L	1		210	230	< 1	350	25	200	9	72
Mercury (dissolved)	mg/L	0.00001		< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Phenols											
4AAP-Phenolics	mg/L	0.002		0.003	0.004	< 0.002	0.012	< 0.002	0.007	< 0.002	< 0.002

Client: WSP E & I Canada Ltd
Project: TY131010.2023.2000.1142.5730-00 GW, Haileybury LF GW
Project Manager: Dominique Gagnon
Samplers: Mikayla Bechard

MATRIX: WATER

Sample Number			15	16	17	18	19
Sample Name			TW-16 (Bear Spray on bag)	TW-17	MW21-01	HB GW DUP 2	HB GW DUP 1
Sample Matrix			Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
Sample Date			16/10/2023	16/10/2023	17/10/2023	16/10/2023	16/10/2023
Parameter	**Units**	**RL**	**Result**	**Result**	**Result**	**Result**	**Result**
General Chemistry							
Biochemical Oxygen Demand (BOD5)	mg/L	2	< 4↑	6	< 4↑	< 4↑	< 4↑
Alkalinity	mg/L as CaCO3	2	123	144	149	94	223
Conductivity	uS/cm	2	256	340	385	182	636
Total Dissolved Solids	mg/L	30	223	194	257	114	389
Dissolved Organic Carbon	mg/L	1.0	1.2	2.7	1.6	1.9	4.7
Chemical Oxygen Demand	mg/L	8	< 8	30	12	< 8	34
Total Kjeldahl Nitrogen (N)	as N mg/L	0.05	< 0.05	0.26	< 0.05	0.16	0.88
Ammonia+Ammonium (N)	as N mg/L	0.04	< 0.04	0.12	0.14	0.07	0.91
Organic Nitrogen	mg/L	0.05	< 0.05	0.14	< 0.05	0.09	< 0.05
Total Reactive Phosphorous (o-phosphate as P)	mg/L	0.03	< 0.03	0.03	< 0.03	< 0.03	< 0.03
Metals and Inorganics							
Fluoride	mg/L	0.06	< 0.06	0.09	< 0.06	0.06	0.07
Sulphate	mg/L	2	7	7	23	4	100
Nitrite (as N)	as N mg/L	0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Nitrate (as N)	as N mg/L	0.06	< 0.06	0.70	3.67	< 0.06	7.98
Hardness (dissolved)	mg/L as CaCO3	0.05	160	267	187	92.6	383
Aluminum (dissolved)	mg/L	0.001	0.001	9.98	0.079	0.002	0.013
Arsenic (dissolved)	mg/L	0.0002	0.0005	0.0018	0.0003	0.0013	0.0002
Barium (dissolved)	mg/L	0.00008	0.0111	0.213	0.0294	0.00458	0.105
Boron (dissolved)	mg/L	0.002	0.017	0.047	0.141	0.006	0.440

Client: WSP E & I Canada Ltd
Project: TY131010.2023.2000.1142.5730-00 GW, Haileybury LF GW
Project Manager: Dominique Gagnon
Samplers: Mikayla Bechard

MATRIX: WATER

Sample Number			15	16	17	18	19
Sample Name			TW-16 (Bear Spray on bag)	TW-17	MW21-01	HB GW DUP 2	HB GW DUP 1
Sample Matrix			Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
Sample Date			16/10/2023	16/10/2023	17/10/2023	16/10/2023	16/10/2023
Parameter	**Units**	**RL**	**Result**	**Result**	**Result**	**Result**	**Result**
Metals and Inorganics (continued)							
Beryllium (dissolved)	mg/L	0.000007	< 0.000007	0.000860	< 0.000007	< 0.000007	< 0.000007
Bismuth (dissolved)	mg/L	0.00001	< 0.00001	0.00001	< 0.00001	< 0.00001	< 0.00001
Calcium (dissolved)	mg/L	0.01	52.2	70.9	57.0	21.0	111
Cadmium (dissolved)	mg/L	0.000003	0.000003	0.000156	0.000005	< 0.000003	0.000041
Chromium (dissolved)	mg/L	0.00008	0.00085	0.0201	0.00070	0.00008	0.00069
Cobalt (dissolved)	mg/L	0.000004	0.000034	0.0120	0.00139	0.000250	0.00395
Copper (dissolved)	mg/L	0.0002	0.0011	0.0627	0.0046	0.0015	0.0103
Iron (dissolved)	mg/L	0.007	0.008	9.70	0.007	0.568	0.037
Potassium (dissolved)	mg/L	0.009	0.355	1.45	4.58	0.414	15.4
Magnesium (dissolved)	mg/L	0.001	7.16	21.8	10.9	9.74	25.9
Manganese (dissolved)	mg/L	0.00001	0.00115	0.807	0.00666	0.121	0.695
Sodium (dissolved)	mg/L	0.01	6.02	9.11	11.8	2.38	32.7
Lead (dissolved)	mg/L	0.00009	< 0.00009	0.01032	0.00041	< 0.00009	< 0.00009
Molybdenum (dissolved)	mg/L	0.00004	0.00009	0.00005	0.00025	0.00031	0.00012
Nickel (dissolved)	mg/L	0.0001	0.0002	0.0230	0.0064	0.0006	0.0057
Phosphorus (dissolved)	mg/L	0.003	0.013	3.12	0.003	0.008	0.009
Selenium (dissolved)	mg/L	0.00004	0.00010	0.00030	0.00006	< 0.00004	0.00009
Silicon (dissolved)	mg/L	0.02	6.74	12.2	6.00	7.26	6.87
Silver (dissolved)	mg/L	0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Strontium (dissolved)	mg/L	0.00008	0.0510	0.162	0.0957	0.0366	0.317
Sulfur (dissolved)	mg/L	3	< 3	< 3	7	< 3	29

Client: WSP E & I Canada Ltd
Project: TY131010.2023.2000.1142.5730-00 GW, Haileybury LF GW
Project Manager: Dominique Gagnon
Samplers: Mikayla Bechard

MATRIX: WATER

Sample Number			15	16	17	18	19
Sample Name			TW-16 (Bear Spray on bag)	TW-17	MW21-01	HB GW DUP 2	HB GW DUP 1
Sample Matrix			Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
Sample Date			16/10/2023	16/10/2023	17/10/2023	16/10/2023	16/10/2023
Parameter	**Units**	**RL**	**Result**	**Result**	**Result**	**Result**	**Result**
Metals and Inorganics (continued)							
Thallium (dissolved)	mg/L	0.000005	< 0.000005	0.000098	< 0.000005	< 0.000005	< 0.000005
Tin (dissolved)	mg/L	0.00006	< 0.00006	< 0.00006	0.00012	< 0.00006	0.00014
Titanium (dissolved)	mg/L	0.00007	< 0.00007	0.06829	0.00014	< 0.00007	0.00053
Uranium (dissolved)	mg/L	0.000002	0.000056	0.00111	0.000368	0.000094	0.000631
Vanadium (dissolved)	mg/L	0.00001	0.00158	0.0239	0.00082	0.00018	0.00051
Zinc (dissolved)	mg/L	0.002	< 0.002	0.047	0.008	< 0.002	< 0.002
Other (ORP)							
pH	No unit	0.05	7.27	7.64	7.95	7.65	7.78
Chloride	mg/L	1	26	21	15	1	71
Mercury (dissolved)	mg/L	0.00001	< 0.00001	0.00002	< 0.00001	< 0.00001	< 0.00001
Phenols							
4AAP-Phenolics	mg/L	0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002

QC SUMMARY

Alkalinity

Method: SM 2320 I Internal ref.: ME-CA-IENVIEWL-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Alkalinity	EWL0526-OCT23	mg/L as CaCO3	2	< 2	1	20	98	80	120	NA		
Alkalinity	EWL0527-OCT23	mg/L as CaCO3	2	< 2	0	20	96	80	120	NA		

Ammonia by SFA

Method: SM 4500 I Internal ref.: ME-CA-IENVISFA-LAK-AN-007

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Ammonia+Ammonium (N)	SKA0188-OCT23	mg/L	0.04	<0.04	0	10	99	90	110	90	75	125
Ammonia+Ammonium (N)	SKA0197-OCT23	mg/L	0.04	<0.04	2	10	101	90	110	109	75	125
Ammonia+Ammonium (N)	SKA0212-OCT23	mg/L	0.04	<0.04	0	10	100	90	110	101	75	125

QC SUMMARY

Anions by discrete analyzer

Method: US EPA 325.2 | Internal ref.: ME-CA-[ENVIEWL-LAK-AN-026

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Chloride	DIO5090-OCT23	mg/L	1	<1	4	20	99	80	120	90	75	125
Sulphate	DIO5090-OCT23	mg/L	2	<2	ND	20	98	80	120	102	75	125
Chloride	DIO5092-OCT23	mg/L	1	<1	7	20	102	80	120	99	75	125
Sulphate	DIO5092-OCT23	mg/L	2	<2	0	20	105	80	120	103	75	125
Chloride	DIO5093-OCT23	mg/L	1	<1	2	20	102	80	120	81	75	125
Sulphate	DIO5093-OCT23	mg/L	2	<2	1	20	104	80	120	98	75	125
Chloride	DIO5097-OCT23	mg/L	1	<1	ND	20	101	80	120	103	75	125
Sulphate	DIO5097-OCT23	mg/L	2	<2	6	20	100	80	120	99	75	125

QC SUMMARY

Anions by IC

Method: EPA300/MA300-Ions1.3 | Internal ref.: ME-CA-IENVIIC-LAK-AN-001

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Nitrite (as N)	DIO0555-OCT23	mg/L	0.03	<0.03	ND	20	98	90	110	102	75	125
Nitrate (as N)	DIO0555-OCT23	mg/L	0.06	<0.06	ND	20	99	90	110	99	75	125
Nitrite (as N)	DIO0559-OCT23	mg/L	0.03	<0.03	ND	20	98	90	110	100	75	125
Nitrate (as N)	DIO0559-OCT23	mg/L	0.06	<0.06	1	20	100	90	110	100	75	125
Nitrite (as N)	DIO0568-OCT23	mg/L	0.03	<0.03	ND	20	98	90	110	103	75	125
Nitrate (as N)	DIO0568-OCT23	mg/L	0.06	<0.06	ND	20	100	90	110	101	75	125
Nitrite (as N)	DIO0573-OCT23	mg/L	0.03	<0.03	2	20	98	90	110	103	75	125
Nitrate (as N)	DIO0573-OCT23	mg/L	0.06	<0.06	1	20	100	90	110	101	75	125
Nitrite (as N)	DIO0675-OCT23	mg/L	0.03	<0.03	16	20	99	90	110	102	75	125

Biochemical Oxygen Demand

Method: SM 5210 | Internal ref.: ME-CA-IENVIEWL-LAK-AN-007

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Biochemical Oxygen Demand (BOD5)	BOD0038-OCT23	mg/L	2	< 2	14	30	103	70	130	69	70	130

QC SUMMARY

Carbon by Combustion/Oxidation

Method: SM 5310B | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-023

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Dissolved Organic Carbon	EWL0497-OCT23	mg/L	1.0	<1.0	ND	20	101	90	110	93	75	125

Chemical Oxygen Demand

Method: HACH 8000 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-009

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Chemical Oxygen Demand	EWL0475-OCT23	mg/L	8	<8	7	20	98	80	120	106	75	125
Chemical Oxygen Demand	EWL0476-OCT23	mg/L	8	<8	0	20	94	80	120	95	75	125
Chemical Oxygen Demand	EWL0477-OCT23	mg/L	8	<8	6	20	116	80	120	101	75	125
Chemical Oxygen Demand	EWL0525-OCT23	mg/L	8	<8	11	20	94	80	120	105	75	125

QC SUMMARY

Conductivity

Method: SM 2510 | Internal ref.: ME-CA-[ENVIEWL-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Conductivity	EWL0526-OCT23	uS/cm	2	< 2	0	20	98	90	110	NA		
Conductivity	EWL0527-OCT23	uS/cm	2	< 2	1	20	100	90	110	NA		

Fluoride by Specific Ion Electrode

Method: SM 4500 | Internal ref.: ME-CA-[ENVIEWL-LAK-AN-014

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Fluoride	EWL0598-OCT23	mg/L	0.06	<0.06	0	10	102	90	110	104	75	125

Mercury by CVAAS

Method: EPA 7471A/SM 3112B | Internal ref.: ME-CA-[ENVISPE-LAK-AN-004

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Mercury (dissolved)	EHG0045-OCT23	mg/L	0.00001	< 0.00001	ND	20	93	80	120	98	70	130

QC SUMMARY

Metals in aqueous samples - ICP-MS

Method: SM 3030/EPA 200.8 | Internal ref.: ME-CA-IENVISPE-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Silver (dissolved)	EMS0184-OCT23	mg/L	0.00005	<0.00005	ND	20	92	90	110	91	70	130
Aluminum (dissolved)	EMS0184-OCT23	mg/L	0.001	<0.001	2	20	96	90	110	99	70	130
Arsenic (dissolved)	EMS0184-OCT23	mg/L	0.0002	<0.0002	2	20	93	90	110	99	70	130
Barium (dissolved)	EMS0184-OCT23	mg/L	0.00008	<0.00008	1	20	93	90	110	98	70	130
Beryllium (dissolved)	EMS0184-OCT23	mg/L	0.000007	<0.000007	10	20	103	90	110	102	70	130
Boron (dissolved)	EMS0184-OCT23	mg/L	0.002	<0.002	6	20	106	90	110	93	70	130
Bismuth (dissolved)	EMS0184-OCT23	mg/L	0.00001	<0.00001	ND	20	94	90	110	90	70	130
Calcium (dissolved)	EMS0184-OCT23	mg/L	0.01	<0.01	0	20	93	90	110	100	70	130
Cadmium (dissolved)	EMS0184-OCT23	mg/L	0.000003	<0.000003	1	20	94	90	110	101	70	130
Cobalt (dissolved)	EMS0184-OCT23	mg/L	0.000004	<0.000004	2	20	98	90	110	94	70	130
Chromium (dissolved)	EMS0184-OCT23	mg/L	0.00008	<0.00008	9	20	95	90	110	95	70	130
Copper (dissolved)	EMS0184-OCT23	mg/L	0.0002	<0.0002	3	20	97	90	110	93	70	130
Iron (dissolved)	EMS0184-OCT23	mg/L	0.007	<0.007	0	20	93	90	110	100	70	130
Potassium (dissolved)	EMS0184-OCT23	mg/L	0.009	<0.009	0	20	107	90	110	79	70	130
Magnesium (dissolved)	EMS0184-OCT23	mg/L	0.001	<0.001	1	20	109	90	110	104	70	130
Manganese (dissolved)	EMS0184-OCT23	mg/L	0.00001	<0.00001	1	20	97	90	110	122	70	130
Molybdenum (dissolved)	EMS0184-OCT23	mg/L	0.00004	<0.00004	1	20	98	90	110	100	70	130
Sodium (dissolved)	EMS0184-OCT23	mg/L	0.01	<0.01	3	20	109	90	110	103	70	130
Nickel (dissolved)	EMS0184-OCT23	mg/L	0.0001	<0.0001	3	20	94	90	110	87	70	130
Lead (dissolved)	EMS0184-OCT23	mg/L	0.00009	<0.00009	1	20	93	90	110	93	70	130

QC SUMMARY

Metals in aqueous samples - ICP-MS (continued)

Method: SM 3030/EPA 200.8 | Internal ref.: ME-CA-IENVISPE-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Phosphorus (dissolved)	EMS0184-OCT23	mg/L	0.003	<0.003	0	20	92	90	110	NV	70	130
Selenium (dissolved)	EMS0184-OCT23	mg/L	0.00004	<0.00004	14	20	91	90	110	89	70	130
Sulfur (dissolved)	EMS0184-OCT23	mg/L	3	<1	4	20	107	90	110	NV	70	130
Silicon (dissolved)	EMS0184-OCT23	mg/L	0.02	<0.02	4	20	93	90	110	NV	70	130
Tin (dissolved)	EMS0184-OCT23	mg/L	0.00006	<0.00006	2	20	98	90	110	NV	70	130
Strontium (dissolved)	EMS0184-OCT23	mg/L	0.00008	<0.00008	0	20	96	90	110	99	70	130
Titanium (dissolved)	EMS0184-OCT23	mg/L	0.00007	<0.00005	1	20	96	90	110	NV	70	130
Thallium (dissolved)	EMS0184-OCT23	mg/L	0.000005	<0.000005	0	20	92	90	110	92	70	130
Uranium (dissolved)	EMS0184-OCT23	mg/L	0.000002	<0.000002	1	20	97	90	110	89	70	130
Vanadium (dissolved)	EMS0184-OCT23	mg/L	0.00001	<0.00001	2	20	96	90	110	98	70	130
Zinc (dissolved)	EMS0184-OCT23	mg/L	0.002	<0.002	1	20	93	90	110	109	70	130
Aluminum (dissolved)	EMS0201-OCT23	mg/L	0.001	<0.001	2	20	99	90	110	122	70	130
Boron (dissolved)	EMS0201-OCT23	mg/L	0.002	<0.002	0	20	106	90	110	105	70	130

QC SUMMARY

pH

Method: SM 4500 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
pH	EWL0526-OCT23	No unit	0.05	NA	0		100			NA		
pH	EWL0527-OCT23	No unit	0.05	NA	0		100			NA		

Phenols by SFA

Method: SM 5530B-D | Internal ref.: ME-CA-[ENV]SFA-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
4AAP-Phenolics	SKA0175-OCT23	mg/L	0.002	<0.002	0	10	99	80	120	89	75	125

QC SUMMARY

Reactive Phosphorus by SFA

Method: SM 4500-P F | Internal ref.: ME-CA-[ENV]SFA-LAK-AN-004

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Total Reactive Phosphorous (o-phosphate as P)	SKA0187-OCT23	mg/L	0.03	<0.03	ND	10	100	90	110	90	75	125

Solids Analysis

Method: SM 2540C | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-005

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Total Dissolved Solids	EWL0498-OCT23	mg/L	30	<30	1	20	91	80	120	NA		
Total Dissolved Solids	EWL0503-OCT23	mg/L	30	<30	1	20	98	80	120	NA		

QC SUMMARY

Total Nitrogen

Method: SM 4500-N C/4500-NO3- F I Internal ref.: ME-CA-[ENV]SFA-LAK-AN-002

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Total Kjeldahl Nitrogen (N)	SKA0184-OCT23	mg/L	0.05	<0.05	ND	10	100	90	110	79	75	125
Total Kjeldahl Nitrogen (N)	SKA0200-OCT23	mg/L	0.05	<0.05	5	10	99	90	110	104	75	125
Total Kjeldahl Nitrogen (N)	SKA0214-OCT23	mg/L	0.05	<0.05	ND	10	103	90	110	93	75	125
Total Kjeldahl Nitrogen (N)	SKA0228-OCT23	mg/L	0.05	<0.05	3	10	100	90	110	113	75	125

Method Blank: a blank matrix that is carried through the entire analytical procedure. Used to assess laboratory contamination.

Duplicate: Paired analysis of a separate portion of the same sample that is carried through the entire analytical procedure. Used to evaluate measurement precision.

LCS/Spike Blank: Laboratory control sample or spike blank refer to a blank matrix to which a known amount of analyte has been added. Used to evaluate analyte recovery and laboratory accuracy without sample matrix effects.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate laboratory accuracy with sample matrix effects.

Reference Material: a material or substance matrix matched to the samples that contains a known amount of the analyte of interest. A reference material may be used in place of a matrix spike.

RL: Reporting limit

RPD: Relative percent difference

AC: Acceptance criteria

Multielement Scan Qualifier: as the number of analytes in a scan increases, so does the chance of a limit exceedance by random chance as opposed to a real method problem. Thus, in multielement scans, for the LCS and matrix spike, up to 10% of the analytes may exceed the quoted limits by up to 10% absolute and the spike is considered acceptable.

Duplicate Qualifier: for duplicates as the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Matrix Spike Qualifier: for matrix spikes, as the concentration of the native analyte increases, the uncertainty of the matrix spike recovery increases. Thus, the matrix spike acceptance limits apply only when the concentration of the matrix spike is greater than or equal to the concentration of the native analyte.

LEGEND

FOOTNOTES

NSS	Insufficient sample for analysis.
RL	Reporting Limit.
↑	Reporting limit raised.
↓	Reporting limit lowered.
NA	The sample was not analysed for this analyte
ND	Non Detect

Results relate only to the sample tested.
Data reported represent the sample as submitted to SGS. Solid samples expressed on a dry weight basis.
"Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.
Analysis conducted on samples submitted pursuant to or as part of Reg. 153/04, are in accordance to the "Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act and Excess Soil Quality" published by the Ministry and dated March 9, 2004 as amended.

SGS provides criteria information (such as regulatory or guideline limits and summary of limit exceedances) as a service. Every attempt is made to ensure the criteria information in this report is accurate and current, however, it is not guaranteed. Comparison to the most current criteria is the responsibility of the client and SGS assumes no responsibility for the accuracy of the criteria levels indicated.

SGS Canada Inc. statement of conformity decision rule does not consider uncertainty when analytical results are compared to a specified standard or regulation.

This report supersedes all previous versions.

-- End of Analytical Report --

SGS

Request for Laboratory Services and CHAIN OF CUSTODY (General)

SGS Environmental Services - Lakefield: 185 Concession St., Lakefield, ON K0L 2H0 Phone: 705-652-2000 Toll Free: 877-747-7658 Fax: 705-652-6365 Web: www.ca.sgs.com {4}

SGS Environmental Services - London: 657 Consortium Court, London, ON, N6E 2S8 Phone: 519-672-4500 Toll Free: 877-848-8060 Fax: 519-672-0361 Web: www.ca.sgs.com {4}

Laboratory Information Section

Received Date (mm/dd/yyyy):	10/18/2023	LAB LIMS #:	CA15288-OCT23
Received Time (After Hours Only):	__:__	Temperature Upon Receipt (°C):	5,5,6

Billing & Reporting Information

Invoice/Receipt to {3}:	
Company:	WSP E & I
Attention:	Dominique Gagnon
Address:	131 Fielding Rd Lively, Ontario P3Y 1L7
Email:	dominique.gagnon@wsp.com, APInvoice.Canada@wsp.com, meg.russell@wsp.com

Project Name/Number:	TY131010.2023.2000.1142.5730-00 - Haileybury LF GW	P.O. #:	C023701288

Quote #: 2021 1246

Attached Parameter List: ☐ YES ☐ NO

Turnaround Time

Is *Rush Turnaround Time Required? ☐ YES ☐ NO

Specify:

* Rush TA Requests Require Lab Approval

Client Information/Report To:

Company Name:	WSP E & I	Phone Number:	705-682-2632
Contact Name:	Dominique Gagnon & Meg Russell	Fax Number:	
Address:		E-mail:	
Copy to:	dominique.gagnon@wsp.com, meg.russell@wsp.com		

Client Lab #:

Sample Information

Sample Identifier	Date Sampled (mm/dd/yy)	Time Sampled	# of Bottles	Field Filtered	SW as per quote	GW as per quote	pH	Temp			
TW-4	10/17/23	13:50	9	X		X	6.29	9.14			
TW-6	10/17/23	13:15	9	X		X	5.62	10.72			
TW-8	10/17/23	12:00	9	X		X	7.42	10.77			
TW-9	10/16/23	18:30	9	X		X	6.25	12:02			
TW-10	10/16/23	18:10	9	X		X	7.33	8.50			
~~TW-12~~	-	-	-	-		~~X~~	-	-			
TW-13	10/16/23	17:25	9	X		X	5.82	9.82			
TW-14	10/16/23	17:00	9	X		X	6.96	8.96			
TW-15	10/16/23	16:25	9	X		X	6.62	10.94			
TW-16 (bear spray on bag)	10/16/23	15:50	9	X		X	7.33	9.13			
TW-17	10/16/23	18:00	9	X		X	8.15	9.69			
MW21-01 " (bear spray on bag) "	10/16/23	15:20	9	X		X	7.02	10.24			
HB GW Dup2	10/17/23	12:00	9	X		X	7.42	10.77			
HBGWDUP1	10/16/23	16:25	9	X			6.62	10.94			

Sampled By {1}:	(Name) Mikayla Bechard	(Signature)		Date:	10/17/23 (mm/dd/yy)
Relinquished by {2}:	(Name) Mikayla Bechard	(Signature)		Date:	10/17/23 (mm/dd/yy)

Note: {1} Submission of samples to SGS is acknowledgement that you have been provided direction on sample collection/handling and transportation of samples. {2} Submission of samples to SGS is considered authorization for completion of work. Signatures may appear on this form or be retained on file in the contract, or in an alternative format (e.g. shipping documents). {3} Results may be sent by email to an unlimited number of addresses for no additional cost. Fax is available upon request. {4} Completion of work may require the subcontracting of samples between the London and Lakefield laboratories.

FINAL REPORT

CA15593-OCT23 R1

TY131010.2023.2000.1142.5730-00 - Haileybury LF SW

Prepared for

WSP E & I Canada Ltd

FINAL REPORT

First Page

CLIENT DETAILS

Client	WSP E & I Canada Ltd
Address	131 Fielding Road, Lively Canada, P3Y 1L7 Phone: 705-665-0159. Fax:
Contact	Dominique Gagnon
Telephone	705-665-0159
Facsimile	
Email	Dominique.Gagnon@wsp.com; meg.russell@wsp.com
Project	TY131010.2023.2000.1142.5730-00 - Haileybury LF SW
Order Number	
Samples	Surface Water (4)

LABORATORY DETAILS

Project Specialist	Brad Moore Hon. B.Sc
Laboratory	SGS Canada Inc.
Address	185 Concession St., Lakefield ON, K0L 2H0
Telephone	705-652-2143
Facsimile	705-652-6365
Email	brad.moore@sgs.com
SGS Reference	CA15593-OCT23
Received	10/18/2023
Approved	10/30/2023
Report Number	CA15593-OCT23 R1
Date Reported	10/30/2023

COMMENTS

Temperature of Sample upon Receipt: 13
Cooling Agent Present: Yes
Custody Seal Present: Yes

Chain of Custody Number: n/a

SIGNATORIES

Brad Moore Hon. B.Sc

TABLE OF CONTENTS

Client: WSP E & I Canada Ltd
Project: TY131010.2023.2000.1142.5730-00 - Haileybury LF SW
Project Manager: Dominique Gagnon
Samplers: Clement Cheling

MATRIX: WATER

Sample Number			6	7	8	9
Sample Name			SW-3	SW-4	SW-5	HB SW Dup
Sample Matrix			Surface Water	Surface Water	Surface Water	Surface Water
Sample Date			17/10/2023	17/10/2023	17/10/2023	17/10/2023
Parameter	**Units**	**RL**	**Result**	**Result**	**Result**	**Result**
General Chemistry						
Unionized Ammonia	mg/L as N	0.001	< 0.001	< 0.001	< 0.001	< 0.001
Total Suspended Solids	mg/L	2	< 2	2	< 2	< 2
Alkalinity	mg/L as CaCO3	2	59	53	10	11
Conductivity	uS/cm	2	255	216	58	54
Total Dissolved Solids	mg/L	30	151	134	123	51
Turbidity	NTU	0.10	1.1	1.1	0.95	0.75
Chemical Oxygen Demand	mg/L	8	38	42	34	42
Dissolved Organic Carbon	mg/L	1.0	12.1	13.1	9.1	9.6
Ammonia+Ammonium (N)	as N mg/L	0.04	0.07	< 0.04	< 0.04	< 0.04
Metals and Inorganics						
Sulphate	mg/L	2	< 2	< 2	< 2	< 2
Hardness	mg/L as CaCO3	0.05	77.3	69.4	18.5	17.5
Silver (total)	mg/L	0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Aluminum (total)	mg/L	0.001	0.051	0.058	0.080	0.080
Arsenic (total)	mg/L	0.0002	0.0012	0.0014	0.0007	0.0007
Barium (total)	mg/L	0.00008	0.0100	0.00922	0.00364	0.00339
Beryllium (total)	mg/L	0.000007	< 0.000007	< 0.000007	0.000013	0.000012
Boron (total)	mg/L	0.002	0.006	0.005	0.005	0.005
Bismuth (total)	mg/L	0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Calcium (total)	mg/L	0.01	20.5	18.4	4.66	4.56
Cadmium (total)	mg/L	0.000003	< 0.000003	0.000010	0.000004	0.000004
Cobalt (total)	mg/L	0.000004	0.000083	0.000096	0.000205	0.000199

Client: WSP E & I Canada Ltd

Project: TY131010.2023.2000.1142.5730-00 - Haileybury LF SW

Project Manager: Dominique Gagnon

Samplers: Clement Cheling

MATRIX: WATER

Sample Number	6	7	8	9	
Sample Name	SW-3	SW-4	SW-5	HB SW Dup	
Sample Matrix	Surface Water	Surface Water	Surface Water	Surface Water	
Sample Date	17/10/2023	17/10/2023	17/10/2023	17/10/2023	
Parameter	**Units**	**RL**	**Result**	**Result**	**Result**	**Result**
Metals and Inorganics (continued)						
Chromium (total)	mg/L	0.00008	0.00038	0.00048	0.00049	0.00045
Copper (total)	mg/L	0.0002	0.0015	0.0018	0.0025	0.0033
Iron (total)	mg/L	0.007	0.247	0.289	0.357	0.339
Potassium (total)	mg/L	0.009	0.767	0.651	0.116	0.115
Magnesium (total)	mg/L	0.001	6.37	5.70	1.67	1.49
Manganese (total)	mg/L	0.00001	0.0131	0.0116	0.0141	0.0137
Molybdenum (total)	mg/L	0.00004	0.00020	0.00019	< 0.00004	< 0.00004
Sodium (total)	mg/L	0.01	26.7	22.1	3.27	3.21
Nickel (total)	mg/L	0.0001	0.0006	0.0006	0.0007	0.0008
Lead (total)	mg/L	0.00009	0.00017	0.00019	0.00016	0.00021
Phosphorus (total)	mg/L	0.003	0.007	0.008	0.007	0.008
Selenium (total)	mg/L	0.00004	0.00007	0.00007	0.00006	0.00008
Silicon (total)	mg/L	0.02	3.33	3.25	3.69	3.86
Sulfur (total)	mg/L	3	< 3	< 3	< 3	< 3
Strontium (total)	mg/L	0.00008	0.0454	0.0408	0.0235	0.0227
Thallium (total)	mg/L	0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
Tin (total)	mg/L	0.00006	< 0.00006	0.00006	0.00008	0.00006
Titanium (total)	mg/L	0.00007	0.00121	0.00136	0.00099	0.00102
Uranium (total)	mg/L	0.000002	0.000049	0.000048	0.000013	0.000012
Vanadium (total)	mg/L	0.00001	0.00037	0.00037	0.00025	0.00026
Zinc (total)	mg/L	0.002	0.002	0.003	0.004	0.005

Client: WSP E & I Canada Ltd
Project: TY131010.2023.2000.1142.5730-00 - Haileybury LF SW
Project Manager: Dominique Gagnon
Samplers: Clement Cheling

MATRIX: WATER

			Sample Number	6	7	8	9
			Sample Name	SW-3	SW-4	SW-5	HB SW Dup
			Sample Matrix	Surface Water	Surface Water	Surface Water	Surface Water
			Sample Date	17/10/2023	17/10/2023	17/10/2023	17/10/2023
Parameter	**Units**	**RL**		**Result**	**Result**	**Result**	**Result**
Other (ORP)							
pH	No unit	0.05		7.63	7.61	6.66	6.75
Chloride	mg/L	1		46	37	9	9
Phenols							
4AAP-Phenolics	mg/L	0.001		< 0.001	< 0.001	< 0.001	< 0.001

QC SUMMARY

Alkalinity

Method: SM 2320 I Internal ref.: ME-CA-IENVIEWL-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Alkalinity	EWL0566-OCT23	mg/L as CaCO3	2	2	6	20	104	80	120	NA		

Ammonia by SFA

Method: SM 4500 I Internal ref.: ME-CA-IENVISFA-LAK-AN-007

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Ammonia+Ammonium (N)	SKA0169-OCT23	mg/L	0.04	<0.04	ND	10	98	90	110	89	75	125

QC SUMMARY

Anions by discrete analyzer

Method: US EPA 325.2 | Internal ref.: ME-CA-[ENVIEWL-LAK-AN-026

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Chloride	DIO5093-OCT23	mg/L	1	<1	2	20	102	80	120	81	75	125
Sulphate	DIO5093-OCT23	mg/L	2	<2	1	20	104	80	120	98	75	125

Carbon by Combustion/Oxidation

Method: SM 5310B | Internal ref.: ME-CA-[ENVIEWL-LAK-AN-023

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Dissolved Organic Carbon	EWL0500-OCT23	mg/L	1.0	<1.0	ND	20	101	90	110	97	75	125
Dissolved Organic Carbon	EWL0543-OCT23	mg/L	1.0	<1.0	ND	20	101	90	110	99	75	125
Dissolved Organic Carbon	EWL0586-OCT23	mg/L	1.0	<1.0	0	20	102	90	110	102	75	125

QC SUMMARY

Chemical Oxygen Demand

Method: HACH 8000 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-009

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Chemical Oxygen Demand	EWL0474-OCT23	mg/L	8	<8	0	20	114	80	120	108	75	125
Chemical Oxygen Demand	EWL0475-OCT23	mg/L	8	<8	7	20	98	80	120	106	75	125

Conductivity

Method: SM 2510 | Internal ref.: ME-CA-[ENV]EWL-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Conductivity	EWL0566-OCT23	uS/cm	2	< 2	0	20	99	90	110	NA		

QC SUMMARY

Metals in aqueous samples - ICP-MS

Method: SM 3030/EPA 200.8 | Internal ref.: ME-CA-IENVISPE-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Silver (total)	EMS0192-OCT23	mg/L	0.00005	<0.00005	ND	20	104	90	110	96	70	130
Aluminum (total)	EMS0192-OCT23	mg/L	0.001	<0.001	0	20	92	90	110	99	70	130
Arsenic (total)	EMS0192-OCT23	mg/L	0.0002	<0.0002	1	20	98	90	110	105	70	130
Barium (total)	EMS0192-OCT23	mg/L	0.00008	<0.00008	2	20	94	90	110	94	70	130
Beryllium (total)	EMS0192-OCT23	mg/L	0.000007	<0.000007	12	20	97	90	110	93	70	130
Boron (total)	EMS0192-OCT23	mg/L	0.002	<0.002	6	20	93	90	110	93	70	130
Bismuth (total)	EMS0192-OCT23	mg/L	0.00001	<0.00001	0	20	95	90	110	90	70	130
Calcium (total)	EMS0192-OCT23	mg/L	0.01	<0.01	1	20	92	90	110	108	70	130
Cadmium (total)	EMS0192-OCT23	mg/L	0.000003	<0.000003	3	20	98	90	110	99	70	130
Cobalt (total)	EMS0192-OCT23	mg/L	0.000004	<0.000004	2	20	100	90	110	99	70	130
Chromium (total)	EMS0192-OCT23	mg/L	0.00008	<0.00008	11	20	96	90	110	105	70	130
Copper (total)	EMS0192-OCT23	mg/L	0.0002	<0.0002	1	20	98	90	110	99	70	130
Iron (total)	EMS0192-OCT23	mg/L	0.007	<0.007	6	20	93	90	110	125	70	130
Potassium (total)	EMS0192-OCT23	mg/L	0.009	<0.009	3	20	107	90	110	102	70	130
Magnesium (total)	EMS0192-OCT23	mg/L	0.001	<0.001	2	20	106	90	110	98	70	130
Manganese (total)	EMS0192-OCT23	mg/L	0.00001	<0.00001	6	20	95	90	110	105	70	130
Molybdenum (total)	EMS0192-OCT23	mg/L	0.00004	<0.00004	11	20	101	90	110	102	70	130
Sodium (total)	EMS0192-OCT23	mg/L	0.01	<0.01	5	20	106	90	110	98	70	130
Nickel (total)	EMS0192-OCT23	mg/L	0.0001	<0.0001	3	20	98	90	110	100	70	130
Lead (total)	EMS0192-OCT23	mg/L	0.00009	<0.00009	3	20	94	90	110	91	70	130

QC SUMMARY

Metals in aqueous samples - ICP-MS (continued)

Method: SM 3030/EPA 200.8 I Internal ref.: ME-CA-IENVISPE-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Phosphorus (total)	EMS0192-OCT23	mg/L	0.003	<0.003	ND	20	92	90	110	NV	70	130
Selenium (total)	EMS0192-OCT23	mg/L	0.00004	<0.00004	0	20	97	90	110	119	70	130
Sulfur (total)	EMS0192-OCT23	mg/L	3	<1	13	20	107	90	110	NV	70	130
Silicon (total)	EMS0192-OCT23	mg/L	0.02	<0.02	7	20	92	90	110	NV	70	130
Tin (total)	EMS0192-OCT23	mg/L	0.00006	<0.00006	ND	20	98	90	110	NV	70	130
Strontium (total)	EMS0192-OCT23	mg/L	0.00008	<0.00008	3	20	99	90	110	102	70	130
Titanium (total)	EMS0192-OCT23	mg/L	0.00007	<0.00005	4	20	98	90	110	NV	70	130
Thallium (total)	EMS0192-OCT23	mg/L	0.000005	<0.000005	0	20	95	90	110	94	70	130
Uranium (total)	EMS0192-OCT23	mg/L	0.000002	<0.000002	2	20	97	90	110	92	70	130
Vanadium (total)	EMS0192-OCT23	mg/L	0.00001	<0.00001	7	20	96	90	110	102	70	130
Zinc (total)	EMS0192-OCT23	mg/L	0.002	<0.002	5	20	99	90	110	104	70	130

pH

Method: SM 4500 I Internal ref.: ME-CA-IENVIEWL-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
pH	EWL0566-OCT23	No unit	0.05	NA	0		100			NA		

QC SUMMARY

Phenols by SFA

Method: SM 5530B-D | Internal ref.: ME-CA-IENVISFA-LAK-AN-006

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
4AAP-Phenolics	SKA0175-OCT23	mg/L	0.001	0.001	0	10	99	80	120	89	75	125

Solids Analysis

Method: SM 2540C | Internal ref.: ME-CA-IENVIEWL-LAK-AN-005

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Total Dissolved Solids	EWL0514-OCT23	mg/L	30	<30	1	20	93	80	120	NA		

Suspended Solids

Method: SM 2540D | Internal ref.: ME-CA-IENVIEWL-LAK-AN-004

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Total Suspended Solids	EWL0491-OCT23	mg/L	2	< 2	2	10	99	90	110	NA		
Total Suspended Solids	EWL0519-OCT23	mg/L	2	< 2	0	10	101	90	110	NA		

QC SUMMARY

Turbidity

Method: SM 2130 I Internal ref.: ME-CA-[ENV]EWL-LAK-AN-003

Parameter	QC batch Reference	Units	RL	Method Blank	Duplicate		LCS/Spike Blank			Matrix Spike / Ref.		
					RPD	AC (%)	Spike Recovery (%)	Recovery Limits (%)		Spike Recovery (%)	Recovery Limits (%)	
								Low	High		Low	High
Turbidity	EWL0436-OCT23	NTU	0.10	< 0.10	5	10	99	90	110	NA		

Method Blank: a blank matrix that is carried through the entire analytical procedure. Used to assess laboratory contamination.

Duplicate: Paired analysis of a separate portion of the same sample that is carried through the entire analytical procedure. Used to evaluate measurement precision.

LCS/Spike Blank: Laboratory control sample or spike blank refer to a blank matrix to which a known amount of analyte has been added. Used to evaluate analyte recovery and laboratory accuracy without sample matrix effects.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate laboratory accuracy with sample matrix effects.

Reference Material: a material or substance matrix matched to the samples that contains a known amount of the analyte of interest. A reference material may be used in place of a matrix spike.

RL: Reporting limit

RPD: Relative percent difference

AC: Acceptance criteria

Multielement Scan Qualifier: as the number of analytes in a scan increases, so does the chance of a limit exceedance by random chance as opposed to a real method problem. Thus, in multielement scans, for the LCS and matrix spike, up to 10% of the analytes may exceed the quoted limits by up to 10% absolute and the spike is considered acceptable.

Duplicate Qualifier: for duplicates as the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Matrix Spike Qualifier: for matrix spikes, as the concentration of the native analyte increases, the uncertainty of the matrix spike recovery increases. Thus, the matrix spike acceptance limits apply only when the concentration of the matrix spike is greater than or equal to the concentration of the native analyte.

LEGEND

FOOTNOTES

NSS Insufficient sample for analysis.
RL Reporting Limit.
↑ Reporting limit raised.
↓ Reporting limit lowered.
NA The sample was not analysed for this analyte
ND Non Detect

Results relate only to the sample tested.
Data reported represent the sample as submitted to SGS. Solid samples expressed on a dry weight basis.
"Temperature Upon Receipt" is representative of the whole shipment and may not reflect the temperature of individual samples.
Analysis conducted on samples submitted pursuant to or as part of Reg. 153/04, are in accordance to the "Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act and Excess Soil Quality" published by the Ministry and dated March 9, 2004 as amended.

SGS provides criteria information (such as regulatory or guideline limits and summary of limit exceedances) as a service. Every attempt is made to ensure the criteria information in this report is accurate and current, however, it is not guaranteed. Comparison to the most current criteria is the responsibility of the client and SGS assumes no responsibility for the accuracy of the criteria levels indicated.

SGS Canada Inc. statement of conformity decision rule does not consider uncertainty when analytical results are compared to a specified standard or regulation.

This report supersedes all previous versions.

-- End of Analytical Report --

SGS

Request for Laboratory Services and CHAIN OF CUSTODY (General)

SGS Environmental Services - Lakefield: 185 Concession St., Lakefield, ON K0L 2H0 Phone: 705-652-2000 Toll Free: 877-747-7658 Fax: 705-652-6365 Web: www.ca.sgs.com {4}

SGS Environmental Services - London: 657 Consortium Court, London, ON, N6E 2S8 Phone: 519-672-4500 Toll Free: 877-848-8060 Fax: 519-672-0361 Web: www.ca.sgs.com {4}

Laboratory Information Section

Received Date (mm/dd/yyyy): OCT 18 2023

LAB LIMS #: Oct 15593 M

Received Time (After Hours Only): __:__

Temperature Upon Receipt (°C): 13 X 3

Billing & Reporting Information

Invoice/Receipt to {3}:

Company: WSP E & I

Attention: Dominique Gagnon

Address: 131 Fielding Rd, Lively, Ontario, P3Y 1L7

Email: dominique.gagnon@wsp.com, APInvoice.Canada@wsp.com, meg.russell@wsp.com

Quote #: 2021 1246

Attached Parameter List: ☐ YES ☐ NO

Turnaround Time

Is *Rush Turnaround Time Required? ☐ YES ☐ NO

Specify:

* Rush TA Requests Require Lab Approval

Project Name/Number: TY131010.2023.2000.1142.5730-00 - Haileybury LF SW

P.O. #: C023701288

Client Information/Report To:

Client Lab #:

Company Name:	**WSP E & I**	**Phone Number:**	**705-682-2632**
Contact Name:	**Dominique Gagnon, Meg Russell**	**Fax Number:**	
Address:		**E-mail:**	
Copy to:	**dominique.gagnon@wsp.com, meg.russell@wsp.com**		

Sample Information

Sample Identifier	Date Sampled (mm/dd/yy)	Time Sampled	# of Bottles	Field Filtered	Field pH	SW as per quote	Temp	pH			
SW-3	10/17/23	14:20	10		X	x	8.97	7.79			
SW-4	10/17/23	14:40	10		X	x	9.88	7.65			
SW-5	10/17/23	12:35	10		X	x	8.59	6.34			
HB SW Dup	10/17/23	12:35	10		X	x	8.59	6.34			

Analysis Requested (please enter the analysis required below and check off which analysis applies to each sample)

Sampled By {1}:	(Name) CLEMENT CHEUNG	(Signature)		**Date:**	10/17/23 (mm/dd/yy)
Relinquished by {2}:	(Name) CLEMENT CHEUNG	(Signature)		**Date:**	10/17/23 (mm/dd/yy)

Note: {1} Submission of samples to SGS is acknowledgement that you have been provided direction on sample collection/handling and transportation of samples. {2} Submission of samples to SGS is considered authorization for completion of work. Signatures may appear on this form or be retained on file in the contract, or in an alternative format (e.g. shipping documents). {3} Results may be sent by email to an unlimited number of addresses for no additional cost. Fax is available upon request. {4} Completion of work may require the subcontracting of samples between the London and Lakefield laboratories.

Revision #: 2.3
Date of Issue: 24 Jun. 2014

10:30

334349181100, Rtn

Appendix E

SUMMARY OF GROUNDWATER GEOCHEMICAL ANALYSES

The City of Temiskaming Shores
2023 Annual Groundwater and Surface Water Monitoring Report
Haileybury Waste Disposal Site
Haileybury, Ontario
April 2024

Groundwater Geochemical Results
TW-4

Parameters	Units	ODWS [1]	2014			2015			2016			2017			2018		
General Chemistry			**June**	**July**	**Sep**	**May**	**July**	**Sep**	**May**	**July**	**Sep**	**May**	**July**	**Sep**	**May**	**July**	**Oct**
Alkalinity	mg/L	30-500 OG [2]	**528**	**568**	**535**	428	483	**516**	**582**	**537**	482	340	363	434	193	264	275
Dissolved Organic Carbon	mg/L	5 AO [3]	**17.5**	**14.3**	**9.8**	**9.3**	**13.8**	**6.9**	**8.3**	**10.6**	**7.7**	**7.6**	**7.4**	**9.5**	4.4	**6.0**	**6.9**
Chloride	mg/L	250 AO	86.0	81.7	39.5	61.6	102.0	<0.50	40.0	30.9	23.5	40.2	21.9	32	14.3	15.4	14.9
Sulphate	mg/L	500 OG	220	195	151	212	254	195	123	144	173	233	188	169	110	122	121
Fluoride	mg/L	1.5 MAC [4]	<0.5	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.10	<0.10	<0.25
Hardness	mg/L	80-100 OG	**738**	**712**	**519**	**629**	**825**	**706**	**577**	**563**	**565**	**509**	**451**	**486**	**285**	**347**	**398**
Nitrate	mg/L	10 MAC	**15.1**	**12.9**	7.54	**11.0**	10.0	5.23	3.0	3.0	2.29	**10.8**	2.09	4.77	1.67	2.76	2.83
Nitrite	mg/L	1 MAC	<0.5	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.10	<0.10	<0.25
Organic Nitrogen	mg/L	0.15 OG	**2.09**	**1.36**	**1.31**	**1.41**	**1.59**	**1.78**	**1.78**	**0.82**	**1.74**	**0.93**	**0.83**	<0.10	**0.52**	**0.45**	**0.45**
Orthophosphate	mg/L		<1.0	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.20	<0.20	<0.50
Phenols	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.012
Ammonia	mg/L		0.14	0.15	0.13	0.58	0.99	0.61	4.96	4.90	3.46	7.7	6.8	7.2	2.53	2.87	2.88
BOD	mg/L		<5	<5	<5	<5	<5	6	<5	<5	<5	<5	7	16	<5	<5	9
Chemical Oxygen Demand (COD	mg/L		53	47	28	26	35	36	26	19	21	17	27	22	<5	12	14
Total Dissolved Solids	mg/L	500 AO	**1190**	**1000**	**868**	**858**	**1050**	**994**	**734**	**776**	**768**	**732**	**656**	**714**	426	484	**518**
Total Kjeldahl Nitrogen (TKN)	mg/L		2.23	1.51	1.44	1.99	2.58	2.39	6.74	5.72	5.2	8.63	7.63	7.21	3.05	3.32	3.33
pH	pH Units	6.5-8.5 OG	7.26	7.74	7.39	7.74	7.85	7.90	7.77	7.70	7.35	7.55	8.06	7.92	6.95	7.52	7.69
Electrical Conductivity	uS/cm		1670	1690	1460	1380	1630	1560	1300	1350	1300	1190	1070	1200	657	777	861
% Difference/ Ion Balance	%		0.5	1.7	2.3	1.9	1.9		2.92		0.913	5.3	3.64	4.49			
Elements																	
Aluminum	mg/L	0.1 OG	<0.004	0.004	<0.004	0.010	0.006	<0.004	0.012	0.012	<0.004	<0.004	<0.004	0.005	<0.004	<0.004	0.016
Arsenic	mg/L	0.01 MAC	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Barium	mg/L	1 MAC	0.129	0.131	0.122	0.119	0.133	0.138	0.121	0.124	0.104	0.129	0.1	0.127	0.065	0.056	0.082
Beryllium	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Boron	mg/L	5 IMAC	1.26	1.35	1.23	1.05	1.00	1.22	0.948	0.88	0.658	0.741	0.862	0.922	0.675	0.597	0.572
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Calcium	mg/L		194	187	137	172	225	194	155	153	157	144	127	131	79.3	96.9	110
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.003	<0.003	<0.003	0.004	0.015	0.006	<0.003	<0.003	0.019	<0.003	<0.003	0.004	<0.003
Cobalt	mg/L		0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.002	0.002	0.002	0.002	0.003	0.001	0.001	0.001
Copper	mg/L	1 AO	0.008	0.008	0.008	0.006	0.006	0.008	0.005	0.005	0.005	<0.003	0.004	0.017	0.003	<0.003	0.004
Iron	mg/L	0.3 AO	<0.010	0.123	**0.826**	0.124	0.016	0.031	0.206	0.099	0.138	<0.010	<0.010	0.191	<0.010	<0.010	0.088
Lead	mg/L	0.01 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001
Magnesium	mg/L		61.5	59.6	42.9	48.4	64.0	53.7	46.1	43.9	42	36.4	32.6	35.1	21.1	25.6	29.9
Manganese	mg/L	0.05 AO	**1.63**	**1.75**	**1.65**	**1.44**	**1.10**	**1.42**	**0.905**	**0.91**	**0.724**	**0.88**	**0.598**	**0.831**	**0.365**	**0.306**	**0.441**
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.001	<0.0001
Molybdenum	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Nickel	mg/L		0.003	0.007	0.007	<0.003	0.007	0.005	0.003	<0.003	<0.003	<0.003	0.004	<0.003	<0.003	<0.003	<0.003
Phorphorus	mg/L		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Potassium	mg/L		17.5	17.0	14.5	15.6	18.6	17.3	19.8	21.0	17.8	20.7	19.6	19	12.8	13.4	14.0
Selenium	mg/L	0.05 MAC	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Silicon	mg/L		6.37	6.34	8.59	6.42	6.15	8.21	7.41	8.04	6.52	6.36	6.4	5.3	5.29	6.46	6.43
Silver	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Sodium	mg/L	200 AO	75.1	77.0	93.1	44.1	50.5	56.4	52.2	50.0	41.8	21.3	25.1	34.5	14.6	12.9	13.7
Strontium	mg/L		0.701	0.736	0.512	0.661	0.738	0.691	0.541	0.555	0.47	0.586	0.509	0.578	0.29	0.351	0.409
Sulphur	mg/L		63.7	66.7	50.1	82.4	73.9	71.4	31.3	41.6	56.1	75.4	60.2	54.5	38.0	42.6	41.9
Thallium	mg/L		<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Tin	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Titanium	mg/L		<0.002	0.003	0.004	0.003	0.004	0.003	0.002	<0.002	0.002	0.004	0.003	0.003	<0.002	<0.002	0.002
Uranium	mg/L	0.02 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Vanadium	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.010	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Zinc	mg/L	5 AO	0.007	0.009	<0.005	0.007	0.008	<0.005	0.006	<0.005	<0.005	<0.005	0.008	0.019	<0.005	0.005	<0.005

Notes:
(1) MECP Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

The City of Temiskaming Shores
2023 Annual Groundwater and Surface Water Monitoring Report
Haileybury Waste Disposal Site
Haileybury, Ontario
April 2024

Groundwater Geochemical Results
TW-4

Parameters	Units	ODWS [1]	2019			2020			2021			2022			2023		
General Chemistry			**May**	**July**	**Sep**	**June**	**Aug**	**Oct**	**June**	**Aug**	**Oct**	**May**	**Aug**	**Oct**	**June**	**Aug**	**Oct**
Alkalinity	mg/L	30-500 OG [2]	237	208	210	226	283	379	276	385		387	475	467	**698**	**683**	**881**
Dissolved Organic Carbon	mg/L	5 AO [3]	**5.2**	5.0	3.8	4.8	**6.2**	**7.9**	**7.1**	**6.7**	**Unsafe to sample**	**7.2**	**7.0**	**9.0**	**14.2**	**22.4**	**45.3**
Chloride	mg/L	250 AO	22.7	18.1	15.1	38.7	40.9	36.6	24.3	24.4		47	43	47	140	91	210
Sulphate	mg/L	500 OG	146	129	106	204	176	171	184	200		110	130	140	190	140	140
Fluoride	mg/L	1.5 MAC [4]	<0.25	<0.25	<0.25	<0.05	<0.05	<0.05	<0.05	<0.05		< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
Hardness	mg/L	80-100 OG	**395**	**345**	**312**	**432**	**506**	**467**	**495**	**590**		**557**	**591**	**663**	**767**	**703**	**984**
Nitrate	mg/L	10 MAC	**13.1**	8.01	6.39	**22.9**	**15.6**	**11.0**	10.0	9.24		1.13	2.38	1.71	1.24	0.76	< 0.06
Nitrite	mg/L	1 MAC	<0.25	0.68	<0.25	0.76	<0.25	<0.25	0.18	<0.05		0.04	0.04	< 0.03	0.04	< 0.03	< 0.3
Organic Nitrogen	mg/L	0.15 OG	**0.84**	**0.68**	**0.66**	**0.42**	**0.70**	**1.45**	**0.54**	**0.73**		**< 0.5**	**0.44**	**0.60**	**1.7**	**1.67**	**2.65**
Orthophosphate	mg/L		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.10	<0.10		< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Phenols	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.005	<0.001		< 0.002	< 0.002	< 0.002	< 0.002	0.002	0.003
Ammonia	mg/L		1.18	1.4	1.27	0.96	0.64	0.32	0.21	0.24		0.25	0.34	0.31	0.84	0.8	1.09
BOD	mg/L		<5	7	<5	<5	<2	<6	2	<2.00		< 4	16	< 4	< 4	< 4	9
Chemical Oxygen Demand (COD	mg/L		12	14	<5	30	13	<5	8	12		24	20	24	50	54	78
Total Dissolved Solids	mg/L	500 AO	486	476	432	**696**	**734**	**502**	**652**	**754**		**691**	**731**	**809**	**1240**	**1060**	**1400**
Total Kjeldahl Nitrogen (TKN)	mg/L		2.02	2.08	1.93	1.38	1.34	1.77	0.75	0.97		0.74	0.78	0.87	2.54	2.47	3.74
pH	pH Units	6.5-8.5 OG	7.60	7.40	7.54	7.71	7.15	7.34	7.42	7.57		8.02	7.97	7.74	7.65	7.64	7.52
Electrical Conductivity	uS/cm		861	847	794	1110	968	951	973	1130		978	1230	1210	1840	1700	1890
% Difference/ Ion Balance	%			0.295			0.0732	6.69									
Elements																	
Aluminum	mg/L	0.1 OG	0.008	<0.004	<0.004	0.012	0.024	0.023	0.027	0.008		0.002	0.002	0.002	0.002	0.002	0.003
Arsenic	mg/L	0.01 MAC	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003		0.0003	0.0005	0.0004	0.0005	0.0007	0.0007
Barium	mg/L	1 MAC	0.085	0.068	0.066	0.089	0.081	0.080	0.072	0.078		0.0840	0.0959	0.1000	0.1610	0.163	0.2090
Beryllium	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		< 0.000007	0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007
Bismuth	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002		< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Boron	mg/L	5 IMAC	0.475	0.569	0.476	0.440	0.678	0.754	0.435	0.418		0.497	0.623	0.880	0.896	0.981	0.849
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002		0.000025	0.000036	0.000046	0.000056	0.000063	0.000076
Calcium	mg/L		117	102	92.4	123	143	136	143	169		162	176	192	226	205	294
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003		0.00022	0.00030	0.00032	0.00067	0.00080	0.00085
Cobalt	mg/L		0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002		0.00194	0.00185	0.00226	0.00288	0.00268	0.00517
Copper	mg/L	1 AO	<0.003	<0.003	<0.003	0.006	0.004	0.006	<0.003	<0.003		0.0053	0.0042	0.0043	0.0105	0.0122	0.0149
Iron	mg/L	0.3 AO	0.071	0.254	**0.596**	0.060	<0.010	<0.010	0.047	0.041		0.141	0.069	0.018	0.067	0.073	**1.35**
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		< 0.00009	< 0.00009	< 0.00009	< 0.00009	< 0.00009	< 0.00009
Magnesium	mg/L		24.9	21.9	19.7	30.4	36.1	30.9	33.6	40.7		36.9	36.9	44.4	49.3	46.7	61
Manganese	mg/L	0.05 AO	**0.472**	**0.360**	**0.363**	**0.39**	**0.715**	**0.673**	**0.519**	**0.63**		**0.897**	**0.615**	**0.899**	**1.57**	**1.5**	**2.48**
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Molybdenum	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002		0.00035	0.00043	0.00044	0.0006	0.0006	0.00064
Nickel	mg/L		<0.003	<0.003	<0.003	<0.003	<0.003	0.003	<0.003	<0.003		0.0027	0.0023	0.0026	0.0071	0.0085	0.0128
Phorphorus	mg/L		<0.05	<0.05	<0.05	<0.050	0.076	<0.050	<0.050	<0.050		< 0.003	< 0.003	0.006	0.004	0.012	0.028
Potassium	mg/L		14.1	13.0	12.8	15.4	15.2	14.4	12.6	13.7		11.7	11.9	14.6	21.2	20.4	23.4
Selenium	mg/L	0.05 MAC	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.004	<0.004		0.00006	0.00020	0.00008	0.00019	0.00018	0.00025
Silicon	mg/L		5.05	6.12	5.55	5.4	6.88	5.99	6.49	6.86		7.61	5.75	9.07	8.06	7.37	8.26
Silver	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002		< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Sodium	mg/L	200 AO	15.9	16.0	15.3	13.9	23.7	37.0	17.3	14.9		22.4	24.2	29.6	72.5	88.3	114
Strontium	mg/L		0.417	0.348	0.328	0.412	0.503	0.466	0.405	0.477		0.465	0.446	0.557	0.714	0.643	0.909
Sulphur	mg/L		47.1	42.5	37.8	54.8	60.1	51.4	62.2	69.6		36	41	55	63	53	50
Thallium	mg/L		<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006		0.000016	0.000015	0.000019	0.000026	0.000027	0.000026
Tin	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002		0.00009	0.00007	0.00014	0.0001	0.00018	0.00016
Titanium	mg/L		0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.009	<0.002		0.00008	0.00021	0.00008	0.0001	0.0002	0.00018
Uranium	mg/L	0.02 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002		0.000284	0.000431	0.000468	0.000542	0.00054	0.000538
Vanadium	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002		0.00013	0.00014	0.00012	0.00023	0.00028	0.00039
Zinc	mg/L	5 AO	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		0.002	< 0.002	0.002	< 0.002	< 0.002	< 0.002

Notes:
(1) MECP Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within O
(6) ODWS exceedances indicated by **bold** entries.

The City of Temiskaming Shores
2023 Annual Groundwater and Surface Water Monitoring Report
Haileybury Waste Disposal Site
Haileybury, Ontario
April 2024

Groundwater Geochemical Results
TW-6

Parameters	Units	ODWS [1]	2014			2015			2016			2017			2018		
General Chemistry			**June**	**July**	**Sep**	**May**	**July**	**Sep**	**May**	**July**	**Sep**	**May**	**July**	**Sep**	**May**	**July**	**Oct**
Alkalinity	mg/L	30-500 OG [2]	70	228	73	71	61	74	72	86	92	79	77	88	86	93	65
Dissolved Organic Carbon	mg/L	5 AO [3]	4.0	**11.2**	2.7	3.0	4.0	3.7	2.9	**6.0**	3.9	3.5	3.7	3.7	3.7	<0.5	3.8
Chloride	mg/L	250 AO	9.49	122	12.3	19.9	25.6	30.2	10.2	31.3	36.8	15	10.9	13.5	24.3	14.1	34.0
Sulphate	mg/L	500 OG	35.4	408	41.4	76.2	57.5	66.6	15.8	90.2	105	46.9	20.8	22.6	82.4	31.6	81.5
Fluoride	mg/L	1.5 MAC [4]	<0.05	<0.25	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	<0.05	<0.05	<0.05	<0.10	<0.05	<0.05
Hardness	mg/L	80-100 OG	90	**680**	95	**164**	**142**	**161**	**68.3**	**209**	**232**	**108**	**79.7**	**107**	**193**	91.4	**205**
Nitrate	mg/L	10 MAC	3.95	**28.3**	5.61	8.56	**10.8**	**13.4**	1.64	**16**	**21**	5.03	3.59	5.53	**12.0**	6.18	**17.1**
Nitrite	mg/L	1 MAC	<0.05	<0.25	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	<0.05	<0.05	<0.05	<0.10	<0.05	<0.05
Organic Nitrogen	mg/L	0.15 OG	**0.60**	**1.08**	<0.10	<0.10	<0.10	**0.90**	**0.46**	**0.68**	<0.10	**0.36**	**0.34**	**0.49**	**0.39**	**0.49**	**0.81**
Orthophosphate	mg/L		<0.10	<0.50	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.20	<0.10	<0.10	<0.10	<0.20	<0.10	<0.10
Phenols	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ammonia	mg/L		0.04	0.04	<0.02	<0.02	<0.02	0.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
BOD	mg/L		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Chemical Oxygen Demand (COD)	mg/L		<5	37	<5	<5	8	<5	8	<5	<5	<5	13	<5	<5	6	<5
Total Dissolved Solids	mg/L	500 AO	150	**1070**	204	204	228	336	108	440	408	166	136	168	342	176	486
Total Kjeldahl Nitrogen (TKN)	mg/L		0.64	1.12	<0.10	<0.10	<0.10	1	0.46	0.68	<0.10	0.36	0.34	0.49	0.39	0.49	0.81
pH	pH Units	6.5-8.5 OG	6.94	7.35	7.23	7.03	7.02	7.41	7.12	7.11	6.97	7.19	7.34	7.41	**6.49**	7.23	7.06
Electrical Conductivity	uS/cm		264	1700	340	436	385	509	201	591	692	329	251	302	524	315	564
% Difference/ Ion Balance	%		1.2	3.1	2.6	<0.1	3.0		5.65		2.67	6.15	6.43	3.12			
Elements																	
Aluminum	mg/L	0.1 OG	0.004	0.014	0.005	0.005	0.012	0.010	0.011	0.010	0.015	0.007	0.008	0.006	0.009	<0.004	0.005
Arsenic	mg/L	0.01 MAC	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Barium	mg/L	1 MAC	0.009	0.073	0.016	0.02	0.019	0.027	0.009	0.027	0.034	0.014	0.009	0.015	0.024	0.012	0.043
Beryllium	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.010
Boron	mg/L	5 IMAC	0.377	1.98	0.405	0.297	0.37	0.581	0.19	0.38	0.512	0.356	0.258	0.234	0.484	0.456	0.517
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Calcium	mg/L		22.2	161	22.8	41.2	35.9	41.5	17.6	54.5	61.2	28.3	20.8	28.4	50.8	24.4	54.2
Chromium	mg/L	0.05 MAC	<0.003	0.003	<0.003	<0.003	<0.003	0.006	0.003	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Cobalt	mg/L		<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	1 AO	0.004	0.012	0.004	0.003	0.004	0.005	<0.003	0.004	0.005	<0.003	0.004	0.003	0.003	0.004	0.004
Iron	mg/L	0.3 AO	<0.010	0.013	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead	mg/L	0.01 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001
Magnesium	mg/L		8.29	67.6	9.25	14.9	12.6	14	5.91	17.6	19.2	9.08	6.74	8.96	16.1	7.4	16.9
Manganese	mg/L	0.05 AO	<0.002	0.006	<0.002	<0.002	<0.002	0.081	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Molybdenum	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Nickel	mg/L		<0.003	0.007	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Phorphorus	mg/L		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Potassium	mg/L		1.54	5.41	3.24	4.03	3.48	4.02	2.32	4.09	4.64	2.77	2.84	4.25	4.48	3.61	4.70
Selenium	mg/L	0.05 MAC	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Silicon	mg/L		3.12	3.67	4.18	3.44	3.38	3.63	2.9	3.84	3.75	3.3	3	2.76	3.52	3.26	3.51
Silver	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.010
Sodium	mg/L	200 AO	21.1	84.2	21.4	18.4	17.7	26.4	11.9	23.0	33.8	16.6	13	13.1	22.1	22.4	18.2
Strontium	mg/L		0.092	0.735	0.129	0.162	0.152	0.176	0.067	0.231	0.259	0.118	0.084	0.13	0.207	0.11	0.309
Sulphur	mg/L		11.9	108	14.4	27.4	18	25.5	4.05	28.2	37.6	14.6	6.64	7.46	28.9	11.3	28.6
Thallium	mg/L		<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Tin	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Titanium	mg/L		<0.002	0.005	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002
Uranium	mg/L	0.02 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Vanadium	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.010	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Zinc	mg/L	5 AO	0.016	0.010	0.005	<0.005	0.009	0.012	<0.005	<0.005	0.038	<0.005	0.006	<0.005	<0.005	<0.005	0.007

Notes:
(1) MECP Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

Groundwater Geochemical Results
TW-6

Parameters	Units	ODWS [1]	2019			2020			2021			2022			2023		
General Chemistry			May	July	Sep	June	Aug	Oct	June	Aug	Oct	May	Aug	Oct	June	Aug	Oct
Alkalinity	mg/L	30-500 OG [2]	96	183	474	80	129	101	113	126	168	265	361	**821**	328	**649**	**634**
Dissolved Organic Carbon	mg/L	5 AO [3]	4.4	**10.1**	**11.6**	2.9	**6.0**	3.3	3.8	4.9	**5.6**	**7.8**	**14**	**66.4**	**12.5**	**61.5**	**22.8**
Chloride	mg/L	250 AO	15.7	80.3	157	11.5	49.3	11.0	14.5	28.3	36.2	46	170	**330**	75	**270**	**230**
Sulphate	mg/L	500 OG	56.6	346	**625**	44.8	233	44.9	63.6	165	130	110	240	200	120	350	370
Fluoride	mg/L	1.5 MAC [4]	<0.05	<0.25	<1.0	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
Hardness	mg/L	80-100 OG	**134**	**552**	**1030**	**104**	**382**	**115**	**172**	**298**	**295**	**278**	**582**	**1030**	**372**	**843**	**857**
Nitrate	mg/L	10 MAC	7.32	**28.0**	**38.9**	5.26	**27.6**	5.72	6.12	**15.9**	**12.7**	8.12	**18.4**	4.44	**12.8**	**10.1**	**24.9**
Nitrite	mg/L	1 MAC	<0.05	<0.25	<1.0	<0.05	<0.25	<0.05	<0.05	<0.05	<0.05	0.08	0.12	< 0.3	0.05	< 0.03	0.04
Organic Nitrogen	mg/L	0.15 OG	**0.29**	<0.10	**2.08**	**0.44**	**0.52**	**0.35**	**0.38**	**0.51**	**0.56**	**0.90**	**0.85**	**5.3**	**2.20**	**3.59**	**2.44**
Orthophosphate	mg/L		<0.10	<0.50	<2.0	<0.10	<0.50	<0.10	<0.10	<0.10	<0.10	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Phenols	mg/L		<0.001	<0.001	0.003	<0.001	<0.001	<0.001	0.002	<0.001	0.035	< 0.002	< 0.002	0.003	< 0.002	0.002	0.004
Ammonia	mg/L		0.03	<0.02	0.53	<0.02	0.03	0.03	<0.02	<0.02	<0.02	0.46	1.57	1.58	7.59	8.58	11
BOD	mg/L		<5	<5	<5	<5	3	<2	<2.00	<2.00	<2.00	< 4	< 4	< 4	12	< 4	< 4
Chemical Oxygen Demand (COD)	mg/L		<5	22	63	18	11	<5	9	<5	9	15	103	144	35	114	53
Total Dissolved Solids	mg/L	500 AO	220	**880**	**1750**	178	**660**	180	246	**520**	**626**	**503**	**994**	**1700**	**734**	**1640**	**1670**
Total Kjeldahl Nitrogen (TKN)	mg/L		0.32	<0.10	2.61	0.44	0.55	0.38	0.38	0.51	0.56	1.38	2.42	6.89	9.79	12.2	13.4
pH	pH Units	6.5-8.5 OG	7.14	6.79	7.43	7.32	6.78	6.70	7.04	7.04	7.00	8.23	7.89	7.69	7.69	7.66	7.46
Electrical Conductivity	uS/cm		402	1460	2800	361	958	289	433	731	741	866	1630	2600	1200	2470	2160
% Difference/ Ion Balance	%			4.31			2.29	5.84			4.85						
Elements																	
Aluminum	mg/L	0.1 OG	<0.004	0.008	0.008	0.010	0.037	0.016	0.018	0.016	0.018	0.003	0.007	0.007	0.004	0.006	0.005
Arsenic	mg/L	0.01 MAC	<0.003	<0.003	<0.003	0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.0003	0.0006	0.0015	0.0005	0.0011	0.0009
Barium	mg/L	1 MAC	0.025	0.094	0.252	0.031	0.104	0.028	0.028	0.041	0.054	0.088	0.212	0.375	0.156	0.351	0.351
Beryllium	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.000007	0.000019	0.000009	< 0.000007	< 0.000007	< 0.000007
Bismuth	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Boron	mg/L	5 IMAC	0.432	1.39	**6.01**	0.342	1.21	0.343	0.347	0.424	0.582	0.773	1.31	3.30	1.25	2.97	3.56
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.000014	0.000052	0.000136	0.000112	0.000291	0.000186
Calcium	mg/L		35.1	147	272	26.7	98.9	30.3	45.3	79.2	78.2	78.3	168	289	102	224	242
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.00040	0.00072	0.00309	0.00072	0.00257	0.00128
Cobalt	mg/L		<0.001	0.002	0.008	<0.001	0.006	<0.001	0.001	0.014	0.007	0.00239	0.00503	0.00915	0.00407	0.00764	0.0119
Copper	mg/L	1 AO	0.004	0.009	0.030	0.004	0.006	<0.003	0.012	0.004	0.005	0.0149	0.0232	0.108	0.0333	0.0838	0.0706
Iron	mg/L	0.3 AO	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	< 0.007	0.014	0.009	0.01	0.012	0.008
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.00009	< 0.00009	< 0.00009	< 0.00009	< 0.00009	< 0.00009
Magnesium	mg/L		11.3	44.8	85.0	8.97	32.8	9.5	14.2	24.4	24.1	20.1	39.7	75.8	28.8	68.9	61.6
Manganese	mg/L	0.05 AO	<0.002	<0.002	0.004	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.0098	0.0382	**0.1300**	**1.34**	**3.47**	**2.34**
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	< 0.00001	0.00001	0.00004	< 0.00001	< 0.00001	< 0.00001
Molybdenum	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.00062	0.00073	0.00215	0.00209	0.0037	0.00597
Nickel	mg/L		<0.003	0.006	0.014	0.025	0.003	<0.003	<0.003	<0.003	<0.003	0.0049	0.0090	0.0279	0.0113	0.0286	0.0208
Phorphorus	mg/L		<0.05	<0.05	<0.05	<0.050	0.054	<0.050	0.317	<0.050	<0.050	0.006	0.005	0.047	< 0.003	0.029	0.021
Potassium	mg/L		4.87	10.9	25.2	12.3	19.8	10.5	7.43	8.7	9.98	24.8	37.4	58	44.7	64.8	74.7
Selenium	mg/L	0.05 MAC	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.00014	0.00032	0.0009	0.0002	0.00132	0.00062
Silicon	mg/L		3.24	4.0	2.89	3.33	4.4	3.59	4.52	4.5	4.1	3.03	2.46	5.44	3.69	4.03	3.67
Silver	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Sodium	mg/L	200 AO	19.0	59.2	183	15.3	49.8	16.2	16.0	18.9	25.6	45.7	68.3	**206**	71.7	173	200
Strontium	mg/L		0.16	0.603	1.17	0.135	0.482	0.141	0.167	0.301	0.322	0.399	0.683	1.37	0.512	1.08	1.18
Sulphur	mg/L		17.9	111	215	14.6	76.9	16.0	21.7	53		29	66	80	46	116	140
Thallium	mg/L		<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	0.000017	0.000041	0.000055	0.00005	0.000069	0.000074
Tin	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	< 0.00006	0.00011	0.00029	0.00011	0.00029	0.00017
Titanium	mg/L		<0.002	0.005	0.008	0.002	<0.002	<0.002	0.01	<0.002	<0.002	0.00012	0.00052	0.00051	0.00015	0.00048	0.00032
Uranium	mg/L	0.02 MAC	<0.002	<0.002	0.011	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.00144	0.00315	0.00802	0.00151	0.0047	0.00578
Vanadium	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.00037	0.00044	0.00099	0.00045	0.00089	0.00072
Zinc	mg/L	5 AO	<0.005	<0.005	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	< 0.002	< 0.002	0.003	< 0.002	0.003	0.003

Notes:
(1) MECP Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within O
(6) ODWS exceedances indicated by **bold** entries.

Groundwater Geochemical Results
TW-8

Parameters	Units	ODWS [1]	2014			2015			2016			2017			2018		
General Chemistry			**June**	**July**	**Sep**	**May**	**July**	**Sep**	**May**	**July**	**Sep**	**May**	**July**	**Sep**	**May**	**July**	**Oct**
Alkalinity	mg/L	30-500 OG [2]	79	102	86	90	91	87	90	108	84	85	111	107	84	103	84
Dissolved Organic Carbon	mg/L	5 AO [3]	2.1	2.1	1.8	1.6	2.1	1.8	1.6	2.4	1.8	1.8	2.6	2.5	3.0	3.3	2.7
Chloride	mg/L	250 AO	0.96	0.95	0.93	0.77	1.32	0.77	1.06	1.37	0.77	0.66	0.65	0.88	0.74	2.27	0.93
Sulphate	mg/L	500 OG	4.83	4.68	4.58	4.49	4.76	4.68	6.11	5.19	4.5	5.3	4.04	4.08	4.33	4.77	3.97
Fluoride	mg/L	1.5 MAC [4]	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Hardness	mg/L	80-100 OG	94	100	83.2	90.5	100	87.1	89.9	**101**	**77.9**	**76.8**	98.4	96.5	87.9	98.4	87.7
Nitrate	mg/L	10 MAC	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.06	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrite	mg/L	1 MAC	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Organic Nitrogen	mg/L	0.15 OG	**0.29**	<0.10	<0.10	<0.10	0.14	**0.19**	**0.36**	**0.51**	**0.21**	<0.10	**0.46**	**0.19**	0.13	0.11	**0.28**
Orthophosphate	mg/L		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Phenols	mg/L		0.001	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	0.005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ammonia	mg/L		0.07	0.11	0.06	<0.02	0.04	<0.02	<0.02	0.17	0.08	<0.02	0.05	0.08	<0.02	0.02	0.04
BOD	mg/L		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Chemical Oxygen Demand (COD)	mg/L		6	8	<5	<5	<5	<5	<5	<5	<5	<5	11	<5	<5	<5	<5
Total Dissolved Solids	mg/L	500 AO	110	156	124	106	114	144	110	126	112	92	120	118	138	120	108
Total Kjeldahl Nitrogen (TKN)	mg/L		0.36	<0.10	<0.10	<0.10	0.18	0.19	0.36	0.68	0.29	<0.10	0.51	0.27	0.13	0.13	0.32
pH	pH Units	6.5-8.5 OG	7.42	7.82	7.81	7.71	7.69	7.93	7.57	7.65	7.52	7.67	7.94	7.88	7.23	7.75	7.51
Electrical Conductivity	uS/cm		176	216	190	176	191	185	180	229	179	167	207	203	179	200	192
% Difference/ Ion Balance	%		7.4	1.0	2	<0.1	4.2		1.14		3.74	5.59	5.62	4.54			
Elements																	
Aluminum	mg/L	0.1 OG	<0.004	0.007	<0.004	<0.004	<0.004	<0.004	0.007	0.015	<0.004	<0.004	<0.004	0.006	<0.004	0.004	<0.004
Arsenic	mg/L	0.01 MAC	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Barium	mg/L	1 MAC	0.004	0.006	0.006	0.004	0.005	0.005	0.005	0.006	0.006	0.004	0.004	0.006	0.004	0.005	0.008
Beryllium	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Boron	mg/L	5 IMAC	<0.010	0.013	<0.010	<0.010	0.014	0.011	<0.010	0.010	<0.010	0.01	<0.010	0.012	0.038	0.013	<0.010
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Calcium	mg/L		22.0	23.2	19.4	20.4	23.4	20.5	20.4	23.6	18.1	17	22.6	22.5	19.7	23.0	20.2
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.005	<0.003	<0.003	<0.003	<0.003
Cobalt	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	1 AO	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Iron	mg/L	0.3 AO	**0.626**	**0.648**	**0.48**	**0.602**	**0.506**	**0.649**	**0.354**	**0.663**	**0.769**	**0.33**	**0.392**	**0.52**	**0.521**	**0.446**	**0.528**
Lead	mg/L	0.01 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001
Magnesium	mg/L		9.41	10.3	8.45	9.61	10.1	8.72	9.46	10.1	7.95	8.33	10.2	9.71	9.41	9.96	9.04
Manganese	mg/L	0.05 AO	**0.163**	**0.399**	**0.142**	**0.161**	**0.180**	**0.157**	**0.143**	**0.312**	**0.135**	**0.112**	**0.201**	**0.19**	**0.159**	**0.145**	**0.151**
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Molybdenum	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Nickel	mg/L		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Phorphorus	mg/L		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Potassium	mg/L		0.45	0.51	0.45	0.66	0.81	0.55	0.98	0.67	0.51	0.78	0.5	0.5	0.98	0.56	0.51
Selenium	mg/L	0.05 MAC	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Silicon	mg/L		5.75	6.43	7.73	5.49	6.70	6.26	5.73	7.70	7.57	5.2	6.43	6.26	5.91	8.16	6.95
Silver	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Sodium	mg/L	200 AO	2.12	2.21	2.12	2.13	2.41	2.08	2.13	2.76	2.16	1.9	2.14	2.23	2.05	2.58	2.38
Strontium	mg/L		0.032	0.047	0.036	0.029	0.037	0.032	0.03	0.041	0.032	0.026	0.037	0.042	0.034	0.042	0.038
Sulphur	mg/L		1.42	1.61	1.73	1.79	1.46	1.58	0.97	1.46	1.77	1.65	1.5	1.39	1.49	2.07	1.99
Thallium	mg/L		<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Tin	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Titanium	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Uranium	mg/L	0.02 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Vanadium	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.010	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Zinc	mg/L	5 AO	<0.005	0.006	<0.005	<0.005	<0.005	<0.005	<0.005	0.011	<0.005	<0.005	0.005	<0.005	<0.005	0.006	<0.005

Notes:
(1) MECP Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

The City of Temiskaming Shores
2023 Annual Groundwater and Surface Water Monitoring Report
Haileybury Waste Disposal Site
Haileybury, Ontario
April 2024

Groundwater Geochemical Results
TW-8

Parameters	Units	ODWS [1]	2019			2020			2021			2022			2023		
General Chemistry			**May**	**July**	**Sep**	**June**	**Aug**	**Oct**	**June**	**Aug**	**Oct**	**May**	**Aug**	**Oct**	**June**	**Aug**	**Oct**
Alkalinity	mg/L	30-500 OG [2]	88	94	92	90	86	102	95	95	104	101	89		97	99	96
Dissolved Organic Carbon	mg/L	5 AO [3]	2.3	2.5	2.3	1.9	2.4	2.3	2.8	2.6	2.9	1.7	2	**Unsafe to sample**	2.1	2.2	1.8
Chloride	mg/L	250 AO	0.67	0.88	0.68	0.76	0.71	0.72	0.77	0.71	0.84	< 1	< 1		< 1	< 1	< 1
Sulphate	mg/L	500 OG	4.06	3.76	3.61	4.49	4.12	3.92	3.79	3.88	3.58	6.00	4.00		4.00	4.00	4.00
Fluoride	mg/L	1.5 MAC [4]	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	< 0.06	< 0.06		< 0.06	< 0.06	0.06
Hardness	mg/L	80-100 OG	85.6	95.4	90.5	90.8	94.5	82.4	95.8	90.5	93.1	87.5	90.3		96.8	99.5	91.3
Nitrate	mg/L	10 MAC	<0.05	<0.05	<0.05	0.06	<0.05	<0.05	<0.05	<0.05	<0.05	< 0.06	< 0.06		< 0.06	< 0.06	< 0.06
Nitrite	mg/L	1 MAC	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	< 0.03	< 0.03		< 0.03	< 0.03	< 0.03
Organic Nitrogen	mg/L	0.15 OG	<0.10	<0.10	<0.10	**0.19**	0.12	0.11	**0.31**	<0.10	0.12	**< 0.5**	0.06		**< 0.5**	< 0.05	< 0.05
Orthophosphate	mg/L		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	< 0.03	< 0.03		< 0.03	< 0.03	< 0.03
Phenols	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.002	< 0.002	< 0.002		< 0.002	< 0.002	< 0.002
Ammonia	mg/L		0.02	0.06	0.03	<0.02	0.08	0.04	0.03	0.05	<0.02	< 0.04	0.10		0.08	0.08	0.04
BOD	mg/L		<5	<5	<5	<5	<2	<2	<2.00	<2.00	<2.00	< 4	< 4		< 4	< 4	4
Chemical Oxygen Demand (COD	mg/L		7	<5	<5	12	<5	<5	<5	<5	<5	< 8	63		< 8	< 8	< 8
Total Dissolved Solids	mg/L	500 AO	84	132	114	102	114	92	96	126	170	89	109		120	129	131
Total Kjeldahl Nitrogen (TKN)	mg/L		<0.10	0.12	<0.10	0.19	0.2	0.15	0.34	<0.10	0.12	0.15	0.16		< 0.05	0.05	< 0.05
pH	pH Units	6.5-8.5 OG	7.41	7.52	7.14	7.65	7.50	6.79	7.27	7.62	7.60	7.94	8.02		7.82	7.83	7.05
Electrical Conductivity	uS/cm		172	214	210	202	176	155	184	185	202	183	183		194	200	162
% Difference/ Ion Balance	%			0.793			4.53	10.2			5.51						
Elements																	
Aluminum	mg/L	0.1 OG	<0.004	0.004	0.005	0.006	0.023	0.028	0.008	0.027	0.012	0.009	0.003		0.002	0.001	0.002
Arsenic	mg/L	0.01 MAC	<0.003	<0.003	<0.003	0.004	<0.003	<0.003	0.004	<0.003	<0.003	0.0013	0.0019		0.0013	0.0016	0.0012
Barium	mg/L	1 MAC	0.005	0.004	0.005	0.008	0.005	0.004	0.005	0.005	0.004	0.00483	0.00733		0.00484	0.00576	0.00459
Beryllium	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.000007	0.000009		< 0.000007	< 0.000007	< 0.000007
Bismuth	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.00002	< 0.00001		< 0.00001	< 0.00001	< 0.00001
Boron	mg/L	5 IMAC	<0.010	0.016	0.185	0.011	<0.010	0.011	0.012	0.011	0.014	0.010	0.005		0.013	0.006	0.005
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.000011	0.000015		0.000009	0.000003	< 0.000003
Calcium	mg/L		20.1	22.0	20.8	20.9	21.5	19.2	22	20.8	21.4	20	22		22.8	23.2	20.7
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.00073	0.00024		0.00023	0.00019	0.00015
Cobalt	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.000328	0.000379		0.000315	0.000277	0.000248
Copper	mg/L	1 AO	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.0021	0.0005		0.0013	0.0014	0.002
Iron	mg/L	0.3 AO	**0.407**	**0.426**	**0.551**	**0.649**	**0.536**	**0.349**	**0.823**	**0.616**	**0.313**	**0.610**	**1.06**		**0.761**	**0.716**	**0.494**
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.00009	< 0.00009		< 0.00009	< 0.00009	< 0.00009
Magnesium	mg/L		8.59	9.82	9.36	9.38	9.91	8.36	9.92	9.36	9.63	9.10	8.59		9.71	10.1	9.61
Manganese	mg/L	0.05 AO	**0.164**	**0.161**	**0.185**	**0.174**	**0.19**	**0.091**	**0.149**	**0.173**	**0.137**	**0.184**	**0.153**		**0.228**	**0.223**	**0.123**
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	< 0.00001	0.00002		< 0.00001	< 0.00001	< 0.00001
Molybdenum	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.00039	0.00031		0.0003	0.00042	0.00031
Nickel	mg/L		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.0007	0.0005		0.0005	0.0004	0.0006
Phorphorus	mg/L		<0.05	<0.05	<0.05	<0.050	0.08	<0.050	0.142	<0.050	<0.050	0.004	0.011		0.007	0.01	0.007
Potassium	mg/L		0.52	0.49	0.71	0.56	0.48	0.41	<0.50	<0.50	<0.50	0.354	0.475		0.513	0.504	0.413
Selenium	mg/L	0.05 MAC	<0.004	<0.004	<0.004	0.009	<0.004	<0.004	<0.004	<0.004	<0.004	< 0.00004	0.00015		< 0.00004	< 0.00004	< 0.00004
Silicon	mg/L		5.13	7.28	6.62	5.88	7.53	6.55	6.13	7.64	7.05	5.69	5.99		6.76	7.31	7.49
Silver	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	< 0.00005	< 0.00005		< 0.00005	< 0.00005	< 0.00005
Sodium	mg/L	200 AO	1.92	2.14	2.18	2.1	2.16	2.02	2.04	2.09	2.1	2.03	2.15		2.22	2.43	2.39
Strontium	mg/L		0.033	0.038	0.033	0.036	0.037	0.035	0.033	0.037	0.035	0.0352	0.0395		0.0401	0.0412	0.0371
Sulphur	mg/L		1.56	1.26	1.48	1.82	1.85	1.33	1.72	1.76		< 1	1		< 3	< 3	< 3
Thallium	mg/L		<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	< 0.000005	< 0.000005		< 0.000005	< 0.000005	< 0.000005
Tin	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.00010	0.00007		0.00007	< 0.00006	< 0.00006
Titanium	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.00028	0.00024		0.0002	0.0002	0.00014
Uranium	mg/L	0.02 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.000134	0.000106		0.00015	0.000164	0.000091
Vanadium	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.00022	0.00031		0.00025	0.00025	0.00019
Zinc	mg/L	5 AO	0.008	<0.005	<0.005	<0.005	<0.005	<0.005	0.007	<0.005	<0.005	0.005	< 0.002		< 0.002	0.002	< 0.002

Notes:
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(4) Maximum Acceptable Concentration (MAC) within ODWS.
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The City of Temiskaming Shores
2023 Annual Groundwater and Surface Water Monitoring Report
Haileybury Waste Disposal Site
Haileybury, Ontario
April 2024

Groundwater Geochemical Results
TW-9

Parameters	Units	ODWS [1]	2014			2015			2016			2017			2018		
General Chemistry			**June**	**July**	**Sep**	**May**	**July**	**Sep**	**May**	**July**	**Sep**	**May**	**July**	**Sep**	**May**	**July**	**Oct**
Alkalinity	mg/L	30-500 OG [2]	**770**	**736**	**822**	**802**	**634**	**559**	**706**	**587**	488	**962**	**593**	**546**	**829**	**542**	437
Dissolved Organic Carbon	mg/L	5 AO [3]	**30.5**	**19.0**	**38.4**	**25.4**	**26.7**	**16.7**	**24.1**	**16.6**	**13.7**	**45.1**	**17.6**	**19.1**	**47.8**	**16.9**	**16.1**
Chloride	mg/L	250 AO	109	109	151	138	115	105	136	123	90.9	165	84.8	107	175	77.7	87.9
Sulphate	mg/L	500 OG	93.1	162	169	202	200	217	282	300	199	172	204	274	71.3	164	226
Fluoride	mg/L	1.5 MAC [4]	<0.5	<0.25	<0.5	<0.5	<0.5	<0.25	<0.5	<0.25	<0.25	<0.05	<0.25	<0.25	<1.0	<0.25	<0.25
Hardness	mg/L	80-100 OG	**806**	**808**	**753**	**869**	**773**	**658**	**746**	**638**	**539**	**705**	**551**	**559**	**724**	**520**	**524**
Nitrate	mg/L	10 MAC	<0.5	<0.25	<0.5	<0.5	<0.5	<0.25	<0.5	<0.25	<0.25	<0.05	<0.25	<0.25	<1.0	<0.25	0.30
Nitrite	mg/L	1 MAC	<0.5	<0.25	<0.5	<0.5	<0.5	<0.25	<0.5	<0.25	<0.25	<0.05	<0.25	<0.25	<1.0	<0.25	<0.25
Organic Nitrogen	mg/L	0.15 OG	**3.2**	**0.30**	**2.7**	**3.0**	**3.5**	**2.6**	**3.2**	**0.2**	**1.6**	**4.4**	**0.8**	<0.10	**6.2**	<0.10	<0.10
Orthophosphate	mg/L		<1.0	<0.50	<1.0	<1.0	<1.0	<0.50	<1.0	<0.50	<0.50	<0.10	<0.50	<0.50	<2.0	<0.50	<0.50
Phenols	mg/L		0.001	0.001	<0.001	<0.001	0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.007	0.002	0.002
Ammonia	mg/L		10.8	10.5	8.3	10.3	10.6	7.8	18.6	17.3	10.1	47.1	30.1	22	29.0	18.1	18.6
BOD	mg/L		7	9	10	20	23	9	7	<5	<5	5	<5	<5	8	<5	27
Chemical Oxygen Demand (COD)	mg/L		83	68	100	91	68	47	78	42	46	117	72	51	99	46	49
Total Dissolved Solids	mg/L	500 AO	**1210**	**1130**	**1350**	**1200**	**1090**	**996**	**1140**	**1070**	**898**	**1250**	**888**	**1000**	**1270**	**754**	**878**
Total Kjeldahl Nitrogen (TKN)	mg/L		14	10.8	11	13.3	14.1	10.4	21.8	17.5	11.7	51.5	30.9	22	35.2	18	18.2
pH	pH Units	6.5-8.5 OG	7.46	7.86	7.62	7.68	7.88	7.95	7.82	7.75	7.15	7.56	8.03	7.86	6.84	7.39	7.74
Electrical Conductivity	uS/cm		1890	1890	2180	2080	1770	1730	1970	1880	1550	2300	1650	1680	2240	1500	1560
% Difference/ Ion Balance	%		2.6	0.2	7.9	<0.1	3.5		2.54		1.88	6.11	3.51	6.04			
Elements																	
Aluminum	mg/L	0.1 OG	0.018	0.019	0.028	0.026	0.018	0.013	0.023	0.024	<0.004	0.019	0.014	0.015	0.012	0.010	0.014
Arsenic	mg/L	0.01 MAC	0.025	**0.032**	**0.031**	**0.028**	**0.028**	**0.028**	**0.039**	**0.031**	**0.03**	**0.03**	**0.038**	**0.033**	**0.029**	**0.038**	**0.032**
Barium	mg/L	1 MAC	0.168	0.180	0.222	0.224	0.179	0.14	0.222	0.185	0.136	0.31	0.15	0.165	0.254	0.108	0.153
Beryllium	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Boron	mg/L	5 IMAC	1.14	1.64	2.42	2.15	1.51	1.49	2.1	1.80	1.44	1.76	1.6	1.9	1.50	1.49	1.53
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Calcium	mg/L		217	208	195	233	205	169	195	166	138	175	140	138	185	134	136
Chromium	mg/L	0.05 MAC	0.006	0.009	0.008	0.008	0.007	0.011	0.021	0.010	0.008	0.006	0.038	0.008	0.008	0.010	0.008
Cobalt	mg/L		0.013	0.014	0.015	0.016	0.015	0.013	0.017	0.015	0.013	0.018	0.014	0.014	0.018	0.012	0.012
Copper	mg/L	1 AO	0.004	0.003	0.005	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Iron	mg/L	0.3 AO	**19.3**	**19.4**	**18.4**	**20.5**	**18.2**	**14.5**	**31.6**	**25.9**	**19.2**	**35.9**	**29.2**	**20.7**	**33.7**	**28.8**	**18.5**
Lead	mg/L	0.01 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001
Magnesium	mg/L		64.2	70.0	64.7	69.7	63.5	57.4	62.9	54.3	47.2	65.2	48.9	47	63.6	45.1	44.9
Manganese	mg/L	0.05 AO	**11.1**	**8.84**	**9.28**	**9.23**	**7.85**	**6.30**	**5.9**	**5.38**	**4.32**	**6.26**	**4.09**	**3.82**	**4.83**	**3.48**	**3.20**
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Molybdenum	mg/L		0.003	0.003	0.003	0.003	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Nickel	mg/L		0.006	0.011	0.013	0.012	0.012	0.008	0.011	0.007	0.007	0.013	0.01	0.008	0.013	0.008	0.010
Phorphorus	mg/L		<0.05	0.06	0.11	0.11	0.08	0.08	0.15	0.06	0.08	<0.05	0.07	0.06	0.06	0.09	<0.05
Potassium	mg/L		32	29.2	23.8	34.9	31.0	24.9	38.1	32.0	23.4	43.5	36.1	31.5	45.8	29.6	32.3
Selenium	mg/L	0.05 MAC	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Silicon	mg/L		16.2	14.7	18.6	18.2	14.5	14.4	16.8	17.1	14.3	16.6	13.4	11.8	14.2	15.6	13.1
Silver	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Sodium	mg/L	200 AO	87.2	78.9	102	119	104.0	93.6	125	104.0	86.7	132	72.7	85.6	139	80.2	86.3
Strontium	mg/L		0.67	0.751	0.808	0.821	0.688	0.523	0.669	0.593	0.489	0.819	0.538	0.574	0.782	0.536	0.540
Sulphur	mg/L		27.7	51.8	59.1	83.5	67.3	83.1	74.9	84.5	68.6	49.5	65	159	25.6	58.0	74.0
Thallium	mg/L		<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Tin	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Titanium	mg/L		<0.002	0.003	0.006	0.005	0.004	0.004	0.006	0.003	0.004	0.002	0.003	0.005	0.002	0.003	0.004
Uranium	mg/L	0.02 MAC	0.003	0.005	0.006	0.004	0.003	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Vanadium	mg/L		0.009	0.009	0.011	0.01	0.008	0.007	<0.002	<0.002	0.005	0.007	<0.002	0.004	0.006	0.004	0.003
Zinc	mg/L	5 AO	0.005	0.006	0.005	0.007	<0.005	0.006	0.007	<0.005	<0.005	<0.005	0.006	<0.005	<0.005	0.007	0.005

Notes:
(1) MECP Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

The City of Temiskaming Shores
2023 Annual Groundwater and Surface Water Monitoring Report
Haileybury Waste Disposal Site
Haileybury, Ontario
April 2024

Groundwater Geochemical Results
TW-9

Parameters	Units	ODWS [1]	2019			2020			2021			2022			2023		
General Chemistry			May	July	Sep	June	Aug	Oct	June	Aug	Oct	May	Aug	Oct	June	Aug	Oct
Alkalinity	mg/L	30-500 OG [2]	**824**	**545**	**523**	**782**	**671**	**751**	**1090**		**845**	**888**	**1220**	**Dry**	**1070**	**1340**	**1440**
Dissolved Organic Carbon	mg/L	5 AO [3]	**21.1**	**22.1**	**8.0**	**36.0**	**30.8**	**40.1**	**62.8**	**No sample obtained**	**54.4**	**38.4**	**77**		**54.4**	**94.2**	**96.7**
Chloride	mg/L	250 AO	145	107	127	152	176	181	248		224	200	**330**		**360**	**320**	**350**
Sulphate	mg/L	500 OG	109	148	364	193	203	257	108		185	35	130		100	77	76
Fluoride	mg/L	1.5 MAC [4]	<0.5	<0.5	<0.5	<0.13	<0.07	<0.07	<0.05		<0.05	< 0.06	< 0.06		< 0.06	< 0.06	0.09
Hardness	mg/L	80-100 OG	**524**	**549**	**728**	**645**	**649**	**692**	**812**		**698**	**567**	**740**		**545**	**719**	**716**
Nitrate	mg/L	10 MAC	<0.5	<0.5	<0.5	<1.0	<0.5	<0.5	0.92		<0.14	< 0.06	< 0.06		< 0.06	0.15	< 0.06
Nitrite	mg/L	1 MAC	<0.5	<0.5	<0.5	<1.0	<0.5	<0.5	<0.11		<0.11	< 0.03	< 0.3		< 0.3	< 0.3	< 0.3
Organic Nitrogen	mg/L	0.15 OG	**8.5**	**0.7**	**1.5**	**6.4**	**2.9**	**4.3**	**3.30**		**3.80**	**9.00**	**8.42**		**< 0.5**	**16.3**	**8.08**
Orthophosphate	mg/L		<1.0	<1.0	<1.0	<2.0	<1.0	<1.0	<0.26		<0.26	< 0.03	< 0.03		< 0.03	< 0.03	< 0.03
Phenols	mg/L		0.009	0.006	0.005	0.011	0.004	0.007	0.012		0.039	0.012	0.005		< 0.02	0.01	0.012
Ammonia	mg/L		51.0	19.5	13.3	37.2	31.5	21.4	56.7		54.8	75.6	94.9		151	136	155
BOD	mg/L		6	11	<5	8	17	9	14		19	4	5		23	13	13
Chemical Oxygen Demand (COD	mg/L		102	70	61	123	98	65	166		138	128	232		255	300	262
Total Dissolved Solids	mg/L	500 AO	**970**	**846**	**1240**	**1180**	**1130**	**1030**	**1420**		**1370**	**977**	**1650**		**1400**	**1620**	**1710**
Total Kjeldahl Nitrogen (TKN)	mg/L		59.5	20.2	14.8	43.6	34.4	25.7	60		58.6	84.6	103		148	153	164
pH	pH Units	6.5-8.5 OG	7.55	7.28	7.49	7.87	7.43	7.56	7.50		7.62	8.00	7.99		7.70	7.89	7.66
Electrical Conductivity	uS/cm		2080	1770	2140	2380	1920	1850	2820		2490	2030	3330		2940	3480	3170
% Difference/ Ion Balance	%			0.124			2.63	7.81			3.11						
Elements																	
Aluminum	mg/L	0.1 OG	0.012	0.010	0.011	0.024	0.046	0.014	0.027		0.021	0.017	0.020		0.014	0.032	0.023
Arsenic	mg/L	0.01 MAC	**0.024**	**0.018**	**0.021**	**0.026**	**0.018**	**0.018**	**0.026**		**0.021**	**0.0182**	**0.0247**		**0.0135**	**0.0212**	**0.0193**
Barium	mg/L	1 MAC	0.314	0.112	0.170	0.268	0.178	0.167	0.336		0.264	0.256	0.377		0.318	0.454	0.493
Beryllium	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	0.000011	0.000018		< 0.000007	0.000016	0.000014
Bismuth	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002		<0.002	< 0.00001	< 0.00001		< 0.00001	< 0.00001	< 0.00001
Boron	mg/L	5 IMAC	1.43	1.33	2.47	2.594	2.07	2.37	1.977		1.94	1.04	2.46		1.55	2.21	2.09
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002		<0.002	0.000007	0.000017		0.000012	0.000023	0.00001
Calcium	mg/L		138	145	184	164	164	179	197		172	136	181		126	166	170
Chromium	mg/L	0.05 MAC	0.013	0.006	0.005	0.006	0.005	0.004	0.008		0.009	0.0102	0.017		0.0117	0.0222	0.0215
Cobalt	mg/L		0.01	0.008	0.014	0.012	0.014	0.016	0.017		0.017	0.0112	0.0164		0.00979	0.0108	0.0117
Copper	mg/L	1 AO	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003		<0.003	0.0019	0.0008		0.0031	0.002	0.0016
Iron	mg/L	0.3 AO	**20.1**	**21.5**	**31.7**	**26.54**	**22.4**	**20.1**	**22.8**		**22.4**	**36.7**	**27.9**		**19.5**	**26.8**	**25.5**
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	0.0001	< 0.00009		< 0.00009	0.0002	< 0.00009
Magnesium	mg/L		43.5	45.4	65.1	57.2	58.1	59.4	77.7		65.3	55.3	70.1		56.3	74.2	70.8
Manganese	mg/L	0.05 AO	**3.50**	**3.24**	**4.50**	**4.40**	**4.11**	**3.70**	**4.46**		**3.72**	**4.37**	**4.34**		**3.47**	**4.14**	**4.16**
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		<0.0001	< 0.00001	< 0.00001		< 0.00001	< 0.00001	< 0.00001
Molybdenum	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002		<0.002	0.00071	0.00165		0.00073	0.00134	0.00106
Nickel	mg/L		0.010	0.008	0.010	0.016	0.014	0.016	0.023		0.015	0.0104	0.0268		0.0178	0.0247	0.0227
Phorphorus	mg/L		0.13	0.05	0.05	0.079	0.187	0.086	0.08		0.113	0.163	0.207		0.13	0.252	0.263
Potassium	mg/L		50.5	29.0	35.4	54	51.8	40.9	63.3		51.1	52.5	69.0		66.8	92.5	96.1
Selenium	mg/L	0.05 MAC	<0.004	<0.004	0.007	0.021	<0.004	<0.004	<0.004		<0.004	0.00035	0.00054		0.00041	0.00418	0.00045
Silicon	mg/L		13.0	11.4	11.2	17.0	14.1	10.2	16.1		13.7	13.3	9.49		12.8	13.2	14.7
Silver	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002		<0.002	< 0.00005	< 0.00005		< 0.00005	< 0.00005	< 0.00005
Sodium	mg/L	200 AO	119	90.5	113	136	113	124	195		144	120	**246**		175	**250**	**263**
Strontium	mg/L		0.628	0.459	0.670	0.744	0.721	0.772	0.906		0.802	0.772	1.00		0.748	0.98	1.07
Sulphur	mg/L		42.3	47.6	128	60.6	66.7	78.1	37.8			7	43		32	28	30
Thallium	mg/L		<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006		<0.006	< 0.000005	< 0.000005		< 0.000005	< 0.000005	< 0.000005
Tin	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002		<0.002	0.00019	0.00036		0.0004	0.00048	0.00042
Titanium	mg/L		0.002	0.002	0.006	0.006	0.002	<0.002	<0.002		0.003	0.00302	0.00539		0.00425	0.0091	0.00877
Uranium	mg/L	0.02 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002		<0.002	0.000328	0.00289		0.000696	0.00148	0.00115
Vanadium	mg/L		0.007	0.003	0.003	0.006	0.005	0.004	0.01		0.006	0.0104	0.0169		0.0113	0.0233	0.0216
Zinc	mg/L	5 AO	<0.005	<0.005	<0.005	<0.005	0.007	<0.005	<0.005		<0.005	0.004	< 0.002		< 0.002	0.003	< 0.002

Notes:
(1) MECP Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within O
(6) ODWS exceedances indicated by **bold** entries.

The City of Temiskaming Shores
2023 Annual Groundwater and Surface Water Monitoring Report
Haileybury Waste Disposal Site
Haileybury, Ontario
April 2024

Groundwater Geochemical Results
TW-10

Parameters	Units	ODWS [1]	2014	2015	2016	2017	2018	2019	2020	2021			2022			2023		
General Chemistry			June	May	May	May	May	May	June	June	Aug	Oct	May	Aug	Oct	June	Aug	Oct
Alkalinity	mg/L	30-500 OG [2]	30	30	32	37	30	**24**	30	36	31	38	47	**25**	**28**	**26**	**24**	31
Dissolved Organic Carbon	mg/L	5 AO [3]	2.9	2.2	2.1	2.8	3.1	2.4	1.9	4.3	3.3	3.4	2.9	3.0	4.2	2.9	2.3	2.8
Chloride	mg/L	250 AO	6.62	8.82	8.14	7.1	11.2	6.21	46.3	35.1	32.9	35	51	25	25	17	20	25
Sulphate	mg/L	500 OG	3.98	3.25	4.2	4.2	3.85	2.99	5.5	3.43	4.94	4.32	6	4	4	4	13	6
Fluoride	mg/L	1.5 MAC [4]	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
Hardness	mg/L	80-100 OG	**27**	**34.7**	**30.5**	**30.1**	**38.8**	**25.2**	**70.8**	**49.6**	**52.7**	**47**	**67.2**	**33**	**34.4**	**27.8**	**27.8**	**34.5**
Nitrate	mg/L	10 MAC	1.25	0.93	1.73	0.87	1.22	1.18	0.87	0.31	0.22	0.12	0.5	0.61	0.89	1.18	0.7	0.62
Nitrite	mg/L	1 MAC	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Organic Nitrogen	mg/L	0.15 OG	**0.55**	<0.10	**0.47**	0.15	**0.20**	<0.10	**0.22**	**0.41**	<0.10	0.14	**< 0.5**	0.09	**< 0.5**	**< 0.5**	0.08	**0.22**
Orthophosphate	mg/L		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Phenols	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Ammonia	mg/L		0.05	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
BOD	mg/L		<5	<5	<5	<5	<5	<5	<5	<2.00	<2.00	44	< 4	< 4	< 4	< 4	< 4	< 4
Chemical Oxygen Demand (COD	mg/L		8	<5	5	<5	<5	<5	11	<5	<5	<5	12	< 8	< 8	8	9	< 8
Total Dissolved Solids	mg/L	500 AO	60	64	62	56	108	38	132	128	124	174	146	86	94	97	103	111
Total Kjeldahl Nitrogen (TKN)	mg/L		0.6	<0.10	0.47	0.15	0.20	<0.10	0.22	0.41	<0.10	0.14	< 0.05	0.09	0.08	0.08	0.1	0.22
pH	pH Units	6.5-8.5 OG	6.70	6.88	6.80	6.75	**6.41**	6.54	7.00	6.55	6.59	6.76	7.64	7.45	6.87	7.06	6.92	6.51
Electrical Conductivity	uS/cm		106	105	99	107	126	87	251	186	181	186	268	138	143	122	121	124
% Difference/ Ion Balance	%		0.4	1.7	8.03	7.63						10.5						
Elements																		
Aluminum	mg/L	0.1 OG	0.028	0.022	0.032	0.022	0.019	0.017	0.062	0.016	0.031	0.03	0.020	0.018	0.023	0.022	0.017	0.019
Arsenic	mg/L	0.01 MAC	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.004	<0.003	<0.003	< 0.0002	0.0002	< 0.0002	< 0.0002	0.0002	< 0.0002
Barium	mg/L	1 MAC	0.004	0.004	0.005	0.005	0.005	0.005	0.009	0.006	0.006	0.007	0.0117	0.00589	0.00591	0.00434	0.00477	0.00558
Beryllium	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.00001	0.000016	0.000013	0.000007	< 0.000007	< 0.000007
Bismuth	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Boron	mg/L	5 IMAC	0.015	<0.010	0.025	0.031	0.067	0.010	0.012	0.011	0.015	0.030	0.006	0.006	0.010	0.008	0.006	0.005
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.000022	0.00001	0.000007	0.000005	0.000004	0.000004
Calcium	mg/L		7.15	9	7.91	7.64	10.1	6.73	18.5	13.1	13.9	12.2	18.1	9.17	9.11	7.42	7.47	8.94
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.0004	0.00061	0.00077	0.00059	0.00066	0.00034
Cobalt	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.000079	0.00007	0.000402	0.000068	0.000063	0.00007
Copper	mg/L	1 AO	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.0027	0.0010	0.0012	0.0022	0.0015	0.002
Iron	mg/L	0.3 AO	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.013	0.012	0.010	<0.010	< 0.007	0.009	0.015	0.016	0.024	0.007
Lead	mg/L	0.01 MAC	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.00009	< 0.00009	< 0.00009	< 0.00009	< 0.00009	< 0.00009
Magnesium	mg/L		2.18	2.97	2.62	2.68	3.29	2.05	5.98	4.11	4.37	4.01	5.38	2.44	2.84	2.25	2.22	2.95
Manganese	mg/L	0.05 AO	0.003	<0.002	0.004	0.002	<0.002	<0.002	0.003	0.011	0.016	0.019	0.0499	0.00167	0.0021	0.00238	0.00313	0.00186
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Molybdenum	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	< 0.00004	0.00015	0.00005	< 0.00004	0.00005	0.00004
Nickel	mg/L		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.008	<0.003	<0.003	0.03	0.0003	< 0.0001	< 0.0001	0.0002	0.0001	0.0003
Phorphorus	mg/L		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.050	<0.050	<0.050	<0.050	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
Potassium	mg/L		0.55	0.64	0.67	0.57	0.70	0.45	0.73	0.71	0.79	0.72	0.860	0.595	0.681	0.561	0.57	0.596
Selenium	mg/L	0.05 MAC	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.00004	0.00007	0.00005	< 0.00004	0.00005	0.00005
Silicon	mg/L		3.77	4.03	3.77	4.53	4.64	3.68	3.69	4.71	4.59	4.69	4.31	3.75	5.5	4.22	4.35	4.61
Silver	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Sodium	mg/L	200 AO	9.16	7.07	6.73	7.34	7.77	5.05	10.7	11.8	13.2	12.4	18.7	11.3	12.6	12.1	9.65	13.4
Strontium	mg/L		0.021	0.025	0.021	0.026	0.029	0.022	0.065	0.051	0.043	0.045	0.0647	0.0322	0.0344	0.0261	0.0254	0.0302
Sulphur	mg/L		1.15	1.34	0.93	1.52	1.37	1.11	2.11	1.57	1.89		< 1	1	3	< 3	< 3	< 3
Thallium	mg/L		<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	0.000007	0.000005	< 0.000005	< 0.000005	< 0.000005	0.000005
Tin	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	< 0.00006	0.00008	< 0.00006	< 0.00006	0.00008	< 0.00006
Titanium	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.01	<0.002	<0.002	0.00012	0.00023	0.0003	0.00036	0.00024	0.00026
Uranium	mg/L	0.02 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.000021	0.000035	0.000025	0.000028	0.000027	0.000023
Vanadium	mg/L		<0.002	<0.002	<0.010	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.00018	0.00021	0.00025	0.00022	0.00025	0.00021
Zinc	mg/L	5 AO	0.007	0.007	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.003	< 0.002	0.003	< 0.002	< 0.002	< 0.002

Notes:
(1) MECP Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

Groundwater Geochemical Results
TW-12

Parameters	Units	ODWS [1]	2014	2015	2016	2017	2018	2019	2020	2021			2022			2023		
General Chemistry			June	May	May	May	May	May	June	June	Aug	Oct	May	Aug	Oct	June	Aug	Oct
Alkalinity	mg/L	30-500 OG [2]	80	71	91	Insufficient volume to obtain sample	Dry	121	96	Dry	Insufficient volume to obtain sample	Dry	Dry	Dry	Dry	Dry	Dry	Dry
Dissolved Organic Carbon	mg/L	5 AO [3]	1.4	1.0	1.2			2.0	1.1									
Chloride	mg/L	250 AO	1.16	0.95	1.32			1.16	1.13									
Sulphate	mg/L	500 OG	11.3	6.78	13			16.6	7.94									
Fluoride	mg/L	1.5 MAC [4]	<0.05	<0.05	<0.05			<0.05	<0.05									
Hardness	mg/L	80-100 OG	98	**73.4**	90			**120**	96.7									
Nitrate	mg/L	10 MAC	0.06	0.06	0.08			0.12	0.06									
Nitrite	mg/L	1 MAC	<0.05	<0.05	<0.05			<0.05	<0.05									
Organic Nitrogen	mg/L	0.15 OG	**0.37**	<0.10	**0.24**			<0.10	**0.37**									
Orthophosphate	mg/L		<0.10	<0.10	<0.10			<0.10	<0.10									
Phenols	mg/L		<0.001	<0.001	<0.001			<0.001	0.001									
Ammonia	mg/L		0.08	<0.02	0.07			0.05	0.03									
BOD	mg/L		<5	<5	<5			<5	<5									
Chemical Oxygen Demand (COD	mg/L		<5	<5	<5			<5	8									
Total Dissolved Solids	mg/L	500 AO	116	102	112			120	122									
Total Kjeldahl Nitrogen (TKN)	mg/L		0.45	<0.10	0.31			<0.10	0.4									
pH	pH Units	6.5-8.5 OG	7.84	7.79	7.72			7.81	7.91									
Electrical Conductivity	uS/cm		196	150	197			261	226									
% Difference/ Ion Balance	%		7	0.2	4.81													
Elements																		
Aluminum	mg/L	0.1 OG	0.008	0.012	0.014			0.004	0.078									
Arsenic	mg/L	0.01 MAC	<0.003	<0.003	<0.003			<0.003	<0.003									
Barium	mg/L	1 MAC	0.011	0.008	0.011			0.015	0.011									
Beryllium	mg/L		<0.001	<0.001	<0.001			<0.001	<0.001									
Bismuth	mg/L		<0.002	<0.002	<0.002			<0.002	<0.002									
Boron	mg/L	5 IMAC	<0.010	<0.010	0.013			<0.010	<0.010									
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.002			<0.002	<0.002									
Calcium	mg/L		31.6	23.6	29.1			39.0	32.1									
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.003			0.004	<0.003									
Cobalt	mg/L		<0.001	<0.001	<0.001			<0.001	0.001									
Copper	mg/L	1 AO	<0.003	<0.003	<0.003			<0.003	<0.003									
Iron	mg/L	0.3 AO	<0.010	<0.010	<0.010			<0.010	0.101									
Lead	mg/L	0.01 MAC	<0.002	<0.002	<0.002			<0.001	<0.001									
Magnesium	mg/L		4.54	3.51	4.21			5.54	4.01									
Manganese	mg/L	0.05 AO	<0.002	<0.002	<0.002			<0.002	0.005									
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001			<0.0001	<0.0001									
Molybdenum	mg/L		<0.002	<0.002	<0.002			0.002	<0.002									
Nickel	mg/L		<0.003	<0.003	<0.003			<0.003	<0.003									
Phorphorus	mg/L		<0.05	<0.05	<0.05			<0.05	<0.050									
Potassium	mg/L		1.72	0.98	0.99			1.21	0.76									
Selenium	mg/L	0.05 MAC	<0.004	<0.004	<0.004			<0.004	<0.004									
Silicon	mg/L		5.76	5.16	5.26			5.25	4.51									
Silver	mg/L		<0.002	<0.002	<0.002			<0.002	<0.002									
Sodium	mg/L	200 AO	3.5	2.42	2.47			2.93	2.33									
Strontium	mg/L		0.11	0.066	0.073			0.086	0.052									
Sulphur	mg/L		3.62	2.61	2.61			3.36	2.89									
Thallium	mg/L		<0.006	<0.006	<0.006			<0.006	<0.006									
Tin	mg/L		<0.002	<0.002	<0.002			<0.002	<0.002									
Titanium	mg/L		<0.002	<0.002	<0.002			<0.002	0.006									
Uranium	mg/L	0.02 MAC	<0.002	<0.002	<0.002			<0.002	<0.002									
Vanadium	mg/L		<0.002	<0.002	<0.010			<0.002	<0.002									
Zinc	mg/L	5 AO	<0.005	<0.005	<0.005			<0.005	<0.005									

Notes:
(1) MECP Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

Groundwater Geochemical Results
TW-13

Parameters	Units	ODWS [1]	2014			2015			2016			2017			2018		
General Chemistry			**June**	**July**	**Sep**	**May**	**July**	**Sep**	**May**	**July**	**Sep**	**May**	**July**	**Sep**	**May**	**July**	**Oct**
Alkalinity	mg/L	30-500 OG [2]	96	**1040**	**1240**	390	**1150**	**780**	100	**1110**	**807**	95	**813**	**912**	**783**	**935**	**687**
Dissolved Organic Carbon	mg/L	5 AO [3]	**7.1**	**82.6**	**72.9**	**17.5**	**130.0**	**35.9**	**8.8**	**87.8**	**41**	**8.3**	**47.1**	**47**	**43.7**	**48.0**	**34.5**
Chloride	mg/L	250 AO	2.52	**423**	214	21.5	**297**	112	1.83	**269**	101	1.42	163	135	153	187	120
Sulphate	mg/L	500 OG	4.87	1.34	2.2	<0.50	11.70	<0.50	4.57	1.60	<1.0	6.78	0.86	1.8	<1.0	2.2	1.02
Fluoride	mg/L	1.5 MAC [4]	0.05	<0.25	<0.5	<0.25	<1.0	<0.25	<0.05	<0.5	<0.5	<0.05	<0.25	<0.5	<0.5	<0.5	<0.25
Hardness	mg/L	80-100 OG	**26**	**717**	**594**	**144**	**718**	**336**	**16**	**497**	**284**	**24.2**	**473**	**328**	**394**	**576**	**258**
Nitrate	mg/L	10 MAC	<0.05	<0.25	<0.5	<0.25	<1.0	<0.25	<0.05	<0.5	<0.5	<0.05	<0.25	<0.5	<0.5	<0.5	<0.25
Nitrite	mg/L	1 MAC	<0.05	<0.25	<0.5	<0.25	<1.0	<0.25	<0.05	<0.5	<0.5	0.07	<0.25	<0.5	<0.5	<0.5	<0.25
Organic Nitrogen	mg/L	0.15 OG	<0.10	**4.10**	**9.5**	**6.2**	**7.8**	**5.2**	**0.2**	**11.0**	**5.7**	**0.9**	**2.6**	**4**	**9.4**	**5.8**	**9.0**
Orthophosphate	mg/L		<0.10	<0.50	<1.0	<0.50	<2.0	<0.50	<0.10	<1.0	<1.0	<0.10	<0.50	<1.0	<1.0	<1.0	<0.50
Phenols	mg/L		<0.001	0.006	0.005	<0.001	0.009	0.002	<0.001	0.004	<0.001	<0.001	0.004	0.001	0.006	0.008	0.007
Ammonia	mg/L		15.9	71.0	86	39	83.4	75	15.2	92.0	81.4	10.8	36.1	105	76.6	40.4	90.0
BOD	mg/L		<5	12	8	7	16	13	6	22	14	9	8	10	9	9	14
Chemical Oxygen Demand (COD)	mg/L		14	245	93	45	257	101	21	217	124	18	105	99	97	136	129
Total Dissolved Solids	mg/L	500 AO	90	**1650**	**1480**	374	**1570**	**782**	68	**1300**	**806**	90	**1020**	**814**	**914**	**1080**	**792**
Total Kjeldahl Nitrogen (TKN)	mg/L		15.7	75.1	95.5	45.2	91.2	80.2	15.4	103.0	87.1	11.7	38.7	109	86.0	46.2	99.0
pH	pH Units	6.5-8.5 OG	7.42	7.81	7.61	7.55	7.69	7.89	7.74	7.45	7.14	7.64	7.6	7.79	6.71	6.82	7.64
Electrical Conductivity	uS/cm		233	3150	2970	858	2960	1910	212	2970	1940	217	1900	2120	2070	2200	1900
% Difference/ Ion Balance	%		5.5	2.2	0.3	0.5	3.9		5.21		0.545	1.46	4.91	0.684			
Elements																	
Aluminum	mg/L	0.1 OG	0.099	0.076	0.094	<0.004	**0.103**	0.073	**0.128**	0.058	0.057	**0.101**	0.059	0.081	0.065	0.058	0.087
Arsenic	mg/L	0.01 MAC	<0.003	0.007	0.008	<0.003	0.006	0.007	<0.003	0.005	0.007	<0.003	0.006	0.007	0.005	0.007	0.008
Barium	mg/L	1 MAC	0.016	0.436	0.454	0.081	0.437	0.199	0.012	0.284	0.164	0.01	0.152	0.235	0.20	0.129	0.186
Beryllium	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Boron	mg/L	5 IMAC	0.082	1.13	1.89	0.45	1.55	1.09	0.063	1.32	1.17	0.145	0.773	1.25	0.947	0.792	1.03
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Calcium	mg/L		6.22	158	126	29.5	175	77	3.97	135	67.2	5.5	108	68.3	92.8	125	63.2
Chromium	mg/L	0.05 MAC	0.005	0.019	<0.003	<0.003	0.015	0.017	0.008	0.005	0.015	0.004	0.005	0.013	0.010	0.023	0.019
Cobalt	mg/L		<0.001	0.026	0.009	0.004	0.017	0.006	<0.001	0.012	0.006	<0.001	0.01	0.006	0.005	0.009	0.005
Copper	mg/L	1 AO	<0.003	<0.003	<0.003	0.009	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Iron	mg/L	0.3 AO	**2.31**	**95.8**	**17.6**	<0.010	**59.7**	**17.8**	**1.1**	**65.3**	**23**	**1.01**	**49**	**15.2**	**27.9**	**48.3**	**14.1**
Lead	mg/L	0.01 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001
Magnesium	mg/L		2.61	78.2	67.9	17.2	68.3	35	1.48	38.9	28.3	2.53	49.3	29.2	39.4	64.0	24.4
Manganese	mg/L	0.05 AO	**0.111**	**5.16**	**3.23**	**1.05**	**4.30**	**1.65**	**0.121**	**4.46**	**1.77**	**0.13**	**4.36**	**2.25**	**2.39**	**3.27**	**1.71**
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Molybdenum	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Nickel	mg/L		<0.003	0.031	0.023	0.005	0.028	0.009	<0.003	0.017	0.01	<0.003	0.018	0.009	0.007	0.018	0.009
Phorphorus	mg/L		<0.05	0.10	0.13	<0.05	0.10	0.08	0.06	<0.05	0.06	<0.05	<0.05	<0.05	<0.05	0.06	0.07
Potassium	mg/L		15.1	65.0	76.2	39	77.7	60.7	11.3	69.0	58.1	9.62	35.3	60.5	59.3	33.7	51.6
Selenium	mg/L	0.05 MAC	<0.004	0.006	0.006	<0.004	<0.004	0.005	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Silicon	mg/L		5.5	7.08	10.5	3.92	8.53	9.41	5.33	7.54	7.64	5.94	10.2	6.61	8.6	12.4	9.91
Silver	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Sodium	mg/L	200 AO	6.73	**304**	**247**	42	**273**	126	5.51	**272**	143	12.1	138	124	136	178	110
Strontium	mg/L		0.023	0.855	0.707	0.162	0.850	0.355	0.016	0.507	0.282	0.026	0.444	0.358	0.417	0.483	0.324
Sulphur	mg/L		1.75	4.51	3.47	0.72	5.01	1.67	1.22	3.33	2.62	2.38	2.21	1.83	1.84	5.67	3.38
Thallium	mg/L		<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Tin	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Titanium	mg/L		0.006	0.008	0.009	<0.002	0.011	0.006	0.008	0.006	0.007	0.009	0.004	0.005	0.005	0.005	0.006
Uranium	mg/L	0.02 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Vanadium	mg/L		0.007	0.016	0.016	<0.002	0.021	0.014	0.004	0.010	0.013	0.007	0.007	0.015	0.011	0.011	0.013
Zinc	mg/L	5 AO	<0.005	0.006	0.007	<0.005	0.007	0.006	<0.005	<0.005	<0.005	<0.005	0.008	<0.005	<0.005	<0.005	<0.005

Notes:
(1) MECP Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

The City of Temiskaming Shores
2023 Annual Groundwater and Surface Water Monitoring Report
Haileybury Waste Disposal Site
Haileybury, Ontario
April 2024

Groundwater Geochemical Results
TW-13

Parameters	Units	ODWS [1]	2019			2020			2021			2022			2023		
General Chemistry			**May**	**July**	**Sep**	**June**	**Aug**	**Oct**	**June**	**Aug**	**Oct**	**May**	**Aug**	**Oct**	**June**	**Aug**	**Oct**
Alkalinity	mg/L	30-500 OG [2]	55	**1110**	**867**	108	**1280**	**878**	348	**599**	**643**	164	**898**	**974**	216	**944**	**1090**
Dissolved Organic Carbon	mg/L	5 AO [3]	**6.1**	**54.8**	**18.7**	**5.7**	**73**	**38.6**	**12.0**	**35.2**	**36.5**	**10.2**	**19**	**40.5**	**14**	**34.8**	**56.8**
Chloride	mg/L	250 AO	0.94	154	84.4	10.5	177	99.2	14.6	86.9	88.8	10	94	140	84	170	200
Sulphate	mg/L	500 OG	4.04	11.6	<2.0	4.52	2.6	0.79	0.63	<0.10	<0.10	5	9	8	5	< 2	< 2
Fluoride	mg/L	1.5 MAC [4]	<0.05	<1.0	<1.0	<0.05	<0.13	<0.05	<0.05	<0.05	<0.05	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
Hardness	mg/L	80-100 OG	**13.1**	**668**	**198**	**38.6**	**709**	**304**	**216**	**364**	**333**	**54.8**	**329**	**501**	**173**	**469**	**533**
Nitrate	mg/L	10 MAC	<0.05	<1.0	<1.0	0.15	<1.0	<0.25	<0.05	0.19	<0.05	0.61	1.43	< 0.06	< 0.06	0.13	< 0.06
Nitrite	mg/L	1 MAC	<0.05	<1.0	<1.0	0.27	<1.0	<0.25	<0.05	<0.05	<0.05	0.04	< 0.3	< 0.3	< 0.3	0.03	< 0.3
Organic Nitrogen	mg/L	0.15 OG	**0.88**	**9.1**	<0.10	**1.2**	**9.0**	**2.5**	**1.2**	**7.4**	**3.4**	**0.8**	**1.21**	**< 0.5**	**1.1**	**9.65**	**14.2**
Orthophosphate	mg/L		<0.10	<2.0	<2.0	<0.10	<2.0	<0.50	<0.10	<0.10	<0.10	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Phenols	mg/L		<0.001	0.016	0.012	0.001	0.010	0.003	0.008	0.002	0.049	< 0.002	0.003	0.011	0.003	0.005	0.007
Ammonia	mg/L		6.6	75.4	123	14.5	107	88	22.6	41.4	46.1	14.5	96.6	96.9	24.4	96.2	93.9
BOD	mg/L		<5	13	21	6	10	28	14	6	18	< 4	4	5	< 4	< 4	9
Chemical Oxygen Demand (COD)	mg/L		18	166	117	27	191	94	30	78	89	32	90	96	65	104	115
Total Dissolved Solids	mg/L	500 AO	54	**1250**	**734**	92	**1380**	**888**	262	**622**	**716**	151	**746**	**917**	346	**890**	**1060**
Total Kjeldahl Nitrogen (TKN)	mg/L		7.48	84.5	112	15.7	116	90.5	23.8	48.8	49.5	15.3	97.8	97	25.5	106	108
pH	pH Units	6.5-8.5 OG	6.70	7.14	7.70	7.65	7.11	7.62	7.25	7.06	7.11	8.15	7.87	7.55	7.00	7.64	7.39
Electrical Conductivity	uS/cm		133	2890	2300	313	2650	1610	691	1360	1470	344	2080	2190	657	2170	2310
% Difference/ Ion Balance	%			2.68			3.35	7.14			2.38						
Elements																	
Aluminum	mg/L	0.1 OG	0.087	0.043	0.082	0.044	0.069	0.087	0.075	0.084	0.079	0.086	0.058	0.061	0.076	0.048	0.044
Arsenic	mg/L	0.01 MAC	<0.003	0.006	0.005	0.008	0.008	0.008	0.007	0.004	0.005	0.0022	0.0033	0.0038	0.0059	**0.0107**	0.0079
Barium	mg/L	1 MAC	0.012	0.316	0.183	0.025	0.399	0.193	0.065	0.137	0.168	0.0216	0.216	0.270	0.0704	0.267	0.316
Beryllium	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.001	<0.001	<0.001	0.000026	0.000028	0.000038	0.000027	0.000029	0.000028
Bismuth	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	<0.002	<0.002	<0.002	0.0001	< 0.00001	< 0.00001	0.00002	< 0.00001	< 0.00001
Boron	mg/L	5 IMAC	0.033	1.90	1.58	0.097	2.32	1.04	0.118	0.42	0.674	0.135	1.18	1.65	0.114	1.33	1.58
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	<0.002	<0.002	<0.002	0.000005	0.000011	0.000003	0.000005	0.000004	0.000007
Calcium	mg/L		3.25	186	53.2	8.19	153	69.1	47.1	88.4	82.1	13.5	90.5	106	45.4	111	119
Chromium	mg/L	0.05 MAC	0.003	0.011	0.012	<0.003	0.009	0.008	0.022	0.007	0.008	0.00539	0.00617	0.00749	0.00323	0.00633	0.00637
Cobalt	mg/L		0.001	0.010	0.006	<0.001	0.010	0.005	0.002	0.006	0.007	0.000865	0.00496	0.00545	0.00305	0.00664	0.00583
Copper	mg/L	1 AO	0.004	<0.003	<0.003	<0.003	<0.003	<0.006	<0.003	<0.003	<0.003	0.0004	0.0005	0.0006	0.0064	0.0009	0.002
Iron	mg/L	0.3 AO	**0.551**	**14.1**	**3.41**	**0.804**	**21.5**	**12.0**	**13.7**	**33.1**	**35.0**	**3.8**	**14.2**	**18.0**	**13.8**	**24.6**	**15.9**
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.001	<0.001	<0.001	<0.002	<0.001	<0.001	<0.001	< 0.00009	0.00015	< 0.00009	0.0002	< 0.00009	< 0.00009
Magnesium	mg/L		1.21	49.4	15.9	4.4	79.5	32	23.8	34.9	31.2	5.12	25.1	57.3	14.4	46.9	57
Manganese	mg/L	0.05 AO	**0.087**	**2.63**	**0.704**	**0.159**	**3.2**	**1.75**	**0.837**	**2.5**	**3.08**	**0.389**	**1.41**	**2.37**	**1.53**	**3.28**	**2.16**
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Molybdenum	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	<0.002	<0.002	<0.002	0.00007	0.00032	0.00021	0.00017	0.00033	0.00025
Nickel	mg/L		<0.003	0.024	0.014	<0.003	0.016	0.010	0.004	0.008	0.006	0.0015	0.0078	0.0088	0.0049	0.01	0.0101
Phorphorus	mg/L		<0.05	0.05	<0.05	<0.050	0.06	<0.100	<0.050	<0.050	<0.050	0.026	0.034	0.059	0.015	0.05	0.062
Potassium	mg/L		6.59	57.9	82.8	13.9	85.3	53.7	21.9	32.5	34.8	10.3	51.2	63.8	19	57.8	71.5
Selenium	mg/L	0.05 MAC	<0.004	0.005	0.004	0.029	<0.004	<0.008	0.004	<0.004	<0.004	0.00008	0.00018	0.00018	0.00016	0.00093	0.00026
Silicon	mg/L		3.77	5.95	5.05	5.09	7.76	7.05	7.99	9.79	8.48	6.25	4.74	7.91	7.38	6.12	6.22
Silver	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	<0.002	<0.002	<0.002	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Sodium	mg/L	200 AO	5.07	185	128	8.27	**202**	90.2	13.8	72.8	87.5	19.9	108	135	11	131	152
Strontium	mg/L		0.015	0.72	0.201	0.036	0.729	0.352	0.179	0.407	0.379	0.052	0.345	0.481	0.193	0.457	0.51
Sulphur	mg/L		8.32	5.40	2.41	1.62	6.94	1.18	1.36	3.13		< 1	3	6	< 3	< 3	< 3
Thallium	mg/L		<0.006	<0.006	<0.006	<0.006	<0.006	<0.012	<0.006	<0.006	<0.006	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
Tin	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.004	<0.002	<0.002	<0.002	0.00014	0.00024	0.00027	0.00043	0.00029	0.00027
Titanium	mg/L		0.004	0.005	0.007	0.002	0.008	0.004	<0.002	0.005	0.004	0.00499	0.00448	0.00475	0.00539	0.00355	0.0039
Uranium	mg/L	0.02 MAC	<0.002	0.002	<0.002	<0.002	<0.002	<0.004	<0.002	<0.002	<0.002	0.000073	0.000316	0.000259	0.00012	0.00179	0.00122
Vanadium	mg/L		0.002	0.010	0.014	0.004	0.013	0.01	0.005	0.011	0.009	0.0084	0.00941	0.0120	0.00451	0.00918	0.0096
Zinc	mg/L	5 AO	<0.005	<0.005	<0.005	<0.005	0.005	<0.010	<0.005	<0.005	<0.005	< 0.002	< 0.002	0.003	< 0.002	0.002	0.003

Notes:
(1) MECP Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within O
(6) ODWS exceedances indicated by **bold** entries.

Groundwater Geochemical Results
TW-14

Parameters	Units	ODWS [1]	2014	2015	2016	2017	2018	2019	2020	2021			2022			2023		
General Chemistry			June	May	May	May	May	May	June	June	Aug	Oct	May	Aug	Oct	June	Aug	Oct
Alkalinity	mg/L	30-500 OG [2]	**29**	34	39	36	35	**28**	38	35	35	52	33	33	33	31	33	30
Dissolved Organic Carbon	mg/L	5 AO [3]	0.9	1.1	0.8	0.9	1.6	1.0	0.7	1.8	1.9	1.8	1.1	1	**5.6**	1	< 1.0	< 1.0
Chloride	mg/L	250 AO	4.26	2.22	4.1	4.21	3.63	4.18	8.18	10.9	6.88	6.92	9	5	8	7	5	9
Sulphate	mg/L	500 OG	3.83	3.15	4.5	3.81	3.77	3.52	3.59	2.9	2.71	2.61	3	3	2	3	3	2
Fluoride	mg/L	1.5 MAC [4]	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	0.06
Hardness	mg/L	80-100 OG	**32.0**	**30.6**	**35.6**	**31.8**	**33.3**	**30.0**	**38.7**	**36.8**	**37.5**	**36.6**	**34.4**	**35**	**34.7**	**34.9**	**33.1**	**35.9**
Nitrate	mg/L	10 MAC	1.22	1.04	1.62	1.4	1.58	1.15	1.37	1.1	1.11	1.08	1.03	1.16	1.07	1.24	1.26	1.24
Nitrite	mg/L	1 MAC	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Organic Nitrogen	mg/L	0.15 OG	**0.28**	<0.10	**0.22**	0.13	**0.45**	<0.10	**0.17**	**0.33**	<0.10	<0.10	**< 0.5**	**0.16**	**< 0.5**	**< 0.5**	< 0.05	0.07
Orthophosphate	mg/L		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Phenols	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Ammonia	mg/L		0.09	<0.02	<0.02	<0.02	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04	< 0.04
BOD	mg/L		<5	<5	<5	<5	<5	<5	<5	<2.00	<2.00	<2.00	< 4	< 4	< 4	< 4	< 4	< 4
Chemical Oxygen Demand (COD	mg/L		<5	<5	<5	<5	<5	7	<5	<5	<5	<5	< 8	< 8	< 8	< 8	< 8	< 8
Total Dissolved Solids	mg/L	500 AO	52	54	70	54	86	30	60	65	72	104	40	66	69	71	66	89
Total Kjeldahl Nitrogen (TKN)	mg/L		0.37	<0.10	0.22	0.13	0.47	<0.10	0.17	0.33	<0.10	<0.10	< 0.05	0.16	0.24	< 0.05	< 0.05	0.07
pH	pH Units	6.5-8.5 OG	7.07	7.29	7.18	7.31	6.94	6.96	7.30	6.68	7.12	7.21	7.51	7.69	7.24	7.47	7.26	7.2
Electrical Conductivity	uS/cm		98	88	102	98	99	88	132	115	107	111	95	98	94	94	97	94
% Difference/ Ion Balance	%		4.6	1.0	6.9	8.02						17.4						
Elements																		
Aluminum	mg/L	0.1 OG	<0.004	<0.004	0.005	0.011	<0.004	0.010	0.012	0.018	0.016	0.014	0.003	0.016	0.001	0.002	0.002	0.003
Arsenic	mg/L	0.01 MAC	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.006	<0.003	<0.003	< 0.0002	0.0003	< 0.0002	< 0.0002	0.0002	< 0.0002
Barium	mg/L	1 MAC	0.003	0.003	0.003	0.005	0.003	0.003	0.002	0.002	0.002	0.002	0.00205	0.00212	0.00186	0.00197	0.00179	0.0018
Beryllium	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.000007	0.000011	< 0.000007	< 0.000007	< 0.000007	< 0.000007
Bismuth	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Boron	mg/L	5 IMAC	<0.010	0.011	0.011	0.016	0.031	<0.010	0.019	0.015	0.018	0.023	0.022	0.045	0.009	0.017	0.009	0.011
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	< 0.000003	0.000005	< 0.000003	< 0.000003	0.000007	< 0.000003
Calcium	mg/L		8.64	8.22	9.5	8.28	8.76	8.12	10.3	9.77	9.91	9.58	9.08	9.67	9.19	9.32	8.9	9.24
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.00184	0.00188	0.00186	0.00148	0.00159	0.00123
Cobalt	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.000075	0.000061	0.000167	0.00004	0.000027	0.000039
Copper	mg/L	1 AO	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.0009	0.0006	0.0003	0.0012	0.0008	0.0019
Iron	mg/L	0.3 AO	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	<0.010	<0.010	0.008	0.037	< 0.007	< 0.007	< 0.007	0.01
Lead	mg/L	0.01 MAC	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.00009	< 0.00009	< 0.00009	< 0.00009	< 0.00009	< 0.00009
Magnesium	mg/L		2.56	2.45	2.88	2.71	2.78	2.36	3.16	3.02	3.1	3.09	2.84	2.63	2.86	2.82	2.65	3.11
Manganese	mg/L	0.05 AO	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.00042	0.00115	0.00019	0.00064	0.00018	0.00085
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Molybdenum	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.00009	0.00038	0.00008	0.00007	0.00012	0.00008
Nickel	mg/L		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.0002	0.0001	< 0.0001	0.0002	0.0001	0.0004
Phorphorus	mg/L		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.097	0.077	<0.050	<0.050	0.004	< 0.003	0.006	< 0.003	0.006	0.007
Potassium	mg/L		0.42	0.44	0.55	0.44	0.48	0.40	0.46	<0.50	0.52	<0.50	0.379	0.382	0.389	0.415	0.354	0.357
Selenium	mg/L	0.05 MAC	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.007	<0.004	<0.004	<0.004	0.00005	0.00008	< 0.00004	0.00005	0.00004	0.00004
Silicon	mg/L		5.19	5.63	5.41	6.09	5.93	4.54	5.12	5.59	6.38	5.66	5.14	4.64	6.74	5.93	5.64	5.89
Silver	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Sodium	mg/L	200 AO	6.71	5.58	5.45	5.05	5.0	4.49	6.52	6.09	5.82	5.28	4.89	4.99	5.11	4.32	4.05	4.51
Strontium	mg/L		0.018	0.019	0.021	0.023	0.021	0.019	0.029	0.018	0.026	0.027	0.0247	0.026	0.0256	0.0231	0.0219	0.0232
Sulphur	mg/L		1.15	1.3	0.97	1.32	1.3	1.3	1.34	1.12	2.23		< 1	1	2	< 3	< 3	< 3
Thallium	mg/L		<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
Tin	mg/L		<0.002	<0.002	<0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	< 0.00006	< 0.00006	< 0.00006	< 0.00006	0.00006	< 0.00006
Titanium	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.00018	0.00088	0.0001	0.00012	0.00018	0.00021
Uranium	mg/L	0.02 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.000009	0.00007	0.000008	0.000011	0.000007	0.00001
Vanadium	mg/L		<0.002	<0.002	<0.010	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.00067	0.00074	0.00069	0.00063	0.0007	0.0006
Zinc	mg/L	5 AO	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002

Notes:
(1) MECP Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

Groundwater Geochemical Results
TW-15

Parameters	Units	ODWS [1]	2014			2015			2016			2017			2018		
General Chemistry			**June**	**July**	**Sep**	**May**	**July**	**Sep**	**May**	**July**	**Sep**	**May**	**July**	**Sep**	**May**	**July**	**Oct**
Alkalinity	mg/L	30-500 OG [2]	360	367	355	**525**	**562**	335	303	426	**580**	361	273	287	319	364	254
Dissolved Organic Carbon	mg/L	5 AO [3]	**5.2**	**6.2**	**8.1**	**12.7**	**12.0**	**5.8**	**5.7**	**15.6**	**12.2**	**6**	**5.6**	**9.2**	**5.1**	**6.6**	4.5
Chloride	mg/L	250 AO	40.6	52.7	54.1	91	106	41.6	59	80	106	48.7	11.3	28.2	41.2	35.4	23.4
Sulphate	mg/L	500 OG	80.3	171	163	115	92	42.4	148	159	78.1	79.2	20.1	59.1	70.8	100	76.5
Fluoride	mg/L	1.5 MAC [4]	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.10	<0.10	<0.25	<0.25	<0.25
Hardness	mg/L	80-100 OG	**405**	**430**	**454**	**549**	**520**	**356**	**417**	**543**	**670**	**395**	**236**	**241**	**490**	**415**	**262**
Nitrate	mg/L	10 MAC	6.42	2.67	**17.3**	4.91	6.20	7.5	**29.7**	**19.40**	**20.6**	**19.2**	4.34	5.91	**41.5**	**11.0**	7.23
Nitrite	mg/L	1 MAC	**1.06**	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.10	<0.10	<0.25	<0.25	<0.25
Organic Nitrogen	mg/L	0.15 OG	**0.89**	**0.33**	**0.47**	**0.78**	**1.50**	**1.13**	**1.69**	**1.98**	**1.56**	**1**	**0.62**	**0.3**	**0.7**	**0.27**	**0.28**
Orthophosphate	mg/L		<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.50	<0.20	<0.20	<0.50	<0.50	<0.50
Phenols	mg/L		<0.001	<0.001	0.007	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001
Ammonia	mg/L		2.94	3.99	7.1	3.98	5.60	4.57	4.01	4.15	5.64	0.73	2.72	16	1.7	3.56	4.89
BOD	mg/L		9	7	<5	22	<5	10	14	<5	6	<5	<5	<5	<5	6	11
Chemical Oxygen Demand (COD)	mg/L		9	21	18	26	31	<5	28	36	35	9	17	16	<5	15	<5
Total Dissolved Solids	mg/L	500 AO	**636**	**672**	**962**	**804**	**916**	**514**	**654**	**800**	**884**	**648**	430	422	**830**	**566**	392
Total Kjeldahl Nitrogen (TKN)	mg/L		3.83	4.32	7.57	4.76	7.10	5.7	5.7	6.13	7.2	1.73	3.34	16.3	2.4	3.83	5.17
pH	pH Units	6.5-8.5 OG	7.49	7.91	7.61	7.64	7.63	7.83	7.95	7.56	7.43	7.86	7.76	7.68	7.23	7.56	7.62
Electrical Conductivity	uS/cm		1050	1200	1300	1460	1560	931	1130	1450	1710	1040	593	783	1130	1060	805
% Difference/ Ion Balance	%		1.3	4.2	3.3	4.6	1.5		4.3		0.295	4.74	1.44	0.0746			
Elements																	
Aluminum	mg/L	0.1 OG	<0.004	<0.004	<0.004	0.007	<0.004	<0.004	0.007	0.007	<0.004	<0.004	<0.004	0.006	<0.004	<0.004	0.005
Arsenic	mg/L	0.01 MAC	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Barium	mg/L	1 MAC	0.099	0.126	0.217	0.195	0.188	0.175	0.091	0.096	0.161	0.084	0.091	0.091	0.09	0.096	0.064
Beryllium	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Boron	mg/L	5 IMAC	0.53	1.02	1.16	1.04	1.19	0.939	0.962	0.92	1.21	0.939	0.972	0.519	0.828	1.2	0.607
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Calcium	mg/L		114	115	125	150	138	102	111	159	199	116	68.1	67.7	144	112	73.3
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.003	<0.003	<0.003	0.005	0.007	0.004	0.01	<0.003	0.019	<0.003	<0.003	0.006	<0.003
Cobalt	mg/L		0.003	0.005	0.005	0.01	0.010	0.006	0.003	0.002	0.007	0.003	0.004	0.002	0.001	0.007	<0.001
Copper	mg/L	1 AO	0.01	0.014	0.014	0.022	0.026	0.017	0.01	0.012	0.023	0.012	0.014	0.009	0.009	0.013	0.006
Iron	mg/L	0.3 AO	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.187	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead	mg/L	0.01 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001
Magnesium	mg/L		29.2	34.7	34.5	42.3	42.6	24.6	34	35.4	42	25.5	16	15.7	31.7	32.8	19.1
Manganese	mg/L	0.05 AO	**1.76**	**2.41**	**2.75**	**2.54**	**2.29**	**2.1**	**1.3**	**0.95**	**1.89**	**0.851**	**1.03**	**0.471**	**0.269**	**1.37**	**0.248**
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Molybdenum	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Nickel	mg/L		0.006	0.011	0.012	0.013	0.014	0.009	0.006	0.005	0.011	0.005	0.008	0.004	<0.003	0.009	0.003
Phorphorus	mg/L		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Potassium	mg/L		14.1	16.0	18.2	24.4	28.9	16.1	18.3	18.7	21.1	8.46	5.57	14.3	9.23	14.6	11.5
Selenium	mg/L	0.05 MAC	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Silicon	mg/L		7.86	7.69	10.4	9.23	8.67	9.41	7.53	8.75	9.03	8.51	7.85	6.04	8.07	10.1	7.52
Silver	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Sodium	mg/L	200 AO	37.0	52.4	54.1	58.4	105	33.1	63.7	76	74.7	55.3	29.2	39.1	30	49.4	39.9
Strontium	mg/L		0.229	0.283	0.366	0.4	0.351	0.295	0.202	0.252	0.367	0.258	0.212	0.168	0.289	0.285	0.165
Sulphur	mg/L		19.7	54.4	56.2	31.4	21.8	19.1	24	46.5	27.5	25.3	19.5	16.7	24.6	37	26
Thallium	mg/L		<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Tin	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Titanium	mg/L		<0.002	0.002	0.004	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Uranium	mg/L	0.02 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Vanadium	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.010	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Zinc	mg/L	5 AO	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.005	<0.005	<0.005	<0.005	0.005	<0.005	<0.005	<0.005	<0.005

Notes:
(1) MECP Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

Groundwater Geochemical Results
TW-15

Parameters	Units	ODWS [1]	2019			2020			2021			2022			2023		
General Chemistry			**May**	**July**	**Sep**	**June**	**Aug**	**Oct**	**June**	**Aug**	**Oct**	**May**	**Aug**	**Oct**	**June**	**Aug**	**Oct**
Alkalinity	mg/L	30-500 OG [2]	244	296	400	340	314	412	363	281	256	258	209	245	326	288	250
Dissolved Organic Carbon	mg/L	5 AO [3]	4.2	4.1	**6.1**	2.7	2.4	**5.1**	**8.4**	**5.1**	3.0	3.5	2	4.5	4.3	**5.6**	5.0
Chloride	mg/L	250 AO	26.9	32.5	37.0	34.2	23.7	51.7	48.4	36.7	30.1	40	13	36	38	43	72
Sulphate	mg/L	500 OG	61.4	93.5	82.0	35.3	59.7	107	131	69	47	110	39	100	62	60	110
Fluoride	mg/L	1.5 MAC [4]	<0.10	<0.25	<0.25	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.06	< 0.06	0.09	< 0.06	< 0.06	< 0.06
Hardness	mg/L	80-100 OG	**257**	**352**	**418**	**382**	**263**	**343**	**480**	**331**	**220**	**283**	**244**	**359**	**361**	**317**	**373**
Nitrate	mg/L	10 MAC	8.88	5.96	4.42	**15.1**	**10.8**	6.88	**20.9**	**11.2**	6.6	**15.3**	7.87	**11.7**	9.79	6.13	7.98
Nitrite	mg/L	1 MAC	0.22	<0.25	<0.25	0.47	<0.10	<0.25	<0.05	<0.05	<0.05	0.05	0.06	0.53	0.06	0.05	< 0.03
Organic Nitrogen	mg/L	0.15 OG	**0.87**	**0.97**	**1.3**	**0.71**	**0.27**	**0.91**	**1.6**	**1.26**	**0.77**	**< 0.5**	< 0.05	**0.60**	**< 0.5**	**0.22**	**1.05**
Orthophosphate	mg/L		<0.20	<0.50	<0.50	<0.50	<0.20	<0.50	<0.10	<0.10	<0.10	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Phenols	mg/L		<0.001	<0.001	0.001	<0.001	<0.001	0.004	0.007	0.003	0.033	< 0.002	< 0.002	0.002	< 0.002	< 0.002	< 0.002
Ammonia	mg/L		3.79	1.67	1.27	0.54	0.8	2.84	1.53	2.56	1.75	2.78	0.6	1.19	0.39	0.42	0.92
BOD	mg/L		7	<5	<5	<5	13	4	3	7	5	< 4	< 4	< 4	< 4	< 4	< 4
Chemical Oxygen Demand (COD	mg/L		7	9	8	13	<5	10	16	<5	<5	21	< 8	10	13	16	21
Total Dissolved Solids	mg/L	500 AO	412	**568**	**612**	**506**	490	**504**	**848**	**534**	462	489	323	500	**586**	494	500
Total Kjeldahl Nitrogen (TKN)	mg/L		4.66	2.64	2.57	1.25	1.07	3.75	3.13	3.82	2.52	3.23	0.33	1.74	0.82	0.64	1.97
pH	pH Units	6.5-8.5 OG	7.73	7.56	7.52	8.05	7.41	7.48	7.55	7.70	7.69	8.17	8.18	7.96	7.83	8	7.7
Electrical Conductivity	uS/cm		720	969	1160	980	793	933	1170	817	710	782	576	805	946	781	669
% Difference/ Ion Balance	%			0.14			18.1	18.3			12.4						
Elements																	
Aluminum	mg/L	0.1 OG	<0.004	<0.004	<0.004	0.009	0.018	0.014	0.009	<0.004	0.010	0.002	0.002	0.003	0.001	0.001	0.016
Arsenic	mg/L	0.01 MAC	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.009	<0.003	<0.003	0.0003	0.0005	0.0003	0.0003	0.0004	0.0003
Barium	mg/L	1 MAC	0.126	0.094	0.108	0.099	0.051	0.115	0.143	0.099	0.067	0.0911	0.0596	0.0926	0.0956	0.0822	0.0993
Beryllium	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.000007	0.000009	< 0.000007	< 0.000007	< 0.000007	< 0.000007
Bismuth	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Boron	mg/L	5 IMAC	0.929	1.04	1.02	0.436	0.315	0.485	1.088	0.767	0.498	0.502	0.448	0.955	0.889	0.688	0.415
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.000031	0.000022	0.00004	0.00004	0.000036	0.000032
Calcium	mg/L		76.4	105	122	109	76.6	99.3	134	92.4	61.1	82.2	73.4	102	103	90.1	108
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.00114	0.00167	0.00128	0.00086	0.00087	0.00073
Cobalt	mg/L		0.003	0.001	0.002	0.001	<0.001	0.002	0.005	0.002	0.001	0.00337	0.00175	0.00441	0.00596	0.00284	0.00366
Copper	mg/L	1 AO	0.011	0.008	0.012	0.007	0.004	0.009	0.010	0.007	0.005	0.0083	0.0048	0.0086	0.0177	0.011	0.0103
Iron	mg/L	0.3 AO	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.016	<0.010	<0.010	0.009	< 0.007	0.035	< 0.007	< 0.007	0.037
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.00009	0.00013	< 0.00009	< 0.00009	< 0.00009	< 0.00009
Magnesium	mg/L		16.2	21.8	27.5	26.7	17.5	23.0	35.3	24.4	16.3	18.9	14.7	25.4	25.4	22.3	25.1
Manganese	mg/L	0.05 AO	**0.818**	**0.601**	**0.76**	**0.583**	**0.271**	**0.93**	**1.05**	**0.432**	**0.212**	**0.599**	**0.260**	**0.811**	**0.759**	**0.532**	**0.662**
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Molybdenum	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.00017	0.0006	0.00014	0.00012	0.0001	0.00009
Nickel	mg/L		0.005	0.006	0.006	0.005	<0.003	0.005	0.009	0.004	<0.003	0.0040	0.0021	0.0048	0.0071	0.0049	0.0053
Phorphorus	mg/L		<0.05	<0.05	<0.05	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.005	< 0.003	0.007	0.003	0.006	0.008
Potassium	mg/L		12.3	14.1	17.1	13.9	8.23	19.8	17.8	15.2	10.8	14.7	8.73	13.7	14.4	11	14.6
Selenium	mg/L	0.05 MAC	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.0001	0.0001	0.00009	0.00011	0.00007	0.0001
Silicon	mg/L		5.85	7.36	7.17	6.7	8.1	7.05	9.15	7.75	7.26	6.11	5.44	8.19	7.34	6.63	6.67
Silver	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Sodium	mg/L	200 AO	33.7	39.5	48.7	27.1	15.6	23.2	43.3	35.7	22.6	24.4	22.3	34.7	53.2	40.2	31.5
Strontium	mg/L		0.205	0.208	0.256	0.267	0.177	0.284	0.258	0.207	0.156	0.214	0.152	0.279	0.291	0.234	0.296
Sulphur	mg/L		29.8	30.2	28.6	12	8.9	20.7	39	25.8		19	12	35	24	18	27
Thallium	mg/L		<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
Tin	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	< 0.00006	0.00007	0.00008	0.00008	0.00026	< 0.00006
Titanium	mg/L		<0.002	<0.002	<0.002	0.004	<0.002	0.002	<0.002	<0.002	<0.002	0.00006	0.00008	0.0001	< 0.00007	0.00011	0.00094
Uranium	mg/L	0.02 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.000465	0.000531	0.000652	0.000593	0.000545	0.000607
Vanadium	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.00060	0.00061	0.00048	0.00037	0.00056	0.00051
Zinc	mg/L	5 AO	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.003	< 0.002	0.003	< 0.002	< 0.002	< 0.002

Notes:
(1) MECP Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within O
(6) ODWS exceedances indicated by **bold** entries.

Groundwater Geochemical Results
TW-16

Parameters	Units	ODWS [1]	2014			2015			2016			2017			2018		
General Chemistry			**June**	**July**	**Sep**	**May**	**July**	**Sep**	**May**	**July**	**Sep**	**May**	**July**	**Sep**	**May**	**July**	**Oct**
Alkalinity	mg/L	30-500 OG [2]	90	55	59	42	34	46	112	73	38	100	70	115	133	108	136
Dissolved Organic Carbon	mg/L	5 AO [3]	1.9	0.8	0.8	1.6	1.4	0.6	1	1.4	0.9	1.2	1.4	1.4	1.1	1.6	1.3
Chloride	mg/L	250 AO	8.68	0.42	0.45	0.76	0.76	0.55	9.22	1.14	0.36	5.53	0.74	0.89	1.7	0.63	0.81
Sulphate	mg/L	500 OG	5.94	3.59	4.13	2.14	2.22	3.55	6.96	6.85	3.59	5.4	2.94	4.18	5.53	3.55	4.8
Fluoride	mg/L	1.5 MAC [4]	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Hardness	mg/L	80-100 OG	**114**	**53**	**46**	**39.8**	**23.9**	**43.5**	**115**	**65.2**	**29.8**	93.7	**51.6**	**105**	**114**	99.8	**144**
Nitrate	mg/L	10 MAC	0.15	<0.05	<0.05	0.14	0.08	<0.05	0.41	0.2	<0.05	0.38	0.07	0.08	0.16	<0.05	0.09
Nitrite	mg/L	1 MAC	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Organic Nitrogen	mg/L	0.15 OG	**0.24**	<0.10	<0.10	<0.10	**0.19**	0.14	**0.24**	0.13	<0.10	0.11	<0.10	**0.17**	<0.10	<0.10	<0.10
Orthophosphate	mg/L		<0.10	<0.10	<0.10	0.17	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Phenols	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Ammonia	mg/L		0.08	0.02	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.05	0.04	<0.02	<0.02	<0.02
BOD	mg/L		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Chemical Oxygen Demand (COD)	mg/L		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Total Dissolved Solids	mg/L	500 AO	126	76	90	72	54	58	134	100	58	104	78	122	154	112	136
Total Kjeldahl Nitrogen (TKN)	mg/L		0.32	<0.10	<0.10	<0.10	0.19	0.14	0.24	0.13	<0.10	0.11	<0.10	0.21	<0.10	<0.10	<0.10
pH	pH Units	6.5-8.5 OG	7.85	7.45	7.92	7.54	6.88	7.35	7.71	7.22	7.32	7.67	7.38	7.69	7.83	7.98	7.66
Electrical Conductivity	uS/cm		232	128	143	86	74	100	248	162	86	216	140	222	234	205	296
% Difference/ Ion Balance	%		5	1.6	8.3	1.5	6.1		3.24		5.52	5.96	10.5	4.39			
Elements																	
Aluminum	mg/L	0.1 OG	0.005	0.011	0.009	0.006	0.010	<0.004	0.008	0.014	<0.004	0.004	<0.004	0.005	<0.004	<0.004	0.004
Arsenic	mg/L	0.01 MAC	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Barium	mg/L	1 MAC	0.008	0.003	0.004	<0.002	0.002	0.003	0.006	0.004	0.003	0.005	0.002	0.004	0.005	0.005	0.010
Beryllium	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Bismuth	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Boron	mg/L	5 IMAC	0.017	<0.010	0.016	0.011	0.012	0.012	0.018	0.023	0.023	0.031	0.024	0.021	0.030	0.023	0.016
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Calcium	mg/L		34.8	14.1	11.5	10.1	6.0	11.2	37	19.3	7.64	30.2	14.7	31.4	36.7	30.5	46.6
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.003	<0.003	<0.003	<0.003	0.004	<0.003	<0.003	0.003	<0.003
Cobalt	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	mg/L	1 AO	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Iron	mg/L	0.3 AO	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Lead	mg/L	0.01 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001
Magnesium	mg/L		6.64	4.40	4.19	3.55	2.18	3.76	5.42	4.14	2.61	4.43	3.61	5.27	5.42	5.75	6.63
Manganese	mg/L	0.05 AO	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Molybdenum	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Nickel	mg/L		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Phorphorus	mg/L		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Potassium	mg/L		0.49	0.37	0.49	0.32	0.39	0.38	0.61	0.46	0.31	0.43	0.38	0.43	0.48	0.50	0.55
Selenium	mg/L	0.05 MAC	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Silicon	mg/L		5.03	4.84	6.97	4.22	5.47	4.66	4.94	6.39	5.21	5.37	5.47	4.24	5.96	6.33	5.96
Silver	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Sodium	mg/L	200 AO	2.41	3.42	3.45	1.95	4.11	2.25	4.52	3.05	3.51	3.52	3.68	2.55	2.06	2.73	2.31
Strontium	mg/L		0.044	0.033	0.036	0.023	0.017	0.028	0.04	0.030	0.024	0.037	0.03	0.041	0.038	0.05	0.054
Sulphur	mg/L		1.74	1.37	1.52	0.83	0.68	1.16	0.91	1.86	1.41	1.98	1.13	1.35	2.02	1.97	2.74
Thallium	mg/L		<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
Tin	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Titanium	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Uranium	mg/L	0.02 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Vanadium	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	<0.002	<0.002	0.003	<0.002	0.002
Zinc	mg/L	5 AO	<0.005	<0.005	<0.005	<0.005	0.007	0.006	<0.005	<0.005	<0.005	<0.005	0.005	<0.005	<0.005	<0.005	<0.005

Notes:
(1) MECP Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

The City of Temiskaming Shores
2023 Annual Groundwater and Surface Water Monitoring Report
Haileybury Waste Disposal Site
Haileybury, Ontario
April 2024

Groundwater Geochemical Results
TW-16

Parameters	Units	ODWS [1]	2019			2020			2021			2022			2023		
General Chemistry			May	July	Sep	June	Aug	Oct	June	Aug	Oct	May	Aug	Oct	June	Aug	Oct
Alkalinity	mg/L	30-500 OG [2]	106	65	33	87	81	53	110	121	140	116	142	130	81	103	123
Dissolved Organic Carbon	mg/L	5 AO [3]	1.4	1.6	1.2	1.3	1.1	1.0	2.7	1.4	1.6	1.4	< 1	1.4	1.1	1.1	1.2
Chloride	mg/L	250 AO	9.35	4.28	0.41	10.2	1.06	0.26	1.23	1.66	0.31	16	< 1	6	8	5	26
Sulphate	mg/L	500 OG	5.35	5.28	3.01	4.23	2.71	2.38	3.7	3.68	2.71	7	3	4	3	4	7
Fluoride	mg/L	1.5 MAC [4]	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
Hardness	mg/L	80-100 OG	**118**	**69.6**	**28.6**	93.1	**56.1**	**27.1**	**103**	**105**	**136**	**124**	**155**	**154**	85	**103**	**160**
Nitrate	mg/L	10 MAC	0.07	0.21	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.23	< 0.06	0.06	< 0.06	< 0.06	< 0.06
Nitrite	mg/L	1 MAC	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Organic Nitrogen	mg/L	0.15 OG	<0.10	<0.10	<0.10	**0.17**	0.11	0.14	<0.10	0.14	<0.10	**< 0.5**	< 0.05	**< 0.5**	**< 0.5**	0.07	< 0.05
Orthophosphate	mg/L		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Phenols	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.004	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Ammonia	mg/L		<0.02	0.03	<0.02	<0.02	0.06	<0.02	<0.02	<0.02	<0.02	< 0.04	< 0.04	< 0.04	0.06	< 0.04	< 0.04
BOD	mg/L		<5	<5	<5	<5	<2	<2	<2.00	<2.00	<2.00	< 4	< 4	< 4	< 4	< 4	< 4
Chemical Oxygen Demand (COD)	mg/L		<5	<5	<5	9	<5	<5	<5	<5	<5	< 8	< 8	< 8	< 8	< 8	< 8
Total Dissolved Solids	mg/L	500 AO	124	86	50	108	80	40	106	150	180	134	157	160	111	146	223
Total Kjeldahl Nitrogen (TKN)	mg/L		<0.10	0.11	<0.10	0.17	0.17	0.14	<0.10	0.14	<0.10	< 0.05	< 0.05	0.2	< 0.05	0.09	< 0.05
pH	pH Units	6.5-8.5 OG	7.51	7.56	6.73	7.42	7.64	6.65	7.58	7.86	7.88	8.07	8.19	7.94	7.92	8.02	7.27
Electrical Conductivity	uS/cm		240	174	82	230	156	74	211	234	269	261	282	280	187	221	256
% Difference/ Ion Balance	%			0.306			14.7	21.6			1.22						
Elements																	
Aluminum	mg/L	0.1 OG	<0.004	0.004	0.018	0.031	0.016	0.023	0.036	0.009	0.020	0.003	0.002	0.003	0.001	0.001	0.001
Arsenic	mg/L	0.01 MAC	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.007	<0.003	<0.003	0.0013	0.0014	0.0008	0.0006	0.0006	0.0005
Barium	mg/L	1 MAC	0.009	0.003	0.002	0.006	0.003	0.003	0.004	0.005	0.007	0.00932	0.00995	0.0101	0.00708	0.00777	0.0111
Beryllium	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007	< 0.000007
Bismuth	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Boron	mg/L	5 IMAC	0.011	0.015	0.013	0.012	<0.010	0.020	0.019	0.011	0.038	0.014	0.008	0.012	0.006	0.008	0.017
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	< 0.000003	0.00001	0.000006	< 0.000003	0.000003	0.000003
Calcium	mg/L		36.8	21.0	7.12	28.7	15.4	6.99	32.2	32.4	43	40.3	51	50.4	26.8	32.9	52.2
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.00085	0.00185	0.00152	0.00118	0.00123	0.00085
Cobalt	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.000051	0.000026	0.00037	0.000028	0.000026	0.000034
Copper	mg/L	1 AO	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.0023	0.0005	0.0014	0.003	0.0009	0.0011
Iron	mg/L	0.3 AO	<0.010	<0.010	<0.010	0.035	<0.010	0.010	<0.010	<0.010	<0.010	0.017	< 0.007	< 0.007	< 0.007	< 0.007	0.008
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.00009	< 0.00009	< 0.00009	< 0.00009	< 0.00009	< 0.00009
Magnesium	mg/L		6.36	4.16	2.63	5.21	4.29	2.34	5.48	5.84	7.01	5.74	6.69	6.75	4.42	5.01	7.16
Manganese	mg/L	0.05 AO	<0.002	<0.002	<0.002	<0.002	<0.002	0.011	<0.002	<0.002	<0.002	0.00032	0.00017	0.00109	0.00011	0.00011	0.00115
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Molybdenum	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.00012	0.00197	0.00011	0.00006	0.00007	0.00009
Nickel	mg/L		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.0002	0.0001	0.0002	0.0002	0.0002	0.0002
Phorphorus	mg/L		<0.05	<0.05	<0.05	0.081	<0.050	<0.050	0.234	<0.050	<0.050	0.016	0.014	0.022	0.01	0.015	0.013
Potassium	mg/L		0.59	0.46	0.54	0.43	0.34	0.31	<0.50	<0.50	<0.50	0.435	0.377	0.461	0.388	0.329	0.355
Selenium	mg/L	0.05 MAC	<0.004	<0.004	<0.004	0.025	<0.004	<0.004	0.004	<0.004	<0.004	0.00006	0.00011	0.00007	< 0.00004	< 0.00004	0.0001
Silicon	mg/L		5.22	6.99	5.09	5.38	6.39	5.37	5.5	6.03	5.76	5.3	5.08	7.56	6.67	5.89	6.74
Silver	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Sodium	mg/L	200 AO	4.91	3.02	3.65	3.34	3.07	3.93	2.06	1.74	1.65	3.35	2.45	4.06	4.56	2.95	6.02
Strontium	mg/L		0.044	0.024	0.016	0.034	0.036	0.022	0.04	0.045	0.05	0.0464	0.0638	0.0542	0.0353	0.0398	0.051
Sulphur	mg/L		2.39	1.76	1.20	1.93	1.16	0.71	1.83	1.75		< 1	1	3	< 3	< 3	< 3
Thallium	mg/L		<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
Tin	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	< 0.00006	< 0.00006	0.0001	0.00016	0.00008	< 0.00006
Titanium	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.00007	0.00015	0.00009	0.00008	0.00008	< 0.00007
Uranium	mg/L	0.02 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.000088	0.000509	0.000088	0.000022	0.000041	0.000056
Vanadium	mg/L		0.003	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.00268	0.00172	0.00210	0.00178	0.00159	0.00158
Zinc	mg/L	5 AO	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	< 0.002	0.003	0.011	< 0.002	< 0.002	< 0.002

Notes:
(1) MECP Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within O
(6) ODWS exceedances indicated by **bold** entries.

The City of Temiskaming Shores
2023 Annual Groundwater and Surface Water Monitoring Report
Haileybury Waste Disposal Site
Haileybury, Ontario
April 2024

Groundwater Geochemical Results
TW-17

Parameters	Units	ODWS [1]	2014	2015	2016	2017	2018	2019	2020	2021			2022			2023		
General Chemistry			June	May	May	May	May	May	June	June	Aug	Oct	May	Aug	Oct	June	Aug	Oct
Alkalinity	mg/L	30-500 OG [2]	105	102	92	109	84	97	90	94	101	109	185	108	116	137	91	144
Dissolved Organic Carbon	mg/L	5 AO [3]	2.2	1.9	2.1	**6.3**	2.9	2.6	2.0	3.2	3.8	3.1	2.8	2.0	3.9	2.8	2.4	2.7
Chloride	mg/L	250 AO	6.76	7.12	7.63	6.77	9.76	8.91	8.33	9.21	12.4	9.81	28	13	14	24	16	21
Sulphate	mg/L	500 OG	11.5	8.09	7.84	13.8	6.04	6.92	6.64	4.9	5.62	5.06	23	7	7	10	7	7
Fluoride	mg/L	1.5 MAC [4]	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	0.09
Hardness	mg/L	80-100 OG	**127**	**116**	95.4	**114**	**111**	**107**	**52.1**	**55.2**	**62.8**	**58.8**	**139**	72.6	**118**	**102**	80.9	**267**
Nitrate	mg/L	10 MAC	0.55	0.52	0.35	0.63	0.48	0.31	0.44	0.36	0.54	0.44	0.31	0.48	0.54	0.66	0.99	0.7
Nitrite	mg/L	1 MAC	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Organic Nitrogen	mg/L	0.15 OG	**0.28**	**0.23**	**0.41**	**0.26**	**0.27**	<0.10	**0.31**	**0.44**	**0.34**	**1.01**	**< 0.5**	0.13	**< 0.5**	**< 0.5**	0.05	0.14
Orthophosphate	mg/L		<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	< 0.03	< 0.03	< 0.03	0.05	0.11	0.03
Phenols	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	0.028	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Ammonia	mg/L		0.08	<0.02	<0.02	<0.02	<0.02	0.04	<0.02	0.02	<0.02	<0.02	< 0.04	0.04	< 0.04	< 0.04	< 0.04	0.12
BOD	mg/L		<5	<5	<5	<5	<5	<5	<5	<2.00	<2.00	<2.00	< 4	< 4	< 4	< 4	< 4	6
Chemical Oxygen Demand (COD	mg/L		6	<5	9	5	<5	<5	16	<5	<5	<5	< 8	65	22	10	< 8	30
Total Dissolved Solids	mg/L	500 AO	142	142	124	134	162	112	120	118	152	168	251	140	177	237	210	194
Total Kjeldahl Nitrogen (TKN)	mg/L		0.36	0.23	0.41	0.26	0.27	<0.10	0.31	0.46	0.34	1.01	0.46	0.17	0.3	0.18	0.07	0.26
pH	pH Units	6.5-8.5 OG	7.87	7.71	7.69	7.82	7.07	7.55	7.85	7.20	7.51	7.63	8.20	8.08	7.83	7.72	7.51	7.64
Electrical Conductivity	uS/cm		267	237	211	253	229	225	240	221	249	257	428	262	271	344	239	340
% Difference/ Ion Balance	%		3.3	2.1	2.7	3.89						31.3						
Elements																		
Aluminum	mg/L	0.1 OG	0.045	0.037	0.037	0.014	0.025	0.006	0.019	0.027	0.016	0.020	0.050	0.037	**0.304**	0.018	0.007	**9.98**
Arsenic	mg/L	0.01 MAC	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.004	0.006	<0.003	<0.003	< 0.0002	0.0002	0.0003	< 0.0002	0.0002	0.0018
Barium	mg/L	1 MAC	0.005	0.005	0.005	0.005	0.004	0.006	0.004	0.005	0.006	0.005	0.0119	0.00678	0.0130	0.00737	0.00709	0.2130
Beryllium	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.000007	0.000008	0.000035	< 0.000007	< 0.000007	0.00086
Bismuth	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	0.00001
Boron	mg/L	5 IMAC	0.011	0.01	0.012	0.02	0.027	0.012	0.013	0.014	0.015	0.017	0.043	0.022	0.023	0.058	0.046	0.047
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.00001	0.000013	0.000011	0.000009	0.000014	0.000156
Calcium	mg/L		38.4	35	27.4	32.8	32.0	32.4	14.1	15	17.1	15.9	39.5	21.1	32.5	28.6	22.5	70.9
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.00043	0.00060	0.00113	0.00025	0.00027	0.0201
Cobalt	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.000321	0.000167	0.000463	0.000215	0.000165	0.012
Copper	mg/L	1 AO	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.0038	0.0020	0.0039	0.0038	0.0031	0.0627
Iron	mg/L	0.3 AO	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.016	0.026	0.021	<0.010	0.070	0.050	**0.368**	0.014	0.008	**9.7**
Lead	mg/L	0.01 MAC	<0.002	<0.002	<0.002	<0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.00011	< 0.00009	0.00032	< 0.00009	< 0.00009	0.01032
Magnesium	mg/L		7.53	6.91	6.55	7.83	7.43	6.31	4.1	4.3	4.89	4.63	9.85	4.82	8.81	7.51	6	21.8
Manganese	mg/L	0.05 AO	0.003	0.006	<0.002	0.002	0.007	0.005	<0.002	<0.002	0.005	0.004	0.01479	0.00337	0.0215	0.00755	0.0105	**0.807**
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	< 0.00001	0.00003	< 0.00001	< 0.00001	< 0.00001	0.00002
Molybdenum	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.00005	0.00009	< 0.00004	< 0.00004	0.00006	0.00005
Nickel	mg/L		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.0017	0.0005	0.0012	0.0013	0.0009	0.023
Phorphorus	mg/L		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.050	<0.050	<0.050	<0.050	0.013	< 0.003	0.111	< 0.003	< 0.003	3.12
Potassium	mg/L		0.44	0.61	0.91	0.75	0.81	0.62	0.42	<0.50	0.53	<0.50	0.655	0.485	0.614	0.652	0.525	1.45
Selenium	mg/L	0.05 MAC	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.014	<0.004	<0.004	<0.004	< 0.00004	0.00013	< 0.00004	< 0.00004	0.00004	0.0003
Silicon	mg/L		3.9	4.15	3.74	4.28	4.44	3.64	3.64	4.95	4.33	4.25	3.97	3.18	5.19	4	3.78	12.2
Silver	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Sodium	mg/L	200 AO	4.34	5.09	4.49	4.6	4.81	4.75	4.24	4.27	4.78	4.23	7.96	5.56	6.13	9.33	8.34	9.11
Strontium	mg/L		0.039	0.041	0.034	0.053	0.038	0.046	0.043	0.024	0.051	0.045	0.1080	0.0532	0.0764	0.0775	0.0615	0.162
Sulphur	mg/L		3.21	3.16	1.76	4.57	1.98	2.36	2.34	2.27	2.1		5	2	4	3	< 3	< 3
Thallium	mg/L		<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	0.000011	0.000006	0.000011	0.000009	0.000008	0.000098
Tin	mg/L		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	< 0.00006	< 0.00006	< 0.00006	0.00008	0.00006	< 0.00006
Titanium	mg/L		0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.00363	0.00244	0.00833	0.00087	0.00044	0.06829
Uranium	mg/L	0.02 MAC	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.000064	0.00003	0.000109	0.000044	0.000038	0.00111
Vanadium	mg/L		<0.002	<0.002	<0.010	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.00064	0.00056	0.00141	0.0005	0.00049	0.0239
Zinc	mg/L	5 AO	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.002	< 0.002	0.009	< 0.002	< 0.002	0.047

Notes:
(1) MECP Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

The City of Temiskaming Shores
2023 Annual Groundwater and Surface Water Monitoring Report
Haileybury Waste Disposal Site
Haileybury, Ontario
April 2024

Groundwater Geochemical Results
MW21-01

Parameters	Units	ODWS (1)	2021			2022			2023		
General Chemistry			**June**	**Aug**	**Oct**	**May**	**Aug**	**Oct**	**June**	**Aug**	**Oct**
Alkalinity	mg/L	30-500 OG (2)	204	198	189	188	165	164	138	145	149
Dissolved Organic Carbon	mg/L	5 AO (3)	2.7	3.0	2.9	1.7	2	1.8	1.6	1.5	1.6
Chloride	mg/L	250 AO	14.4	14.6	14.9	15	13	14	13	14	15
Sulphate	mg/L	500 OG	23.7	30.2	28.5	31	23	23	20	28	23
Fluoride	mg/L	1.5 MAC (4)	<0.05	<0.05	<0.05	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06
Hardness	mg/L	80-100 OG	**220**	**244**	**209**	**187**	**189**	**193**	**152**	**155**	**187**
Nitrate	mg/L	10 MAC	5.0	6.07	6.28	5.73	4.61	4.15	3.57	3.47	3.67
Nitrite	mg/L	1 MAC	0.14	<0.05	<0.05	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Organic Nitrogen	mg/L	0.15 OG	**0.47**	**0.34**	**0.33**	**< 0.5**	< 0.05	**< 0.5**	**< 0.5**	0.09	< 0.05
Orthophosphate	mg/L		<0.10	<0.10	<0.10	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Phenols	mg/L		0.023	<0.001	0.048	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Ammonia	mg/L		<0.02	0.10	<0.02	0.04	0.04	< 0.04	0.04	< 0.04	0.14
BOD	mg/L		<2.00	<2.00	<2.00	< 4	< 4	< 4	< 4	< 4	< 4
Chemical Oxygen Demand (COD	mg/L		<5	<5	<5	9	63	18	8	< 8	12
Total Dissolved Solids	mg/L	500 AO	394	298	356	260	217	263	226	237	257
Total Kjeldahl Nitrogen (TKN)	mg/L		0.47	0.44	0.33	0.36	< 0.05	< 0.05	< 0.05	0.11	< 0.05
pH	pH Units	6.5-8.5 OG	7.69	7.71	7.85	8.33	8.23	8.01	7.94	8.11	7.95
Electrical Conductivity	uS/cm		503	503	508	459	429	416	362	383	385
% Difference/ Ion Balance	%				3.2						
Elements											
Aluminum	mg/L	0.1 OG	0.043	**0.102**	0.015	0.036	0.006	0.012	0.005	0.004	0.079
Arsenic	mg/L	0.01 MAC	<0.003	<0.003	<0.003	0.0004	0.0004	0.0004	0.0003	0.0004	0.0003
Barium	mg/L	1 MAC	0.031	0.041	0.038	0.0369	0.0374	0.0326	0.0265	0.02756	0.0294
Beryllium	mg/L		<0.001	<0.001	<0.001	< 0.000007	0.000009	< 0.000007	< 0.000007	< 0.000007	< 0.000007
Bismuth	mg/L		<0.002	<0.002	<0.002	0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Boron	mg/L	5 IMAC	0.221	0.257	0.232	0.223	0.185	0.309	0.165	0.154	0.141
Cadmium	mg/L	0.005 MAC	<0.002	<0.002	<0.002	0.000009	0.000017	0.000006	0.000008	0.000005	0.000005
Calcium	mg/L		66.5	73.2	63	57.6	59.2	58.9	46.2	46.8	57
Chromium	mg/L	0.05 MAC	<0.003	<0.003	<0.003	0.00046	0.00073	0.00079	0.00056	0.0008	0.0007
Cobalt	mg/L		0.002	0.003	0.003	0.00258	0.00205	0.00202	0.0011	0.0013	0.00139
Copper	mg/L	1 AO	<0.003	0.006	0.005	0.0054	0.0030	0.0036	0.0045	0.0032	0.0046
Iron	mg/L	0.3 AO	<0.010	0.145	<0.010	0.111	< 0.007	0.014	< 0.007	< 0.007	0.007
Lead	mg/L	0.01 MAC	<0.001	<0.001	<0.001	0.00021	< 0.00009	< 0.00009	< 0.00009	< 0.00009	0.00041
Magnesium	mg/L		13.2	14.8	12.6	10.4	10.1	11.2	8.86	9.35	10.9
Manganese	mg/L	0.05 AO	**0.134**	**0.135**	**0.094**	**0.0515**	0.0207	0.0208	0.018	0.0232	0.00666
Mercury	mg/L	0.001 MAC	<0.0001	<0.0001	<0.0001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Molybdenum	mg/L		0.002	0.005	<0.002	0.0004	0.00041	0.00034	0.00022	0.00049	0.00025
Nickel	mg/L		0.006	0.009	0.006	0.0103	0.0112	0.0076	0.0089	0.0084	0.0064
Phorphorus	mg/L		<0.050	<0.050	<0.050	0.006	< 0.003	0.006	< 0.003	< 0.003	0.003
Potassium	mg/L		4.21	5.55	4.57	4.53	3.85	4.47	4.09	3.88	4.58
Selenium	mg/L	0.05 MAC	<0.004	<0.004	<0.004	0.00005	0.00012	< 0.00004	0.00007	0.00004	0.00006
Silicon	mg/L		6.04	6.54	5.74	5.74	4.85	6.91	5.89	5.5	6
Silver	mg/L		<0.002	<0.002	<0.002	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Sodium	mg/L	200 AO	15.7	17.1	14.2	15	13.1	14	11.6	11.3	11.8
Strontium	mg/L		0.103	0.13	0.118	0.114	0.101	0.113	0.0868	0.0946	0.0957
Sulphur	mg/L		8.75	10.9		6	7	9	6	7	7
Thallium	mg/L		<0.006	<0.006	<0.006	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005	< 0.000005
Tin	mg/L		<0.002	<0.002	<0.002	0.00006	< 0.00006	0.0001	0.00006	0.00008	0.00012
Titanium	mg/L		<0.002	0.004	<0.002	0.00104	0.00022	0.00031	< 0.00007	0.00011	0.00014
Uranium	mg/L	0.02 MAC	<0.002	<0.002	<0.002	0.000389	0.000577	0.000500	0.000242	0.000327	0.000368
Vanadium	mg/L		<0.002	<0.002	<0.002	0.00090	0.00088	0.00099	0.00080	0.0008	0.00082
Zinc	mg/L	5 AO	<0.005	0.006	<0.005	0.006	0.006	0.006	0.007	0.007	0.008

Notes:
(1) MECP Ontario Drinking Water Standards.
(2) Operational Guideline (OG) within ODWS.
(3) Aesthetic Objective (AO) within ODWS.
(4) Maximum Acceptable Concentration (MAC) within ODWS.
(5) Interim Maximum Acceptable Concentration (IMAC) within ODWS.
(6) ODWS exceedances indicated by **bold** entries.

2023 Groundwater Duplicate Data

Parameters	Units	Jun-23						Aug-23						Oct-23					
		TW-15	HB GW DUP1	Relative Percent Difference (%)	TW-17	HB GW DUP2	Relative Percent Difference (%)	TW-15	HB GW DUP1	Relative Percent Difference (%)	TW-17	HB GW DUP2	Relative Percent Difference (%)	TW-15	HB GW DUP1	Relative Percent Difference (%)	TW-8	HB GW DUP2	Relative Percent Difference (%)
General Chemistry																			
Alkalinity	mg/L	326	355	(8.517)	137	135	1.471	288	297	(3.077)	91	90	1.105	250	223	11.416	96	94	2.105
Dissolved Organic Carbon	mg/L	4.3	4.4	(2.299)	2.8	2.7	3.636	5.6	5.6	0.000	2	2.3	4.255	5.0	4.7	6.186	1.8	1.9	(5.405)
Chloride	mg/L	38	38	0.000	24	23	4.255	43	44	(2.299)	16	17	(6.061)	72	71	1.399	< 1	1	NC
Sulphate	mg/L	62	63	(1.600)	10	10	0.000	60.0	59	1.681	7.0	7	0.000	110.0	100.0	9.524	4.0	4.0	0.000
Fluoride	mg/L	< 0.06	< 0.06	NC	< 0.06	< 0.06	NC	< 0.06	< 0.06	NC	< 0.06	< 0.06	NC	< 0.06	0.07	NC	0.06	0.06	0
Hardness	mg/L	361	372	(3.001)	102	107	(4.785)	317	324	(2.184)	81	81.5	(0.739)	373	383	(2.646)	91.3	92.6	(1.414)
Nitrate	mg/L	9.79	9.75	0.409	0.66	0.66	0.000	6.1	6.1	0.984	0.99	1.0	1.015	7.98	7.98	0.000	< 0.06	< 0.06	NC
Nitrite	mg/L	0.06	0.05	18.182	< 0.03	< 0.03	NC	0.05	0.04	22.222	< 0.03	< 0.03	NC	< 0.03	< 0.03	NC	< 0.03	< 0.03	NC
Organic Nitrogen	mg/L	< 0.5	< 0.5	NC	< 0.5	< 0.5	NC	0.22	< 0.05	NC	0.05	0.11	**(75.000)**	1.05	< 0.05	NC	< 0.05	0.09	NC
Orthophosphate	mg/L	< 0.03	< 0.03	NC	0.05	0.06	(18.182)	< 0.03	< 0.03	NC	0.11	0.1	9.524	< 0.03	< 0.03	NC	< 0.03	< 0.03	NC
Phenols	mg/L	< 0.002	< 0.002	NC	< 0.002	< 0.002	NC	< 0.002	< 0.002	NC	< 0.002	< 0.002	NC	< 0.002	< 0.002	NC	< 0.002	< 0.002	NC
Ammonia	mg/L	0.39	0.6	(42.424)	< 0.04	0.1	NC	0.42	0.43	(2.353)	< 0.04	< 0.04	NC	0.92	0.91	1.093	0.04	0.07	**(54.545)**
BOD	mg/L	< 4	4	NC	< 4	< 4	NC	< 4	< 4	NC	< 4	< 4	NC	< 4	< 4	NC	4	< 4	NC
Chemical Oxygen Demand (COD)	mg/L	13	16	(20.690)	10	17	**(51.852)**	16	13	20.690	< 8	9	NC	21	34	(47.273)	< 8	< 8	NC
Total Dissolved Solids	mg/L	586	509	14.064	237	186	24.113	494	494	0.000	210	169	21.636	500	389	24.972	131	114	13.878
Total Kjeldahl Nitrogen (TKN)	mg/L	0.82	0.67	20.134	0.2	0.2	(10.526)	0.64	0.37	**53.465**	0.07	0.13	**(60.000)**	1.97	0.88	**76.491**	< 0.05	0.16	NC
pH	pH Units	7.83	7.93	(1.269)	7.72	7.73	(0.129)	8	7.69	3.952	7.51	7.51	0.000	7.7	7.78	(1.034)	7.05	7.65	(8.163)
Electrical Conductivity	uS/cm	946	1030	(8.502)	344	339	1.464	781	815	(4.261)	239	243	(1.660)	669	636	5.057	162	182	(11.628)
Elements																			
Aluminum	mg/L	0.001	0.001	0.000	0.018	0.022	(20.000)	0.001	0.002	**(66.667)**	0.007	0.008	(13.333)	0.016	0.013	20.690	0.002	0.002	0.000
Arsenic	mg/L	0.0003	0.0003	0.000	< 0.0002	< 0.0002	NC	0.0004	0.0003	28.571	0.0002	0.0002	0.000	0.0003	0.0002	40.000	0.0012	0.0013	(8.000)
Barium	mg/L	0.0956	0.107	(11.254)	0.007	0.008	(6.307)	0.0822	0.0864	(4.982)	0.00709	0.00712	(0.422)	0.0993	0.105	(5.580)	0.00459	0.00458	0.218
Beryllium	mg/L	< 0.000007	< 0.000007	NC	< 0.000007	< 0.000007	NC	< 0.000007	< 0.000007	NC	< 0.000007	< 0.000007	NC	< 0.000007	< 0.000007	NC	< 0.000007	< 0.000007	NC
Bismuth	mg/L	< 0.00001	< 0.00001	NC	< 0.00001	< 0.00001	NC	< 0.00001	< 0.00001	NC	< 0.00001	< 0.00001	NC	< 0.00001	< 0.00001	NC	< 0.00001	< 0.00001	NC
Boron	mg/L	0.889	1.02	(13.724)	0.058	0.053	9.009	0.688	0.613	11.530	0.046	0.051	(10.309)	0.42	0.44	(5.848)	0.005	0.006	(18.182)
Cadmium	mg/L	0.00004	0.000062	(43.137)	0.000009	0.000007	25.000	0.000036	0.000028	25.000	0.000014	0.000009	43.478	0.000032	0.000041	(24.658)	< 0.000003	< 0.000003	NC
Calcium	mg/L	103	104	(0.966)	28.6	30.1	(5.111)	90.1	92.2	(2.304)	22.5	22.5	0.000	108	111	(2.740)	20.7	21	(1.439)
Chromium	mg/L	0.00086	0.00079	8.485	0.00025	0.0004	(46.154)	0.00087	0.00075	14.815	0.00027	0.00025	7.692	0.00073	0.00069	5.634	0.00015	0.00008	**60.870**
Cobalt	mg/L	0.00596	0.00767	(25.092)	0.00022	0.00021	1.878	0.00284	0.002835	0.176	0.000165	0.000172	(4.154)	0.00366	0.00395	(7.622)	0.000248	0.00025	(0.803)
Copper	mg/L	0.0177	0.0321	**(57.831)**	0.0038	0.0038	0.000	0.011	0.0111	(0.905)	0.0031	0.0034	(9.231)	0.0103	0.0103	0.000	0.002	0.0015	28.571
Iron	mg/L	< 0.007	< 0.007	NC	0.014	0.017	(19.355)	< 0.007	< 0.007	NC	0.008	0.011	(31.579)	0.037	0.037	0.000	0.494	0.568	(13.936)
Lead	mg/L	< 0.00009	0.00017	NC	< 0.00009	< 0.00009	NC	< 0.00009	< 0.00009	NC	< 0.00009	< 0.00009	NC	< 0.00009	< 0.00009	NC	< 0.00009	< 0.00009	NC
Magnesium	mg/L	25.4	27.2	(6.844)	7.5	7.8	(3.660)	22.3	22.6	(1.336)	6	6.2	(2.469)	25.1	25.9	(3.137)	9.61	9.74	(1.344)
Manganese	mg/L	0.759	0.96	(23.386)	0.008	0.009	(15.741)	0.532	0.517	2.860	0.0105	0.011	(4.651)	0.662	0.695	(4.864)	0.12300	0.121	1.639
Mercury	mg/L	< 0.00001	< 0.00001	NC	< 0.00001	< 0.00001	NC	< 0.00001	< 0.00001	NC	< 0.00001	< 0.00001	NC	< 0.00001	< 0.00001	NC	< 0.00001	< 0.00001	NC
Molybdenum	mg/L	0.00012	0.00017	(34.483)	< 0.00004	0.00019	NC	0.0001	0.0	(33.333)	0.00006	0.00006	0.000	0.00009	0.00012	(28.571)	0.00031	0.00031	0.000
Nickel	mg/L	0.0071	0.009	(23.602)	0.0013	0.0013	0.000	0.0049	0.0047	4.167	0.0009	0.0011	(20.000)	0.0053	0.0057	(7.273)	0.0006	0.0006	0
Phorphorus	mg/L	0.003	0.004	(28.571)	< 0.003	< 0.003	NC	0.006	0.004	40.000	< 0.003	< 0.003	NC	0.008	0.009	(11.765)	0.007	0.008	(13.333)
Potassium	mg/L	14.4	16.3	(12.378)	0.65	0.65	0.153	11.0	11.1	(0.905)	0.5	0.5	(3.738)	14.6	15	(5.333)	0.413	0.414	(0.242)
Selenium	mg/L	0.00011	0.00015	(30.769)	< 0.00004	0.00005	NC	0.00007	0.00014	**(66.667)**	0.00004	< 0.00004	NC	0.0001	0.00009	10.526	< 0.00004	< 0.00004	NC
Silicon	mg/L	7.34	7.47	(1.756)	4.00	3.93	1.765	6.63	6.47	2.443	3.78	3.81	(0.791)	6.67	6.87	(2.954)	7.49	7.26	3.119
Silver	mg/L	< 0.00005	< 0.00005	NC	< 0.00005	< 0.00005	NC	< 0.00005	< 0.00005	NC	< 0.00005	< 0.00005	NC	< 0.00005	< 0.00005	NC	< 0.00005	< 0.00005	NC
Sodium	mg/L	53.2	60.9	(13.497)	9.33	9.33	0.000	40.2	40.7	(1.236)	8.34	8.38	(0.478)	31.5	32.7	(3.738)	2.39	2.4	0.419
Strontium	mg/L	0.291	0.312	(6.965)	0.078	0.081	(4.046)	0.234	0.242	(3.361)	0.0615	0.0623	(1.292)	0.296	0.317	(6.852)	0.0371	0.0366	1.357
Sulphur	mg/L	24	25.0	(4.082)	3.00	3.00	0.000	18	17.0	5.714	< 3	< 3	NC	27	29	(7.143)	< 3	< 3	NC
Thallium	mg/L	< 0.000005	0.000006	NC	0.000009	0.000008	11.765	< 0.000005	< 0.000005	NC	0.000008	0.000007	13.333	< 0.000005	< 0.000005	NC	< 0.000005	< 0.000005	NC
Tin	mg/L	0.00008	0.00038	**(130.435)**	0.00008	0.00008	0.000	0.00026	0.00011	**81.081**	0.00006	0.00009	(40.000)	< 0.00006	0.00014	NC	< 0.00006	< 0.00006	NC
Titanium	mg/L	< 0.00007	0.00007	NC	0.00087	0.00093	(6.667)	0.00011	0.00014	(24.000)	0.00044	0.00049	(10.753)	0.00094	0.00053	**55.782**	0.00014	< 0.00007	NC
Uranium	mg/L	0.000593	0.000624	(5.094)	0.000044	0.000044	0.000	0.000545	0.000525	3.738	0.000038	0.000038	0.000	0.000607	0.000631	(3.877)	0.000091	0.000094	(3.243)
Vanadium	mg/L	0.00037	0.00036	2.740	0.0005	0.00053	(5.825)	0.00056	0.00048	15.385	0.00049	0.00057	(15.094)	0.00051	0.00051	0.000	0.00019	0.00018	5.405
Zinc	mg/L	< 0.002	< 0.002	NC	< 0.002	< 0.002	NC	< 0.002	< 0.002	NC	< 0.002	0.002	NC	< 0.002	< 0.002	NC	< 0.002	< 0.002	NC

Notes:
(1) NC - not calculable as one or both concentrations are below the laboratory method detection limit.
(2) Relative percent differences exceeeding 50% are presented as bold and shaded entries.

Appendix F

SUMMARY OF SURFACE WATER GEOCHEMICAL ANALYSES

The City of Temiskaming Shores
2023 Annual Groundwater and Surface Water Monitoring Report
Haileybury Waste Disposal Site
Haileybury, Ontario
April 2024

Surface Water Geochemical Results
SW-3

Parameters	Units	PWQO[1]	APV[2]	CWQG[3]	2013		2014		2015		2016		2017		2018		2019		2020		2021		2022		2023	
General Chemistry					**May**	**Sept**	**June**	**Sept**	**May**	**Sept**	**May**	**Sept**	**May**	**Sept**	**May**	**Oct**	**May**	**Sept**	**June**	**Oct**	**June**	**Oct**	**May**	**Oct**	**June**	**Oct**
Alkalinity	mg/L				42	87	47	72	66	65	41	82	47	90	40	83	49	85	83	79	103	99	52	Dry	77	59
Chemical Oxygen Demand (CO	mg/L				20	20	91	12	13	434	22	1110	105	107	7	<5	12	8	15	34	24	13	20		26	38
Total Dissolved Solids	mg/L				142	180	140	204	172	198	110	258	120	224	140	292	128	294	246	152	208	250	151		271	151
Total Suspended Solids	mg/L				<10	<10	126	<10	<10	788	44	322	141	482	<10	20	<10	<10	<10	<10	<10	<10	4		3	< 2
Ammonia	mg/L				<0.02	<0.02	0.07	0.05	<0.02	0.16	<0.02	0.08	<0.02	0.14	<0.02	<0.02	0.03	<0.02	<0.02	<0.02	0.07	<0.02	< 0.04		0.07	0.07
Turbidity	NTU				1	1.8	7.2	1.5	2.0	29.9	8.0	917	27.2	193	1.4	5.2	3.6	0.8	2.4	5.7	1.1	1.3	0.84		1.4	1.1
Un-ionized Ammonia	mg/L	0.02			<0.0004	<0.0008	0.00013	0.00085	<0.00024	0.00006	<0.000028	0.00054	<0.000054	<0.000336	<0.0001	<0.0001	0.00024	<0.00005	<0.00002	<0.00001	7.0E-04	<0.00015			< 0.001	< 0.001
Chloride	mg/L		180	128	29.5	46.8	41.5	64.7	54.1	70.9	37.4	96.9	32.8	66.5	31.1	102	38.1	97.3	91.2	38.9	61	74.7	42		90	46
Dissolved Organic Carbon	mg/L				6.6	11.2	7.2	8.3	5.8	8.5	7.3	4.6	6.5	10.5	7.7	5.2	8.1	5.8	6.5	11.8	10	8.6	7.3		7.8	12.1
Sulphate	mg/L				4.0	4.52	2.9	8.25	5.5	5.84	4.6	4.54	4.5	0.84	5.47	6.24	4.64	4.6	5.58	3.1	4.45	4.98	6		5	< 2
Hardness	mg/L				54.4	150	63	89.6	75.1	90.5	49.2	111	44.6	98.3	50.4	107	51.9	102	91.5	71.8	98.2	112	81.4		110	77.3
Phenols	mg/L	0.001	0.961	0.004	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.001	0.001	**0.002**	<0.001	**0.002**	**0.002**	< 0.001		< 0.001	< 0.001
Phosphorus	mg/L				<0.05	<0.05	<0.05	<0.05	<0.05	0.27	<0.05	0.21	<0.05	0.23	<0.05	<0.05	<0.05	<0.05	<0.10	<0.10	<0.10	<0.10	0.034		0.012	0.007
pH	pH units	6.5 - 8.5			6.71	7.03	7.43	7.87	7.65	7.51	**8.66**	7.04	7.50	7.61	7.27	7.50	7.10	7.60	7.75	6.67	7.43	7.83	7.89		7.91	7.63
Conductivity	uS/cm				196	305	231	382	299	385	207	516	204	380	204	536	212	571	628	217	397	446	230		473	255
Elements																										
Aluminum	mg/L				0.027	0.016	0.056	0.01	0.014	0.019	0.029	0.005	0.017	0.019	0.020	0.007	0.026	<0.004	0.008	0.019	0.009	0.005	0.09		0.044	0.051
Arsenic	mg/L	0.1	0.15		<0.003	<0.003	<0.003	<0.003	<0.003	0.007	<0.003	0.012	<0.003	0.008	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.0011		0.001	0.0012
Barium	mg/L		2.3		0.007	0.01	0.011	0.012	0.008	0.063	0.02	0.155	0.018	0.088	0.008	0.019	0.012	0.016	0.016	0.009	0.013	<0.002	0.0127		0.01636	0.01
Beryllium	mg/L	0.011	0.0053		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.001	0.000011		< 0.000007	< 0.000007
Bismuth	mg/L				<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	< 0.00001		< 0.00001	< 0.00001
Boron	mg/L	0.2	3.55	1.5	<0.010	<0.010	0.01	<0.010	<0.010	<0.010	0.059	0.033	<0.010	0.014	<0.010	0.014	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.017		0.008	0.006
Cadmium	mg/L	0.0002	0.00021	0.000017	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	*0.0002*	<0.0001	***0.0009***	*0.0001*	*0.0002*	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.000007		0.000003	< 0.000003
Calcium	mg/L				15.1	50.3	17.2	24.8	20.6	25.1	13.1	31.1	12	27.4	13.9	29.7	14.7	28.4	25.72	20.16	26.2	31.8	24.1		31.1	20.5
Chromium	mg/L	0.0089	0.064		<0.003	<0.003	<0.003	<0.003	<0.003	0.006	<0.003	0.004	<0.003	<0.003	<0.003	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.0005		0.00036	0.00038
Cobalt	mg/L	0.0009	0.0052		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	**0.0036**	<0.0005	**0.0278**	0.0008	**0.0064**	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.000095		0.000114	0.000083
Copper	mg/L	0.005	0.0069		<0.002	<0.002	<0.002	<0.002	<0.002	**0.007**	<0.002	**0.03**	0.003	**0.009**	<0.002	<0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.0014		0.001	0.0015
Iron	mg/L	0.3		0.3	0.11	0.16	***0.38***	0.11	0.16	***17.1***	***0.65***	***73.4***	***2.88***	***31.8***	0.060	0.030	0.110	0.100	0.233	***0.386***	***0.397***	0.276	0.196		***0.362***	0.25
Lead	mg/L		0.002		<0.001	<0.001	<0.001	<0.001	<0.001	0.004	<0.001	0.004	0.001	0.006	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	< 0.00009		< 0.00009	0.00017
Magnesium	mg/L				4.06	6.01	4.88	6.71	5.74	6.75	4.01	8.02	3.55	7.25	3.82	8.08	3.70	7.62	6.63	5.21	7.97	7.99	5.13		7.88	6.37
Manganese	mg/L				0.023	0.005	0.053	0.014	0.02	0.631	0.021	2.22	0.104	0.93	0.011	0.016	0.016	0.012	0.033	0.011	0.048	0.063	0.0184		0.06078	0.0131
Molybdenum	mg/L		0.73		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.00068		0.00071	0.0002
Nickel	mg/L	0.025	0.039		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.01	<0.003	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.0005		0.0004	0.0006
Potassium											0.48	1.22	0.43	1.11	0.59	0.54	0.58	0.64	0.8	0.83	0.68	0.95	0.785		0.991	0.767
Selenium	mg/L	0.1	0.005		<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.002	<0.002	0.00008		0.0001	0.00007
Silicon	mg/L				0.91	1.44	2.5	1.78	0.49	4.45	2.55	4.16	2.73	4.18	1.37	2.35	1.10	2.10	0.67	3.05	0.38	0.31	1.12		0.44	3.33
Silver	mg/L	0.0001	0.00012		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	< 0.00005		< 0.00005	< 0.00005
Sodium	mg/L		180		15.8	26.8	19.6	37.5	29.2	34.2	21	50.3	19.2	31.1	18.5	53.6	19.2	57.6	40.06	20.87	42.1	44.2	20.8		49.7	26.7
Strontium	mg/L				0.032	0.051	0.039	0.057	0.04	0.069	0.029	0.136	0.038	0.094	0.032	0.075	0.034	0.069	0.074	0.049	0.064	0.071	0.057		0.08119	0.0454
Sulphur	mg/L				1.58	0.85	1.03	3.1	1.9	1.97	1220	1.83	1.59	0.64	1.98	3.06	1.65	1.71	2.001	1.257	1.81	1.9	6.00		< 3	< 3
Thallium	mg/L	0.0003	0.04		<0.0003	<0.0002	<0.0001	<0.0000	<0.0001	<0.0002	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	< 0.000005		< 0.000005	< 0.000005
Tin	mg/L				<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	< 0.00006		< 0.00006	< 0.00006
Titanium	mg/L				<0.002	<0.002	<0.002	<0.002	<0.002	0.028	0.002	0.032	0.01	0.031	<0.002	<0.002	0.002	<0.002	0.002	0.004	<0.002	<0.010	0.00221		0.00187	0.00121
Uranium	mg/L	0.005	0.033		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0005	<0.0005	<0.0005	<0.0005	0.00008		0.000124	0.000049
Vanadium	mg/L	0.006	0.02		<0.002	<0.002	<0.002	<0.002	<0.002	**0.007**	<0.002	**0.094**	<0.002	**0.010**	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.00053		0.00031	0.00037
Zinc	mg/L	0.03	0.089	0.03	0.016	<0.005	<0.005	<0.005	0.005	0.026	<0.005	***0.103***	0.008	0.028	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.020	< 0.002		< 0.002	0.002

Notes:
(1) PWQO - Provincial Water Quality Objectives.
(2) APV - Aquatic Protection Value from *Rationale for the Development of Soil and Groundwater Standards for use at Contaminated Site in Ontario* , Table 3.1.
(3) CWQG - Canadian Water Quality Guidelines.
(4) Exceedences of the PWQO are indicated by **BOLD** entries.
(5) Exceedences of the APV are indicated by underlined entries.
(6) Exceedences of the CWQG are indicated by *italicized* entries.

The City of Temiskaming Shores
2023 Annual Groundwater and Surface Water Monitoring Report
Haileybury Waste Disposal Site
Haileybury, Ontario
April 2024

Surface Water Geochemical Results
SW-4

Parameters	Units	PWQO[1]	APV[2]	CWQG[3]	2013		2014		2015		2016		2017		2018		2019		2020		2021		2022		2023	
General Chemistry					**May**	**Sept**	**June**	**Sept**	**May**	**Sept**	**May**	**Sept**	**May**	**Sept**	**May**	**Oct**	**May**	**Sept**	**June**	**Oct**	**June**	**Oct**	**May**	**Oct**	**June**	**Oct**
Alkalinity	mg/L				26	45	36	73	66	97	55	92	53	84	55	82	52	89	90	81	99	97	55	66	79	53
Chemical Oxygen Demand (CO	mg/L				33	44	47	16	16	9	17	7	13	30	5	<5	22	<5	15	25	18	<5	19	40	22	42
Total Dissolved Solids	mg/L				56	90	64	208	172	262	156	276	138	228	142	288	130	286	282	152	208	250	143	249	271	134
Total Suspended Solids	mg/L				<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	7	17	3	2
Ammonia	mg/L				<0.02	<0.02	0.05	0.03	<0.02	<0.02	<0.02	<0.02	<0.02	0.03	<0.02	<0.02	0.03	<0.02	<0.02	<0.02	0.03	<0.02	< 0.04	< 0.04	0.07	< 0.04
Turbidity	NTU				0.6	1.8	1.5	<0.5	1.1	0.5	4.3	2.9	0.9	0.8	1.2	1.4	0.6	1.0	2.4	2.3	1.6	7.3	0.7	6.5	1.0	1.1
Un-ionized Ammonia	mg/L	0.02			<0.00004	<0.00002	0.000055	0.00063	<0.00019	<0.000032	<0.000126	<0.0001	<0.00016	<0.00033	<0.000172	<0.000118	0.00018	<0.0001	<0.00013	<0.00001	0.00108	<0.00016			< 0.001	< 0.001
Chloride	mg/L		180	128	1.61	2.71	0.94	67.6	57.2	95.5	59.6	98.2	44.1	77.7	34.9	103	44.4	124	106	40.1	61.2	73.2	42	67	96	37
Dissolved Organic Carbon	mg/L				9.8	21.8	11.9	8.7	6.8	3.1	7.1	5.2	7.7	8.6	6.8	5.4	8.4	5.2	7.2	12.7	9.8	7.1	8	14.1	7.9	13.1
Sulphate	mg/L				1.6	1.76	0.6	8.56	5.7	5.30	7.3	4.83	6.4	6.41	5.9	6.21	4.86	5.62	6.59	3.17	4.86	4.82	6	< 2	5	< 2
Hardness	mg/L				30.7	73.3	38.4	91.9	77.4	114	69.5	115	56.7	93.5	52.4	107	55.2	105	107	73.9	99.7	103	79.6	91.7	106	69.4
Phenols	mg/L	0.001	0.961	0.004	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	**0.002**	0.001	**0.002**	<0.001	0.001	0.001	**0.002**	**0.002**	< 0.001	< 0.001
Phosphorus	mg/L				<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.10	<0.10	<0.10	<0.10	0.03	0.015	0.011	0.008
pH	pH units	6.5 - 8.5			**6.40**	6.88	7.24	7.81	7.68	8.01	7.15	7.92	7.86	7.89	7.38	7.64	7.19	7.58	7.80	6.70	7.37	7.83	7.95	7.63	7.94	7.61
Conductivity	uS/cm				64	92	77	398	314	520	290	544	250	419	223	540	235	589	591	225	396	431	238	368	478	216
Elements																										
Aluminum	mg/L				0.052	0.063	0.046	0.009	0.010	0.007	0.019	<0.004	0.023	0.007	0.030	0.010	0.023	0.004	0.006	0.016	0.006	0.006	0.096	0.113	0.021	0.058
Arsenic	mg/L	0.1	0.15		<0.003	<0.003	0.004	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.0012	0.0015	0.001	0.0014
Barium	mg/L		2.3		0.003	0.006	0.006	0.012	0.007	0.014	0.011	0.014	0.010	0.014	0.008	0.022	0.010	0.016	0.018	0.009	0.012	0.015	0.014	0.0128	0.01626	0.00922
Beryllium	mg/L	0.011	0.0053		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.001	0.000014	< 0.000007	< 0.000007	< 0.000007
Bismuth	mg/L				<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	< 0.00001	0.007	< 0.00001	< 0.00001
Boron	mg/L	0.2	3.55	1.5	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	0.016	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.012	0.013	< 0.00001	0.007	0.005
Cadmium	mg/L	0.0002	0.00021	0.000017	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.000005	0.000005	0.000003	0.00001
Calcium	mg/L				7.86	23.4	9.97	25.5	21.3	31.5	19.1	31.9	15.5	26.3	14.5	29.6	15.6	29.4	30.08	20.77	26.5	29	23.5	26.1	29.3	18.4
Chromium	mg/L	0.0089	0.064		<0.003	<0.003	<0.003	<0.003	<0.003	0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.00046	0.000124	0.00038	0.00048
Cobalt	mg/L	0.0009	0.0052		<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	0.000194	0.00079	0.000093	0.000096
Copper	mg/L	0.005	0.0069		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.004	0.0013	0.0014	0.0008	0.0018
Iron	mg/L	0.3		0.3	0.080	***0.400***	***0.610***	0.150	0.110	0.030	0.170	0.030	<0.01	0.040	0.060	<0.01	0.070	0.010	0.275	***0.439***	0.223	0.079	0.294	0.256	***0.394***	0.289
Lead	mg/L		0.002		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.00016	0.00012	< 0.00009	0.00019
Magnesium	mg/L				2.68	3.61	3.27	6.86	5.87	8.51	5.3	8.52	4.38	6.76	3.94	8.0	3.94	7.73	7.7	5.35	8.14	7.31	5.09	6.42	8.01	5.7
Manganese	mg/L				0.004	0.009	0.039	0.025	0.017	0.006	0.017	0.012	0.01	0.012	0.008	0.003	0.013	0.007	0.03	0.022	0.031	0.009	0.0802	0.0207	0.03662	0.0116
Molybdenum	mg/L		0.73		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.0006	0.00025	0.00063	0.00019
Nickel	mg/L	0.025	0.039		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.0004	0.0006	0.0004	0.0006
Potassium											0.65	0.62	0.45	0.63	0.61	0.59	0.57	0.49	1.03	0.77	0.75	0.94	0.776	0.842	0.916	0.651
Selenium	mg/L	0.1	0.005		<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.002	<0.002	0.00006	0.00008	0.00009	0.00007
Silicon	mg/L				0.56	2.05	0.34	1.53	0.28	2.21	1.04	2.12	0.5	1.8	1.09	2.44	0.89	1.65	0.296	2.83	0.11	1.74	0.79	2.69	0.34	3.25
Silver	mg/L	0.0001	0.00012		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Sodium	mg/L		180		2.68	2.87	1.88	39.7	31.1	51	29.2	54.7	22.9	39.2	21.0	52.9	22.1	59.8	50.05	21.89	44.0	39.9	21.4	33.8	49.9	22.1
Strontium	mg/L				0.016	0.025	0.025	0.058	0.037	0.072	0.042	0.068	0.043	0.063	0.032	0.077	0.035	0.064	0.079	0.05	0.066	0.067	0.05	0.0623	0.08031	0.0408
Sulphur	mg/L				0.76	0.51	0.4	3.18	1.95	1.88	1570	2.28	2.15	2.3	2.10	2.98	1.78	2.02	2.492	1.4	1.92	1.72	7.00	2.00	< 3	< 3
Thallium	mg/L	0.0003	0.04		<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	< 0.000005	< 0.000005	< 0.000005	< 0.000005
Tin	mg/L				<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	< 0.00006	< 0.00006	0.00009	0.00006
Titanium	mg/L				<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.004	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.002	<0.002	<0.002	<0.010	0.00194	0.00353	0.00047	0.00136
Uranium	mg/L	0.005	0.033		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.0005	<0.0005	<0.0005	<0.0005	0.000093	0.000082	0.000108	0.000048
Vanadium	mg/L	0.006	0.02		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.00066	0.00051	0.00023	0.00037
Zinc	mg/L	0.03	0.089	0.03	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.020	0.002	0.004	< 0.002	0.003

Notes:
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Surface Water Geochemical Results
SW-5

Parameters	Units	PWQO[1]	APV[2]	CWQG[3]	2013		2014		2015		2016		2017		2018		2019		2020		2021		2022		2023	
General Chemistry					**May**	**Sept**	**June**	**Sept**	**May**	**Sept**	**May**	**Sept**	**May**	**Sept**	**May**	**Oct**	**May**	**Sept**	**June**	**Oct**	**June**	**Oct**	**May**	**Oct**	**June**	**Oct**
Alkalinity	mg/L				8	12	11	10	15	Insufficient	9	Dry	9	26	7	Dry	8	39	13	27	21	23	7	15	10	10
Chemical Oxygen Demand (CO	mg/L				20	29	38	23	32	Water	19		13	41	<5		15	39	29	23	24	18	20	43	24	34
Total Dissolved Solids	mg/L				42	74	46	44	50	to Sample	36		34	58	66		30	94	44	30	28	58	< 30	74	< 30	123
Total Suspended Solids	mg/L				<10	<10	15	<10	<10		<10		<10	15	<10		<10	61	19	<10	16	<10	10	4	8	< 2
Ammonia	mg/L				<0.02	0.05	0.12	0.06	0.05		<0.02		0.02	0.95	<0.02		0.04	0.42	0.02	0.02	0.11	0.04	0.06	< 0.04	0.06	< 0.04
Turbidity	NTU				0.8	3.2	3.7	3	6.5		2.3		2.3	10.8	3.1		1.6	110	5.7	13.9	6.8	2.3	1.81	1.3	3	0.95
Un-ionized Ammonia	mg/L	0.02			<0.00003	0.000011	0.000087	0.000114	0.000155		0.000004		<0.0000138	<0.00304	<0.000054		0.00011	0.0011	0.00001	<0.000004	0.00012	0.0001			< 0.001	< 0.001
Chloride	mg/L		180	128	5.24	10.6	3.1	3.42	6.22		2.14		2.55	4.15	0.94		2.42	9.62	3.9	2.64	1.97	3.12	6	4	6	9
Dissolved Organic Carbon	mg/L				6.2	13	11.7	12.2	9.2		7.7		6.2	13.5	8		6.4	14	10	10.2	13.6	10.2	6.4	12.2	8.1	9.1
Sulphate	mg/L				3.3	4.04	2.0	1.65	1.0		2.9		3.0	0.35	0.67		2.94	2.48	1.05	0.89	0.52	0.18	< 2	< 2	< 2	< 2
Hardness	mg/L				16.1	43.2	16.7	16.1	18.3		11		9.9	21.7	10.1		10.6	37.8	13	17.9	17.7	20.3	15.8	19.2	16.2	18.5
Phenols	mg/L	0.001	0.961	0.004	<0.001	<0.001	<0.001	<0.001	**0.003**		<0.001		<0.001	**0.002**	<0.001		**0.002**	***0.012***	**0.004**	<0.001	<0.001	<0.001	**0.002**	**0.003**	< 0.001	< 0.001
Phosphorus	mg/L				<0.05	<0.05	<0.05	<0.05	0.1		<0.05		<0.05	<0.05	<0.05		<0.05	0.06	<0.10	<0.10	<0.10	<0.10	0.052	0.022	0.038	0.007
pH	pH units	6.5 - 8.5			**5.98**	**5.92**	6.66	6.59	6.81		**6.25**		7.08	7.15	**6.40**		**6.39**	7.02	7.06	**6.30**	6.51	7.04	6.86	6.83	7.01	6.66
Conductivity	uS/cm				49	78	44	45	56		34		34	64	35		32	131	53	40	41	49	38	49	38	58
Elements																										
Aluminum	mg/L				0.063	0.062	0.149	0.086	0.085		0.052		0.037	0.033	0.042		0.047	0.021	0.028	0.040	0.015	0.021	0.352	0.062	0.102	0.08
Arsenic	mg/L	0.1	0.15		<0.003	<0.003	<0.003	<0.003	<0.003		<0.003		<0.003	<0.003	<0.003		0.004	**0.239**	<0.003	<0.003	0.004	<0.003	0.0022	0.0013	0.0015	0.0007
Barium	mg/L		2.3		0.004	0.007	0.006	0.005	0.008		0.005		0.005	0.01	0.004		0.004	0.029	0.004	0.004	0.006	0.006	0.00667	0.00468	0.00382	0.00364
Beryllium	mg/L	0.011	0.0053		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001		<0.001	<0.001	<0.001		<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.001	0.000028	< 0.000007	0.000012	0.000013
Bismuth	mg/L				<0.002	<0.002	<0.002	<0.002	<0.002		<0.002		<0.002	<0.002	<0.002		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.00003	0.007	0.00001	< 0.00001
Boron	mg/L	0.2	3.55	1.5	<0.010	<0.010	0.016	<0.010	<0.010		0.035		<0.010	<0.010	<0.010		<0.010	0.012	<0.010	<0.010	<0.010	<0.010	0.009	< 0.00001	0.005	0.005
Cadmium	mg/L	0.0002	0.00021	0.000017	<0.0001	<0.0001	<0.0001	*0.0001*	***0.0003***		<0.0001		<0.0001	<0.0001	<0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.000013	0.000004	0.000007	0.000004
Calcium	mg/L				4.36	14.0	4.53	4.22	4.79		2.89		2.59	5.92	2.61		2.83	11.0	3.51	4.9	4.51	5.5	4.34	5.07	4.49	4.66
Chromium	mg/L	0.0089	0.064		<0.003	<0.003	<0.003	<0.003	0.005		<0.003		<0.003	<0.003	<0.003		<0.003	0.004	<0.003	<0.003	<0.003	<0.003	0.00095	0.000254	0.0006	0.00049
Cobalt	mg/L	0.0009	0.0052		<0.0005	0.0007	**0.0012**	0.0008	**0.0016**		<0.0005		<0.0005	**0.0023**	<0.0005		0.0006	**0.0233**	<0.0005	0.0007	**0.0013**	<0.0005	0.000671	0.00049	0.000839	0.000205
Copper	mg/L	0.005	0.0069		0.002	0.002	0.004	0.002	0.002		<0.002		0.002	<0.002	0.002		0.002	**0.021**	**0.006**	<0.002	0.003	<0.002	0.003	0.0015	0.0017	0.0025
Iron	mg/L	0.3		0.3	0.14	***1.11***	***1.17***	***1.09***	***5.65***		***0.46***		***0.34***	***3.45***	***0.45***		***0.35***	***3.17***	***0.887***	***1.08***	***2.05***	***1.18***	***1.79***	***0.511***	***1.88***	***0.357***
Lead	mg/L		0.002		<0.001	<0.001	<0.001	<0.001	<0.001		<0.001		<0.001	<0.001	<0.001		<0.001	0.016	<0.001	<0.001	0.001	<0.001	0.00061	0.00015	0.00035	0.00016
Magnesium	mg/L				1.27	2.0	1.32	1.35	1.53		0.93		0.83	1.68	0.87		0.86	2.51	1.04	1.37	1.56	1.63	1.19	1.58	1.22	1.67
Manganese	mg/L				0.012	0.08	0.102	0.076	0.158		0.023		0.018	0.279	0.027		0.022	0.175	0.027	0.068	0.091	0.027	0.0356	0.0165	0.07944	0.0141
Molybdenum	mg/L		0.73		<0.002	<0.002	<0.002	<0.002	<0.002		<0.002		<0.002	<0.002	<0.002		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.00011	< 0.00004	0.00007	< 0.00004
Nickel	mg/L	0.025	0.039		<0.003	<0.003	<0.003	<0.003	<0.003		<0.003		<0.003	<0.003	<0.003		<0.003	**0.041**	<0.003	<0.003	<0.003	<0.003	0.0012	0.0006	0.0009	0.0007
Potassium											0.28		0.14	0.82	0.29		0.28	3.34	<0.25	<0.25	<0.58	<0.58	0.256	0.279	0.192	0.116
Selenium	mg/L	0.1	0.005		<0.004	<0.004	<0.004	<0.004	<0.004		<0.004		<0.004	<0.004	<0.004		<0.004	<0.004	<0.004	<0.004	<0.002	<0.002	0.00007	0.00005	0.00006	0.00006
Silicon	mg/L				1.55	1.13	1.28	3.43	0.89		0.87		0.96	1.11	0.96		0.91	3.1	0.378	2.49	0.49	1.63	1.09	0.88	0.31	3.69
Silver	mg/L	0.0001	0.00012		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		<0.0001		<0.0001	<0.0001	<0.0001		<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Sodium	mg/L		180		2.77	3.91	2.01	1.99	3.13		1.61		1.74	2.45	1.87		1.58	4.72	1.54	1.86	1.54	1.7	2.63	2.44	1.43	3.27
Strontium	mg/L				0.016	0.03	0.019	0.019	0.02		0.013		0.016	0.028	0.013		0.014	0.042	0.021	0.026	0.026	0.03	0.02	0.0265	0.02362	0.0235
Sulphur	mg/L				1.38	1.61	0.89	0.75	0.53		774		1.03	0.49	0.88		1.02	1.21	0.584	0.371	0.417	0.318	5	1	< 3	< 3
Thallium	mg/L	0.0003	0.04		<0.0003	<0.0003	<0.0003	<0.0003	<0.0003		<0.0003		<0.0003	<0.0003	<0.0003		<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	<0.0003	< 0.000005	< 0.000005	< 0.000005	< 0.000005
Tin	mg/L				<0.002	<0.002	<0.002	<0.002	<0.002		<0.002		<0.002	<0.002	<0.002		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.00007	< 0.00006	< 0.00006	0.00008
Titanium	mg/L				<0.002	<0.002	0.004	0.003	0.009		<0.002		<0.002	0.003	0.003		<0.002	0.04	0.007	0.003	0.013	<0.010	0.00938	0.00153	0.00294	0.00099
Uranium	mg/L	0.005	0.033		<0.002	<0.002	<0.002	<0.002	<0.002		<0.002		<0.002	<0.002	<0.002		<0.002	<0.002	<0.0005	<0.0005	<0.0005	<0.0005	0.000017	0.00001	0.000012	0.000013
Vanadium	mg/L	0.006	0.02		<0.002	<0.002	<0.002	<0.002	<0.002		<0.002		<0.002	<0.002	<0.002		<0.002	0.003	<0.002	<0.002	<0.002	<0.002	0.00095	0.00023	0.00053	0.00025
Zinc	mg/L	0.03	0.089	0.03	0.007	***0.077***	0.013	0.011	0.024		0.008		0.016	<0.005	0.005		<0.005	***0.036***	0.006	0.005	0.008	<0.020	0.007	0.005	0.004	0.004

Notes:
(1) PWQO - Provincial Water Quality Objectives.
(2) APV - Aquatic Protection Value from *Rationale for the Development of Soil and Groundwater Standards for use at Contaminated Site in Ontario* , Table 3.1.
(3) CWQG - Canadian Water Quality Guidelines.
(4) Exceedences of the PWQO are indicated by **BOLD** entries.
(5) Exceedences of the APV are indicated by underlined entries.
(6) Exceedences of the CWQG are indicated by *italicized* entries.

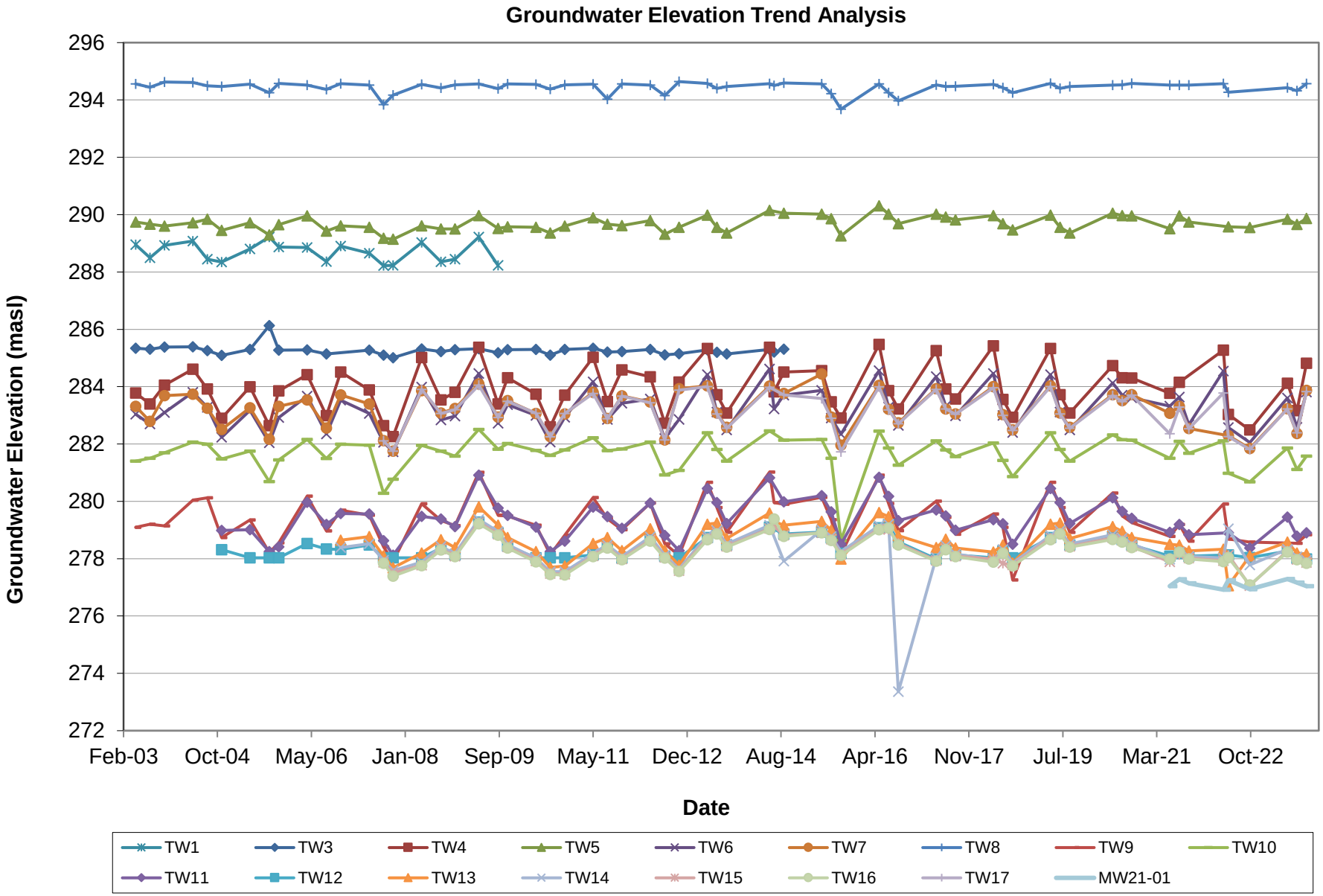
2023 Surface Water Duplicate Data

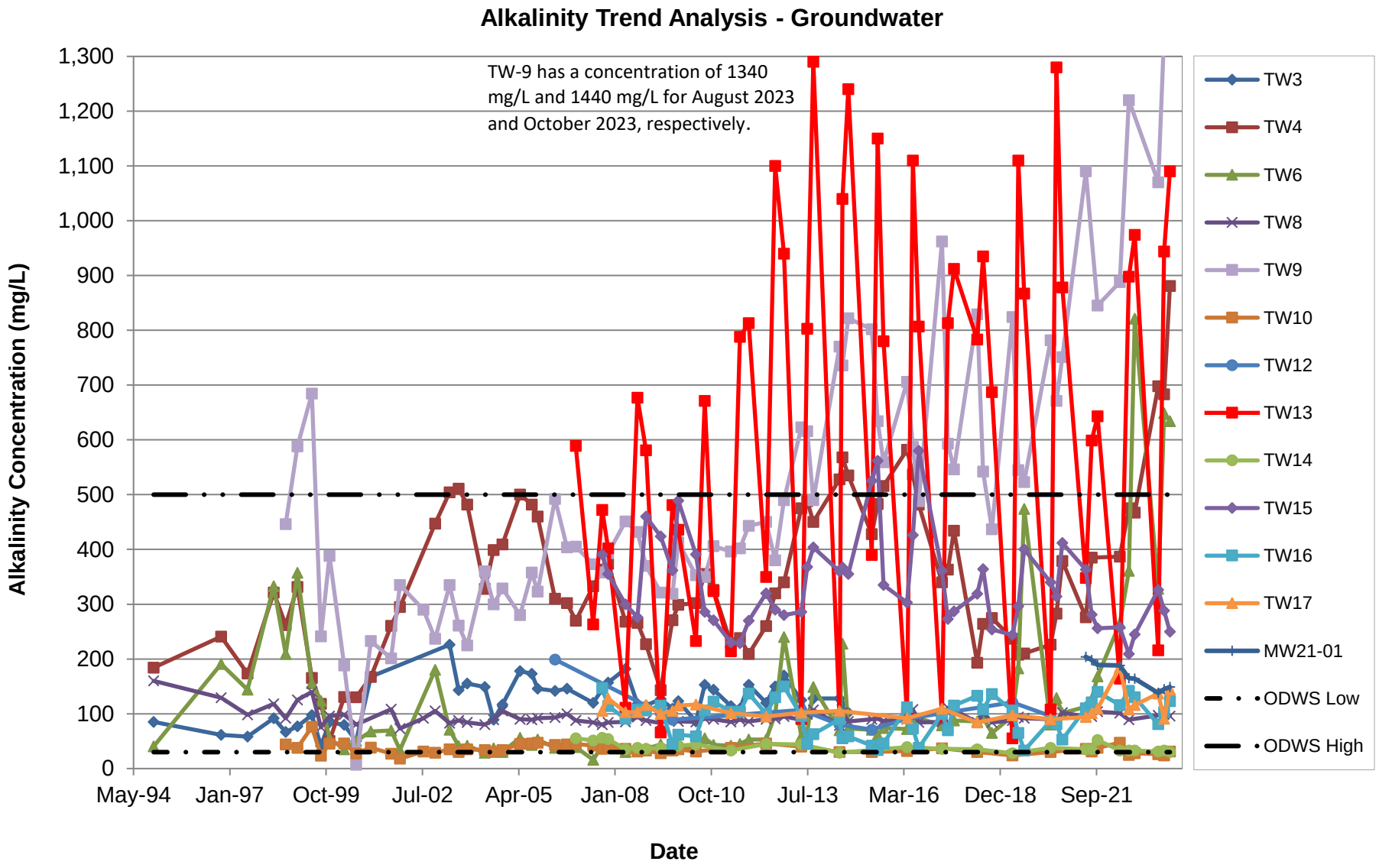
Parameters	Units	Jun-23			Oct-23		
		SW-4	HB SW DUP	Relative Percent Difference (%)	SW-5	HB SW DUP	Relative Percent Difference (%)
General Chemistry							
Alkalinity	mg/L	79	78	1.27	10	11	(9.52)
Chemical Oxygen Demand (COD)	mg/L	22	23	(4.44)	34	42	(21.05)
Total Dissolved Solids	mg/L	271	286	(5.39)	123	51	**82.76**
Total Suspended Solids	mg/L	3	2	40.00	< 2	< 2	NC
Ammonia	mg/L	0.07	0.06	15.38	< 0.04	< 0.04	NC
Turbidity	NTU	1	1	0.00	0.95	0.75	23.53
Un-ionized Ammonia	mg/L	< 0.001	< 0.001	NC	< 0.001	< 0.001	NC
Chloride	mg/L	96	95	1.05	9	9	0.00
Dissolved Organic Carbon	mg/L	7.9	7.9	0.00	9.1	9.6	(5.35)
Sulphate	mg/L	5	4	22.22	< 2	< 2	NC
Hardness	mg/L	106	110.0	(3.70)	18.5	18	5.56
Phenols	mg/L	< 0.001	< 0.001	NC	< 0.001	< 0.001	NC
Phosphorus	mg/L	0.011	0.013	(16.67)	0.007	0.01	(13.33)
pH	pH units	7.94	8.00	(0.75)	6.66	6.75	(1.34)
Conductivity	uS/cm	478	488	(2.07)	58	54	7.14
Elements							
Aluminum	mg/L	0.021	0.022	(4.65)	0.08	0.08	0.00
Arsenic	mg/L	0.001	0.0009	10.53	0.0007	0.0007	0.00
Barium	mg/L	0.01626	0.01614	0.74	0.00364	0.00339	7.11
Beryllium	mg/L	< 0.000007	< 0.000007	NC	0.000013	0.000012	8.00
Bismuth	mg/L	< 0.00001	< 0.00001	NC	< 0.00001	< 0.00001	NC
Boron	mg/L	0.007	0.008	(13.33)	0.005	0.005	0.00
Cadmium	mg/L	0.000003	< 0.000003	NC	0.000004	0.000004	0.00
Calcium	mg/L	29.3	30.8	(4.99)	4.66	4.6	2.17
Chromium	mg/L	0.00038	0.00035	8.22	0.00049	0.00045	8.51
Cobalt	mg/L	0.000093	0.000097	(4.21)	0.000205	0.000199	2.97
Copper	mg/L	0.0008	0.0009	(11.76)	0.0025	0.0033	(27.59)
Iron	mg/L	0.394	0.397	(0.76)	0.357	0.339	5.17
Lead	mg/L	< 0.00009	< 0.00009	NC	0.00016	0.00021	(27.03)
Magnesium	mg/L	8.01	8.04	(0.37)	1.67	1.49	11.39
Manganese	mg/L	0.03662	0.037	(0.41)	0.0141	0.01370	2.88
Molybdenum	mg/L	0.00063	0.0006	6.56	< 0.00004	< 0.00004	NC
Nickel	mg/L	0.0004	0.0004	0.00	0.0007	0.0008	(13.33)
Potassium	mg/L	0.916	0.918	(0.22)	0.116	0.115	0.87
Selenium	mg/L	0.00009	0.00011	(20.00)	0.00006	0.00008	(28.57)
Silicon	mg/L	0.34	0.34	0.00	3.69	3.86	(4.50)
Silver	mg/L	< 0.00005	< 0.00005	NC	< 0.00005	< 0.00005	NC
Sodium	mg/L	49.9	51.10	(2.38)	3.27	3.2	1.85
Strontium	mg/L	0.080	0.081	(0.57)	0.0235	0.023	3.46
Sulphur	mg/L	< 3	< 3	NC	< 3	< 3	NC
Thallium	mg/L	< 0.000005	< 0.000005	NC	< 0.000005	< 0.000005	NC
Tin	mg/L	0.00009	< 0.00006	NC	0.00008	0.00006	28.57
Titanium	mg/L	0.00047	0.00061	(25.93)	0.00099	0.00102	(2.99)
Uranium	mg/L	0.000108	0.00011	1.87	0.000013	0.00001	8.00
Vanadium	mg/L	0.00023	0.00025	(8.33)	0.000	0.00026	(3.92)
Zinc	mg/L	< 0.002	< 0.002	NC	0.004	0.005	(22.22)

Notes:
(1) NC - not calculable as one or both concentrations are below the laboratory method detection limit.
(2) Relative percent differences exceeding 50% are presented as bold and shaded entries.

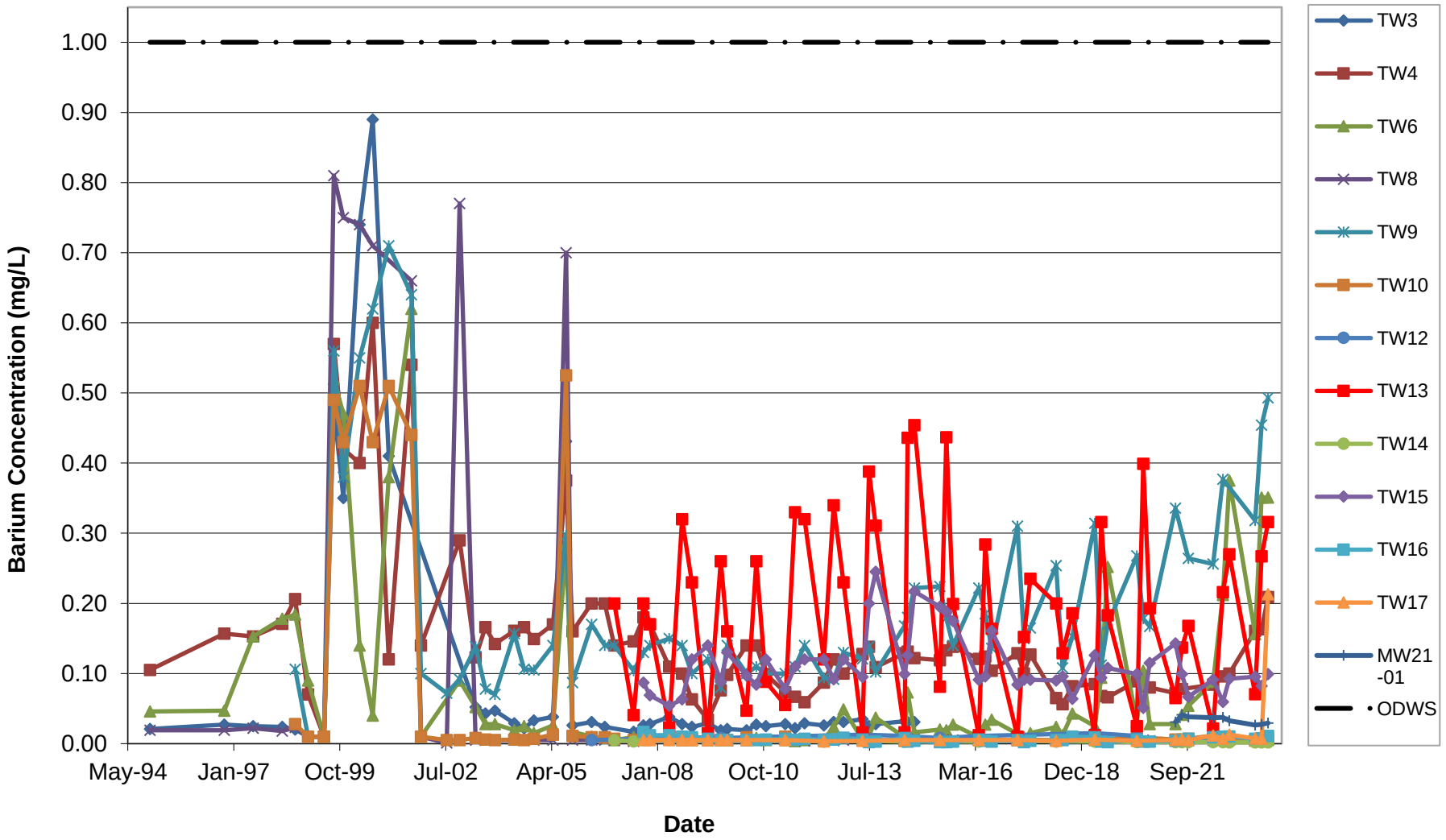
Appendix G

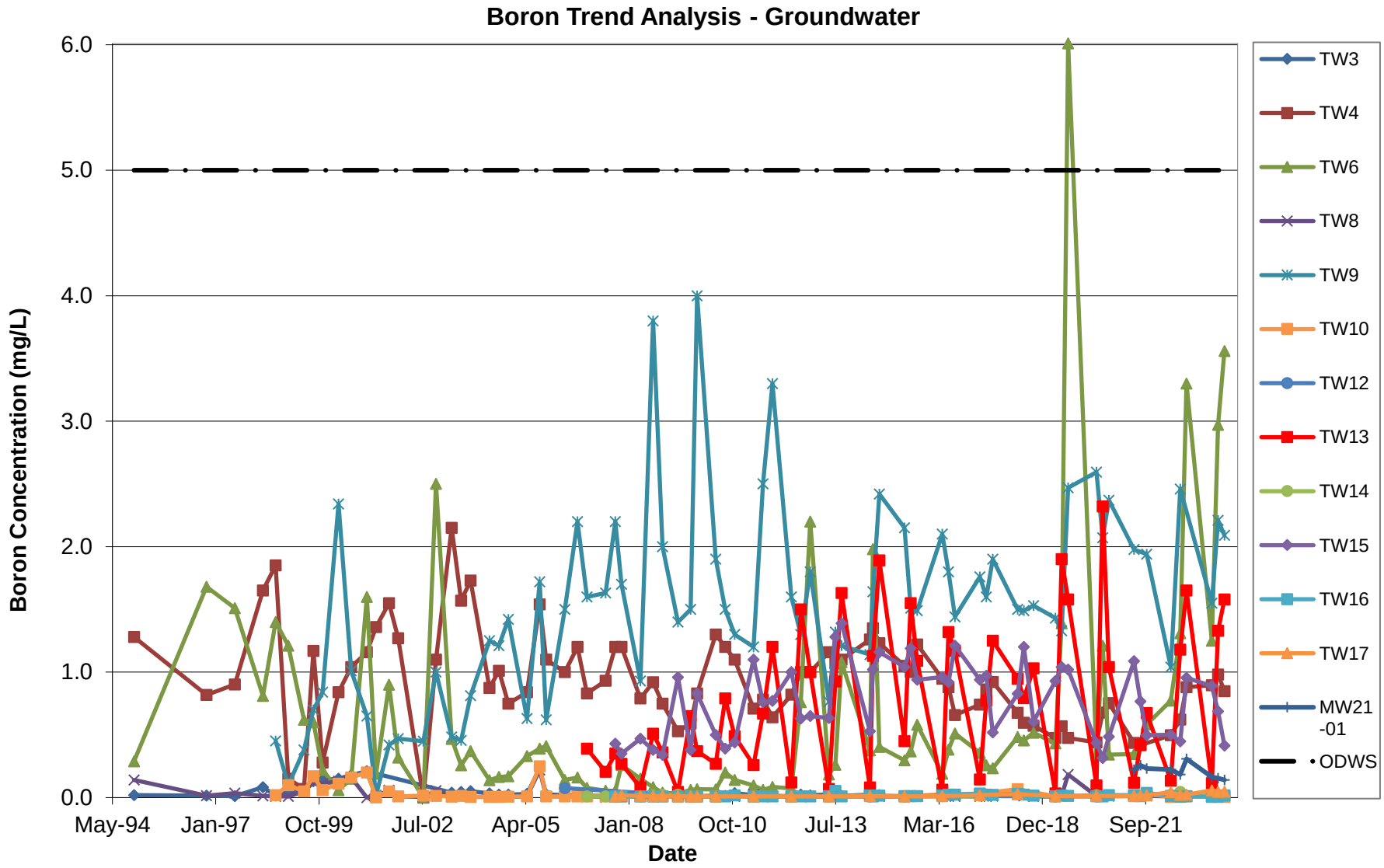
TREND ANALYSIS


Groundwater Elevation Trend Analysis
Groundwater Elevation (masl)
296
294
292
290
288
286
284
282
280
278
276
274
272
Feb-03
Oct-04
May-06
Jan-08
Sep-09
May-11
Dec-12
Aug-14
Apr-16
Nov-17
Jul-19
Mar-21
Oct-22
Date
TW1
TW3
TW4
TW5
TW6
TW7
TW8
TW9
TW10
TW11
TW12
TW13
TW14
TW15
TW16
TW17
MW21-01

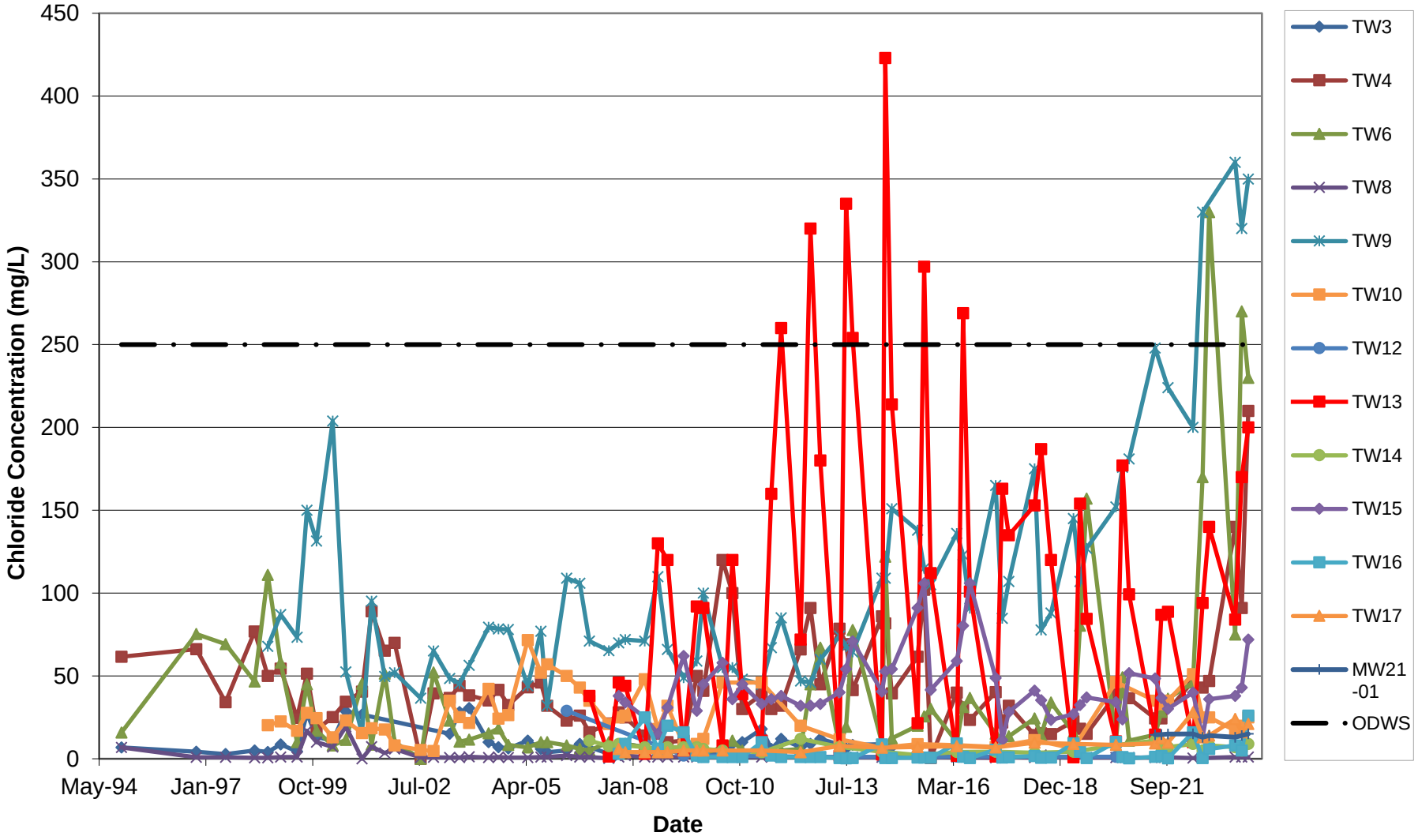

Alkalinity Trend Analysis - Groundwater
TW-9 has a concentration of 1340 mg/L and 1440 mg/L for August 2023 and October 2023, respectively.
Alkalinity Concentration (mg/L)
1,300
1,200
1,100
1,000
900
800
700
600
500
400
300
200
100
0
May-94
Jan-97
Oct-99
Jul-02
Apr-05
Jan-08
Oct-10
Jul-13
Mar-16
Dec-18
Sep-21
Date
TW3
TW4
TW6
TW8
TW9
TW10
TW12
TW13
TW14
TW15
TW16
TW17
MW21-01
ODWS Low
ODWS High

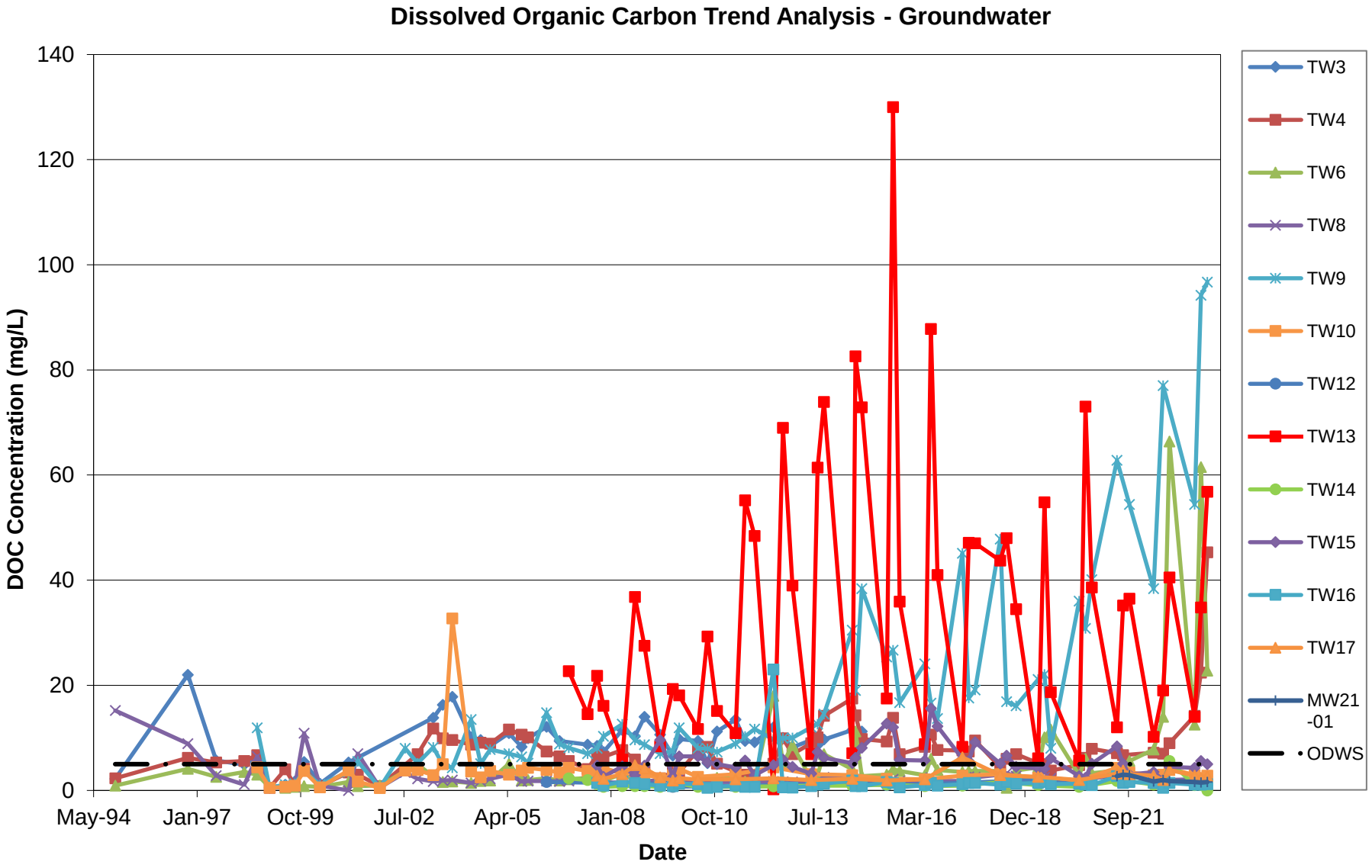
Barium Trend Analysis - Groundwater



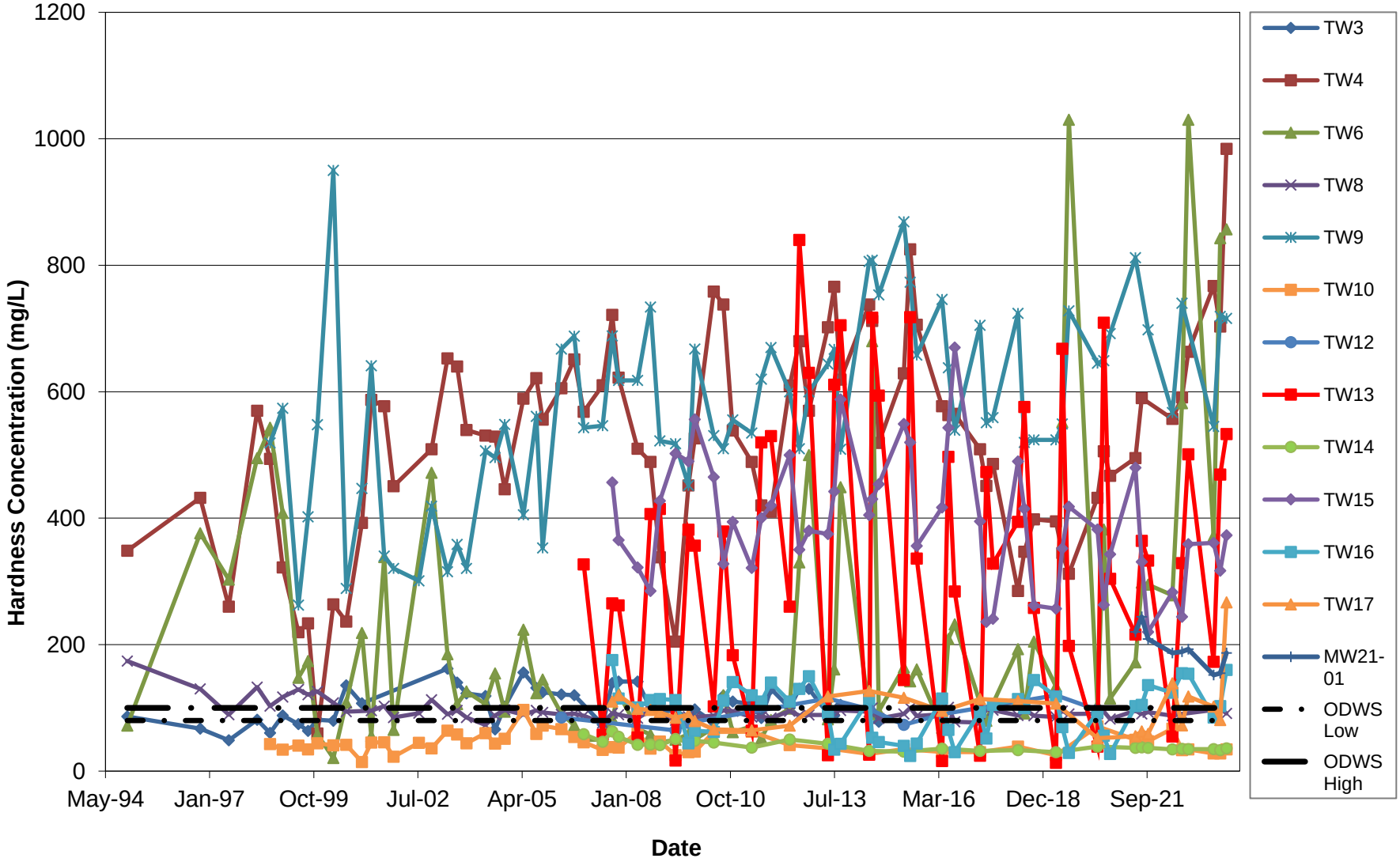

Boron Trend Analysis - Groundwater
Boron Concentration (mg/L)
6.0
5.0
4.0
3.0
2.0
1.0
0.0
May-94
Jan-97
Oct-99
Jul-02
Apr-05
Jan-08
Oct-10
Jul-13
Mar-16
Dec-18
Sep-21
Date
TW3
TW4
TW6
TW8
TW9
TW10
TW12
TW13
TW14
TW15
TW16
TW17
MW21-01
ODWS

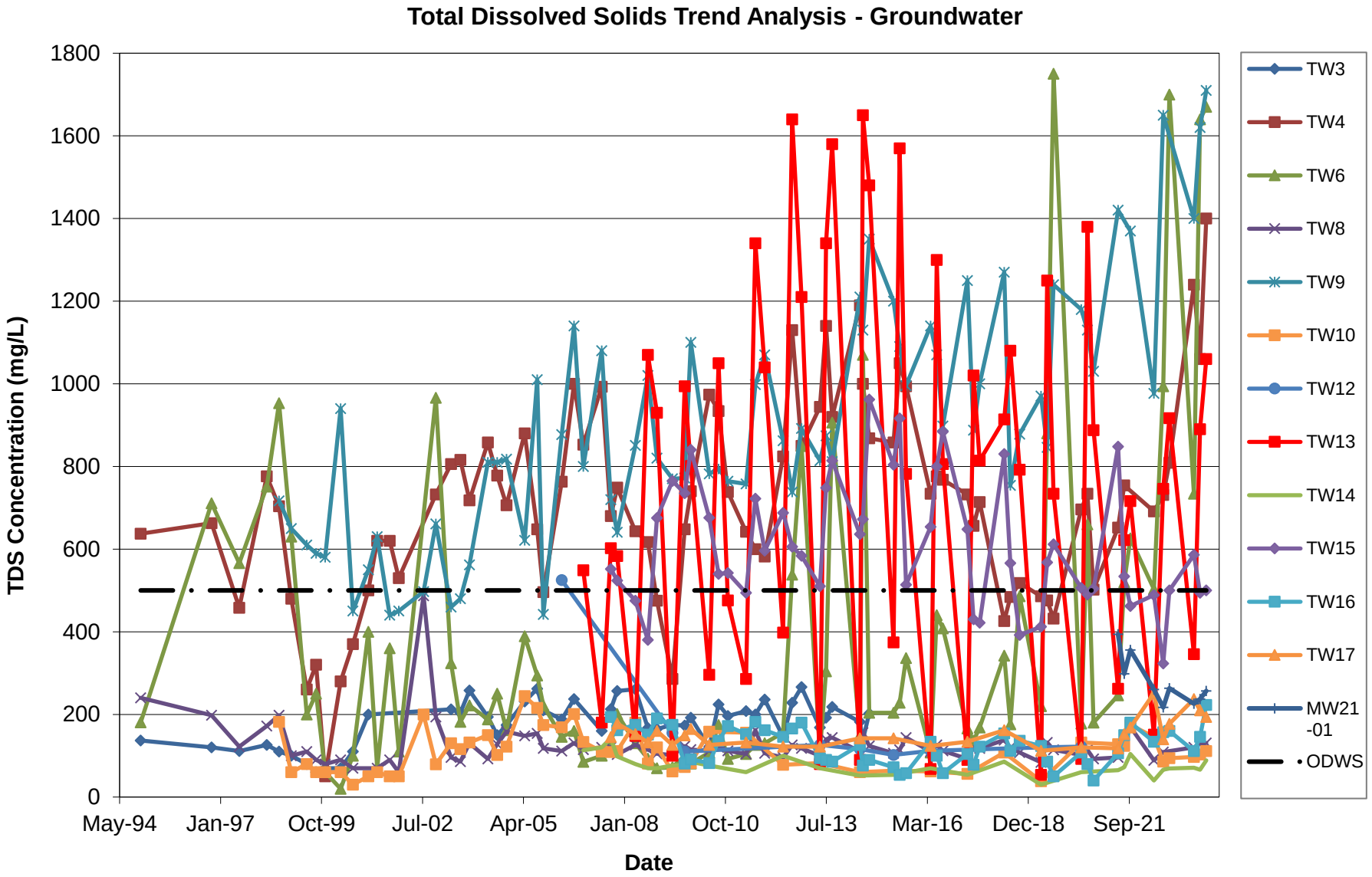
Chloride Trend Analysis - Groundwater

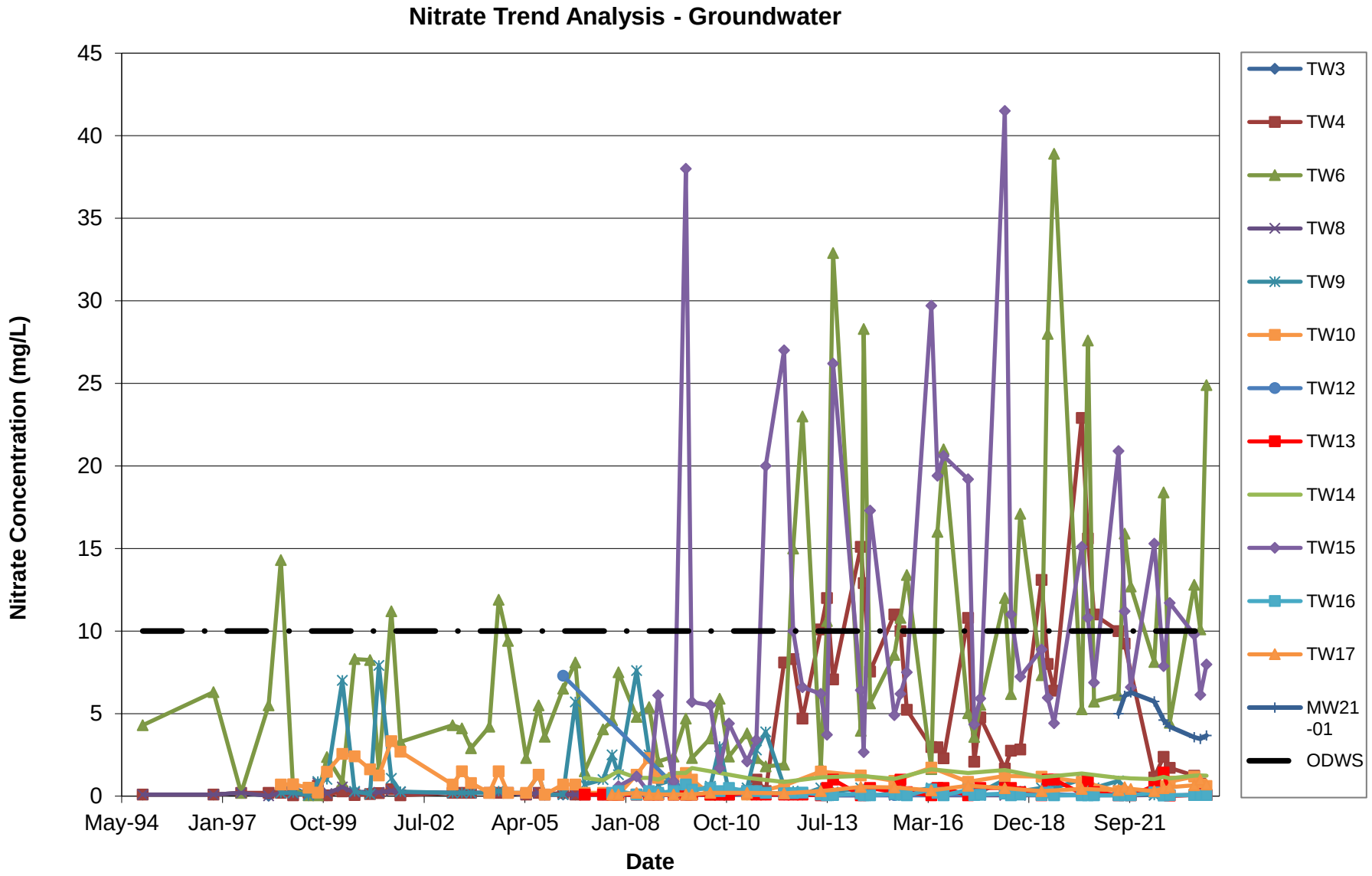


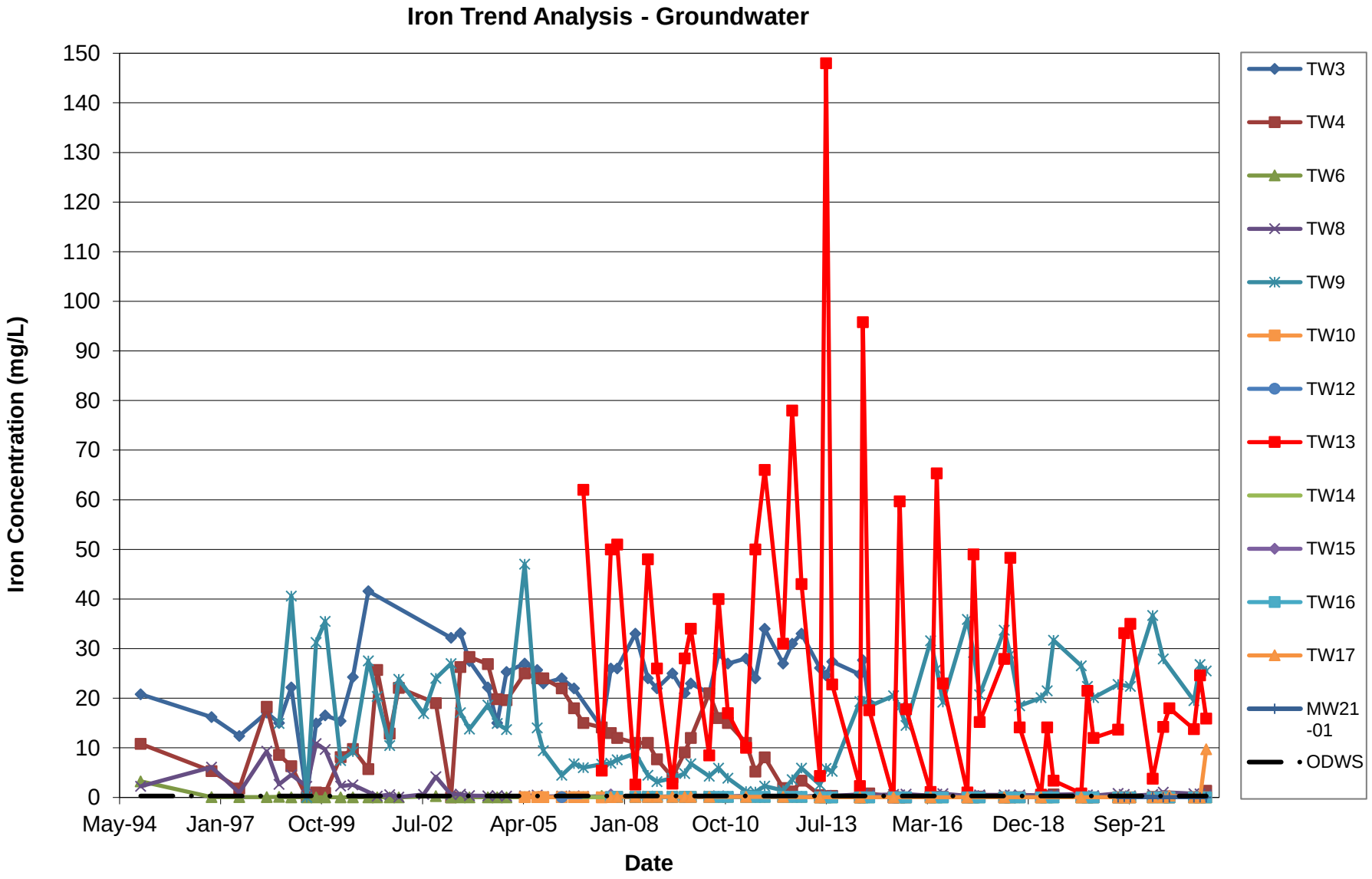

Dissolved Organic Carbon Trend Analysis - Groundwater
DOC Concentration (mg/L)
140
120
100
80
60
40
20
0
May-94
Jan-97
Oct-99
Jul-02
Apr-05
Jan-08
Oct-10
Jul-13
Mar-16
Dec-18
Sep-21
Date
TW3
TW4
TW6
TW8
TW9
TW10
TW12
TW13
TW14
TW15
TW16
TW17
MW21-01
ODWS

Hardness Trend Analysis - Groundwater

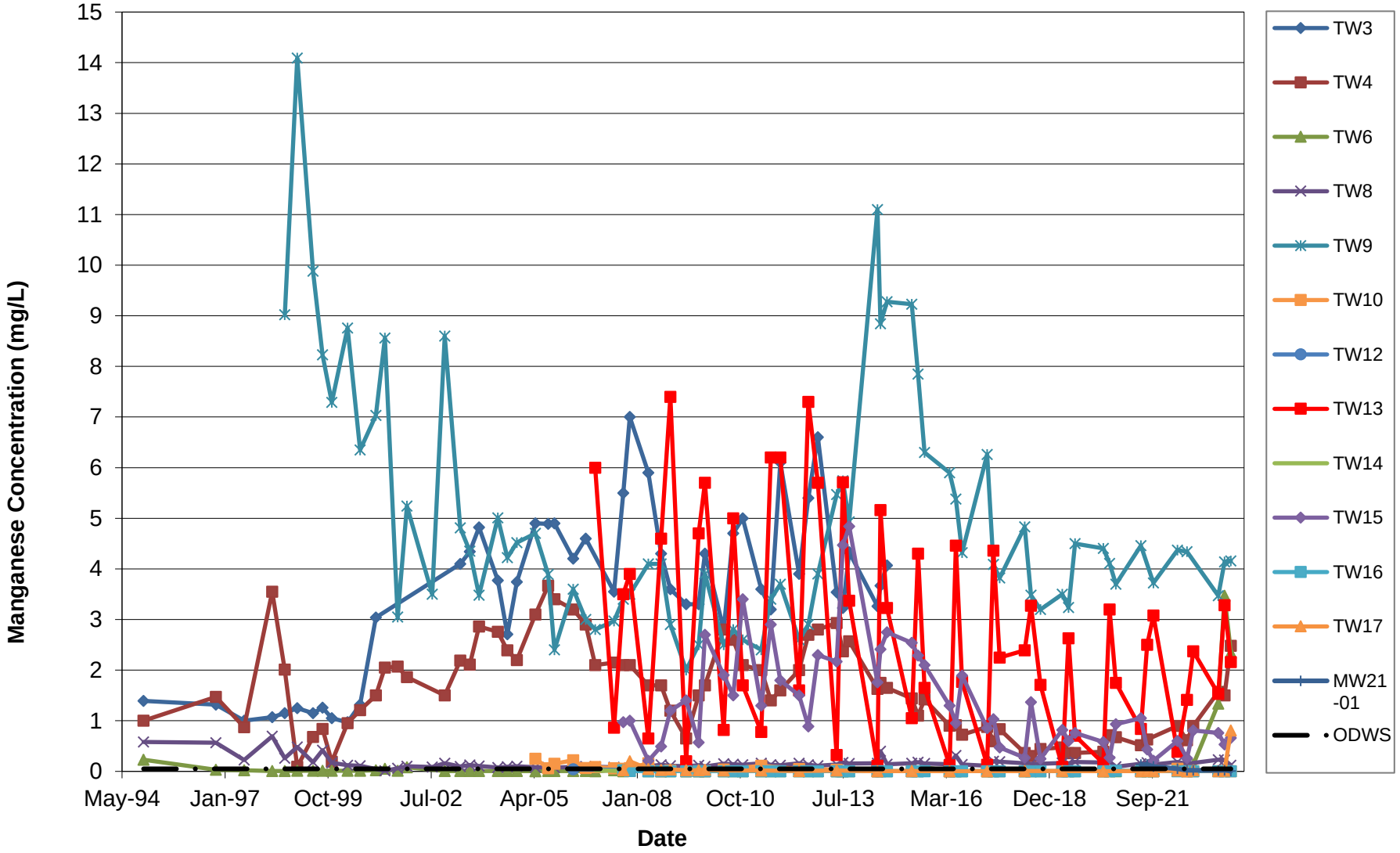



Total Dissolved Solids Trend Analysis - Groundwater
TDS Concentration (mg/L)
1800
1600
1400
1200
1000
800
600
400
200
0
May-94
Jan-97
Oct-99
Jul-02
Apr-05
Jan-08
Oct-10
Jul-13
Mar-16
Dec-18
Sep-21
Date
TW3
TW4
TW6
TW8
TW9
TW10
TW12
TW13
TW14
TW15
TW16
TW17
MW21-01
ODWS

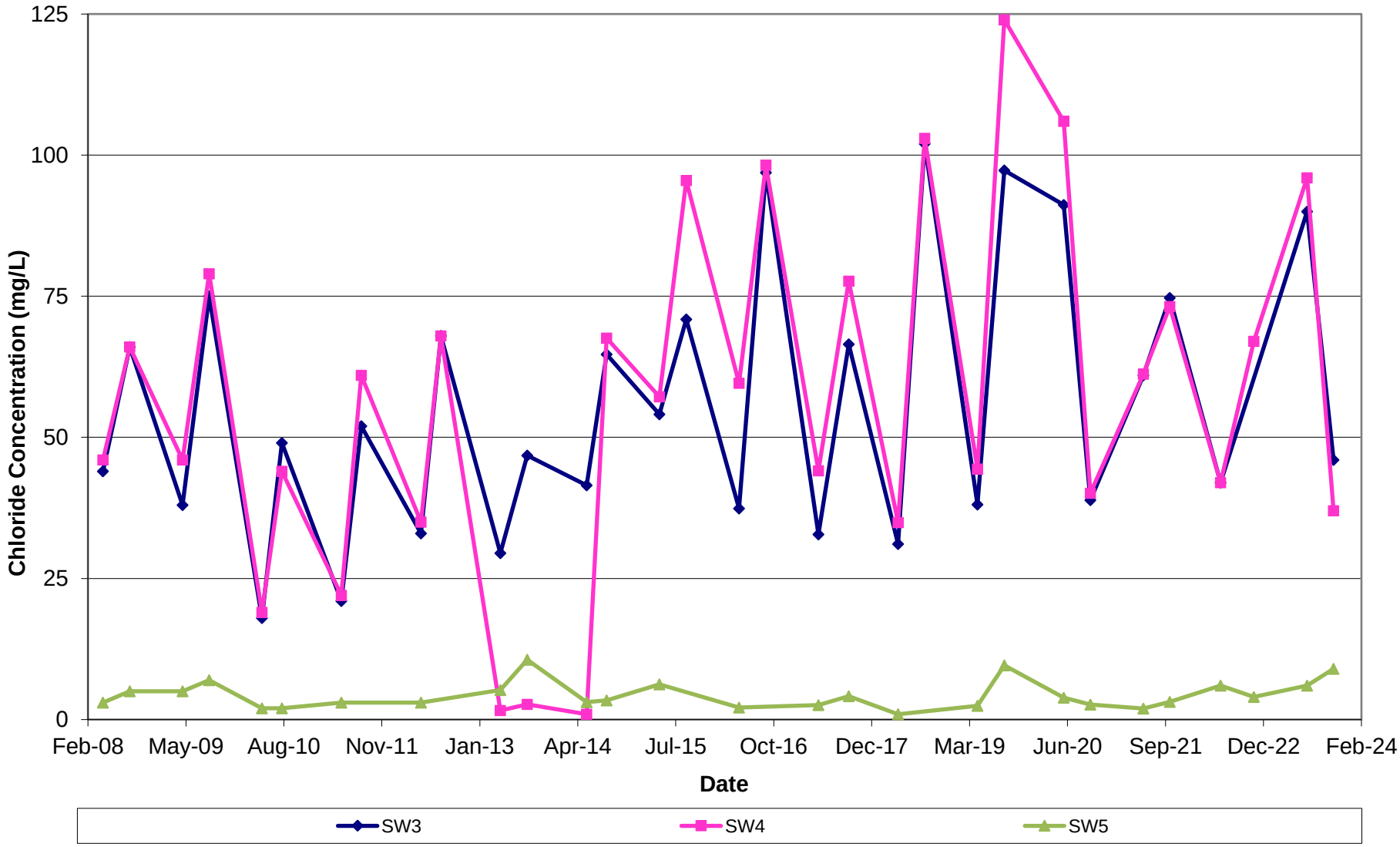

Nitrate Trend Analysis - Groundwater
Nitrate Concentration (mg/L)
45
40
35
30
25
20
15
10
5
0
May-94
Jan-97
Oct-99
Jul-02
Apr-05
Jan-08
Oct-10
Jul-13
Mar-16
Dec-18
Sep-21
Date
TW3
TW4
TW6
TW8
TW9
TW10
TW12
TW13
TW14
TW15
TW16
TW17
MW21-01
ODWS


Iron Trend Analysis - Groundwater
Iron Concentration (mg/L)
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
May-94
Jan-97
Oct-99
Jul-02
Apr-05
Jan-08
Oct-10
Jul-13
Mar-16
Dec-18
Sep-21
Date
TW3
TW4
TW6
TW8
TW9
TW10
TW12
TW13
TW14
TW15
TW16
TW17
MW21-01
ODWS

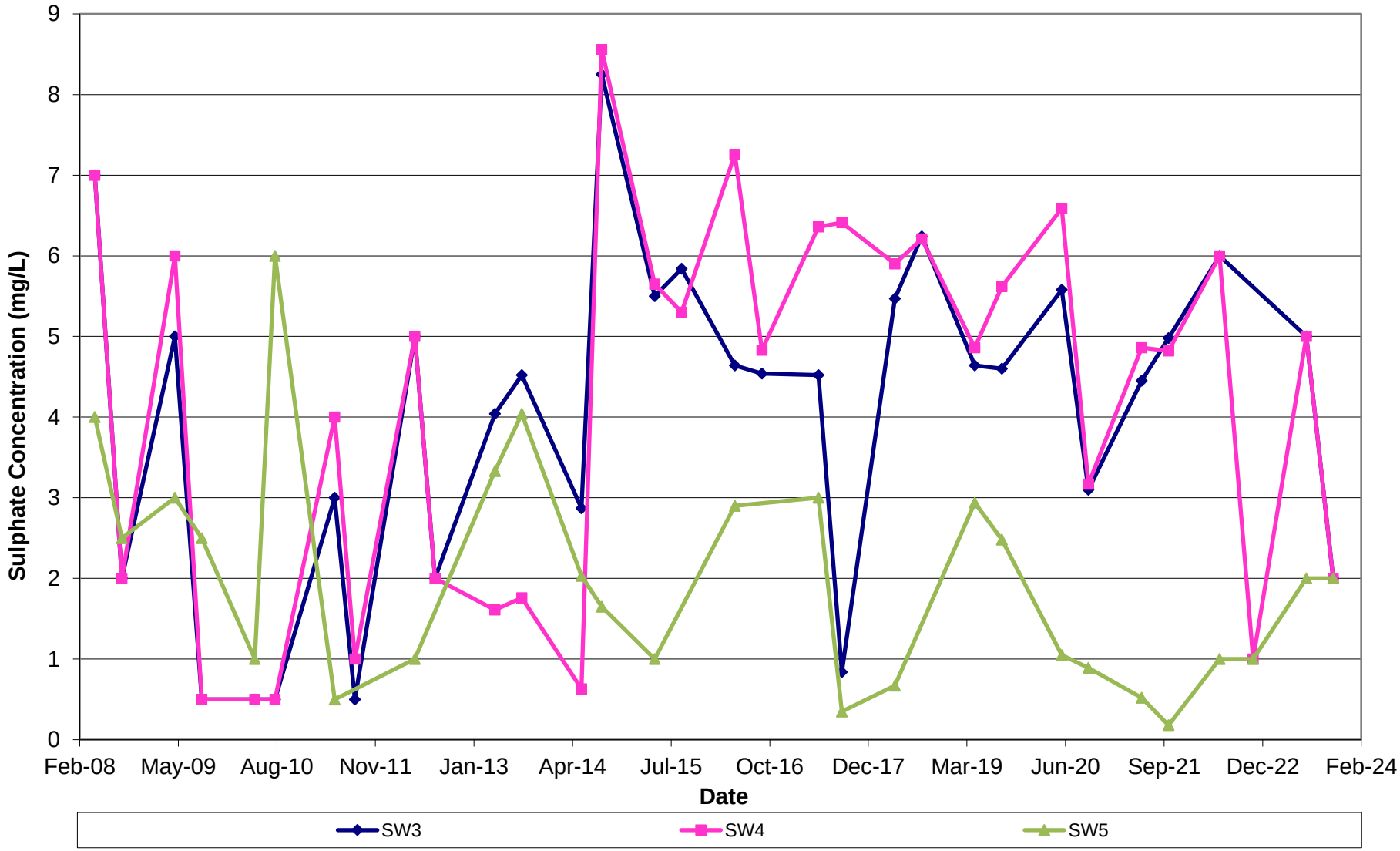
Manganese Trend Analysis - Groundwater



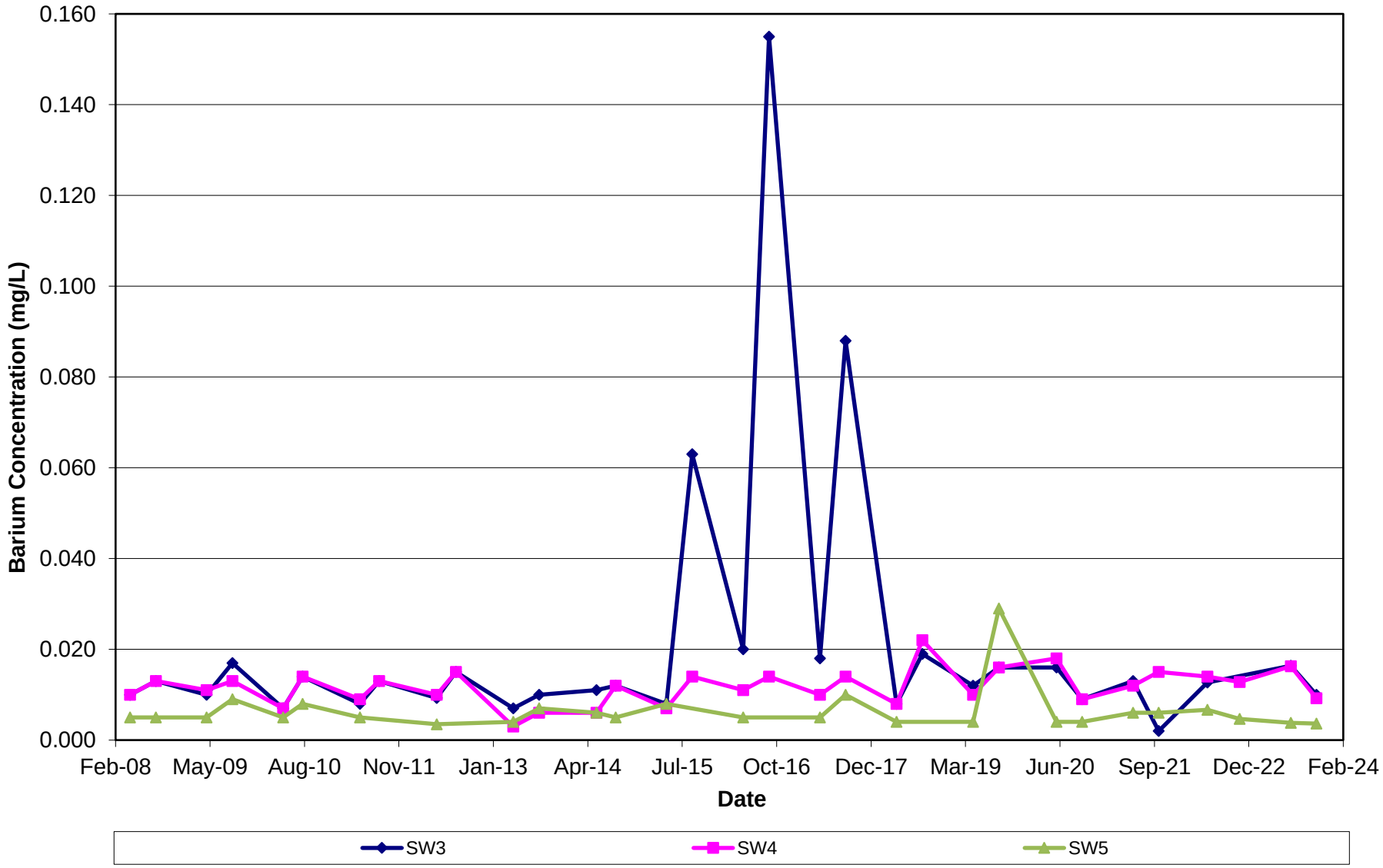
Chloride Trend Analysis - Surface Water



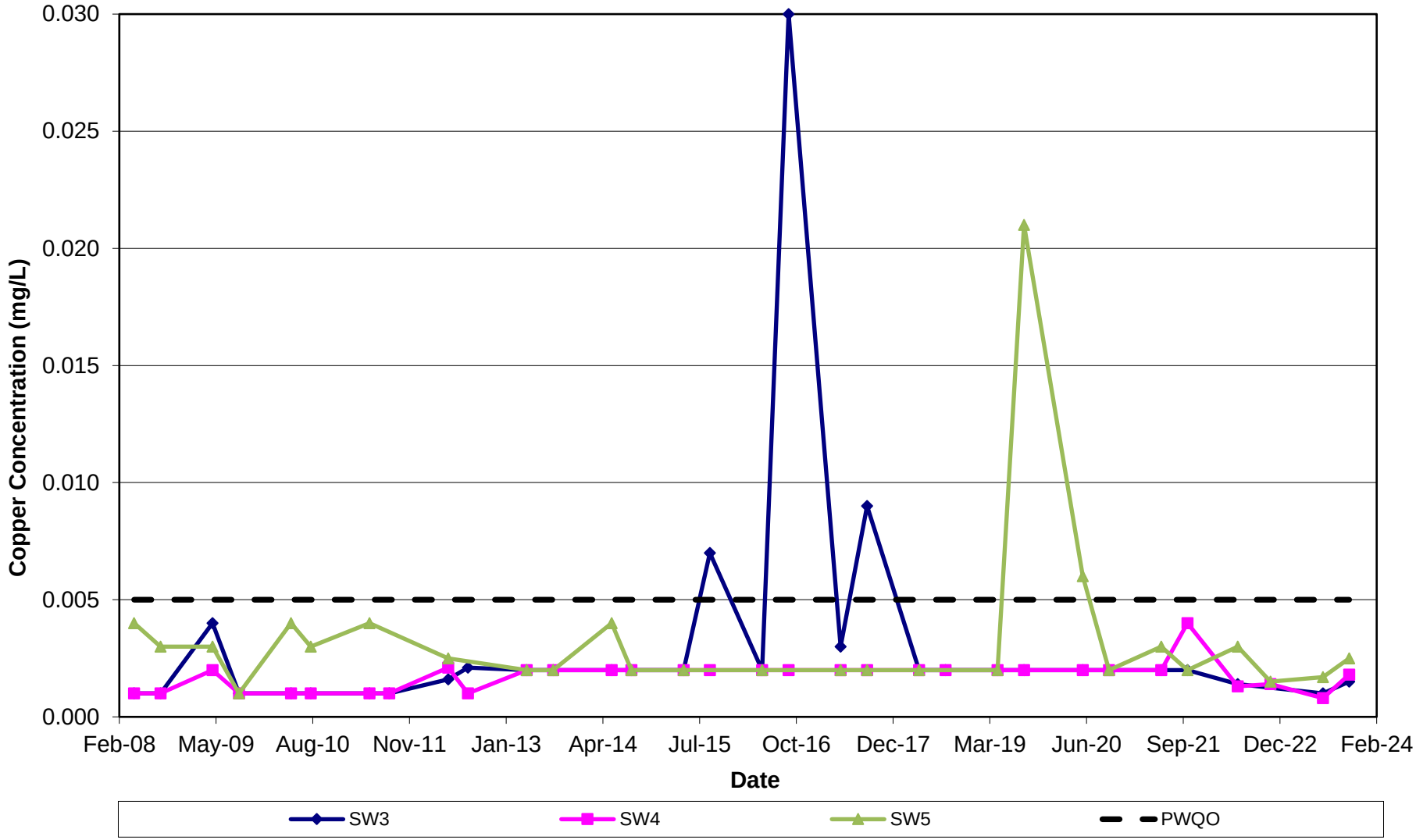
Sulphate Trend Analysis - Surface Water



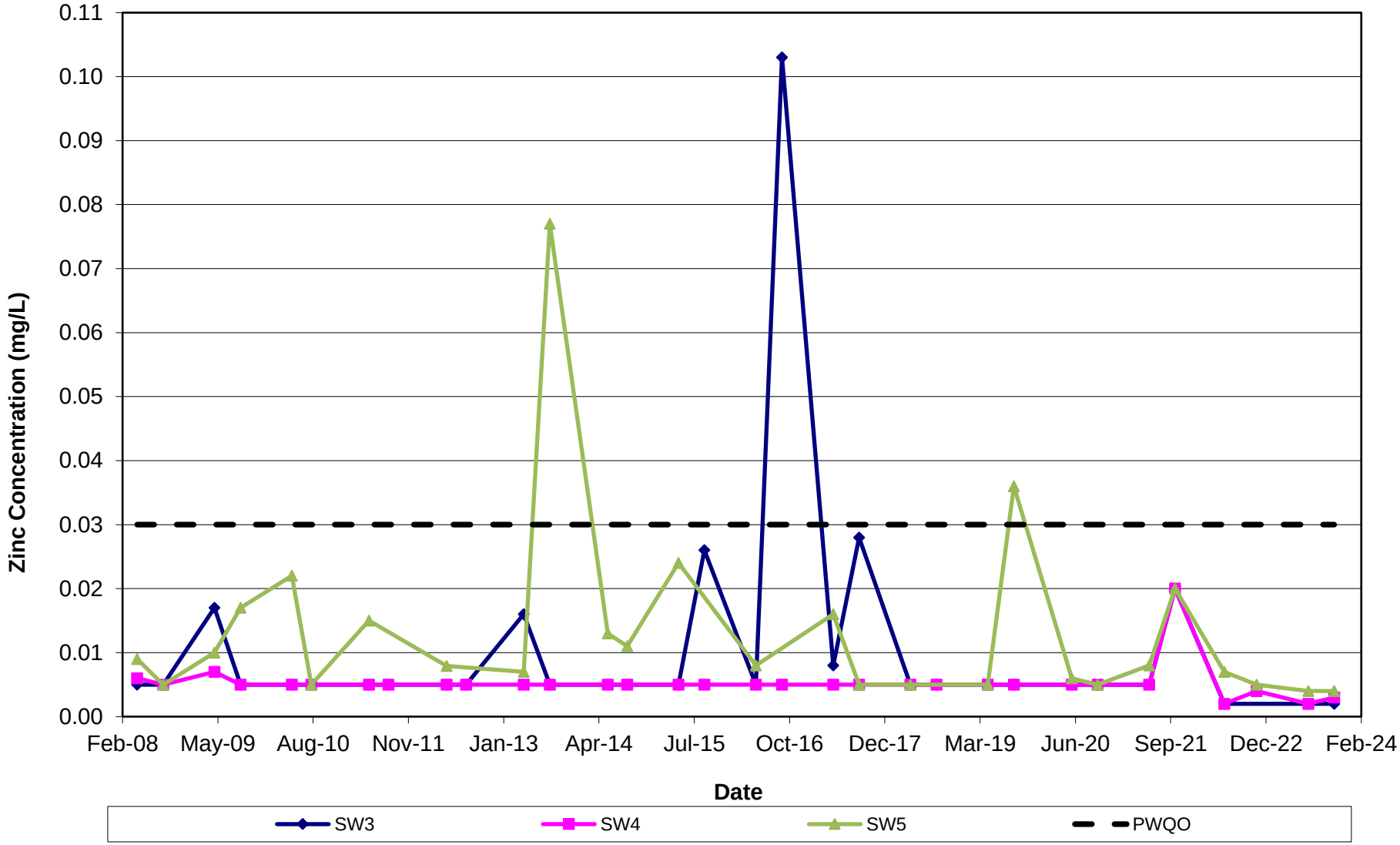
Barium Trend Analysis - Surface Water



Copper Trend Analysis - Surface Water



Zinc Trend Analysis - Surface Water



Appendix H

PHOTOGRAPHIC INVENTORY OF GROUNDWATER AND SURFACE WATER MONITORING LOCATIONS

		**TW-3** **2015**

		**TW-3** **2015**

TW-4
2023

TW-4
2023

TW-5
2022

TW-5
2022

TW-6
2023

TW-6
2023

TW-7
2019

TW-7
2019

TW-8
2023

TW-8
2023

TW-9
2023

TW-9
2023

TW-10
2023

TW-10
2023

TW-11
2022

TW-11
2022

TW-12
2023

TW-12
2023

TW-13
2023

TW-13
2023

TW-14
2023

TW-14
2023

TW-15
2023

TW-15
2023

TW-16
2023

TW-16
2023

TW-17
2023

TW-17
2023

MW21-01
2023

MW21-01
2023

SW-3
2023

SW-3
2023

SW-4
2023

SW-4
2023

	**SW-5** **2023**

	**SW-5** **2023**

Appendix I

GUIDELINE B-7 CALCULATIONS

The City of Temiskaming Shores
2023 Annual Groundwater and Surface Water Monitoring Report
Haileybury Waste Disposal Site
Haileybury, Ontario
April 2024

Guideline B-7 Calculations
Spring 2023 Monitoring Event

Guideline B-7 Calculations				Downgradient Monitoring Wells									
Parameter	**ODWS [3] C_r (mg/L)**	**Background Concentration $C_{b\,(1)}$ (mg/L)**	**Maximum Concentration $C_m=C_b+x(C_r-C_b)$ (mg/L)**	**TW-4 (mg/L)**	**TW-6 (mg/L)**	**TW-9 (mg/L)**	**TW-10 (mg/L)**	**TW-13 (mg/L)**	**TW-14 (mg/L)**	**TW-15 (mg/L)**	**TW-16 (mg/L)**	**TW-17 (mg/L)**	**MW21-01[5] (mg/L)**
Health Related			x=0.25 [2]										
Arsenic	0.01	0.001	0.004	0.0005	0.0005	**0.0135**	< 0.0002	**0.006**	< 0.0002	0.0003	0.0006	< 0.0002	0.0003
Barium	1	0.007	0.255	0.161	0.156	**0.318**	0.00434	0.0704	0.00197	0.0956	0.00708	0.00737	0.0265
Boron	5	0.010	1.257	0.896	1.250	**1.550**	0.008	0.114	0.017	0.889	0.006	0.058	0.165
Cadmium	0.005	0.0002	0.0014	0.000056	0.000112	0.000012	0.000005	0.000005	< 0.000003	0.00004	< 0.000003	0.000009	0.000008
Chromium	0.05	0.0021	0.014	0.00067	0.00072	0.0117	0.00059	0.00323	0.00148	0.00086	0.00118	0.00025	0.00056
Lead	0.01	0.0006	0.003	< 0.00009	< 0.00009	< 0.00009	< 0.00009	0.0002	< 0.00009	< 0.00009	< 0.00009	< 0.00009	< 0.00009
Nitrate-N	10	0.051	2.54	1.24	**12.80**	< 0.06	1.18	< 0.06	1.24	**9.79**	< 0.06	0.66	**3.57**
Nitrite-N	1	0.020	0.26	0.04	0.05	**< 0.3**	< 0.03	**< 0.3**	< 0.03	0.06	< 0.03	< 0.03	< 0.03
Non-Health Related			x=0.50 [2]										
Chloride	250	1.01	125.5	**140.0**	75.0	**360.0**	17.0	84.0	7.0	38.0	8.0	24.0	13.0
Copper	1	0.002	0.50	0.0105	0.0333	0.0031	0.0022	0.0064	0.0012	0.0177	0.003	0.0038	0.0045
DOC	5	2.04	3.5	**14.2**	**12.5**	**54.4**	2.9	**14.0**	1.0	**4.3**	1.1	2.8	1.6
Iron	0.3	0.52	0.52 [6]	0.067	0.01	**19.50**	0.016	**13.80**	< 0.007	< 0.007	< 0.007	0.014	< 0.007
Manganese	0.05	0.14	0.14 [6]	**1.57**	**1.34**	**3.47**	0.00238	**1.53**	0.00064	**0.759**	0.00011	0.00755	0.018
Sodium	200	2.54	101.3	72.5	71.7	**175.0**	12.1	11.0	4.32	53.2	4.56	9.33	11.6
Sulphate	500	6.10	253	190	120	100	4	5	3	62	3	10	20
TDS	500	118	309	**1240**	**734**	**1400**	97	**346**	71	**586**	111	237	226
Zinc	5	0.005	2.50	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	0.007

Notes:
(1) Average of valid sampling rounds at TW-8.
(2) Defined according to Guideline B-7 (MECP, 1994).
(3) ODWS - Ontario Drinking Water Standards (MECP, 2001).
(4) **BOLD and shaded** indicates an exceedance of the Maximum Concentration.
(5) Downgradient property boundary well (i.e., compliance point).
(6) Background exceeds the ODWS, therefore the maximum concentration has been set at background.

The City of Temiskaming Shores
2023 Annual Groundwater and Surface Water Monitoring Report
Haileybury Waste Disposal Site
Haileybury, Ontario
April 2024

Guideline B-7 Calculations
Summer 2023 Monitoring Event

Guideline B-7 Calculations				Downgradient Monitoring Wells									
Parameter	**ODWS [3] C_r (mg/L)**	**Background Concentration $C_{b\,(1)}$ (mg/L)**	**Maximum Concentration $C_m=C_b+x(C_r-C_b)$ (mg/L)**	**TW-4 (mg/L)**	**TW-6 (mg/L)**	**TW-9 (mg/L)**	**TW-10 (mg/L)**	**TW-13 (mg/L)**	**TW-14 (mg/L)**	**TW-15 (mg/L)**	**TW-16 (mg/L)**	**TW-17 (mg/L)**	**MW21-01[5] (mg/L)**
Health Related			x=0.25 [2]										
Arsenic	0.01	0.001	0.004	0.0007	0.0011	**0.0212**	0.0002	**0.011**	0.0002	0.0004	0.0006	0.0002	0.0004
Barium	1	0.007	0.255	0.163	**0.351**	**0.454**	0.00477	**0.267**	0.00179	0.0822	0.00777	0.00709	0.02756
Boron	5	0.010	1.257	0.981	**2.970**	**2.210**	0.006	**1.330**	0.009	0.688	0.008	0.046	0.154
Cadmium	0.005	0.0002	0.0014	0.000063	0.000291	0.000023	0.000004	0.000004	0.000007	0.000036	0.000003	0.000014	0.000005
Chromium	0.05	0.0020	0.014	0.0008	0.00257	**0.0222**	0.00066	0.00633	0.00159	0.00087	0.00123	0.00027	0.0008
Lead	0.01	0.0005	0.003	< 0.00009	< 0.00009	0.0002	< 0.00009	< 0.00009	< 0.00009	< 0.00009	< 0.00009	< 0.00009	< 0.00009
Nitrate-N	10	0.051	2.54	0.76	**10.10**	0.15	0.70	0.13	1.26	**6.13**	< 0.06	0.99	**3.47**
Nitrite-N	1	0.020	0.26	< 0.03	< 0.03	**< 0.3**	< 0.03	0.03	< 0.03	0.05	< 0.03	< 0.03	< 0.03
Non-Health Related			x=0.50 [2]										
Chloride	250	1.00	125.5	91.0	**270.0**	**320.0**	20.0	**170.0**	5.0	43.0	5.0	16.0	14.0
Copper	1	0.002	0.50	0.0122	0.0838	0.002	0.0015	0.0009	0.0008	0.011	0.0009	0.0031	0.0032
DOC	5	2.04	3.5	**22.4**	**61.5**	**94.2**	2.3	**34.8**	< 1.0	**5.6**	1.1	2.4	1.5
Iron	0.3	0.53	0.53 [6]	0.073	0.012	**26.80**	0.024	**24.60**	< 0.007	< 0.007	< 0.007	0.008	< 0.007
Manganese	0.05	0.14	0.14 [6]	**1.50**	**3.47**	**4.14**	0.00313	**3.28**	0.00018	**0.532**	0.00011	0.0105	0.0232
Sodium	200	2.54	101.3	88.3	**173.0**	**250.0**	9.65	**131.0**	4.05	40.2	2.95	8.34	11.3
Sulphate	500	6.07	253	140	**350**	77	13	< 2	3	60	4	7	28
TDS	500	118	309	**1060**	**1640**	**1620**	103	**890**	66	**494**	146	210	237
Zinc	5	0.005	2.50	< 0.002	0.003	0.003	< 0.002	0.002	< 0.002	< 0.002	< 0.002	< 0.002	0.007

Notes:
(1) Average of valid sampling rounds at TW-8.
(2) Defined according to Guideline B-7 (MECP, 1994).
(3) ODWS - Ontario Drinking Water Standards (MECP, 2001).
(4) **BOLD and shaded** indicates an exceedance of the Maximum Concentration.
(5) Downgradient property boundary well (i.e., compliance point).
(6) Background exceeds the ODWS, therefore the maximum concentration has been set at background.

The City of Temiskaming Shores
2023 Annual Groundwater and Surface Water Monitoring Report
Haileybury Waste Disposal Site
Haileybury, Ontario
April 2024

Guideline B-7 Calculations
Fall 2023 Monitoring Event

Guideline B-7 Calculations				Downgradient Monitoring Wells									
Parameter	**ODWS [3] C_r (mg/L)**	**Background Concentration $C_{b\,(1)}$ (mg/L)**	**Maximum Concentration $C_m=C_b+x(C_r-C_b)$ (mg/L)**	**TW-4 (mg/L)**	**TW-6 (mg/L)**	**TW-9 (mg/L)**	**TW-10 (mg/L)**	**TW-13 (mg/L)**	**TW-14 (mg/L)**	**TW-15 (mg/L)**	**TW-16 (mg/L)**	**TW-17 (mg/L)**	**MW21-01[5] (mg/L)**
Health Related			x=0.25 [2]										
Arsenic	0.01	0.001	0.004	0.0007	0.0009	**0.0193**	< 0.0002	**0.0079**	< 0.0002	0.0003	0.0005	0.0018	0.0003
Barium	1	0.007	0.255	0.209	**0.351**	**0.493**	0.00558	**0.316**	0.0018	0.0993	0.0111	0.213	0.0294
Boron	5	0.010	1.257	0.849	**3.560**	**2.090**	0.005	**1.580**	0.011	0.415	0.017	0.047	0.141
Cadmium	0.005	0.0002	0.0014	0.000076	0.000186	0.00001	0.000004	0.000007	< 0.000003	0.000032	0.000003	0.000156	0.000005
Chromium	0.05	0.0019	0.014	0.00085	0.00128	**0.0215**	0.00034	0.00637	0.00123	0.00073	0.00085	**0.0201**	0.0007
Lead	0.01	0.0005	0.003	< 0.00009	< 0.00009	< 0.00009	< 0.00009	< 0.00009	< 0.00009	< 0.00009	< 0.00009	**0.01032**	0.00041
Nitrate-N	10	0.050	2.54	< 0.06	**24.90**	< 0.06	0.620	< 0.06	1.24	**7.98**	< 0.06	0.700	**3.67**
Nitrite-N	1	0.019	0.26	**< 0.3**	0.04	**< 0.3**	< 0.03	**< 0.3**	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Non-Health Related			x=0.50 [2]										
Chloride	250	0.99	125.5	**210.0**	**230.0**	**350.0**	25.0	**200.0**	9.0	72.0	26.0	21.0	15.0
Copper	1	0.002	0.50	0.0149	0.071	0.0016	0.002	0.002	0.0019	0.0103	0.0011	0.0627	0.0046
DOC	5	2.04	3.5	**45.3**	**22.8**	**96.7**	2.8	**56.8**	< 1.0	**5.0**	1.2	2.7	1.6
Iron	0.3	0.52	0.52 [6]	**1.35**	0.008	**25.50**	0.007	**15.90**	0.01	0.0370	0.008	**9.70**	0.007
Manganese	0.05	0.14	0.14 [6]	**2.48**	**2.34**	**4.16**	0.00186	**2.16**	0.00085	**0.662**	0.00115	0.807	0.0067
Sodium	200	2.54	101.3	**114.0**	**200.0**	**263.0**	13.4	**152.0**	4.51	31.5	6.02	9.11	11.8
Sulphate	500	6.03	253	140	**370**	76	6	< 2	2	110	7	7	23
TDS	500	119	309	**1400**	**1670**	**1710**	111	**1060**	89	**500**	223	194	257
Zinc	5	0.005	2.50	< 0.002	0.003	< 0.002	< 0.002	0.003	< 0.002	< 0.002	< 0.002	0.047	0.008

Notes:
(1) Average of valid sampling rounds at TW-8.
(2) Defined according to Guideline B-7 (MECP, 1994).
(3) ODWS - Ontario Drinking Water Standards (MECP, 2001).
(4) **BOLD and shaded** indicates an exceedance of the Maximum Concentration.
(5) Downgradient property boundary well (i.e., compliance point).
(6) Background exceeds the ODWS, therefore the maximum concentration has been set at background.

Appendix J

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	Haileybury Waste Disposal Site
Location (e.g. street address, lot, concession)	~9 km southwest of Haileybury, Ontario, Lot 1, Concession 2, within the City of Temiskaming Shores, in the District of Temiskaming
GPS Location (taken within the property boundary at front gate/ front entry)	593843 Easting and 5252782 Northing, NAD83 Zone 17
Municipality	The City of Temiskaming Shores
Client and/or Site Owner	The City of Temiskaming Shores
Monitoring Period (Year)	2023
This Monitoring Report is being submitted under the following:	
Certificate of Approval No.:	A570402
Director's Order No.:	
Provincial Officer's Order No.:	
Other:	

Report Submission Frequency	◉ **Annual** ○ **Other**	Specify (Type Here):
The site is:	◉ **Active** ○ **Inactive** ○ **Closed**	
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:	Landfill has closed to the public as of October 17, 2023.	
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:

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:	◉ **Yes** ○ **No**	If no, list exceptions (Type Here):
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):	◉ **Yes** ○ **No** ○ **Not Applicable**	If no, list exceptions below or attach information.

Groundwater Sampling Location	**Description/Explanation for change (change in name or location, additions, deletions)**	**Date**
Type Here	Type Here	Select Date
Type Here	Type Here	Select Date
Type Here	Type Here	Select Date

3) a) Some or all groundwater, leachate and WDS gas sampling and monitoring requirements have been established or defined outside of a ministry C of A, authorizing, or control document.	○ **Yes** ◉ **No** ○ **Not Applicable**	
b) If yes, 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:	○ **Yes** ○ **No** ◉ **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**
Type Here	Type Here	Select Date
Type Here	Type Here	Select Date
Type Here	Type Here	Select Date

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):	◉ **Yes** ○ **No**	If no, specify (Type Here):

Sampling and Monitoring Program Results/WDS Conditions and Assessment:

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.	(●) **Yes** ( ) **No**	If no, the potential design and operational concerns/ exceptions are as follows (Type Here):	
6) The site meets compliance and assessment criteria.	(●) **Yes** ( ) **No**		
7) The site continues to perform as anticipated. There have been no unusual trends/ changes in measured leachate and groundwater levels or concentrations.	(●) **Yes** ( ) **No**	If no, list exceptions and explain reason for increase/change (Type Here):	
1) Is one or more of the following risk reduction practices in place at the site: ***(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** ***(b)*** **There is a predictive monitoring program in-place (modeled indicator concentrations projected over time for key locations); or** ***(c)*** **The site meets the following two conditions (typically achieved after 15 years or longer of site operation):** ***i.*** **The site has developed stable leachate mound(s) and stable leachate plume geometry/concentrations; and** ***ii.*** **Seasonal and annual water levels and water quality fluctuations are well understood.**	(●) **Yes** ( ) **No**	**Note which practice(s):**	☐ **(a)** ☐ **(b)** ☒ **(c)**
9) Have trigger values for contingency plans or site remedial actions been exceeded (where they exist):	( ) **Yes** (●) **No** ( ) **Not Applicable**	No exceedances of the trigger level concentrations were recorded. MW21-01 exceeded Guideline B-7 concentrations for nitrate in 2023, however additional land is available within the CAZ for continued attenuation, therefore continued monitoring is recommended at this time.	

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.

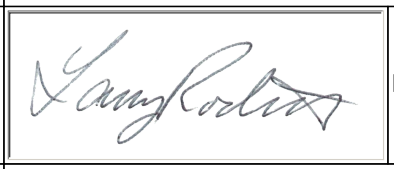
I have examined the applicable Certificate of Approval and any other environmental authorizing or control documents that apply to the site. I have read and followed the Monitoring and Reporting for Waste Disposal Sites Groundwater and Surface Water Technical Guidance Document (MOE, 2010, or as amended), 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:

◉ **No changes to the monitoring program are recommended** ○ **The following change(s) to the monitoring program is/are recommended:**	
◉ **No Changes to site design and operation are recommended** ○ **The following change(s) to the site design and operation is/ are recommended:**	Type Here

Name:	Larry Rodricks		
Seal:	Add Image		
Signature:		**Date:**	March 15, 2024
CEP Contact Information:	Larry Rodricks Senior Principal Engineer		
Company:	WSP Canada Inc.		
Address:	900 Maple Grove Road, Unit 10 Cambridge, Ontario N3H 4R7		
Telephone No.:	(519) 650-7108	Fax No. :	
E-mail Address:	larry.rodricks@wsp.com		
Co-signers for additional expertise provided:			
Signature:		**Date:**	Select Date
Signature:		**Date:**	Select 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)	Intermittent stream and unnamed tributary to South Wabi Creek.
Distance(s)	Intermittent stream is situated immediately adjacent to site, flowing along the southern property boundary. Unnamed tributary to South Wabi Creek is situated 100 m from the southwest corner of the site property at its nearest point.

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:	◉ Yes ○ No	If no, identify issues (Type Here):
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):	◉ Yes ○ No ○ **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
Type Here	Type Here	Select Date
Type Here	Type Here	Select Date
Type Here	Type Here	Select Date

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.	◯ **Yes** ◉ **No** ◯ **Not Applicable**	
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:	◯ **Yes** ◯ **No** ◉ **Not Applicable**	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**
Type Here	Type Here	Select Date
Type Here	Type Here	Select Date
Type Here	Type Here	Select Date
Type Here	Type Here	Select Date

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):	◉ **Yes** ◯ **No**	If no, specify (Type Here):

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):	○ **Yes** ◉ **No**

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
Iron	PWQO and CWQG	18.73% above PWQO and CWQG in spring SW3 sample. 27.1% above PWQO and CWQG in spring SW4 sample. 144.95% above PWQO and CWQG in spring SW5 sample. 17.35% above PWQO and DWQG in fall SW5 sample.
Type Here	Type Here	Type Here
Type Here	Type Here	Type Here
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)?	◉ **Yes** ○ **No**	

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.	(●) **Yes** ( ) **No**	
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)):	(●) Yes ( ) No ( ) Not Known ( ) Not Applicable	No remedial measures are necessary.
9) Have trigger values for contingency plans or site remedial actions been exceeded (where they exist):	( ) **Yes** (●) **No** ( ) **Not Applicable**	If yes, list value(s) that are/have been exceeded and follow-up action taken (Type Here)

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:

◉ **No Changes to the monitoring program are recommended**	Type Here
○ **The following change(s) to the monitoring program is/are recommended:**	
◉ **No changes to the site design and operation are recommended**	Type Here
○ **The following change(s) to the site design and operation is/are recommended:**	

CEP Signature	
Relevant Discipline	
Date:	March 15, 2024
CEP Contact Information:	Larry Rodricks Senior Principal Engineer
Company:	WSP Canada Inc.
Address:	900 Maple Grove Road, Unit 10 Cambridge, Ontario N3H 4R7
Telephone No.:	(519) 650-7108
Fax No. :	
E-mail Address:	larry.rodricks@wsp.com

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Appendix K

Limitations

Limitations

1. The work performed in the preparation of this report and the conclusions presented are subject to the following:
   a. The Standard Terms and Conditions which form a part of our Professional Services Contract;
   b. The Scope of Services;
   c. Time and Budgetary limitations as described in our Contract; and
   d. The Limitations stated herein.
2. No other warranties or representations, either expressed or implied, are made as to the professional services provided under the terms of our Contract, or the conclusions presented.
3. The conclusions presented in this report were based, in part, on visual observations of the Site and attendant structures. Our conclusions cannot and are not extended to include those portions of the Site or structures, which are not reasonably available, in WSP's opinion, for direct observation.
4. The environmental conditions at the Site were assessed, within the limitations set out above, having due regard for applicable environmental regulations as of the date of the inspection. A review of compliance by past owners or occupants of the Site with any applicable local, provincial or federal bylaws, orders-in-council, legislative enactments and regulations was not performed.
5. The Site history research included obtaining information from third parties and employees or agents of the owner. No attempt has been made to verify the accuracy of any information provided, unless specifically noted in our report.
6. Where testing was performed, it was carried out in accordance with the terms of our contract providing for testing. Other substances, or different quantities of substances testing for, may be present on-site and may be revealed by different or other testing not provided for in our contract.
7. Because of the limitations referred to above, different environmental conditions from those stated in our report may exist. Should such different conditions be encountered, WSP must be notified in order that it may determine if modifications to the conclusions in the report are necessary.
8. The utilization of WSP's services during the implementation of any remedial measures will allow WSP to observe compliance with the conclusions and recommendations contained in the report. WSP's involvement will also allow for changes to be made as necessary to suit field conditions as they are encountered.
9. This report is for the sole use of the party to whom it is addressed unless expressly stated otherwise in the report or contract. Any use which any third party makes of the report, in whole or the part, or any reliance thereon or decisions made based on any information or conclusions in the report is the sole responsibility of such third party. WSP accepts no responsibility whatsoever for damages or loss of any nature or kind suffered by any such third party as a result of actions taken or not taken or decisions made in reliance on the report or anything set out therein.
10. This report is not to be given over to any third party for any purpose whatsoever without the written permission of WSP.
11. Provided that the report is still reliable, and less than 12 months old, WSP will issue a third-party reliance letter to parties that the client identifies in writing, upon payment of the then current fee for such letters. All third parties relying on WSP's report, by such reliance agree to be bound by our proposal and WSP's standard reliance letter. WSP's standard reliance letter indicates that in no event shall WSP be liable for any damages, howsoever arising, relating to third-party reliance on WSP's report. No reliance by any party is permitted without such agreement.